



Vegetation Mapping Inventory Project

Minute Man National Historical Park, Massachusetts

Natural Resource Report NPS/MIMA/NRR—2017/1450



ON THE COVER

Managed Wooded Pasture in Minute Man National Historical Park
Photograph by: Sue Gawler, NatureServe

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Executive Summary

Vegetation classification and mapping of Minute Man National Historical Park (MIMA) was conducted as a part of the National Park Service Vegetation Mapping Inventory (NPS-VMI) by NatureServe and the James W. Sewall Company. After a scoping session with park staff and field reconnaissance, a preliminary vegetation classification for the park based on the U.S. National Vegetation Classification (USNVC) and other existing information was developed. Thirty-nine vegetation classification plots were sampled in the summer of 2004. Plot sampling included information on vegetation structure, composition and individual species cover by vegetation stratum, and environmental setting. Quantitative analysis of the plot data, along with supplemental observations, defined the final vegetation classification for the park.

Twenty-seven (27) USNVC vegetation associations were described for MIMA. The upland forests that characterize the area include three oak-dominated forest associations, a mixed pine - oak forest association, one northern hardwood forest association, and two early successional forest associations dominated by non-native tree species. Wetland forests include two floodplain forest associations and three red maple-dominated swamp associations. Upland herb-dominated areas were predominantly wooded pastures and old-field vegetation with one area of sandplain grassland. Shrub-herb wetlands included two fen associations, six herbaceous wet meadow or marsh associations (including two exotic-dominated associations), three shrub swamp associations, and one aquatic vegetation association.

The Dry Oak - Hickory Forest and Red Oak - Red Maple Successional Forest are the matrix vegetation at MIMA. Forested wetlands and open marshes are regularly interspersed. Invasive species are common in both upland and wetland habitats. Natural and semi-natural vegetation patches are highly fragmented as a result of previous and ongoing land use, both within and outside MIMA.

Remotely sensed mapping of the vegetation types was conducted using leaf-off (non-growing season) color infrared aerial photography and color orthophotos from the growing season. Stands representing classified vegetation associations were mapped onto acetate overlays of the aerial photos, orthorectified and converted to a Geographic Information System (GIS) polygon theme. The aerial photos were separately orthorectified into a Multiresolution Seamless Image Database (MrSID) file to aid interpretation of the vegetation map.

Mapping to the association level was not always possible, and map classes representing aggregations of ecologically similar associations were created where necessary. Twenty (20) map classes were employed to represent the 27 USNVC vegetation associations and six Anderson Level II land use categories that represent cultural vegetation or non-vegetated land cover. One hundred nine accuracy assessment (AA) points were visited in the field in order to estimate the accuracy of the vegetation map. The overall map accuracy was estimated to be 67.5% at the level of the finest thematic resolution (20 map classes total) and estimated to be 85.9% when these map classes are aggregated to the thematic resolution levels of USNVC division for natural vegetation and of Anderson Level II for cultural vegetation (10 map classes total).

Detailed descriptions of the local and global expressions of each vegetation association, a field key to the associations and map classes, a photointerpretation key to map classes, a plant species list, metadata for the vegetation map and the plot data, and an index to photographic documentation are included as appendixes. A geodatabase containing GIS data for the vegetation map and the spatial locations of plot and AA points, the digital orthophoto developed for MIMA, and a database containing information on vegetation classification plots and accuracy assessment observations are also products of this project.

Keywords: vegetation association, vegetation classification, vegetation mapping, Minute Man National Historical Park (MIMA).

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Chris Lea, Jim Von Loh, and Dan Cogan of Cogan Technology, Inc. edited and updated this report and its associated products to reflect 2016 National Park Service and U.S. National Vegetation Classification standards.

Acronyms and Abbreviations

AA	Accuracy Assessment
ac	Acre(s)
CEGL	Community Element Code – Global
CIR	Color Infrared
cm	Centimeters
CONUS	Continental United States
DEM	Digital Elevation Model
DOQQ	Digital Orthophoto Quarter Quadrangle
dpi	Dots Per Inch
e.g.	for example (<i>exempli gratia</i>)
ERDAS	Earth Resources Data Analysis System
ESRI	Environmental Systems Research Institute
et al.	and others (<i>et alia</i>)
etc.	and others, and so forth, and so on (<i>et cetera</i>)
FGDC	Federal Geographic Data Committee
ft	Foot/Feet
GIS	Geographic Information System
GMP	General Management Plan
GPS	Global Positioning System Receiver
ha	Hectare(s)
I&M	Inventory and Monitoring Program
i.e.	that is (<i>id est</i>)
in	Inch(es)
km	Kilometer(s)
m	Meter(s)
MA	Massachusetts
mi	Mile(s)
MIMA	Minute Man National Historical Park
MMU	Minimum Mapping Unit
MNH&ESP	Massachusetts Natural Heritage and Endangered Species Program
MrSID	Multiresolution Seamless Image Database
N/A	Not Applicable
NAD83	North American Datum of 1983
NCSU	North Carolina State University
NCSU-CEO	North Carolina State University-Center for Earth Observation
NED	National Elevation Dataset
NETN	Northeast Temperate Inventory and Monitoring Network
NMS	Non-metric Multidimensional Scaling
NPS	National Park Service
NRC	Natural Resources Challenge (National Park Service program)

NRTR	Natural Resources Technical Report
NPS-VMI	National Vegetation Mapping Inventory (National Park Service)
PA	Pennsylvania
RMSE	Root Mean Square Error
sp./spp.	Species (singular/plural)
TIFF	Tagged Image File Format
TNC	The Nature Conservancy
U.S.	United States of America
USDA	United States Department of Agriculture
USDA-NRCS	United States Department of Agriculture-Natural Resources Conservation Service (formerly United States Department of Agriculture-Soil Conservation Service)
USDA-SCS	United States Department of Agriculture-Soil Conservation Service
USDI	United States Department of the Interior
USGS	United States Geological Survey
USNVC	United States National Vegetation Classification
UTM	Universal Transverse Mercator
VT	Vermont
WAAS	Wide Area Augmentation System

Introduction

The purpose of this project was to produce a standardized map and classification of the vegetation communities and land cover of Minute Man National Historical Park (MIMA), a unit of the National Park Service (NPS) and to provide thorough baseline data on the park's vegetation. These products can inform natural resource decision-making in the development and implementation of the MIMA General Management Plan (GMP), the Inventory and Monitoring Network's Vital Signs Monitoring Plan, and the MIMA Long-Range Interpretive Plan (USDI-NPS 2015b). They can also assist in the evaluation of potential impacts to vegetation and wildlife habitat when environmental assessments are prepared to address future construction and maintenance projects and management actions. This project is part of the NPS Vegetation Mapping Inventory (NPS-VMI), a national program to map and describe the vegetation of national parks using the United States National Vegetation Classification (USNVC).

NPS National Vegetation Mapping Inventory

In 1998, the United States Congress passed the Omnibus National Parks Management Act, which became Public Law 105-391. Section 204 of this law directs the Secretary of the Department of the Interior to “undertake a program of inventory and monitoring of National Park System resources to establish baseline information and to provide information on the long-term trends in the condition of National Park System resources” (16 United States Code 5934). Pursuant to this mandate, the Director of the NPS approved the Natural Resource Challenge (NRC) in 1999 to facilitate the preservation of the nation's natural heritage through science, natural resource inventories, and expanded resource monitoring (USDI-NPS 1999). The NRC provided the funding for 12 baseline inventories to be completed in each of 270 parks with significant natural resources. The NPS-VMI, begun in 1994 as a partnership with the U.S. Geological Survey (USGS), was assimilated into the NRC as one of the inventories, and funding was increased to accelerate Service wide completion of the inventory. The objectives of the NPS-VMI are to classify, describe, and map vegetation in 270 National Park units. Using vegetation data specific to a park unit enables park managers to conserve biodiversity, manage challenges such as exotic species, pest outbreaks, and diseases, and understand resources and processes such as wildlife habitat relationships and wildland fires, in a more effective and efficient manner. The NPS-VMI is supervised by staff in Fort Collins, Colorado and funded at the national level of the NPS, but individual NPS unit projects typically are overseen by local NPS staff located in 32 Inventory and Monitoring (I&M) network offices that were also established by the NRC and are more local to clusters of individual park units.

The NPS-VMI uses quality control and methodology procedures for data collection and production of vegetation and land cover maps in order to ensure the reliability of the vegetation data and to encourage the use of resulting maps, reports, and databases at multiple scales (*e.g.*, TNC and ESRI 1994, Lea and Curtis 2010). A complete vegetation classification and mapping project for a park includes, at a minimum, the following products:

- Detailed vegetation report
- Digital vegetation map

- Vegetation classification plot data
- Accuracy assessment data and analysis
- Dichotomous vegetation key
- Photo-interpretation key

Classified vegetation types are described both as they appear locally at individual park units and also in the national context of the USNVC, using recognized USNVC units, whenever feasible (Lea 2011). Vegetation map classes are based on the locally classified vegetation types. Maps are produced in Universal Transverse Mercator (UTM) coordinates (NAD 83) with a 1:24,000 scale and a minimum mapping unit of 0.5 hectares (ha) (1.24 acres (ac)). The vegetation maps must meet the FGDC National Map Accuracy Standards (1998b) for positional accuracy (which specify horizontal errors of less than 40.0 feet (ft) (12.2 meters (m)) on the ground for 1:24,000-scale maps). The overall (entire map) thematic accuracy goal is at least 80%. In addition to assessing overall thematic accuracy, the accuracy of individual map classes that comprise the map is assessed and reported; these estimates allow users to be informed of map limitations (Lea and Curtis 2010). Digital vegetation products are accompanied by FGDC-compliant metadata, which describe the content, quality, condition, and other characteristics of the spatial dataset and are critical elements that expedite the interpretation and exchange of information among users. NPS-VMI products are available through the NPS Data Store (<http://science.nature.nps.gov/im/datamgmt/IRMA.cfm>).

U.S. National Vegetation Classification

The USNVC is a hierarchical system for vegetation classification within the United States that was originally developed by The Nature Conservancy (TNC) (Grossman et al. 1998). The Federal Geographic Data Committee adopted the upper hierarchy levels of the original TNC version with some modifications as a federal standard (FGDC-STD-005) (FGDC 1997) which was intended to facilitate the sharing and merging of vegetation data throughout the United States. In 2008, the FGDC adopted a new version of the USNVC (FGDC 2008); this version extensively revised the upper levels of the hierarchy into units that were more coherent biogeographically, floristically, and ecologically than were the units of the 1997 version, which were more strongly based on vegetation physiognomy and structure. Since 2008, the FGDC and partners, including the Ecological Society of America Panel on Vegetation Classification, NatureServe, and individual federal agencies including the NPS have supported the development of taxonomic units for the revised hierarchy and the dissemination of the content of the USNVC and its public availability (USNVC 2015).

The upper three hierarchy levels of the USNVC (class, subclass, and formation) are based on vegetation physiognomic characteristics that reflect patterns of climate, hydrology, and substrate that recur globally (USNVC 2015). The fourth level (division) represents geographic partitions of Formations that vary by major intracontinental climate and biogeographical patterns at the scale of biotic regions, provinces, or subprovinces (Dice 1943, McLaughlin 2007). Most divisions recognized by the USNVC are unique to North America. The next levels (macrogroup and group) subdivide divisions based on broad sets of diagnostic plant species and habitat factors along intraregional topographic, edaphic, and disturbance gradients. Units of the lower two levels (alliance and association) are distinguished from one another by differences in local floristic composition.

Alliances are physiognomically uniform groupings of plant associations that share dominant or diagnostic species, usually in the uppermost stratum of the vegetation. Alliances are generally more wide-ranging geographically than are associations, although many monotypic alliances have been classified.

The basic unit of vegetation classification in the USNVC is the association (a plant community type that is relatively homogeneous in composition and structure, and occurs in a uniform habitat). Associations are roughly equivalent in taxonomic scale to the plant association of European phytosociologists (Mueller-Dombois and Ellenberg 1974). They are defined from a rangewide perspective and are assigned global rarity ranks as well as ranking specifications to be applied to individual occurrences of associations across their range. A map of associations occurring at a site can provide information about the abundance and distribution of each type, the significance of the individual occurrences, as well as providing surrogate information about the location and abundance of individual species characteristic of the association.

Each association that is recognized by the USNVC (USNVC 2015) is assigned a unique Community Element Global code (CEGL). For example, the Eastern Hemlock - American Beech - Northern Red Oak Forest (CEGL006088) is a widespread association in southern New England that ranges south locally in the northern Piedmont and High Allegheny Mountains. Associations are also assigned global rarity ranks that indicate their conservation status and relative risk of extirpation (Grossman et al. 1998). Associations from the USNVC are often equivalent to communities in state-specific vegetation classifications such as Classification of the Natural Communities of Massachusetts (Swain and Kearsley 2011, Version 1.4 described below) and can usually be translated to equivalent units (e.g., associations or community types) of state agency classifications.

Several associations that share one or more dominant or characteristic species can be grouped to form an alliance which is generally more wide-ranging geographically than associations, covering multiple habitats and broader species composition. For example, the Eastern Hemlock - American Beech - Northern Red Oak Forest (CEGL006088) association and the Eastern Hemlock - Yellow Birch - Sugar Maple/Intermediate Woodfern Forest (CEGL006109) are grouped into the Eastern Hemlock - Yellow Birch Forest Alliance. An association with unique species composition or environmental niche can be assigned to its own alliance, such that the alliance only contains one association instead of multiple associations.

Massachusetts Natural Heritage and Endangered Species Program (MNH&ESP) Relation to the USNVC

In 1984, TNC, Eastern Regional Office prepared the unpublished manuscript, the *New England Natural Community Classification* (Rawinski 1984), a classification of natural and human-influenced communities that included Massachusetts. This TNC classification became the primary source for natural community classification in Massachusetts and a contributory reference for natural community classifications in the northeastern United States. First published in 2001 and updated through 2011, the MNH&ESP developed an updated classification for Massachusetts to provide a useful framework for describing, inventorying, and tracking natural communities (Swain and Kearsley 2011, Version 1.4). This natural community classification was designed to describe

vegetation at a scale that is meaningful for conservation and land protection. It reduced the natural vegetation complexity to 105 community types of somewhat homogenous and relatively easily understood, but abstract and artificial, groups. Its intent is to describe community types that can be identified in the field and to accurately (if arbitrarily) divide the vegetation into identifiable and useful categories; attempts were made to use community names that are recognizable and meaningful to a broad conservation audience from local civic planners to field ecologists. Swain and Kearsley (2011) encourage input into the classification categories and delineations relative to the intended use for conservation, including a focus on uncommon community types.

More specifically, Swain and Kearsley (2011) is a state-based classification system of ecological habitats that occur within Massachusetts using three major sections: Terrestrial, Palustrine, and Estuarine (Aquatic communities are not addressed in this classification). As the composition and structure of the community types become better defined, future splitting or lumping may occur within currently identified vegetation types. For example, the complex of communities characterized by oak trees and another inter-related group characterized by red maple may be further split as additional data are collected and analyzed.

Swain and Kearsley (2011) did identify recurrent groupings of plant species (and associated animal species) that shared responses to environmental conditions. These natural community types vary in response to gradients of temperature gradients, soil moisture, soil nutrient content, soil acidity, and other factors in a multidimensional, rather than linear, manner (Swain and Kearsley 2011). Although not generally of conservation focus, cultural plant communities (those planted or maintained by humans, including forest plantations, orchards, pastures, etc.) concepts could be expanded, however at this time they remain lumped into a few groups, typically categorized by land use. The role of land use history is important to consider relative to plant communities of Massachusetts, as over 300 years of intensive land use has occurred.

The classification of Swain and Kearsley (2011) focuses on the natural communities of Massachusetts which are closely related to regional natural communities of the surrounding states. The Massachusetts community type descriptions include lists of synonyms for the surrounding states, each of which has also developed classifications for natural communities within their boundaries. The USNVC and these synonyms are included in the Massachusetts classification, thus allowing some community types to be more finely divided into multiple associations, as recognized by the USNVC (USNVC 2015). Swain and Kearsley (2011) have also prepared a cross-walk to the earlier classification of Rawinski (1984) and have noted that for northern forest types, there is a lack of precision in this cross-walk (at least partially a result of the lack of clear boundaries between types).

MNH&ESP is an active participant in NatureServe, the international network of biodiversity data centers. The network includes natural heritage programs in all 50 states and several interstate regions and 21 Conservation Data Centers in Canada and Central and South America. These programs work with NatureServe to develop biodiversity data, maintain compatible standards for data management, and provide information about rare species and natural communities that is consistent across many geographic scales from sites to continents. MNH&ESP collaboration with NatureServe, other states, and nations places local information into a broader regional context.

NPS Northeast Temperate Network

Through the NRC, the 270 national parks with significant natural resources were organized into 32 networks for the purpose of accomplishing natural resource inventory and monitoring projects in a more localized, cost-effective manner. One of the networks, the Northeast Temperate Network (NETN) (Figure 1), headquartered in Woodstock, Vermont, is comprised of 13 parks located in seven northeastern states as well as six additional states through which the Appalachian National Scenic Trail passes. These parks are Acadia National Park, Appalachian National Scenic Trail (from Maine to Maryland), Boston Harbor Islands National Recreation Area, Home of Franklin D. Roosevelt National Historic Site, Eleanor Roosevelt National Historic Site, Marsh-Billings-Rockefeller National Historical Park, Minute Man National Historical Park, Morristown National Historical Park, Saint-Gaudens National Historic Site, Saratoga National Historical Park, Saugus Iron Works National Historic Site, Vanderbilt Mansion National Historic Site, and Weir Farm National Historic Site (USDI-NPS 2015d). Collectively, the 13 parks comprise nearly 57,933 ha (143,156 ac) and range considerably in size (3-to-34,398 ha) (9-to-85,000 ac) and topographic relief.



Figure 1. Parks of the Northeast Temperate Network [Source: USDI-NPS (2015d)].

NETN parks are located within the temperate deciduous forest biome (characteristic trees are broadleaf/deciduous including species of oak, maple, beech, hickory, and chestnut). Deciduous forest regions are exposed to warm and cold air masses, which results in four distinct seasons. Temperature varies widely from season to season with cold winters and hot, wet summers. The areas in which deciduous forests are located receive from 75-to-150 cm (29.5-to-59.1 inches) of precipitation throughout the year. The diversity of ecological communities established within NETN park units range from tidal wetland and other coastal communities, freshwater wetlands and vernal pools, and deciduous, mixed, and evergreen forests.

NETN staff oversees ongoing network-wide natural resource monitoring programs and also facilitate the implementation of the nationally funded baseline inventories, including this project at MIMA, as they are implemented at individual parks within the network.

Project Area and Minute Man National Historical Park

Minute Man National Historical Park (MIMA) was established in 1959 as a historical park unit within the National Park Service (USDI-NPS 2015a). It is located 16 miles (~26 kilometers) northwest of Boston in Concord and Lexington in Middlesex County, Massachusetts (Figures 2 and 3).

MIMA preserves the location of the first exchange of gunfire on April 19, 1775 at North Bridge in Concord, Massachusetts and subsequent skirmishes between colonial militia and the British army during the American Revolutionary War. More specifically, MIMA preserves and interprets: (1) the historic landscape along the road between Lexington and Concord; (2) sites associated with the causes and consequences of the American Revolution; (3) the Wayside on Lexington Road in Concord, the home of Nathaniel Hawthorne, Bronson Alcott, Louisa May Alcott, and Margaret Sidney (whose works illustrate the 19th century American literary renaissance); and (4) Barrett's Farm, the home of Colonel James Barrett, the 1775 commander of the Middlesex Militia (P.L. 111-11 2009; P.L. 102-488 1992) (USDI- 2015b).

MIMA was assembled from multiple acquisitions that have occurred since the park's establishment in 1959 and now includes the sites of numerous historical events along the roadway from Concord to Lexington, Massachusetts. MIMA includes 420 hectares (1,038 acres) within four units, they are: (1) Battle Road Unit (849 acres, 344 hectares); (2) North Bridge Unit (112 acres, 45 hectares); (3) The Wayside Unit (6 acres, 2.5 hectares; and (4) Barrett's Farm Unit (71 acres, 29 hectares; the Barrett's Farm Unit was acquired by NPS following completion of the MIMA vegetation inventory, and its lands were not included in this project).

MIMA is different from many national parks due to its historical land use practices. Human alteration of the land for agriculture and resource development (e.g., forestry, grazing, hay fields, etc.) and general human habitation has maintained the landscape in an altered state for hundreds of years. As late as the 1960s most of the park remained a suburban area, containing commercial development such as motels, restaurants, and gas stations. Since the establishment of MIMA, the landscape has trended towards an increasingly vegetated state as the park has moved closer to its goal of representing condition of the landscape during the colonial period of the American Revolution.

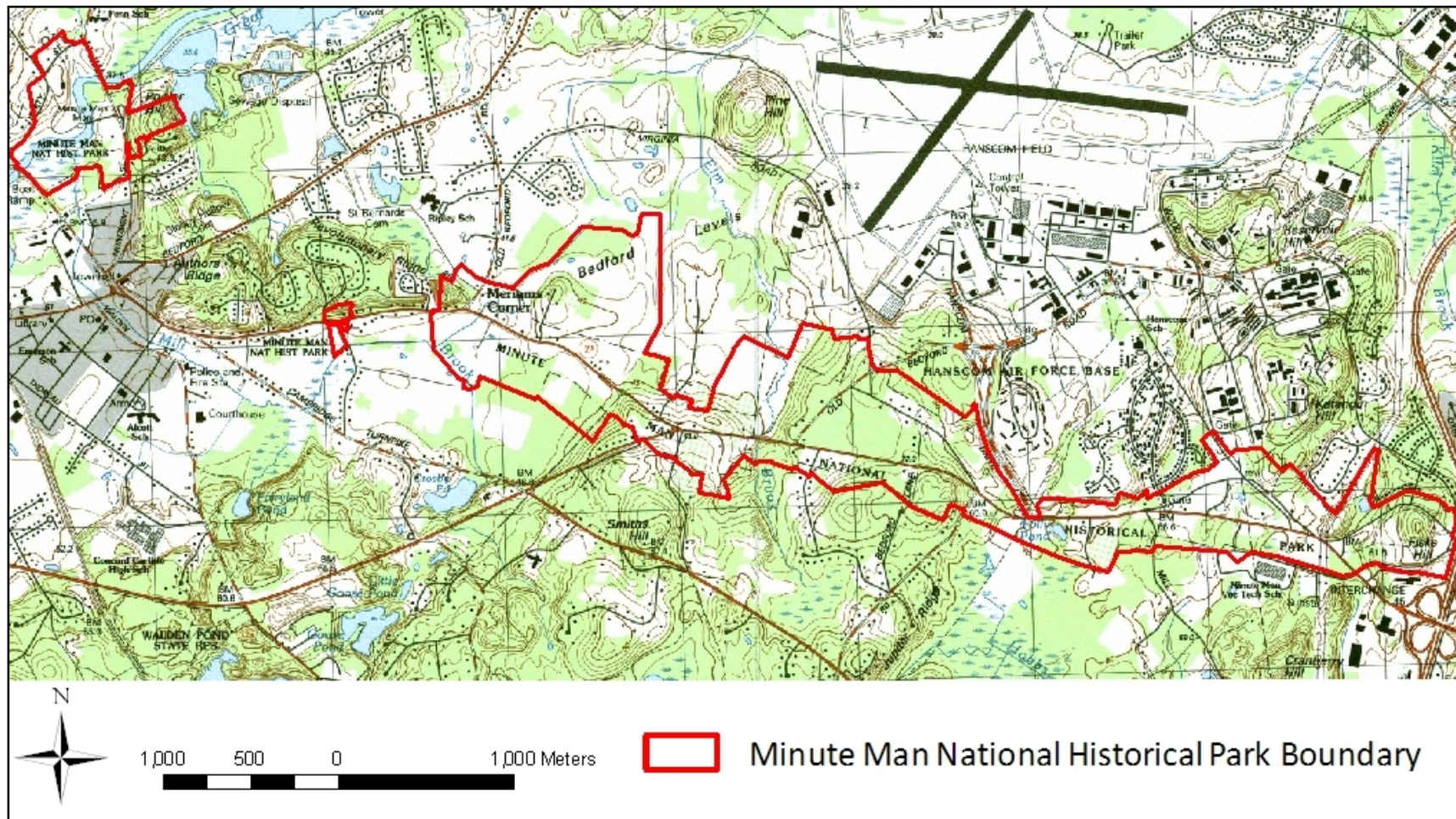


Figure 2. Location of Minute Man National Historical Park, Middlesex County, on the Lexington and Concord, MA 1:24,000 USGS topographic quad maps. From west to east, units are North Bridge Unit, Wayside Unit, and Battle Road Unit. The Barrett's Farm Unit, recently added to the park and not included in this project, lies to the west of The North Bridge Unit.

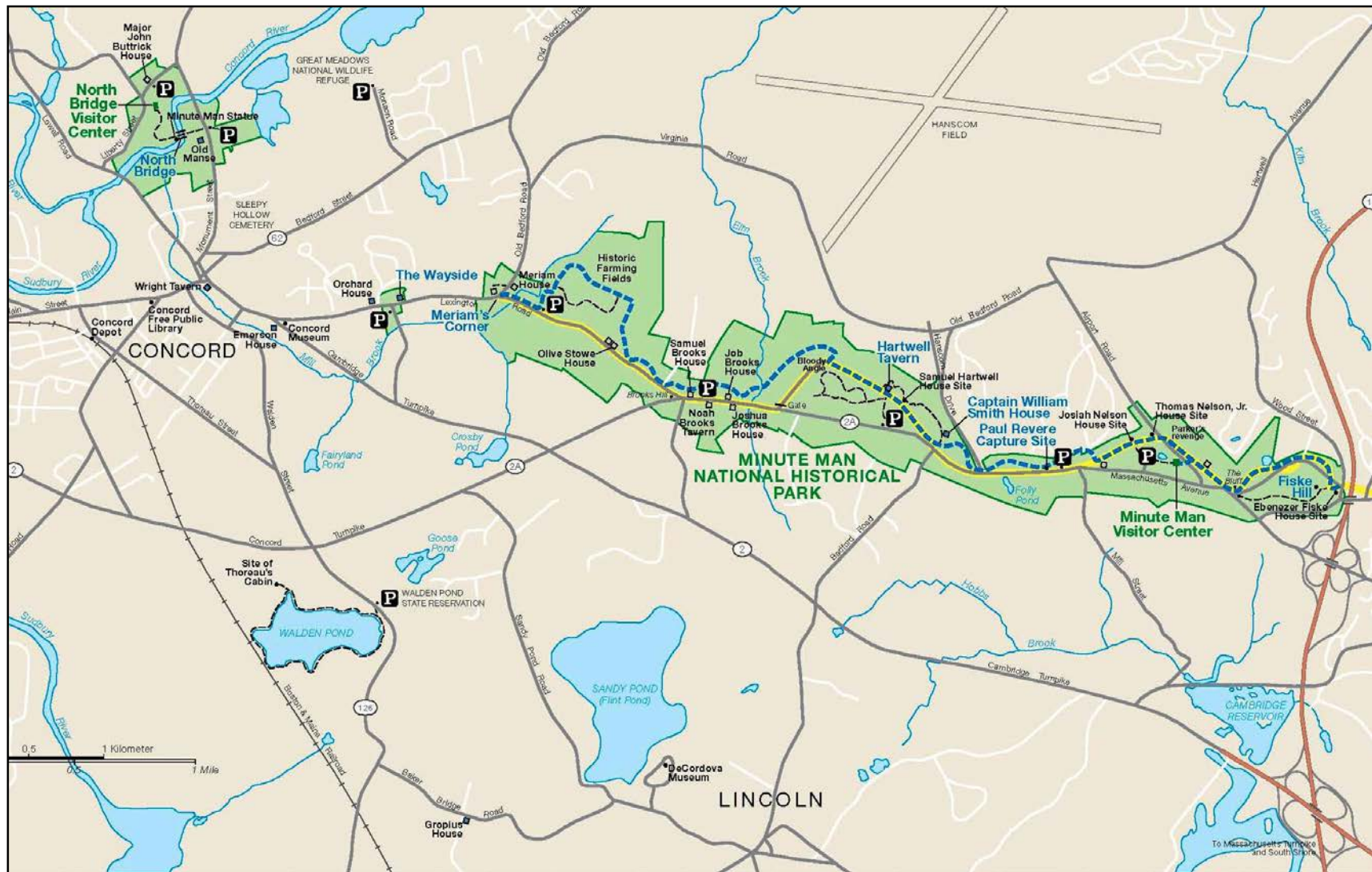


Figure 3. Overview of Minute Man National Historical Park (from the NPS MIMA Brochure Map).

Park Environmental Attributes

MIMA lies within mature suburbs experiencing continual growth pressures for residential, commercial, and industrial development (USDI-NPS 2015a). Developed areas consisting of roads, trails, bridges, parking lots, and buildings occur throughout MIMA. The Concord River flows through the North Bridge Unit, while Route 2A traverses the Wayside and Battle Road Units. The park is bordered by Hanscom Civilian Air Field and Air Force Base, privately owned land, and a variety of public and conservation lands.

The general landscape of MIMA is comprised of small-scale, irregular topography with elevations ranging from 35 m (115 ft) at the Concord River to 88 m (290 ft) at Fiske Hill. The topography consists of low hills with gradual slopes (generally 10-20%), intersected by the Concord River and smaller streams and other wetlands. The entire area displays its geologic processes including a recently glaciated past and consists of rocky hilltops with pockets of sands and gravels. Most low areas are less rocky. The borders of the Concord River and Elm Brook are locally flat with organic soils. The lower slope of the hill on the east side of Elm Brook is very rocky.

Despite its suburban setting, the park supports a variety of vegetation and habitat types, including forests, shrublands, pastures, old fields, ponds, and wetlands (forested and shrub swamps, seasonal ponds, fens, wet meadows, and marshes). Forest (upland and wetland) communities provide cover for approximately half of MIMA's acreage. Within upland forest, woodland, and shrubland communities, characteristic trees and shrubs include sugar maple (*Acer saccharum*), silver maple (*Acer saccharinum*), white oak (*Quercus alba*), American beech (*Fagus grandifolia*), glossy buckthorn[†] (*Frangula alnus* = *Rhamnus frangula*), common buckthorn[†] (*Rhamnus cathartica*), and Morrow bush honeysuckle (*Lonicera morrowii*). Active farmlands are managed under an agricultural leasing program.

Common mammals include species typically associated with rural and developed areas, including eastern cottontail (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), deer mouse (*Peromyscus maniculatus*), beaver (*Castor canadensis*), red fox (*Vulpes vulpes*), Eastern coyote (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*), and the less common bobcat (*Lynx rufus*) and fisher (*Martes pennanti*) (USDI-NPS 2015a). During biotic species inventories, MIMA was found to support 940 known vascular plant taxa; vertebrate wildlife inventories documented 19 species of amphibians, 15 reptile species, 118 bird species, 48 species of mammals, and 26 fish species, in addition to many invertebrates, nonvascular plants, fungi, and microorganisms (USDI-NPS 2015e).

The extent and condition of environmental features at MIMA have been and continue to be influenced by a variety of factors, including natural and social changes, historical and modern land-use in the area, and non-native species introductions and invasions. By the turn of the 18th century, approximately 90% of land currently within the boundary had been converted to agriculture.

[†] See Appendix J for more information on the distribution on *Rhamnus* species

Although extensive meadows existed in the area prior to European settlement, forests were cleared to create pasture and cultivated cropland; for example, in 1600, an estimated 30% of the Battle Road Unit supported open fields and meadows, by 1775, the percentage of fields had increased to more than 80%, and at the time of MIMA designation in 1959, many acres of abandoned agricultural land had reverted to forest or had been developed for residential and commercial purposes. Since MIMA establishment, many 20th century structures have been removed or demolished and the sites have been planted to forest or meadow communities. Planning is also underway to remove additional structures to support forest and meadow restoration.

The distribution of plant and animal species closely corresponds with ecoregion boundaries which define areas of ecological homogeneity with similarities in soil, physiography, climate, hydrology, geology, and vegetation. Within the ecoregion classification of The Nature Conservancy (TNC) (TNC 2001), MIMA is located in the Gulf of Maine Subsection (221Ai) of the Lower New England – Northern Piedmont (LNE) Ecoregion (Keys et al. 1995) near its boundary with the North Atlantic Coast (NAC) Ecoregion (Figure 4). In the context of the

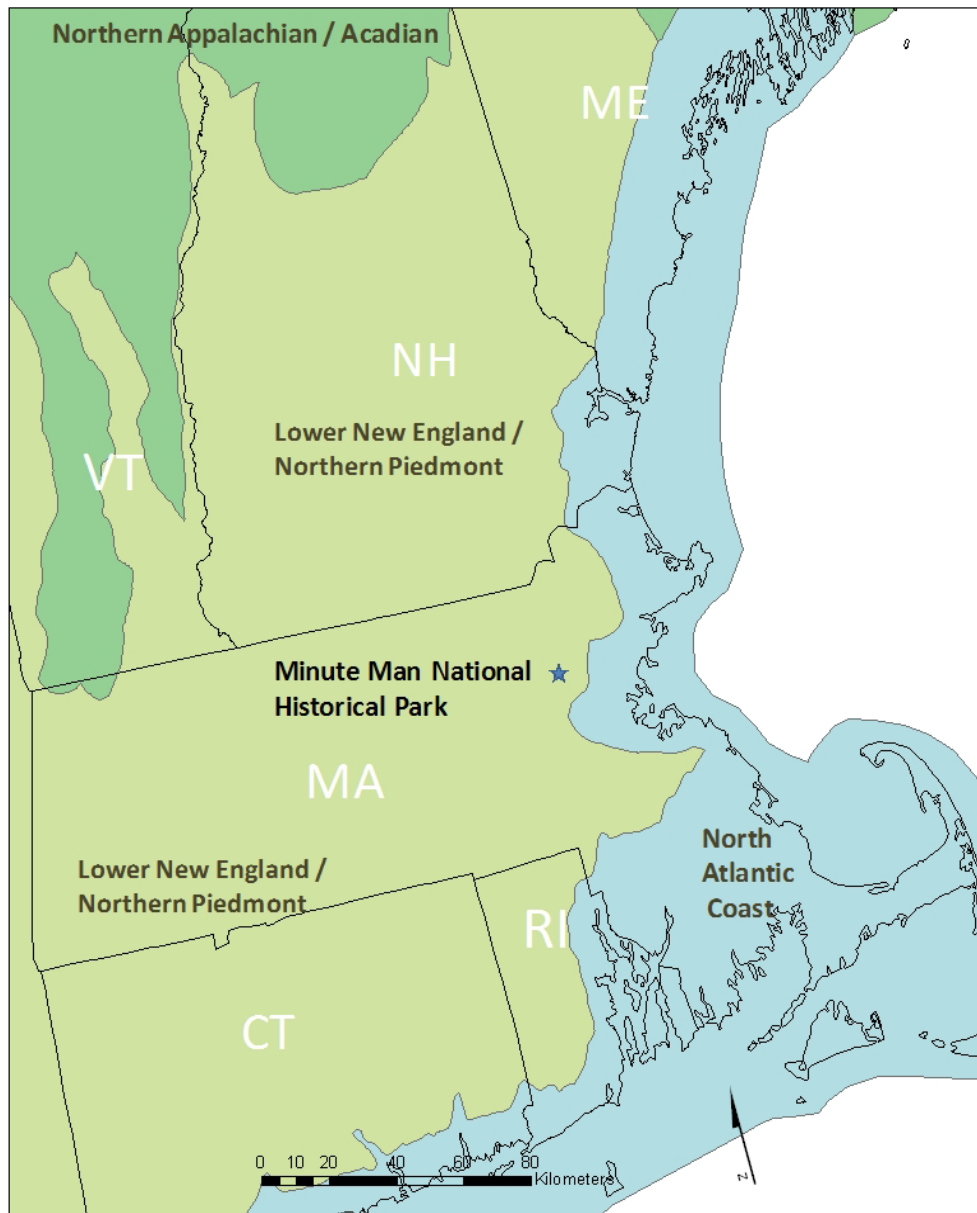


Figure 4. Ecoregion setting of Minute Man National Historical Park.

ecoregion classification adopted by the U.S. Environmental Protection Agency (Omernik and Griffith 2008), MIMA is within the Gulf of Maine Coastal Plain Sub-ecoregion (59h), Northeastern Coastal Zone Ecoregion (8.1.7), Mixed Wood Plains (8.1), and Eastern Temperate Forests (8.0). The USDA Forest Service (Bailey 1997) classifies the area of MIMA as within the Eastern Broadleaf Forest (Oceanic) Province (221), which, in turn, is within the Humid Temperate Domain; Hot Continental Division (220). This ecoregion occupies the low, formerly glaciated, and rolling topography of the mid-Atlantic coastal plain in eastern Massachusetts (Bailey 1997). The ecoregion is characterized by a temperate deciduous forest of the dominant white and northern red oak trees which provides dense canopy cover in the summer; prior to leaf-out in the spring, a dense ground cover of herbaceous

species becomes established. Much of the basin and associated slopes and ridges have been developed to commercial and residential land uses and the associated infrastructure.

Geology

A series of accreted terranes comprise the bedrock underlying eastern Massachusetts and MIMA. An accreted terrane is a crustal block or fragment that exhibits distinctive geology, attached onto the margin of a continent as a result of tectonic processes. The *Geologic Resource Evaluation Scoping Summary Minute Man NHP and Saugus Iron Works NHS* (Thornberry-Ehrlich 2008) described the easternmost terrane (Avalon Terrane) as tangentially colliding with North America during the Acadian orogenic event about 390 million years ago. The Bloody Bluff fault that runs through MIMA separates the Avalon Terrane from the Nashoba Terrane to the west. Deformation along this fault was oblique as the Avalon Terrane subducted beneath and slid past the Nashoba Terrane. The Bloody Bluff exposures within MIMA consist chiefly of diorite in various stages of alteration and deformation (Cuppels 1961). The Nashoba Terrane is comprised of metamorphosed volcanics, volcanogenic sediments, and intrusions of diorite, granite, and tonalite (Goldsmith 1991b) and comprises the majority of bedrock geology of MIMA, where it is represented primarily by the map units of Andover [gneissic] granite and Assabet quartz diorite (USDI-NPS 2014a) (Figure 5). The Avalon terrane includes metasedimentary and metavolcanics, gabbroic and granitic intrusions, and granites and occupies a small area at the east end of MIMA (east of the Bloody Bluff fault, where the Fiske Hill granite and the Westboro Formation (primarily quartzite) (Goldsmith 1991a, USDI-NPS 2014a) (Figure5).

Pleistocene glaciers covered eastern Massachusetts and glacial to post-glacial surficial features presently dominate the landscape of MIMA (Thornberry-Ehrlich 2008). Glaciers deposited mantles of glacial till across the area as they retreated. Glacial lakes, formed as ice melted, deposited additional lacustrine sediments in low areas of the landscape. As a result, gently undulating hills, muted ridges, broad stream valleys, kettle ponds, and flatlands of meadows and fields characterize the landscape of the MIMA region, which is generally classified and mapped under Glacial Stratified Deposits and Glacial Till Deposits with areas of near-to-surface bedrock and bedrock outcrops (Stone and Stone 2006, USDI-NPS 2014b).

The Glacial Stratified Deposits mapping unit includes both Coarse Deposits and Fine Deposits as sub-mapping units (Stone and Stone 2006). Deposited and layered by glacial meltwater, this mapping unit generally is characterized by sorted and stratified sediments including layers of gravel, sand, silt, and clay. Coarse Deposits are composed of gravel deposits, gravel-sized clasts, cobbles, and boulders; sand and gravel deposits; and sand deposits. Fine Deposits are composed of very fine sand, silt, and clay that are well-sorted and thinly layered.

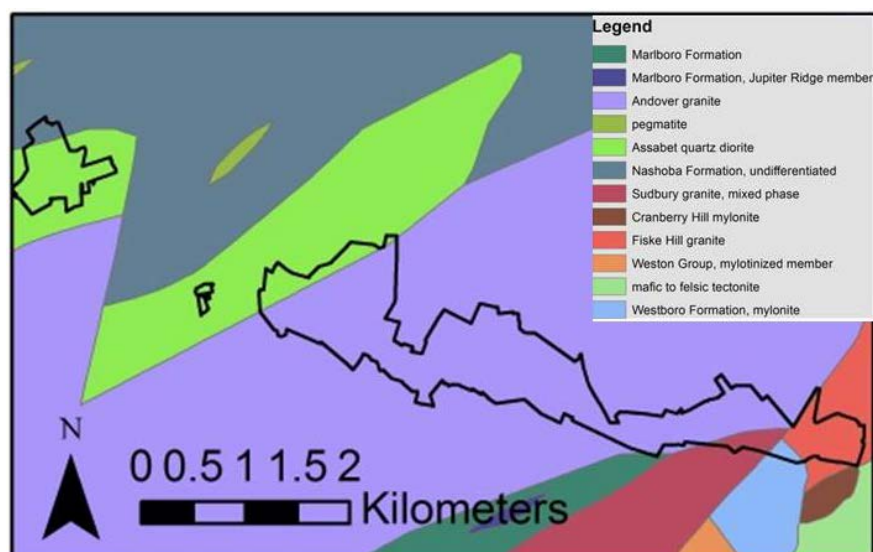


Figure 5. Map of bedrock geology of Minute Man National Historical Park (USDI-NPS 2014a).

The Glacial Till Deposits, classified as predominantly Thin Till in the area of MIMA, are characterized by a non-sorted and non-stratified matrix composed of sand, some silt, and little clay in addition to scattered gravel clasts, a few large boulders, and some bedrock outcrops (Stone and Stone 2006). Much of the associated bedrock underlies the surface till deposits by 10-15 feet (3.1-4.6 m).

Post-glacial surface deposits, include alluvium, primarily in the North Bridge Unit of MIMA along the Concord River, and swamp (palustrine) deposits lie atop the glacial till and form a minority of the surficial geology of MIMA (Stone and Stone 2006; USDI-NPS 2014b).

Soils

A detailed account of MIMA soil types was prepared in the *Soil Survey of Middlesex County, Massachusetts* (USDA-SCS 1991). Regionally, these soils have developed in the approximately 10,000 years since glaciations retreated; they have undergone little weathering compared to soils in unglaciated areas and they display weak soil horizon development. Due to agricultural activities since settlement, particularly with the use of mechanized farming practices, there is a distinct plow layer present in many soils. Additionally, these farmed lands have likely received soil amendments to improve crop production including organic matter such as green and livestock manures, lime, and fertilizer (USDA-SCS 1991). Also in support of agricultural and development land uses, there may be areas of artificially drained soils and filling of naturally wet sites.

Forty-three (43) soil mapping units in 21 soil associations have been identified and mapped at MIMA (USDI-NPS 2009) (Figure 6, Table 1); seven of the associations have been designated as Prime Farmland (USDA-SCS 1991).

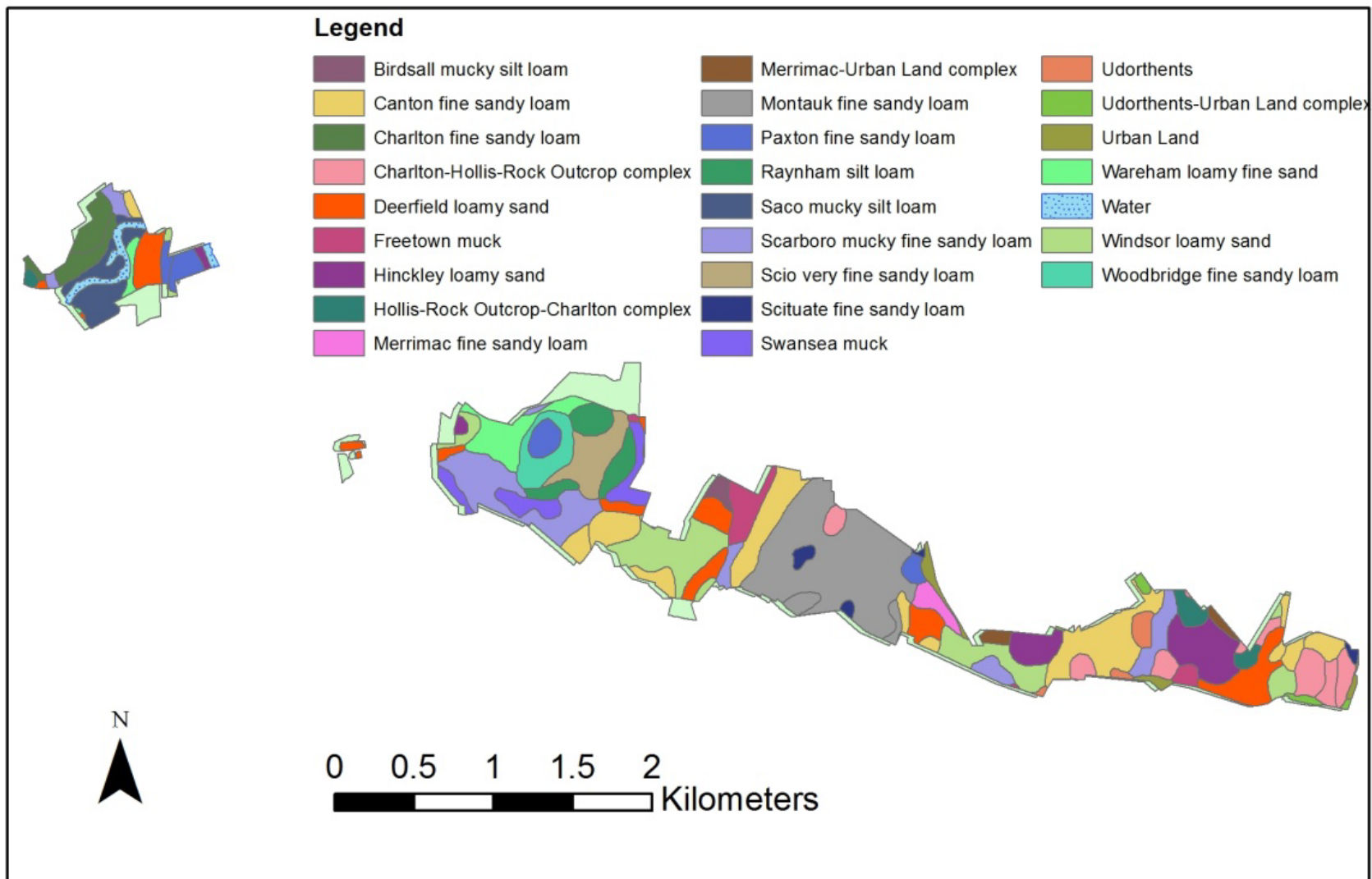


Figure 6. Map of the soil associations of Minute Man National Historical Park (from USDI-NPS 2009).

Table 1. Soil map units of Minute Man National Historical Park (USDI-NPS 2009).

MAP UNIT NAME	ACRES	% OF MIMA
Birdsall mucky silt loam, 0 to 1 percent slopes	5.0	0.5%
Canton fine sandy loam, 3 to 8 percent slopes	59.0	6.4%
Canton fine sandy loam, 3 to 8 percent slopes, extremely stony	16.6	1.8%
Canton fine sandy loam, 8 to 15 percent slopes, extremely bouldery	4.0	0.4%
Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	38.9	4.2%
Canton fine sandy loam, 15 to 25 percent slopes, extremely bouldery	3.6	0.4%
Charlton-Hollis-Rock Outcrop Complex, 3 to 8 percent slopes	35.6	3.9%
Charlton-Hollis-Rock Outcrop Complex, 8 to 15 percent slopes	9.8	1.1%
Charlton fine sandy loam, 3 to 8 percent slopes	12.9	1.4%
Charlton fine sandy loam, 8 to 15 percent slopes	13.6	1.5%
Deerfield loamy sand, 0 to 3 percent slopes	41.4	4.5%
Deerfield loamy sand, 3 to 8 percent slopes	32.9	3.6%
Freetown muck, 0 to 1 percent slopes	16.8	1.8%
Freetown muck, ponded, 0 to 1 percent slopes	4.7	0.5%
Hinckley loamy sand, 3 to 8 percent slopes	46.3	5.0%
Hinckley loamy sand, 25 to 35 percent slopes	3.8	0.4%
Hollis-Rock Outcrop-Charlton Complex, 3 to 15 percent slopes	1.9	0.2%
Hollis-Rock Outcrop-Charlton Complex, 15 to 25 percent slopes	11.5	1.2%
Merrimac-Urban Land Complex, 0 to 8 percent slopes	6.7	0.7%
Merrimac fine sandy loam, 3 to 8 percent slopes	9.1	1.0%
Montauk fine sandy loam, 3 to 8 percent slopes, extremely stony	137.5	14.9%
Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	9.1	1.0%
Paxton fine sandy loam, 3 to 8 percent slopes	14.3	1.5%
Paxton fine sandy loam, 8 to 15 percent slopes	8.0	0.9%
Paxton fine sandy loam, 15 to 25 percent slopes	3.7	0.4%
Raynham silt loam, 0 to 5 percent slopes	28.5	3.1%
Saco mucky silt loam, 0 to 1 percent slopes	28.3	3.1%
Scarboro mucky fine sandy loam, 0 to 3 percent slopes	83.2	9.0%
Scio very fine sandy loam, 3 to 8 percent slopes	29.3	3.2%
Scituate fine sandy loam, 3 to 8 percent slopes	7.5	0.8%
Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	0.1	0.0%
Swansea muck, 0 to 1 percent slopes	27.1	2.9%
Udorthents-Urban Land Complex	5.0	0.5%
Udorthents, loamy	1.5	0.2%
Udorthents, refuse substratum	0.7	0.1%
Udorthents, wet substratum	6.3	0.7%
Urban Land	9.2	1.0%

Table 1 (continued). Soil map units of Minute Man National Historical Park (USDI-NPS 2009).

MAP UNIT NAME	ACRES	% OF MIMA
Wareham loamy fine sand, 0 to 5 percent slopes	31.7	3.4%
Water	13.0	1.4%
Windsor loamy sand, 0 to 3 percent slopes	24.1	2.6%
Windsor loamy sand, 3 to 8 percent slopes	52.9	5.7%
Windsor loamy sand, 8 to 15 percent slopes	7.0	0.8%
Woodbridge fine sandy loam, 3 to 8 percent slopes	22.5	2.4%

Hydrology

The Sudbury and Assabet rivers converge near the Concord town center to form the Concord River that flows through the North Bridge unit of MIMA. The Concord River drainage basin (USGS Hydrologic Unit Code 01070005) (Environmental Protection Agency 2015) includes portions of Worcester County and much of Middlesex County (Figure 7).

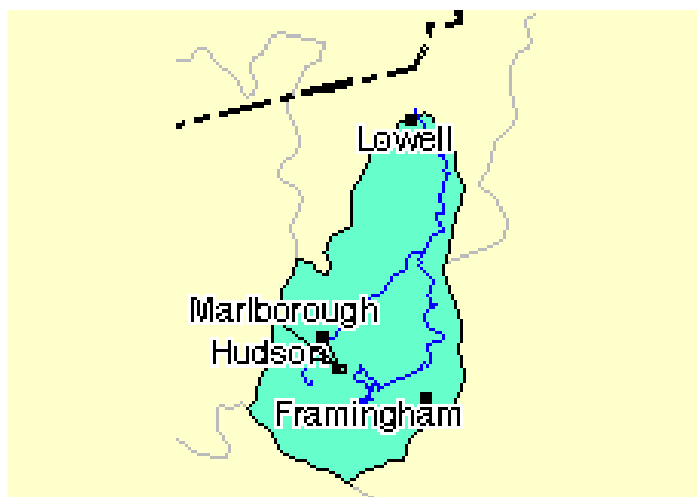


Figure 7. Map of drainage basin for the Concord River (Environmental Protection Agency 2015).

Flows within the 16.3 mile-long (26.2 km-long) river are generally north, from eastern Concord (along the northwestern edge of the Boston metropolitan area) into the Merrimack River from the south on the eastern side of Lowell. It is a gently flowing river with little variation in topography along most of its route; 36 towns have been established within its drainage basin. It was called the Musketaquid or grass-grown river by Native Americans due to the abundance of aquatic and semi-aquatic vegetation and adjacent riverine herbaceous wetlands characterized by species of grass, sedge, and rush; by 1635, English settlers arrived and assigned the present name. On April 19, 1775, the original Old North Bridge in the town of Concord was the scene of the Battle of Concord on the same day when the first shots of the Revolutionary War were fired at nearby Lexington. The existing, small, wooden Concord Bridge (a reproduction) is preserved by the NPS as part of MIMA. Other perennial MIMA streams include Mill and Elm brooks; Battle Road was constructed along a divide between these small drainages (Thornberry-Ehrlich 2008).

Land Use

Before European settlement, the MIMA uplands were all forested and dominated by hardwoods. The borders of the Concord River probably supported seasonally-flooded forests like those present today, dominated by silver maple (*Acer saccharinum*). In several areas, notably Bloody Angle, shallow depressions with poor drainage probably supported patches of red maple (*Acer rubrum*) swamp among more upland hardwood forest.

The Concord/Lexington area was settled early in the Colonial Period because of its proximity to Boston and access to the Concord River. Most of the land that is now part of MIMA was cleared for agriculture. Dry, low-lying areas were tilled, while hilltops and rocky sites were subject to the grazing and browsing of livestock. The flat wetland areas bordering Elm Brook were drained and managed as a hayfield. Over time, farming became less dominant and the village of Concord developed with homes along the road connecting Concord to Lexington and Boston.

At the time of the Revolutionary War, the landscape had been used by the early colonists and their descendants for over 130 years. It is likely that most of the site now included in MIMA was open and grassy during the Revolutionary War, although many of the grazed hilltops had reverted to woodlands and were used as wood lots. A forest is known to have existed at the time in the vicinity of Bloody Angle, where there was a dense understory and it was difficult to travel.

Between 1775 and 1960, sites along Route 2, later to become Route 2A with the construction of a more modern road, were developed into housing and commercial uses. Farms persisted in some areas with fertile soil. Many areas that had been tilled or grazed were allowed to revert to forest. Many of these areas have been logged several times. Some sites were selectively cut with minimal soil disturbance, allowing reestablishment of a forest fairly similar to the pre-existing conditions, with primarily native shrubs and herbaceous species. In other areas, forests were clear-cut and regeneration favored species requiring mineral soil for germination and sun for successful establishment, such as eastern white pine (*Pinus strobus*), which also provided the opportunity for exotic species to become established.

Hanscom Air Force Base is located north of the eastern part of MIMA and has had a significant effect on the general landscape. There is a major highway intersection within the park providing access off Route 2A into the base. A military airport runway and high density housing for base staff border the park to the north.

Following the acquisition of tracts for MIMA, houses and commercial developments, including a car dealership, were removed. Most of these sites were converted to grassy fields or were allowed to revegetate naturally. Some old house sites are extremely weedy, dominated by black locust (*Robinia pseudoacacia*) and Norway maple (*Acer platanoides*). Some of the small patches of forest along Route 2A were selectively cleared to convey the appearance of the general landscape during the Revolutionary War Period.

Methods

Project Timeline

This project was begun in July, 2004. The MIMA vegetation map and classification were created using a combination of existing sources of information, vegetation sampling, field observation, and remote sources. A preliminary vegetation map was interpreted and automated for these historical units and delivered in 2006. Work at MIMA was completed in December 2007.

The following sections provide general details of each phase of the inventory project as it relates to MIMA to create the draft project components prior to the 2015-2016 CTI input.

Planning and Scoping

A scoping meeting to plan the mapping project was held on May 5, 2004 at the park's headquarters. NatureServe staff S. Gawler and L. Sneddon and James W. Sewall Company employee D. Boss met with park personnel to review the process, discuss the timeline, learn about other natural resource initiatives that might relate to the mapping, obtain input from park staff on particular areas of interest, and gather existing information.

MIMA is classified as a small park within the NPS-VMI, one in which the sample area includes the entire park (TNC and ESRI 1994). Decisions regarding the number and placement of environmentally stratified classification plots were based on representative polygons distributed across the whole park. By comparison, in large parks, the classification plot placement and stratification can be focused on a representative section of the park and results extrapolated to the whole, or a system of gradient-oriented transects may be used to determine the vegetation associations of a large park from which photo-interpretive mapping cues (signatures) are prepared.

Review of Existing Information and Preliminary Vegetation Classification

Because the location of MIMA is agricultural and suburban, early descriptions of the vegetation of the park area are very general. Information from the park's files indicate there was a dense forest in the vicinity of Bloody Angle and that the wetlands adjacent to Elm Brook north of Route 2A were drained in the Colonial Period and managed as a hayfield.

In 1992, the Massachusetts Natural Heritage and Endangered Species Program (MNH&ESP) was contracted to describe the plant communities of MIMA and conduct surveys for rare plant species; Jerry Jenkins and Elizabeth Thompson conducted the surveys. During 1992, they made six visits to MIMA and described the plant communities in some detail. They did not sample plots during this work and did not use the USNVC. Their report (Thompson and Jenkins 1992, which is available at both MIMA and MNH&ESP) documents the species assemblage of specific areas within the park and was a significant resource for locating different plant communities. The MNH&ESP described an occurrence of a red maple (*Acer rubrum*) swamp (ranked "C" for Element Occurrence quality) at Bloody Angle based on the 1992 project. Thompson's and Jenkins's species lists, where they could be tied to specific USNVC associations, were incorporated into this work.

A land-cover map was created for the park in 1993 (August et al. 1993). This effort used aerial photography, but only limited ground observation (done in December) and it did not characterize MIMA vegetation in detail. Land cover classes included conifer forest, deciduous forest, mixed forest, open wetland, agricultural land, and transportation and developed areas.

To determine a set of preliminary USNVC types in MIMA, a subset of associations was reported from Biotics, the NatureServe vegetation community database. Associations attributed to the subsection containing MIMA (Gulf of Maine Coastal Plain Subsection, 221Ai of the Lower New England/ Northern Piedmont Ecoregion (Keys et al. 1995)) were evaluated for inclusion by comparing the association characteristics to the known vegetation information available from existing records.

Field reconnaissance was conducted on July 1, 2004 by Brad Agius (formerly of the James W. Sewall Company), Christopher Davis (NPS), Susan Gawler (NatureServe), and Robert Zaremba (ecological contractor). Reconnaissance of the habitats and plant species composition in the park yielded 14 preliminary working vegetation map classes and seven cultural map classes that were later translated to Anderson (1976) Level II land use categories (Table 2). Most of these preliminary vegetation map classes were tied to a single USNVC association. Some map classes represented aggregated associations because they could not be teased apart in the photography or on the ground (i.e. Cattail – Reed - Loosestrife Marsh preliminary map class represents multiple USNVC associations: Cattail Marsh, Common Reed Marsh, and Purple Loosestrife Marsh). These preliminary map classes were delineated by Gawler and Zaremba in the field as candidates for photographic interpretation by James W. Sewall Company and plot sampling by NatureServe.

Aerial Photography Acquisition and Processing

On April 28, 2003, William Frament, USDA Forest Service (Northeastern Area State and Private Forestry, Durham, NH), acquired leaf-off (non-growing season) color infrared (CIR), stereo pair 1:8,000 scale aerial photography of MIMA. The photography was acquired as part of a larger project flown for several eastern national parks at one time, and thus preceded the vegetation classification and mapping project. The photography was captured in late April when deciduous trees were mostly bare and the ground was generally free of snow. The image type consists of a raster 3-band color image. The bands are blue, green, and near infrared. Each pixel contains a value ranging from 0 to 255 per band.

The photos were used by North Carolina State University Center for Earth Observation (NCSU-CEO) to create an orthorectified photomosaic using ER Mapper 6.4 and Earth Resources Data Analysis System (ERDAS) Imagine 8.7 (NCSU-CEO 2004). The photos were scanned at 600 dots per inch (dpi) and imported into Imagine. The 30-m Digital Elevation Model (DEM) USGS National Elevation Dataset (NED) was acquired for the project area and data were transformed from 30 meters to 10 meters to assist with data comparability.

Digital Orthophoto Quarter Quadrangle (DOQQ) images (1:5,000 Color Ortho Imagery, April 2001) were obtained from the Office of Geographic and Environmental Information of the Commonwealth of Massachusetts Executive Office of Environmental Affairs (MassGIS). These were combined to

create a single mosaic file for use as ground control. The images were orthorectified in ERDAS Imagine Orthobase software using the DOQQs and the DEM as ground control. Aerial triangulation produced a single root mean square error (RMSE) of less than one meter for the entire block of photos. The orthorectified images were then combined within ER Mapper to form two seamless base images for MIMA. The mosaics were then re-stretched with the polynomial method to the original reference image using ER Mapper with a RMSE of less than 1. The two final mosaics were then mosaicked into one single seamless image. The mosaic was compressed using MrSID software at a 1:20 target compression ratio. Key information for the digital MIMA photomosaic, finalized in November 2004, is summarized in Table 3. FGDC-compliant metadata were also written for the final photomosaic, which was archived at the NPS NETN office in Woodstock, VT.

Table 2. Preliminary U.S. National Vegetation Classification vegetation map classes and seven cultural land use map classes identified for photointerpretation.

CLASS NAME TYPE	CLASS NAMES
Preliminary Vegetation Map Class Name¹	Black Oak - Beech - Pine Forest
	Buttonbush Swamp
	Cattail - Reed - Loosestrife Marsh
	Leatherleaf Bog
	Modified Successional Forest
	Northern Hardwood - Oak Forest
	Oak - Hickory Forest
	Red Maple - Ash Swamp
	Red Oak - Red Maple - Pine Forest
	Sedge Grass Wet Meadow
	Sedge - Mannagrass Fen
	Silver Maple Floodplain Forest
	Wet Shrub Swamp
	White Pine Forest
Cultural Map Class Names	Abandoned Field
	Mowed Field
	Open Water
	Other Agricultural Land
	Residential
	Transmission Right-of-way
	Transportation and Roads / Paved

¹The names of the preliminary vegetation map classes listed in the table are from the preliminary classification determined before plot sampling. Numerous changes were made to the classification after plot sampling and accuracy assessment, therefore the preliminary map class names in this table do not fully match the final map class names presented in this report. The cultural map classes were also modified as the project progressed and were later translated to Anderson Level II land use categories shown in the final vegetation map.

Table 3. Summary of key information for the Minute Man National Historical Park mosaic.

ATTRIBUTE	VALUE
Title of metadata record	Minute Man National Historical Park Color Infrared Orthorectified Photomosaic – Leaf-off (ERDAS Imagine 8.7 IMG and MrSID formats)
Publication date of mosaic (from metadata)	November 30, 2004
Date aerial photography was acquired	April 28, 2003 (leaf-off conditions)
Vendor that acquired photography	William Frament, USDA Forest Service (Northeastern Area State and Private Forestry, Durham, NH)
Scale of photography	1:8,000
Type of photography	Color infrared, stereo pairs
Number of air photos in mosaic	16
Archive location of air photos, camera calibration certificate, and shapefile of image center locations	USGS Earth Resources Observation Science (EROS) Center, Sioux Falls, SD
Scanning specifications	600 dots per inch, 24-bit color depth
Estimated horizontal positional accuracy of mosaics	2.33 meters, meets Class 2 National Map Accuracy Standard
Number of ground control points upon which horizontal accuracy estimate is based	20
Method of calculating positional accuracy	Root mean square error (RMSE)
Archive location of mosaics and metadata	NPS Northeast Temperate Network, Woodstock, VT
Format(s) of archived mosaics	.img (uncompressed); MrSID (20:1 compression)

Photointerpretation and Preliminary Vegetation Map Production

Aerial photograph interpretation is the act of examining aerial photographs to identify vegetation types (Avery 1978). Photointerpretation was conducted by James W. Sewall Company with limited fieldwork by the mappers. Given the unique human manipulation of MIMA’s landscape, vegetated areas in many parts of the park are in a successional stage and riddled with invasive species. To add further difficulties to the photointerpretation and vegetation mapping, the CIR photography was acquired during the leaf-off period which made differentiating between the many USNVC associations more difficult for the mappers, whose experience was with photography from other seasons. MassGIS 0.5m color orthophotos were used to augment leaf-off photo-signatures.

The method of conversion from photo to map for this project utilized a Massachusetts state digital terrain model, Massachusetts state DOQQs, and PCI Geomatics orthorectification software. The orthophotos and digital elevation data, used as a basis for the orthorectification, were obtained from the MassGIS.

Field Data Collection and Classification

NatureServe developed a vegetation classification plot sampling design based on the 14 preliminary vegetation map classes identified at MIMA and in accordance with NPS-VMI guidelines (TNC and ESRI 1994). Plots were allocated to all vegetation classes known to occur in the park, with replicate plots assigned over the type's environmental range to the extent possible. Vegetation sampling focused on less invaded sites to provide insight on past and remnant vegetation associations to document the range of vegetation variability and to provide possible models for restoration. Plots were established in areas most representative of the vegetation stands (Mueller-Dombois and Ellenberg 1974).

Classification plots for sampling were allocated based on the 14 preliminary vegetation map classes identified for the park. While three classification plots were originally targeted per map class, fewer than three plots were allocated to map classes that had only one or two examples on the ground (i.e. Leatherleaf Bog, Buttonbush Swamp, Sedge – Mannagrass Fen, Northern Hardwood – Oak Forest), represented associations that were well documented in the USNVC, or were of low priority for conservation (i.e. Modified Successional Forest, Abandoned Field, etc.). Classification plots were subjectively placed in the field to be representative of the vegetation present at the start of field work in late July 2004. Classification plot data were recorded where the vegetation documented in the field was not classified in the preliminary classification. Cultural map classes lacking natural or ruderal vegetation were not sampled (e.g. Residential, Transportation and Roads).

Field Survey

Test plots were established at two locations during the summer of 2004 to allow the contractor to become familiar with the sampling protocol used in this project. Before additional classification plots were chosen, a range of sites at MIMA were visited to determine the best locations for plots. Attempts were made both to sample the floristic and physical setting variations of an association and its geographic range within the park. Whenever possible, multiple examples of the different variations of an association were sampled, but in many cases there was only one example of a community in the park. Because of high variability in the upland forest at MIMA, greater focus was given to these sites to determine floristic differences through statistical analysis. Additional effort was made to locate examples of associations not previously known of or found in previous vegetation surveys.

Thirty-nine vegetation classification plots were sampled in the park during July, August, and September of 2004 (Table 4, Figure 8). All vegetation data were collected following accepted Natural Heritage Program protocols (Strakosch-Walz 2000), with 20-m x 20-m plots in forests and woodlands, 10-m x 10-m plots in shrublands, and 5-m x 5-m plots in herbaceous vegetation. In some cases, where the stands were too narrow to accommodate square plots of standard dimensions, rectangular plots of identical area were used.

All vegetation strata were sampled in each classification plot. Vascular plant species present were listed for each stratum and percent cover estimated to the nearest 5% for each species. Additional species which occurred outside of sampled plots were listed separately for each vegetation association. Species that were not identifiable in the field were collected for later identification. In

some cases, identification could be made only to genus because plants were sterile or otherwise not in a condition for accurate identification. In addition to floristic information, the following environmental information was recorded: soil profile description, flooding regime, soil moisture regime, slope, aspect, and evidence of disturbance. Percent cover was estimated for the unvegetated ground surface within categories including bedrock, litter/duff, wood >1cm, large rocks (cobbles, boulders >10cm), small rocks (gravel, 0.2-10cm), sand (0.1-2mm), and bare soil, with the total ground surface cover summing to 100%. Digital photographs were taken of most vegetation associations. Latitude and longitude for each plot were recorded using a Garmin 76S GPS receiver. The GPS receiver was WAAS (Wide-Area Augmentation System) enabled and provided real-time differential correction.

Plot survey forms (Appendix B) were completed for all 39 classification plots. The completed forms are on file with NPS and NatureServe. Abbreviated instructions for completing this form and definitions of the fields can be found in TNC and ESRI (1994).

Table 4. Allocation of plots to preliminary vegetation and cultural map classes.

PRELIMINARY NATURAL VEGETATION MAP CLASS NAME	NUMBER OF PLOTS
Black Oak - Beech - Pine Forest	1
Buttonbush Swamp	2
Cattail - Reed - Loosestrife Marsh	4
Leatherleaf Bog	2
Modified Successional Forest	2
Northern Hardwood - Oak Forest	1
Oak - Hickory Forest	2
Red Maple - Ash Swamp	8
Red Oak - Red Maple - Pine Forest	3
Sedge - Grass Wet Meadow	3
Sedge - Mannagrass Fen	1
Silver Maple Floodplain Forest	3
Wet Shrub Swamp	1
White Pine Forest	3
PRELIMINARY CULTURAL VEGETATION AND NON-VEGETATED MAP CLASS NAME	NUMBER OF PLOTS
Abandoned Field	1
Mowed Field	0
Open Water	1
Other Agricultural Land	0
Residential	0
Transmission Right-of-way	1
Transportation and Roads – Paved	0
Transportation and Roads - Unpaved	0
Total Plots	39

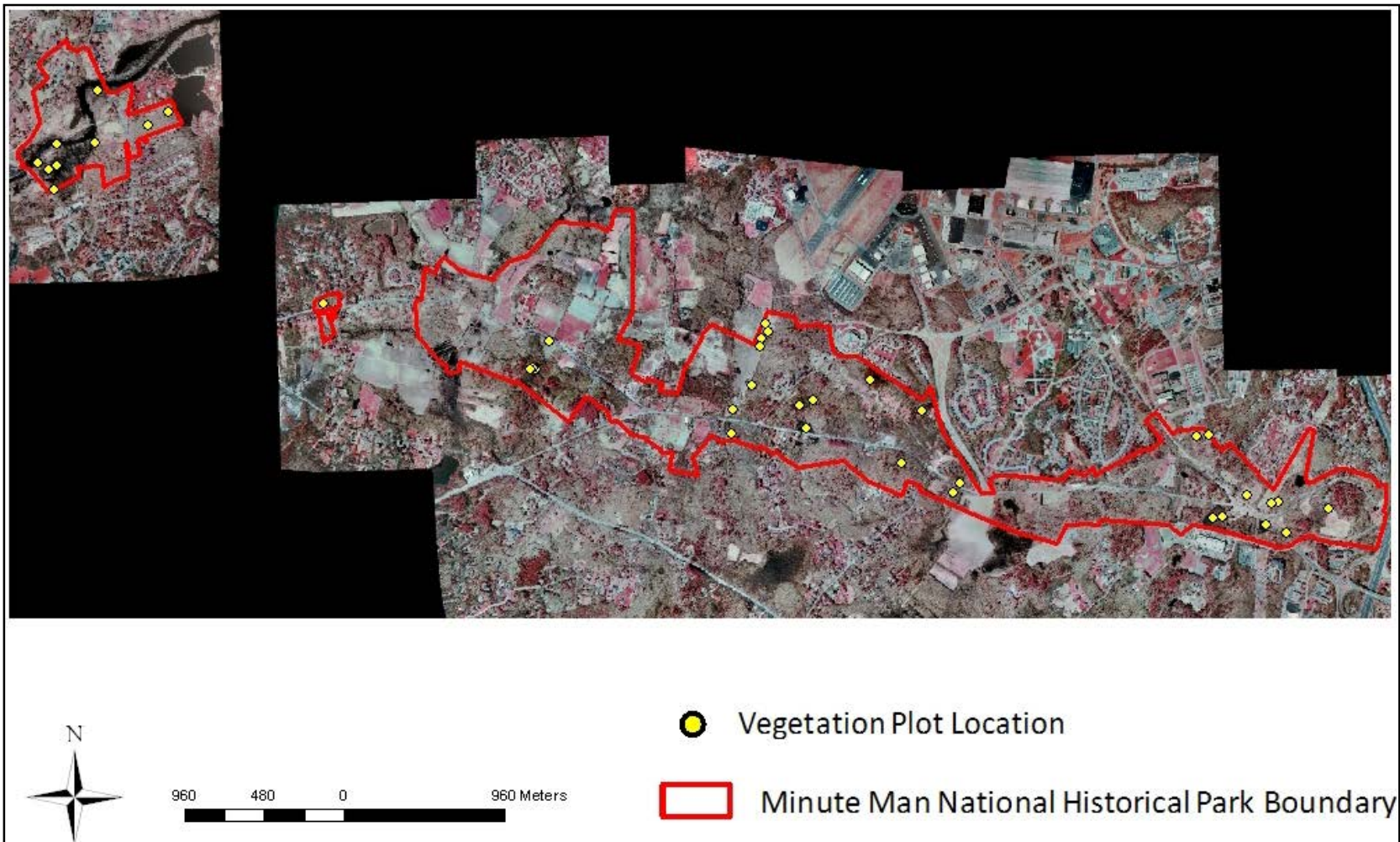


Figure 8. Locations of the 39 vegetation plots for vegetation classification and mapping in Minute Man National Historical Park.

Vegetation Classification and Characterization

Data from the 39 classification plots were entered into the NatureServe PLOTS 2.0 Database on a Microsoft Access platform. Species were assigned standardized names based on PLANTS Database, Version 3.5, developed by National Resources Conservation Service (NRCS) in cooperation with the Biota of North America Program (USDA NRCS 2006). A data dictionary for the PLOTS database is included in Appendix C. The common and scientific names of plants observed during the vegetation plot sampling are listed in Appendix D.

Species and plot data were formatted into an Excel spreadsheet for quantitative analysis in the PC-ORD version 4.0 Multivariate Analysis package (McCune and Mefford 1999). Because the data were collected in a way that would facilitate the structural description of the types, some species occurred in short shrub and tall shrub layers, or in tree subcanopy and canopy layers. The data were modified to collapse species into single shrub, tree, or herb layers, creating "pseudospecies" (for woody plants) comprised of the species identity and the layer. For example, red maple that occurred in the canopy is considered a different "species" from red maple in the herb layer, in the context of the analysis.

For classification, which produces groups of plots which can then be assigned to USNVC associations, we used cluster analysis, an algorithm that successively aggregates plots into hierarchical groups that are based on similarities in species composition. We used Non-metric Multidimensional Scaling (NMS) (Kruskal and Wish 1978) as an ordination method that shows the relationships of plots in multi-dimensional space¹. NMS allows visualization of plot data based on relative similarities between plots and aids in the interpretation of the data to environmental gradients. NMS was run separately for the full data set (39 plots) and the forest plots (23 plots). The combination of both analyses provides the framework for a robust vegetation classification that is based on plot data.

The Cluster Analysis and NMS ordination results (i.e. groups of similar plots) were compared with the recognized USNVC associations and plots were matched to existing associations. If no recognized USNVC association matched a plot or set of plots, new associations were described as preliminary associations of the USNVC. Qualitative environmental data on landscape position, soil characteristics, and flooding regime for each plot were used to also interpret the results. The soil survey, topographic maps, and air photos further aided the assignment of associations to plots. Because global association descriptions include species from across the global range of the association, park-specific descriptions were written. Any new information about the association was incorporated into the global description as appropriate. Global information was then appended to the local descriptions to provide resource managers with a broader context for the vegetation in the park (Appendix E).

¹ Ordination shows the relationship of plots in an n-dimensional hyperspace, but visualizing more than three dimensions is difficult, so ordination diagrams are usually presented in two or three dimensions. NMS calculates the appropriate number of dimensions for a dataset; in these analyses, it was three.

Each vegetation association was assigned a park-specific local name. Usually, the USNVC colloquial name (USNVC 2015) was adopted. For cultural vegetation types or non-vegetated types, the Anderson Level II name was adopted as the local name.

A park-specific dichotomous key was created for the vegetation associations and preliminary vegetation map classes to guide accuracy assessment (AA) and for use by park natural resource managers and others (Appendix F). A dichotomous key is a tool structured by a series of couplets, two statements that describe different, mutually exclusive characteristics of the associations. Choosing the statement that best fits the association in question leads the user to the correct association. The dichotomous key should be used in conjunction with the detailed vegetation association descriptions to confirm that the association selected with the key is appropriate.

2006 Draft Vegetation Map Preparation

James W. Sewall Company developed a complete GIS coverage for the park and revised the preliminary vegetation map classes to better match the results from the cluster analysis and NMS ordination. Polygons representing vegetation stands were digitized on-screen in ArcGIS 8.3, and later in ArcMap 9.1 and 9.2, using lines drawn on the acetate overlays, base layers of 1:8,000 CIR aerial photography, orthorectified photo composite image, and plot location and data. The minimum map unit used was 0.5 ha (1.24 ac). Stereo pairs were used to double check stand signatures during the digitizing process. Photo interpretation and polygon digitization extended outside the NPS boundary, especially where vegetation units were arbitrarily truncated by the boundary.

Each polygon was attributed with the name of a vegetation map class or an Anderson Level II land use category based on plot data, field observations, aerial photography signatures, and topographic maps. Data fields identifying the USNVC association inclusions within the vegetation map class were attributed to the vegetation polygons in the shapefile.

The GIS coverages and shapefiles were projected to Universal Transverse Mercator (UTM) Zone 19 North American Datum 1983 (NAD83). FGDC compliant metadata (FGDC 1998a) were created with the NPS-MP ESRI extension and included with the vegetation map shapefile. A photointerpretation key to the map classes for the 2006 draft vegetation map is included as Appendix A. The composite vegetation coverage was clipped to the NPS 2002 MIMA boundary shapefile for accuracy assessment (AA). After the 2006 vegetation map was completed, the thematic accuracy of this map was assessed.

Positional Accuracy Assessment

The horizontal positional accuracy of a remotely sensed product is the mean horizontal discrepancy between the geographic position of a feature depicted by the product and the corresponding position of the same feature as measured on the earth's surface (usually by a GPS or other geographic surveying device).

The horizontal positional accuracy of the initial mosaic was assessed using guidelines of the NPS-VMI (ESRI et al. 1994). Well-defined positional accuracy ground control points, spaced throughout all quadrants of the mosaic, were placed on the mosaic in ArcMap. Ground control points and

zoomed-in screenshots of each point were plotted on hard copy maps with the mosaic as a background. These maps and plots were used to locate the ground control points in the field. For each plotted ground control point, field staff noted any alterations to the location in the field, and then recorded the coordinates with a Trimble Pro XRS global positioning system receiver with real-time differential correction. Mapped ground control points that were physically inaccessible were also noted. The field crew correctly located and collected positional AA data at 20 ground control points. The field-collected “true” or “reference” coordinates for the 20 points were compared to the coordinates obtained from the mosaic viewed in ArcMap. Both pairs of coordinates for each point were entered into a spreadsheet in order to calculate horizontal accuracy (in meters). The accuracy calculation formula is based on root mean square error (FGDC 1998b; Minnesota Governor’s Council on Geographic Information (MGCGI) and Minnesota Land Management Information Center (MLMIC) 1999).

Following this initial positional AA, the mosaic was re-rectified to the DOQQs (as described in the Aerial Photography Acquisition and Processing section above). The accuracy of the final (re-rectified) mosaic was calculated by comparing the “true” coordinates of the ground control points to the coordinates obtained from the re-rectified mosaic viewed in ArcMap. Figure 9 on page 29 shows the distribution of the 20 ground control points within the park and surrounding area. The accuracy calculation formula is based on root mean square error (FGDC 1998b; MGCGI and MLMIC 1999).

Thematic Accuracy Assessment

The thematic accuracy of a remotely sensed map is the probability, for any location depicted by the map, that the thematic map class that is depicted by the product for that location will match the class in the same theme as observed at the location on the earth’s surface. NPS-VMI protocols (ESRI et al. 1994, Lea and Curtis 2010) require that this probability (accuracy) be assessed for individual classes within the theme (*i.e.*, individual vegetation map classes). To assess individual classes, a random sample of locations within the class (the sample data) is selected. A field observer who is not informed of (“blind to”) the sample data values then visits the locations on the ground and establishes their thematic identity from that perspective (the reference data). The reference data value is assumed to be the accurate value, and accuracy is estimated as the percentage of all observations that have sample and reference data values matching.

The Generate Random Points tool in Hawth’s Analysis Tools (Beyer 2006) was used in ArcGIS to randomly select the polygons in Scenarios B and C. First, each polygon was buffered on its interior by 35 m to prevent the generation of AA observation points too close to a transition from one vegetation map class to another. For polygons smaller than 70 m in width, smaller buffers were used to prevent them from being completely excluded. A total of 121 AA observation points were allocated for the 2006 draft vegetation map. Twelve of these observation points were excluded because they were located on lands outside of the park boundaries. One hundred nine (109) AA observation points were sampled, six of which occurred within park polygons that extended beyond the boundary (Table 5) (Figure 10).



Figure 9. Ground control points used to calculate horizontal positional accuracy of the Minute Man National Historical Park mosaic.

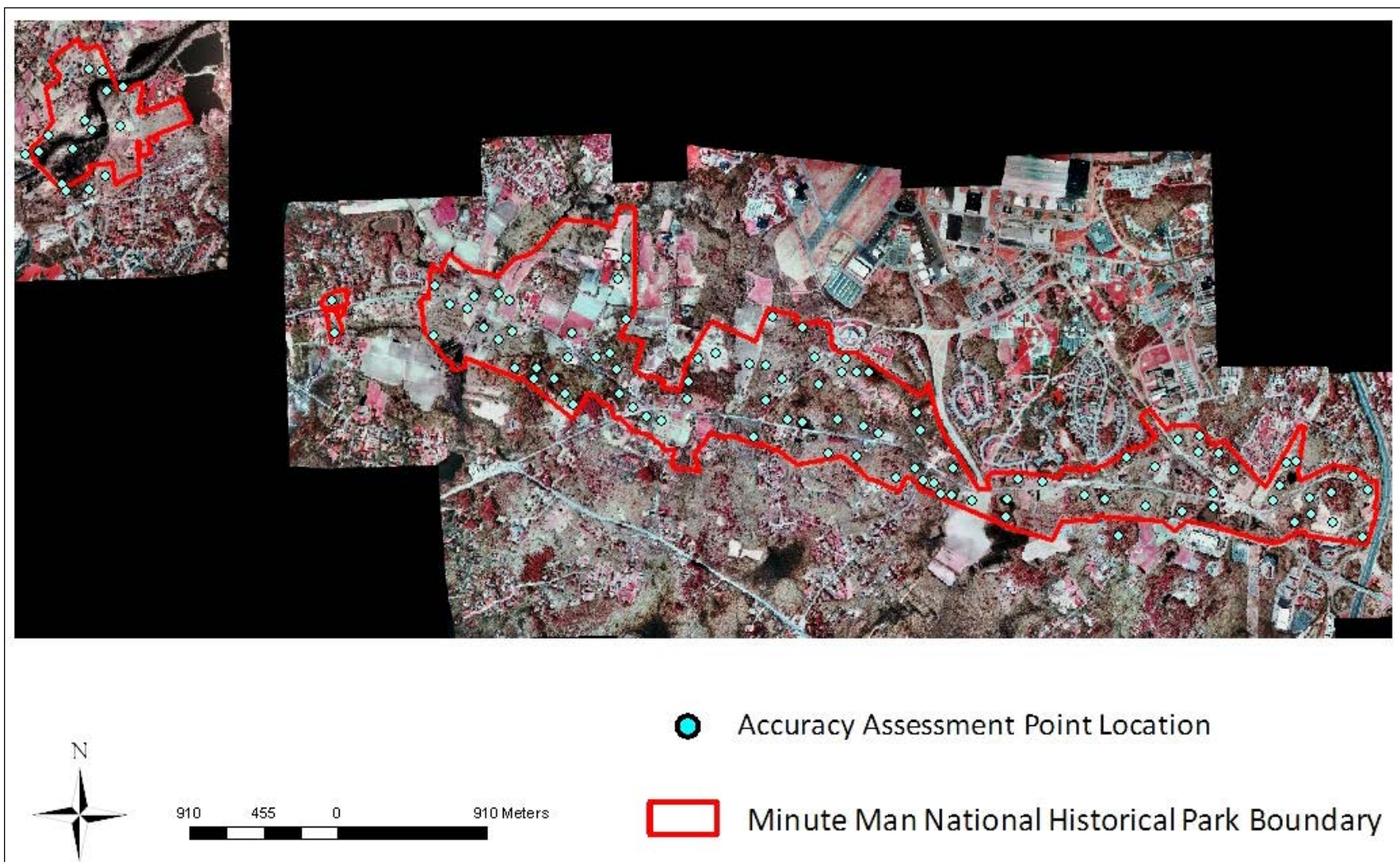


Figure 10. Locations of the 109 accuracy assessment observation points in Minute Man National Historical Park.

Table 5. Allocations of thematic accuracy assessment observation points by preliminary map class.

PRELIMINARY MAP CLASS NAME / ANDERSON LEVEL II LAND USE CATEGORY	NUMBER OF POLYGONS MAPPED ¹	MAPPED HECTARES ¹	NUMBER OF AA OBSERVATION POINTS FROM PROTOCOL	NUMBER OF AA OBSERVATION POINTS SAMPLED
Abandoned Field	13	15.4	5	5
Black Oak - Beech - Pine Forest	2	1.4	1	1
Buttonbush Swamp	2	1.2	1	1
Cattail - Reed - Loosestrife Marsh	6	28.7	3	3
Leatherleaf Bog	2	1.8	1	1
Modified Successional Forest	4	2.4	4	3
Mowed Field	53	44.2	10	10
Northern Hardwood - Oak Forest	5	3.1	5	5
Oak - Hickory Forest	93	136.0	25	21
Open Water	6	5.4	1	1
Other Agricultural Land	10	42.5	4	4
Paved	6	2.8	0	0
Red Maple - Ash Swamp	22	33.7	5	3
Red Oak - Red Maple - Pine Forest	82	92.1	25	24
Residential	56	28.5	0	0
Sedge - Grass Wet Meadow	9	11.7	5	4
Sedge - Mannagrass Fen	1	0.4	1	1
Silver Maple Floodplain Forest	8	5.8	6	6
Transmission Right-of-way	1	3.4	1	1
Transportation and Roads - Unpaved	7	17.5	0	0
Wet Shrub Swamp	12	20.9	5	4
White Pine Forest	34	29.8	13	11
TOTAL	434	528.7	121	109

¹Because corrections were made in the map following accuracy assessment, counts for these classes may vary from the counts for these classes as reported in Table 10 (page 50), which were derived from the final map.

The determination of sample size of thematic AA observations for each map class was determined by the following rules:

Scenario A: The map class consisted of more than 50 hectares in total area and was distributed among at least 30 polygons. In this case, 30 polygons were selected at random, and one sampling point was assigned to each of the 30 selected polygons.

Scenario B: The map class consisted of more than 50 hectares in total area and was distributed among fewer than 30 polygons. In this case, 20 polygons were selected at random, and one sampling point was assigned to each of the polygons. If the map class consisted of

fewer than 20 polygons, some polygons received multiple observation points, with the number of observation points to be assigned to each polygon determined by the relative area of that polygon. (Note: no map classes for MIMA met this scenario).

Scenario C: The map class consisted of less than 50 hectares in total area and was distributed among more than 30 polygons. In this case, 20 polygons were selected at random, and one sampling point was assigned to each of the polygons.

Scenario D: The map class consisted of less than 50 hectares in total area and was distributed among 5–30 polygons. In this case, five polygons were selected at random, and one sampling point was assigned to each of the polygons.

Scenario E: The map class consisted of less than 50 hectares in total area and was distributed among fewer than five polygons. In this case, one sampling point was assigned to each polygon.

Map classes that were assigned to Anderson Level II land use categories that did not represent natural vegetation (Mowed Field, Transportation and Roads, Residential, and Other Agricultural Land,) were not included in the AA sampling design.

Field Methods

During August 2006, 109 AA observation points were navigated to in the field using Garmin GPSMAP 60CSx receivers. The datum on the GPS receivers was set to NAD83, Continental United States (CONUS) and the coordinate system was set to UTM zone 19. Using the GPS receiver and the aerial photos with unlabeled polygons, ecologists navigated to each point. Within a circular area of up to approximately 50 m², depending on polygon size, data were collected using a standardized field form (Appendix G). Vegetation data included average height and percent cover of each stratum, as well as dominant species of each stratum. Percent cover was estimated for the unvegetated ground surface within categories including bedrock, litter/duff, wood >1cm, large rocks (cobbles, boulders >10cm), small rocks (gravel, 0.2-10cm), sand (0.1-2mm), and bare soil. The total percent cover sums to 100% of the unvegetated surface and provides an overview of what occurs on the ground in addition to the vegetation. Other environmental data such as topographic position, hydrologic regime, or unusual features that further aided identification to association were collected.

Using the dichotomous key to map classes¹ (Appendix F), the observation polygon was assigned to the appropriate map class or association (hereafter referred to as the “first call”). If the classification decision was ambiguous, a comments field was completed to describe the reason for ambiguity, and a “second call” was noted. The ecologists also noted whether the sampling point was characteristic of the polygon as a whole or whether the point was atypical of the polygon. The minimum area of observation around the sampling point was a circle with a radius of 25 m.

¹ USNVC associations and vegetation map classes are both identified in the vegetation key in Appendix F.

Data from the 109 AA points were entered into the NatureServe PLOTS 2.0 Database System on a Microsoft Access platform during the winter of 2007. In the PLOTS database (NatureServe 2004), species were assigned standardized codes based on the PLANTS Version 3.5 database (USDA-NRCS 2006). The common and scientific names of plants observed during thematic AA sampling are listed in Appendix D.

GPS positions for the AA points were downloaded from the receivers into an ArcGIS shapefile to compare the field identification of each point to the mapped identity. The AA point coverage was joined to the vegetation layer to obtain sample data and reference data values for each point. The senior author also reviewed every field data sheet to ensure that the classification concept was correctly applied. Additional columns were added to the table to record 2nd calls where the initial identification was ambiguous.

Data Analysis

Although the sample size allocation for each map class followed NPS protocols, the assignment of points randomly to individual polygons, rather than randomly throughout the map class, constitutes a polygon-based sampling design (see Lea and Curtis 2010, Appendix A). Such a design varies from the point-based (or minimum mapping unit-based) design that is recommended by either the original (ESRI et al. 1994) or revised (Lea and Curtis 2010) NPS protocol. The polygon-based design introduced an additional layer of stratification that, if not accounted for, would bias the results in favor of observations made within smaller polygons. To correct this bias, each AA point was weighted by the size of its assigned polygon in the computation of accuracy rates. Thus, individual observations for this analysis were often tabulated and listed as decimal fractions of whole numbers of observations, rather than as single observations.

A thematic accuracy assessment seeks to estimate quantitatively (1) the overall accuracy (percentage of correctly mapped sites in the study, regardless of the map class present at the sites) and (2) the accuracy of the individual classes that have been mapped. There are two aspects of accuracy for individual classes that are of interest to a map user. User's accuracy is the probability that the class, wherever depicted by the map, has been mapped accurately (as observed on the ground) and is equivalent to 100% minus the estimated rate of errors of commission, for observations that were placed and made within that map class. Producer's accuracy for a class is the probability that the class, wherever it may be encountered on the ground, will have been depicted correctly by the map and is equivalent to 100% minus the estimated rate of errors of omission, for all observations that were identified as the class on the ground.

Individual class accuracy rates are of interest to a map user because resource management activities often are directed toward individual map classes or smaller sets of classes of interest, rather than toward the entire map (Lea and Curtis 2010). User's and producer's accuracy rates lend insight into which classes are confused with which other classes into the rate of over-mapping or under-mapping for individual classes. In order to allow relatively robust per-class estimation, the AA observations are stratified by map class to ensure a reasonably large sample size for each class.

Overall accuracy is the probability that any individual site depicted by the map will have been mapped accurately (*i.e.*, the probability that the class depicted by the map and the class observed on the ground will match). Such an estimate pertains to the entire map, regardless of the identity of the classes involved in the errors, and is a simplified metric that lends insight into the overall quality and reliability of the map. When AA observations are stratified by map class, the individual class samples typically are pooled to yield an overall map accuracy estimate.

Since the sampling design to obtain individual class user's accuracies constitutes simple random sampling within each class, the user's accuracy for a class is estimated simply as the number of observations for which the ground observation is a match with the map class. Calculation of producer's accuracies is more complex, since the occurrence of any class as it occurs on the ground cannot be predicted *a priori*. Therefore, individual observations must be weighted by the size of the map class (sampling stratum) in which they were observed, since the different strata have different sizes and, therefore, observations between strata will have different probabilities of inclusion (Czaplewski 1992, 2003; Congalton and Green 2009; Lea and Curtis 2010).

Similarly, individual observations that are pooled in order to estimate overall accuracy have unequal probabilities of inclusion because they are sampled from map class strata of different sizes. The subsample from each individual map class must be weighted by its map class size when it is pooled with the other subsamples. The calculations of Lea and Curtis (2010) for simple random sampling (for user's accuracies) and for stratified random sampling (for producer's accuracies and overall accuracy) were applied. The results were displayed as (1) a sample contingency table, which is a matrix that depicts the total raw counts of AA observations having sample data (map class) values and reference data (field call) values and as (2) a population (or proportional) contingency table, which is a matrix of the same sample/reference value data adjusted to their estimated representative proportion of the entire map (Lea and Curtis 2010).

Final Products Preparation

In order to complete the final report and geodatabase to the NPS-VMI standards of 2015, Cogan Technology, Incorporated (CTI) was contracted to review the MIMA vegetation inventory project deliverables and create the final submittals. CTI tasks included reviewing the existing data and reports, reviewing map label, vegetation type, and plant species nomenclature for consistency, recalculating map class accuracy to comply with NPS-VMI 2010 accuracy standards (Lea and Curtis 2010), reviewing wetland classification in attribute data and relabeling USNVC hierarchy units to conform to changes specified by the 2008 FGDC standard (www.usnvc.org), reviewing and editing the draft report, completing metadata files using the FGDC standard for metadata creation, reviewing map topology and other geographic issues, creating a complete project geodatabase using current NPS-VMI models, creating map graphics for the vegetation map, classification plot distribution, and AA observations, and preparing data products for final review.

Results

Vegetation Classification and Characterization

Data from the 39 classification plots were analyzed to determine groups of similar plots based on species composition and environmental setting using cluster analysis and NMS ordination. Cluster analysis grouped the plots based on species and cover. While 39 plots are insufficient to capture the variation in all of the vegetation in the park, the dendrogram successfully shows the higher-level divisions in the vegetation. Pruned at the six-group level, the major vegetation groups appear clearly (Figure 11): 1) Red Maple Swamps, 2) Oak-characterized Upland Forests, 3) Fens and Bogs, 4) Marshes, 5) Non-native Forests (forests dominated by non-native tree species), and 6) Floodplain Forests.

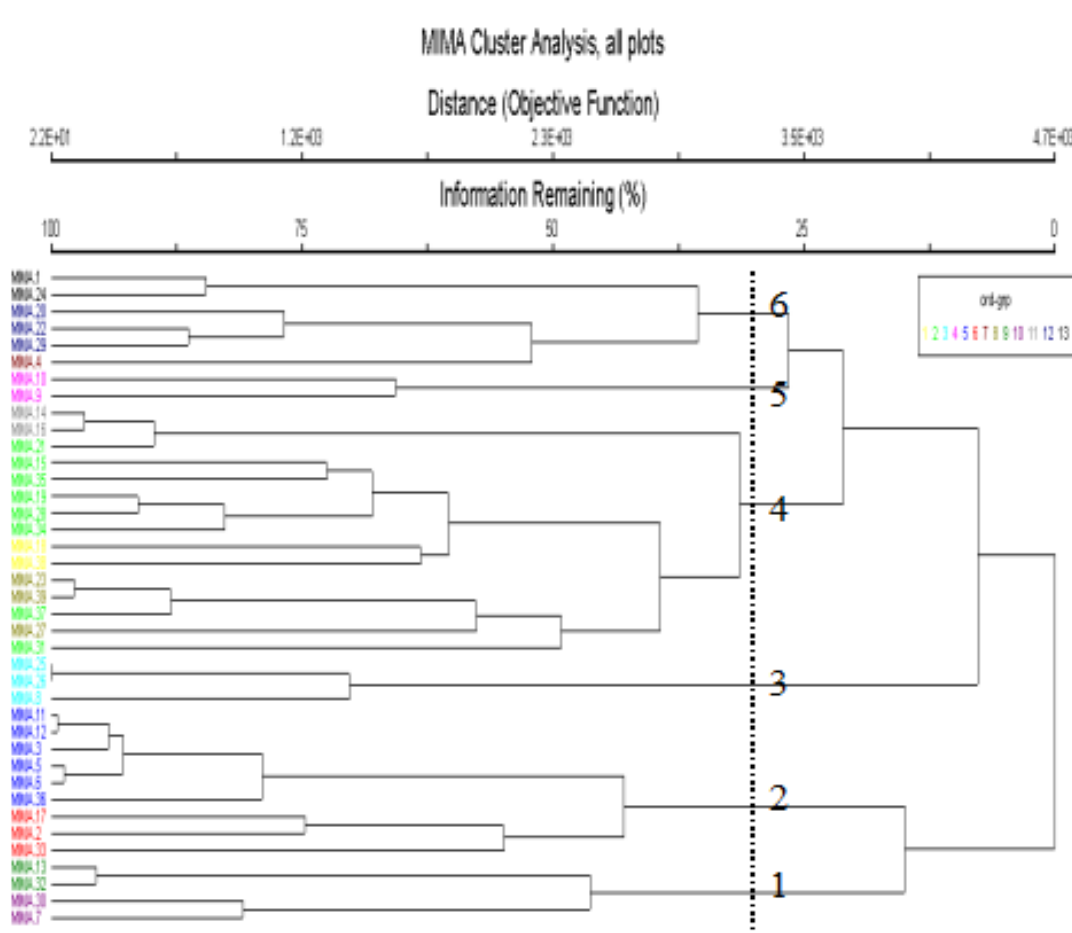


Figure 11. Cluster Analysis dendrogram of the 39 vegetation plots at Minute Man National Historical Park. Dashed vertical line shows pruning of the dendrogram at the six-group level. Vegetation groups represented by the group numbers are: 1) Red Maple Swamps, 2) Oak-characterized Upland Forests, 3) Fens and Bogs, 4) Marshes, 5) Non-native Forests and 6) Floodplain Forests.

Three plots, each representing a single USNVC association, did not fall out neatly on the dendrogram. The Red Oak - Northern Hardwood Forest plot (MIMA.04) dominated by sugar maple (*Acer saccharum*) and northern red oak (*Quercus rubra*) clustered with the floodplain forests. The two upland grassland association plots, Successional Old Field (MIMA.38) and Sandplain Grassland (MIMA.18), clustered with the graminoid marshes.

The relationships of the plots and groups can also be seen in the ordination diagrams (Figures 12-15). NMS analysis of all 39 classification plots shows the separation of some groups, but shows substantial overlap in the forested plots. This is in part due to the large differences between the forest vegetation and the non-forest vegetation. To examine the variation in forest plots more carefully, NMS was run separately on the forest plots and in these results the separation and relationships of the forest types is seen more clearly (Figures 14 & 15).

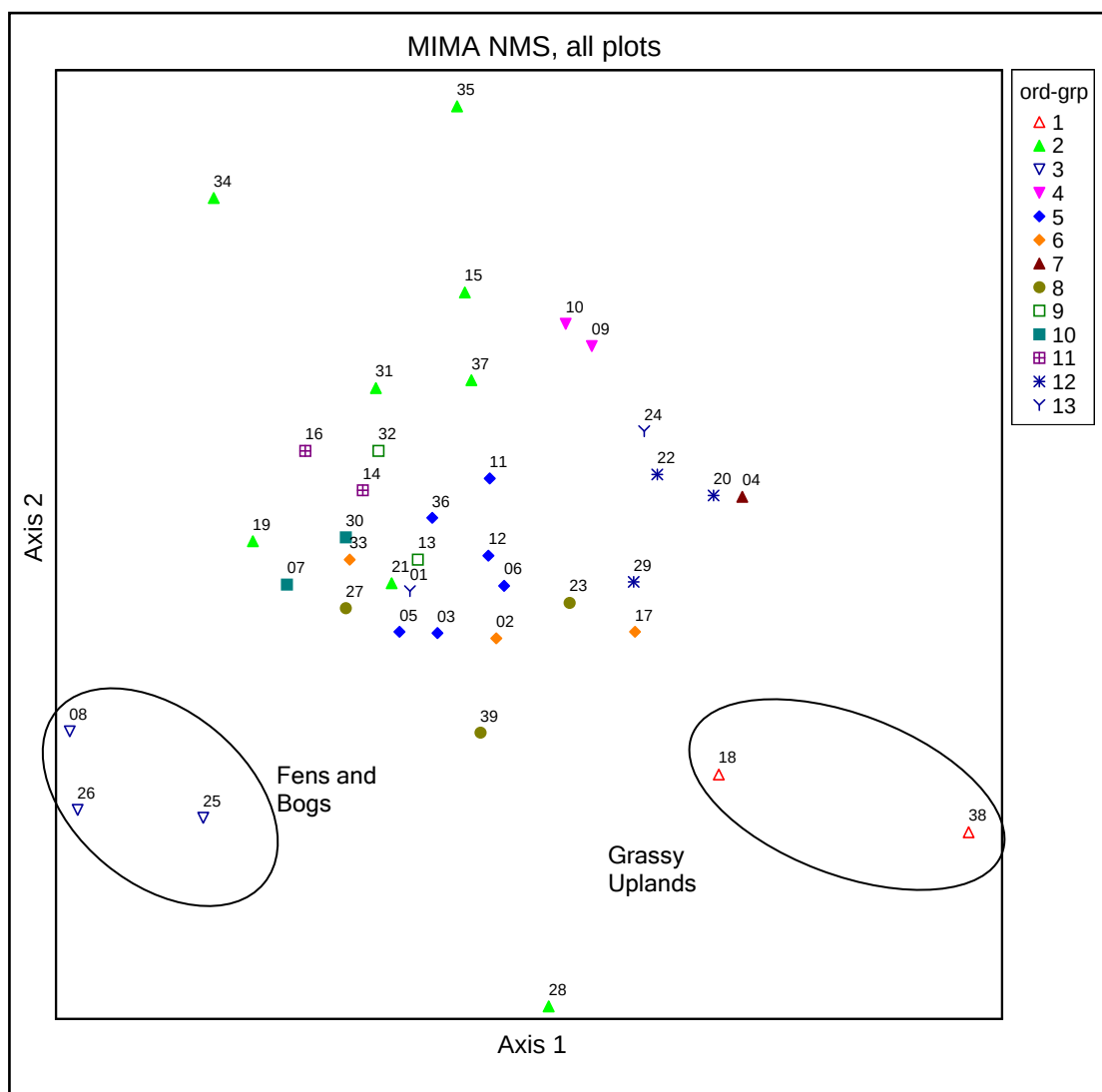


Figure 12. NMS ordination (axes 1 and 2) of the full set of vegetation plots (N=39), showing the strong separation of the grassy uplands and the fens and bogs on the first axis, which is obscuring the relationships of the other groups (see Figure 13). Numbers in the figure refer to the plot numbers.

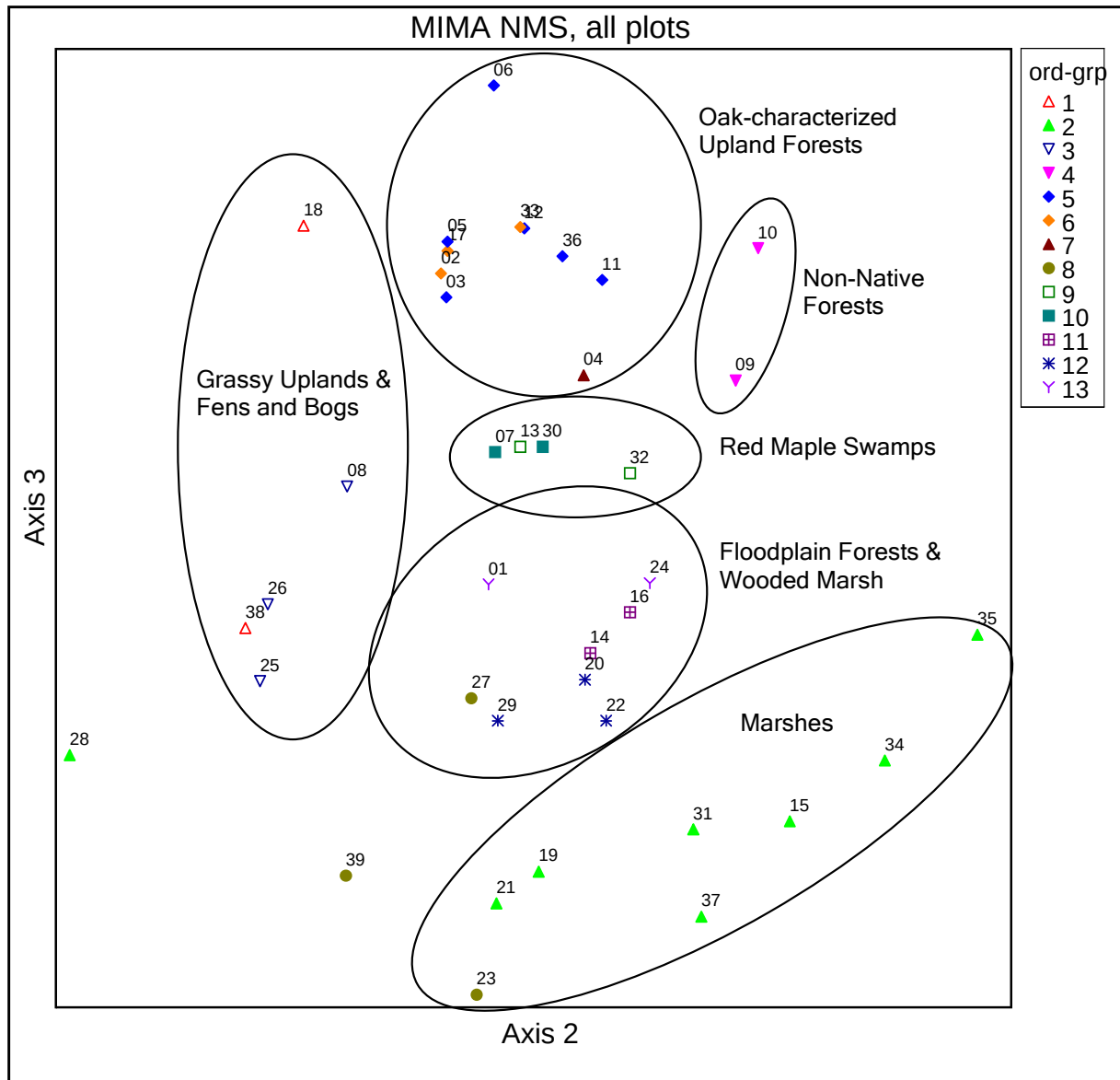


Figure 13. NMS ordination (axes 2 and 3) of the full set of vegetation plots (N=39), showing the relationships among the major groups. Grassy uplands and fens and bogs separated on the first axis (see Figure 12). Numbers in the figure refer to the plot numbers.

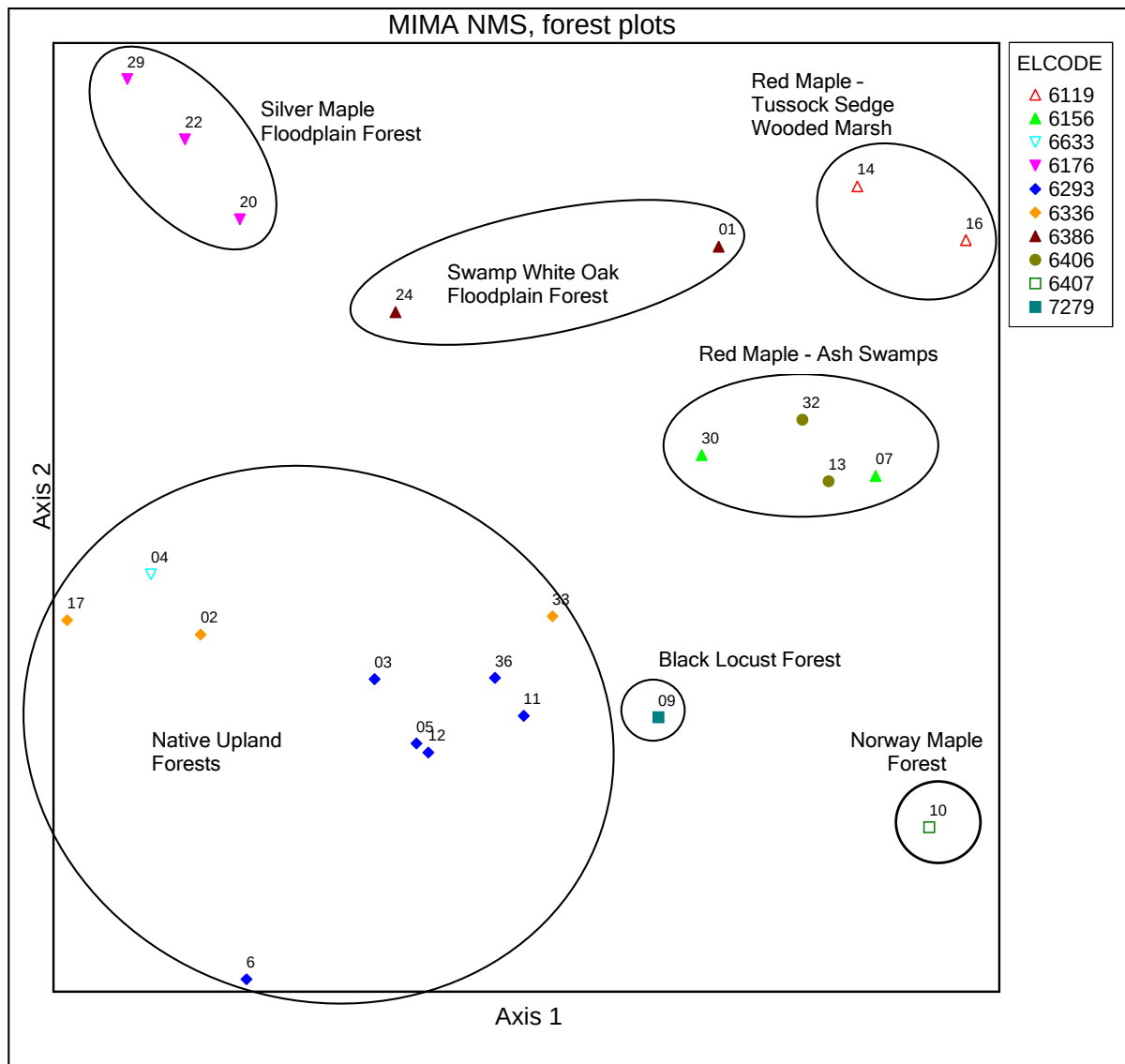


Figure 14. NMS ordination (axes 1 and 2) of the wooded vegetation plots (N=23), showing the relationships of the major groups. The two red maple swamp types and the upland forest types separate on the third axis (see Figure 13). Numbers in the figure refer to the plot numbers.

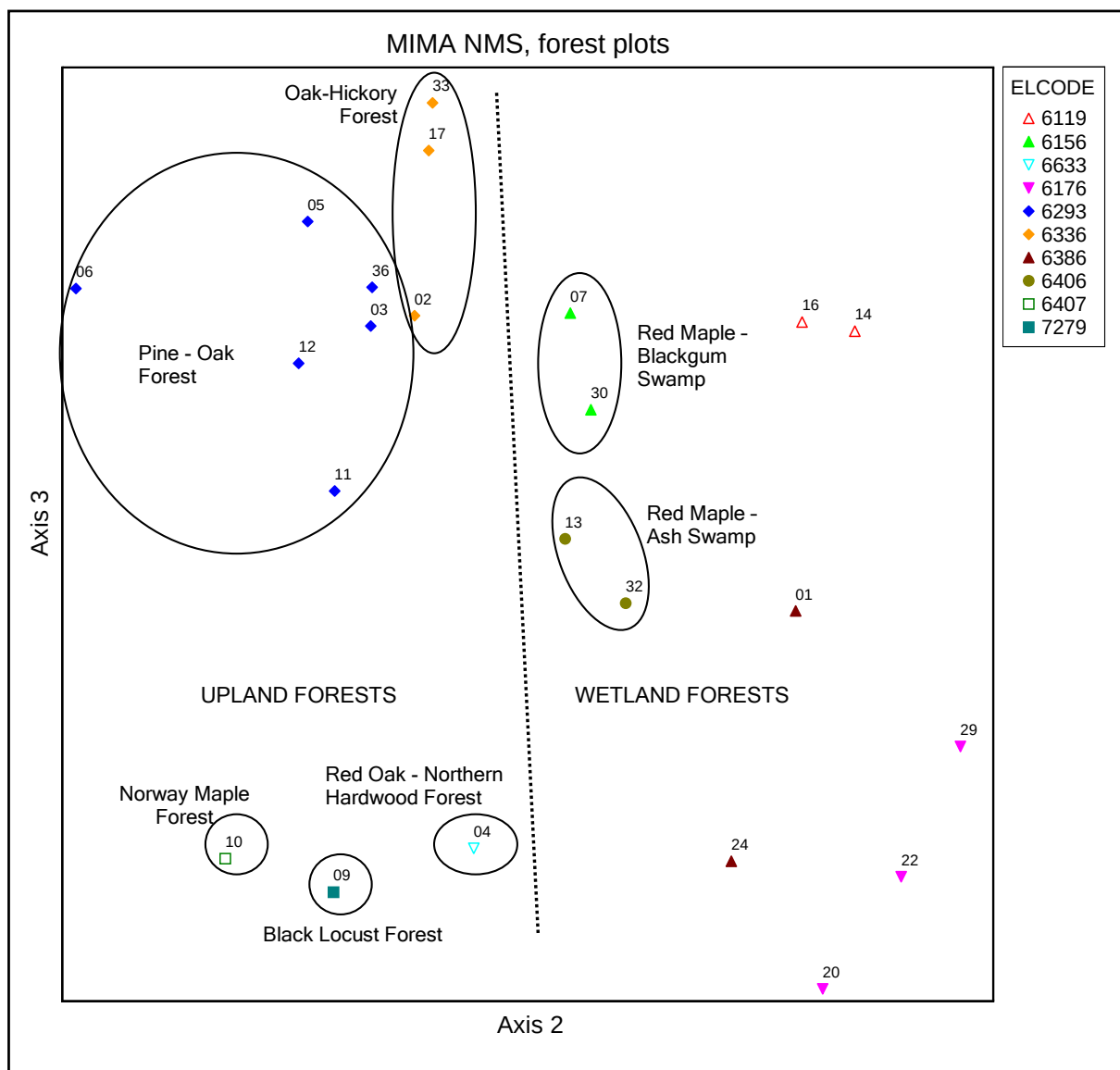


Figure 15. NMS ordination (axes 2 and 3) of the wooded vegetation plots, showing the segregation of the upland forest types and the red maple swamp types. Numbers in the figure refer to the plot numbers.

Using the results of the cluster and NMS ordinations analyses, the groups of similar plots were used to inform plot assignment to USNVC association as well as to verify the aggregation of associations into the preliminary map classes (Table 6).

Table 6. The assignment of U.S. National Vegetation Classification associations to plots and to the preliminary vegetation and cultural map classes.

PRELIMINARY MAP CLASSES	USNVC ASSOCIATION COMMON NAME OR ANDERSON LEVEL II CATEGORY	PLOTS
NATURAL VEGETATION MAP CLASSES		
Abandoned Field	Successional Old Field	1
Black Oak - Beech - Pine Forest	Mixed Oak - White Pine Forest	1
Buttonbush Swamp	Buttonbush Swamp	2
Cattail - Reed - Loosestrife Marsh	Cattail Marsh	2
	Common Reed Marsh	1
	Purple Loosestrife Wetland	1
Leatherleaf Bog	Leatherleaf Bog	2
Modified Successional Forest	Black Locust Successional Forest	1
	Norway Maple Forest	1
Northern Hardwood - Oak Forest	Red Oak - Northern Hardwood Forest	1
Oak - Hickory Forest	Dry Oak - Hickory Forest	2
Forested Swamp (originally, Red Maple - Ash Swamp)	Swamp White Oak Floodplain Forest	2
	Red Maple - Ash Swamp	2
	Red Maple - Blackgum Swamp	2
	Red Maple - Tussock Sedge Wooded Marsh	2
Red Oak - Red Maple - Pine Forest	Oak - Red Maple Successional Forest	3
Sedge - Grass Wet Meadow	Bluejoint Wet Meadow	1
	Lake Sedge Wet Meadow	1
	Tussock Sedge Meadow	1
Sedge - Mannagrass Fen	Sedge - Mannagrass Fen	1
Silver Maple Floodplain Forest	Silver Maple Floodplain Forest	3
Wet Shrub Swamp	Alder Swamp	1
White Pine Forest	Mixed Oak - White Pine Forest	3
CULTURAL VEGETATION AND NON-VEGETATED MAP CLASSES		
Mowed Field	Cropland or Pasture	0
Open Water	Water-lily Aquatic Wetland (small patch inclusion)	1
Other Agricultural Land	Other Agricultural Land	0
Residential	Residential	0
Transmission Right-of-way	Sandplain Grassland (small patch inclusion)	1
Transportation and Roads	Transportation and Roads	0
Total Plots		39

Vegetation Map

The 2006 preliminary (first draft) vegetation map was composed of 22 map classes which were developed based on the results of the cluster analysis and NMS ordination in addition to photointerpretation, field observations, and topographic maps. The vegetation analyses provided groups of ecologically similar associations that could be mapped together in map classes. Fifteen vegetation map classes represented 22 USNVC vegetation associations and seven cultural map classes represented seven Anderson Level II land use categories. Two of the cultural map classes contained small patch inclusions of two additional USNVC vegetation associations (Table 6).

The preliminary natural vegetation map classes are equivalent to the association level of the USNVC, with four exceptions. For these classes, associations were aggregated into map classes because they could not be distinguished individually during photointerpretation. The Cattail - Reed - Loosestrife Marsh map class included the Cattail Marsh, Purple Loosestrife Wetland, and Common Reed Marsh associations. The Modified Successional Forest map class included two forest associations: Norway Maple Forest and Black Locust Successional Forest. The Red Maple - Ash map class included the Swamp White Oak Floodplain Forest, Red Maple - Blackgum Swamp, Red Maple - Ash Swamp, and Red Maple - Tussock Sedge Wooded Marsh associations. The Sedge Grass Wet Meadow map class included the Tussock Sedge Meadow, Bluejoint Wet Meadow, and Lake Sedge Wet Meadow associations.

One association, Mixed Oak - White Pine Forest, was represented by two map classes, Black Oak - Beech - Pine Forest and White Pine Forest, differentiated by the cover of eastern white pine (*Pinus strobus*). Two small patch associations are inclusions within Anderson Land Use Level II land use categories: Sandplain Grassland occurs under a Transmission Right-of-way and Water-lily Aquatic Wetland occurs in the Open Water map class.

The map classes Abandoned Field and Mowed Field were reviewed and the data collected indicated that the Abandoned Field map class was equivalent to the USNVC association Successional Old Field, and that the Mowed Field map class, which contained lands used for agriculture, could be translated to the Anderson Level II land use category Cropland and Pasture.

Because the overall thematic accuracy of the 2006 preliminary vegetation map at the USNVC association level was estimated to be 53%, map classes that had low accuracy were aggregated into more generalized map classes, generally at the USNVC group or macrogroup level (*i.e.*, a reasonable compromise between higher thematic resolution, but lower accuracy, and a lower (coarser) thematic resolution, but with higher accuracy. Where the accuracy of larger, association level map classes were unacceptably low, aggregating the similar vegetation map classes into a single map class that made ecological sense yielded a higher degree of accuracy, but one with somewhat lower detail.

The following aggregations were made pursuant to the assessment of the preliminary map classes.

Marshes and shrub swamps were generally problematic. Three of the four AA points mapped as Wet Shrub Swamp turned out to be very robust herbaceous marshes dominated by purple loosestrife (*Lythrum salicaria*) and cattail (*Typha* spp.) and should have been mapped as Cattail - Reed -

Loosestrife Marsh map class. Though herbaceous marshes and shrub swamps are normally discernable from aerial imagery, the invasion of wetlands by purple loosestrife blurs the distinction, as the plant can grow more than 2 m tall with a density and form that can resemble shrubs. Three of the four AA points mapped as Sedge - Grass Wet Meadow also turned out to be less robust Cattail - Reed - Loosestrife Marsh. Because of these errors, the three map classes were combined in the 2007 final vegetation map into a Wet Meadow / Shrubland unit composed of the twelve polygons originally mapped as Wet Shrub Swamp, the nine polygons originally mapped as Sedge - Grass Wet Meadow, and the six polygons originally mapped as Cattail - Reed - Loosestrife Marsh.

The Red Oak - Northern Hardwood Forest association is limited within MIMA (5 polygons) and the signature resembles that of the Swamp White Oak Floodplain Forest association dominated by swamp white oak (*Quercus bicolor*) (3 polygons). A mapping rule was developed to better distinguish these associations in the final vegetation map. The Swamp White Oak Floodplain Forest (included as a component of the Forested Swamp map class) occurs adjacent to and at a similar elevation with floodplains, whereas the Red Oak - Northern Hardwood Forest (mapped as the Northern Hardwood - Oak Forest map class) occurs at higher elevations and not near floodplains or wetlands. Polygon attributions were updated based on this rule in the 2007 final vegetation map.

The Forested - Ash Swamp map class is more variable on the ground than the 2006 preliminary vegetation map indicated. Because of the limited topography at MIMA, some points that were deemed in the field to be Forested Swamps, which include the Swamp White Oak Floodplain Forest association, were mapped as Northern Hardwood - Oak Forest or Oak - Hickory Forest. The herbaceous flora was significant in discriminating the swamps in the field, with some areas shifting from wetland herb dominance to more upland herb dominance over a fairly short distance. This level of detail could not be seen in the aerial photos. Based on the AA fieldwork, we attributed an additional forested association, Upland / Wetland Transitional Forest, to MIMA that represents upland-wetland transitional forests in this region, and included this type within the Red Oak - Red Maple - Pine Forest map class.

Modified Successional Forest was originally mapped to include areas dominated by non-native trees such as Norway maple (*Acer platanoides*) and black locust (*Robinia pseudoacacia*). AA surveys showed that areas with strong black locust dominance were generally mapped as Oak-Hickory Forest. We therefore changed the name of the Modified Successional Forest map unit to Norway Maple Forest in the final vegetation map to represent forests with a strong presence of Norway maple. We combined areas dominated by black locust (Black Locust Successional Forest) into the Oak-Hickory Forest map class.

Black Oak - Beech - Pine Forest had only one AA point mapped, but nine points were assigned to this type in the field. This unacceptably low user's accuracy was remedied by combining the Black Oak - Beech - Pine Forest and White Pine Forest map classes into a new Pine - Oak Forest map class. These map classes should have been merged as one map class in the 2006 preliminary vegetation map prior to AA since they represented the same association; however, the mapper believed the cover of eastern white pine (*Pinus strobus*) justified splitting the map classes.

An additional vegetation association, Managed Wooded Pasture, was identified for the park during the AA, occurring in areas under active restoration. This association reflects vegetation structure in areas used during pre-settlement or colonial times for grazing (they are being created either by clearing secondary forest or by allowing scattered trees to persist in open meadows). The overall physiognomy is that of a savanna (grassland with widely scattered trees). Five AA points occurred within this type: two polygons were mapped as Oak - Hickory Forest; one polygon was mapped as Abandoned Field; one polygon was mapped as Mowed Field; and one polygon was mapped as Red Oak - Red Maple - Pine Forest. The most extensive example of Managed Wooded Pasture occurs in the vicinity of the Bloody Angle. This vegetation map class was added to the 2007 final vegetation map.

The Dogwood - Arrowwood Wet Shrubland association was identified during AA fieldwork. Two polygons mapped as Abandoned Field were determined to be Dogwood - Arrowwood Successional Shrubland in the field. Superficially, this association is similar to shrubby upland Successional Old Field, and sometimes contiguous with the fields, but is dominated by wetland shrubs and herbs and is seasonally flooded. This vegetation association was added to the 2007 final vegetation map in the Abandoned Field map class. Since the Paved and Transportation and Roads Map Classes were both translated to the same Anderson Level II land use category, they were combined into one map class called Transportation and Roads. The Mowed Field map class name was changed to Cropland or Pasture.

Data collected during AA point surveys supported expanding the total number of distinct USNVC associations in the final vegetation classification to 27, which are represented by 13 vegetation map classes in the final vegetation map.

With the above map class aggregations made, the final vegetation and land use map (Table 7, Figure 16) for MIMA is composed of 20 map classes, including 13 classes representing natural vegetation (25 associations), two classes representing natural vegetation in part, and five classes representing entirely cultural vegetation. The map classes are distributed among 434 polygons. The boundaries of some of the polygons extend beyond the park boundary and were delineated through interpretation of remote sources only.

Positional Accuracy Assessment

The horizontal positional accuracy of the final mosaic is 2.33 meters, which meets Class 2 National Map Accuracy Standards (FGDC 1998b). A spreadsheet containing the x and y coordinates for each ground control point and the accuracy calculation formula is included in the air photo archive located at USGS Earth Resources Observation Science Center.

Table 7. Relationships of USNVC associations, Anderson Level II classes and Minute Man National Historical Park preliminary and final map classes. Shaded cells denote map classes that did not change in name or concept from preliminary to final map.

LOCAL NAME	USNVC SCIENTIFIC NAME OR ANDERSON LEVEL II NAME AND CODE	MAP CLASS AND CODE	
		PRELIMINARY	FINAL
Norway Maple Forest	<i>Acer platanoides</i> Ruderal Forest (CEGL006407)	Modified Successional Forest (NOM)	Norway Maple Forest (NOM)
Black Locust Successional Forest	<i>Robinia pseudoacacia</i> Ruderal Forest (CEGL007279)		Oak - Hickory Forest (OHH)
Dry Oak - Hickory Forest	<i>Quercus (alba, rubra, velutina) / Viburnum acerifolium</i> Forest (CEGL006336)	Oak - Hickory Forest (OHH)	
Red Oak - Northern Hardwood Forest	<i>Quercus rubra - Acer saccharum - Fagus grandifolia / Viburnum acerifolium</i> Forest (CEGL006633)	Northern Hardwood - Oak Forest (MDF)	
Oak - Red Maple Successional Forest	<i>Quercus rubra - Acer rubrum - Betula</i> spp. - <i>Pinus strobus</i> Ruderal Forest (CEGL006506)	Red Oak - Red Maple - Pine Forest (OMP)	Red Oak - Red Maple - Pine Forest (OMP)
Upland / Wetland Transitional Forest	<i>Quercus rubra - Betula alleghaniensis / Osmunda cinnamomea</i> Forest (CEGL006000)	not recognized	
Mixed Oak - White Pine Forest	<i>Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia</i> Forest (CEGL006293)	Black Oak - Beech – Pine Forest (OPF)	Pine - Oak Forest (POF)
		White Pine Forest (WPI)	
Swamp White Oak Floodplain Forest	<i>Quercus bicolor - Acer rubrum / Carpinus caroliniana</i> Forest (CEGL006386)	Forested Swamp (FS)	
Red Maple - Tussock Sedge Wooded Marsh	<i>Acer rubrum / Carex stricta - Onoclea sensibilis</i> Woodland (CEGL006119)		
Red Maple - Ash Swamp	<i>Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus</i> Forest (CEGL006406)		
Red Maple - Blackgum Swamp	<i>Acer rubrum / Rhododendron viscosum - Clethra alnifolia</i> Forest (CEGL006156)		
Silver Maple Floodplain Forest	<i>Acer saccharinum / Onoclea sensibilis - Boehmeria cylindrica</i> Forest (CEGL006176)	Silver Maple Floodplain Forest (SIM)	
Managed Wooded Pasture	<i>Quercus (rubra, velutina) - (Acer saccharum, Fraxinus americana, Pinus strobus) / (Phleum pratense, Festuca</i> spp., <i>Dactylis glomerata)</i> Ruderal Wooded Herbaceous Vegetation (CEGL006668)	not recognized	Managed Wooded Pasture (MWP)
Successional Old Field	<i>Dactylis glomerata - Phleum pratense - Festuca</i> spp. - <i>Solidago</i> spp. Ruderal Herbaceous Vegetation (CEGL006107)	Abandoned Field (AF)	Abandoned Field (AF)
Dogwood - Arrowwood Successional Wet Shrubland	<i>Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora</i> Ruderal Shrubland (CEGL006576)	not recognized	

Table 7 (continued). Relationships of USNVC associations, Anderson Level II classes and Minute Man National Historical Park preliminary and final map classes. Shaded cells denote map classes that did not change in name or concept from preliminary to final map.

LOCAL NAME	USNVC SCIENTIFIC NAME OR ANDERSON LEVEL II NAME AND CODE	MAP CLASS AND CODE	
		PRELIMINARY	FINAL
Sandplain Grassland	<i>Vaccinium angustifolium</i> / <i>Schizachyrium scoparium</i> - <i>Carex lucorum</i> Shrub Herbaceous Vegetation (CEGL006393)	Transmission Right-of-way (TL)	
Leatherleaf Bog	<i>Chamaedaphne calyculata</i> - (<i>Gaylussacia dumosa</i>) - <i>Decodon verticillatus</i> / <i>Woodwardia virginica</i> Dwarf-shrubland (CEGL006008)	Leatherleaf Bog (LLB)	
Sedge - Mannagrass Fen	<i>Carex canescens</i> - <i>Eriophorum virginicum</i> - <i>Sphagnum</i> spp. Herbaceous Vegetation (CEGL006549)	Sedge - Mannagrass Fen (FEN)	
Buttonbush Swamp	<i>Cephalanthus occidentalis</i> - <i>Decodon verticillatus</i> Shrubland (CEGL006069)	Buttonbush Swamp (BBS)	
Alder Swamp	<i>Alnus serrulata</i> Swamp Shrubland (CEGL005082)	Wet Shrub Swamp (WSS)	Wet Meadow / Shrubland (WMS)
Bluejoint Wet Meadow	<i>Calamagrostis canadensis</i> – <i>Carex</i> spp. Laurentian & Northeast Wet Meadow (CEGL005448)	Sedge - Grass Wet Meadow (CSM)	
Tussock Sedge Meadow	<i>Carex stricta</i> - <i>Carex vesicaria</i> Herbaceous Vegetation (CEGL006412)		
Lake Sedge Wet Meadow	<i>Carex utriculata</i> - <i>Carex lacustris</i> - (<i>Carex vesicaria</i> , <i>Carex stricta</i>) Herbaceous Vegetation (CEGL002257)		
Cattail Marsh	<i>Typha</i> (<i>angustifolia</i> , <i>latifolia</i>) - (<i>Schoenoplectus</i> spp.) Eastern Herbaceous Vegetation (CEGL006153)	Cattail - Reed – Loosestrife Marsh (TYL)	
Common Reed Marsh	<i>Phragmites australis</i> Eastern North America Temperate Ruderal Herbaceous Vegetation (CEGL004141)		
Purple Loosestrife Wetland	<i>Lythrum salicaria</i> Ruderal Herbaceous Vegetation (CEGL006403)		
Open Water	<i>Nuphar advena</i> - <i>Nymphaea odorata</i> Herbaceous Vegetation (CEGL002386)	Open Water (WA)	
	Streams and Canals (51)		
	Lakes (52)		
Mowed Field	Cropland and Pasture (21)	Mowed Field (FD)	
Other Agricultural Land	Other Agricultural Land (24)	Other Agricultural Land (AG)	
Residential	Residential (11)	Residential (UR)	
Transportation and Roads -Unpaved	Transportation, Communications, and Utilities (14)	Paved (PV)	Transportation and Roads – Paved (PV)
Transportation and Roads -Paved		Transportation and Roads – Unpaved (UT)	Transportation and Roads – Unpaved (UT)



Vegetation Inventory Project

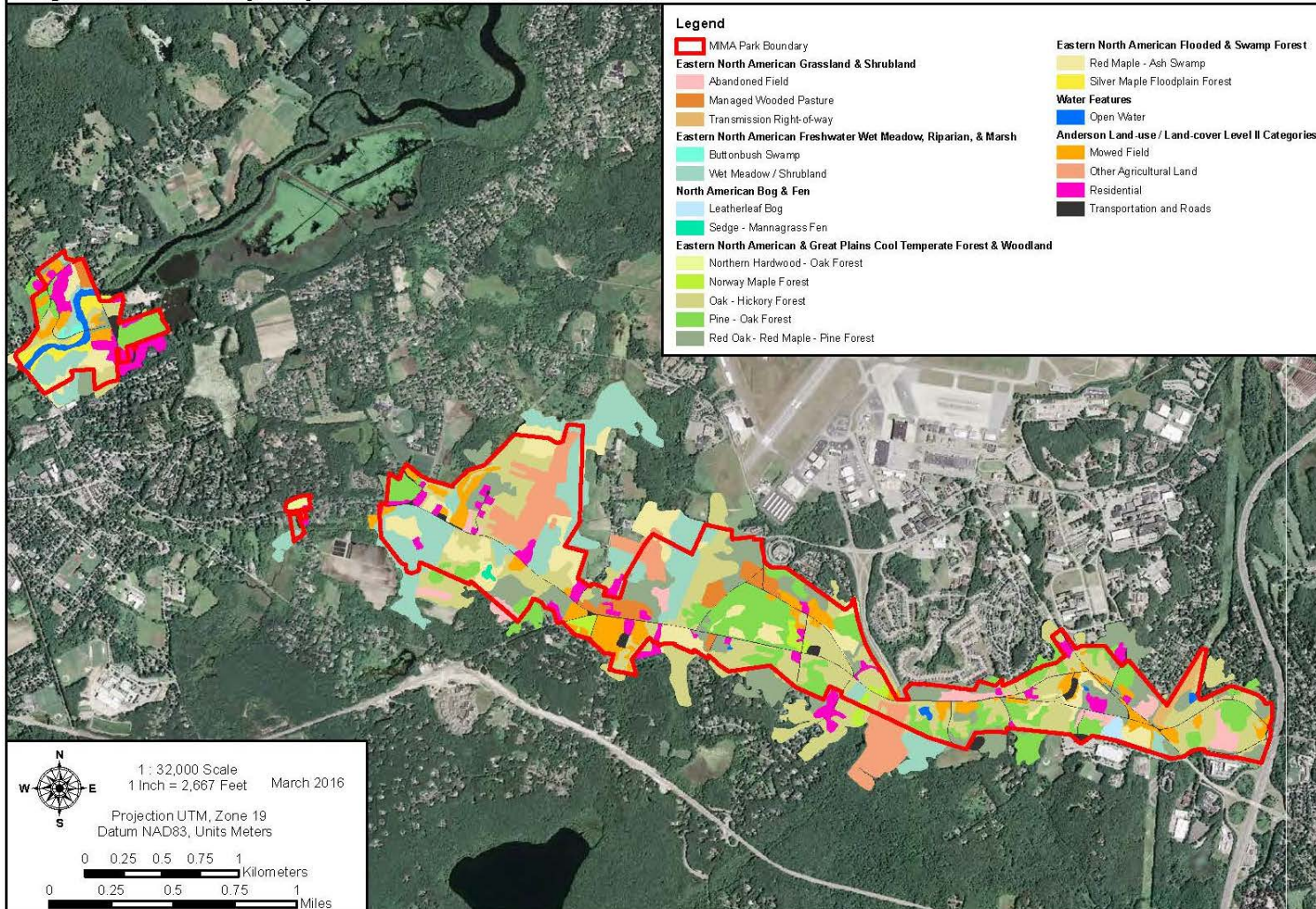


Figure 16. Final vegetation map for Minute Man National Historical Park.

Thematic Accuracy Assessment

Following the aggregations of the preliminary map classes to the final map classes (see previous section), the accuracy of the final map was assessed. Table 8 on page 48 is a sample contingency table (Lea and Curtis 2010) that shows the distribution of individual AA observations with respect to their combinations of sampling data values and reference data values, at the map class level of thematic accuracy. Table 9 on page 49 is a population (or proportional) contingency table (Lea and Curtis). This table evaluates the user's (rightmost column) and producer's accuracies (bottom row) for each individual map class and the overall map accuracy (all classes pooled). The table corrects individual class producer's accuracies and overall accuracy, accounting for the stratification by map class that was done to assess individual class user's accuracies (Lea and Curtis 2010).

The overall accuracy of the [aggregated, final] map class level is estimated at 67.5 %, with a 90% confidence interval of from 61.3% to 73.6% (Lea and Curtis 2010). The thematic level of individual map classes ranges from that of the USNVC association to USNVC division level

(*e.g.*, for non-forested wetlands) for natural vegetation and is equivalent to Anderson Level II classes for cultural vegetation and non-vegetated land cover.

A summary of the areal cover of the MIMA map classes is provided in Table 10 on page 50. Table 10 also displays estimates of the cover of the true area of each map class within MIMA, as corrected for mapping error (Czaplewski 1992, 2003; Lea and Curtis 2010). This information is useful because it gives insight into the true abundances of individual vegetation types that are of interest, taking into account limitations of the map as estimated from field observations. These estimates, of course, cannot predict *where* in the park the errors that account for the discrepancies between mapped areas and estimated areas might occur.

Table 11 on page 51 is a population (or proportional) contingency table (as with Table 9) when the map classes that represent natural vegetation and the corresponding AA sampling point data are aggregated to the USNVC division and formation levels (with map classes that represent cultural vegetation or unvegetated land cover retained at Anderson Level II). This information may be useful to users of the map who require less thematic resolution but more accuracy. At the division/Anderson Level II level of thematic accuracy, the estimated overall accuracy is 85.9%. This is also the estimated overall accuracy at the USNVC formation level, since each USNVC formation is represented by a single division at the scale of MIMA. Similarly, the estimated overall accuracy increases only slightly when map classes are further aggregated to the USNVC subclass (89.1%) and USNVC class (89.5 %) levels.

Vegetation Classification and Characterization

The classification of vegetation associations includes descriptive information for both park-specific map units and USNVC vegetation associations. Twenty-seven vegetation associations were identified at MIMA during classification plot sampling and AA (Table 7). These include eleven forests, one woodland, four shrublands (including dwarf-shrublands), and eleven herbaceous community types. Seventeen of these types are wetlands; ten are uplands.

Table 8. Accuracy assessment sample contingency table for map class level of the Minute Man National Historical Park vegetation map.

		FIELD CALL (REFERENCE DATA VALUE)																					
MAP CLASS (MCLASSNAME) (SAMPLE DATA VALUE)	Code	NOM	MDF	OMP	OHH	POF	FS	SIM	MWP	AF	TL	LLB	FEN	BBS	WMS	WA	AG	FD	UR	PV	UT	Total	
Norway Maple Forest	NOM	3.0																				3	
Northern Hardwood - Oak Forest	MDF		2.5		1.3		1.1															5	
Red Oak - Red Maple - Pine Forest	OMP	1.1		5.3	5.3	6.2	2.9		3.2													24	
Oak - Hickory Forest	OHH	0.3		5.2	9.1	3.2	1.4		1.7													21	
Pine - Oak Forest	POF			2.0		10.0																12	
Forested Swamp	FS						3.0															3	
Silver Maple Floodplain Forest	SIM							4.8							1.2							6	
Managed Wooded Pasture	MWP																					0	
Abandoned Field	AF				0.8				0.8	2.7					0.6							5	
Transmission Right-of-way	TL										1.0											1	
Leatherleaf Bog	LLB											1.0										1	
Sedge - Mannagrass Fen	FEN												1.0									1	
Buttonbush Swamp	BBS						1.0															1	
Wet Meadow / Shrubland	WMS						1.7								9.3							11	
Open Water	WA															1.0						1	
Other Agricultural Land	AG														1.0		3.0					4	
Cropland or Pasture	FD								1.4	2.0					0.7			5.9				10	
Residential*	UR																					0	
Transportation and Roads – Paved*	PV																					0	
Transportation and Roads – Unpaved*	UT																					0	
	Total	4.4	2.5	12.5	16.6	19.4	11.1	4.8	7.1	4.7	1.0	1.0	1.0	0	12.9	1.0	3.0	5.9	0	0	0	109	

Row names and codes indicate map class to which sample points were allocated (sample data value). Column codes indicate class to which sample points were found in the field (reference data value). Cell numbers indicate numbers of accuracy assessment sample points (individual observations) for each combination of sample data value (rows) and reference data value (columns). Shaded cells along the upper left to lower right diagonal represent numbers of observations for which sample data (map class) values and reference data (field call) values are the same (i.e., the observations are from accurately mapped areas). Fractional numbers of observations occur from weighting (see methods). *Map classes representing Managed Wooded Pasture, Residential, Transportation and Roads - Paved, and Transportation and Roads - Unpaved were not sampled in accuracy assessment and are assumed to have 100% user's accuracy, for purposes of calculating overall accuracy

Table 9. Accuracy assessment population contingency table for map class level for the Minute Man National Historical Park vegetation map.

		FIELD CALL (REFERENCE DATA VALUE)																					
MAP CLASS (SAMPLE DATA VALUE)	Code	NOM	MDF	OMP	OHH	POF	FS	SIM	MWP	AF	TL	LLB	FEN	BBS	WMS	WA	AG	FD	UR	PV	UT	User's Accuracy (% Correct)	
Norway Maple Forest	NOM	0.8																				100	
Northern Hardwood - Oak Forest	MDF		0.2		0.1		0.1															51	
Red Oak - Red Maple - Pine Forest	OMP	0.6		2.9	2.9	3.4	1.6		1.7													22	
Oak - Hickory Forest	OHH	0.4		5.5	9.6	3.4	1.5		1.7													43	
Pine - Oak Forest	POF			1.9		9.4																83	
Forested Swamp	FS						8.8															100	
Silver Maple Floodplain Forest	SIM							0.7							0.2							79	
Managed Wooded Pasture	MWP								0.3													100	
Abandoned Field	AF				0.5				0.5	1.6					0.4							55	
Transmission Right-of-way	TL										0.6											100	
Leatherleaf Bog	LLB											0.3										100	
Sedge - Mannagrass Fen	FEN												0.1									100	
Buttonbush Swamp	BBS						0.1															0	
Wet Meadow / Shrubland	WMS						1.9								10.8							85	
Open Water	WA															1.0						100	
Other Agricultural Land	AG														1.7		5.2					75	
Cropland or Pasture	FD								0.9	1.3					0.4			3.8				59	
Residential*	UR																		5.4			100	
Transportation and Roads – Paved*	PV																			0.5		100	
Transportation and Roads – Unpaved*	UT																				3.3	100	
Producer's Accuracy (% Correct)		45	100	28	74	58	63	100	35	55	100	100	100	0	80	100	100	100	100	100	100		
Estimated overall accuracy at map class level =67.5 % (90% confidence interval: 61.3% to 73.6%).																							

Row names and codes indicate map class to which sample points were allocated (sample data value). Column names indicate class to which sample points were found in the field (reference data value). Cell numbers indicate percentages of map estimated for each combination of sample data value and reference data value *Map classes representing Managed Wooded Pasture, Residential, Transportation and Roads - Paved, and Transportation and Roads - Unpaved were not sampled in accuracy assessment and are assumed to have 100% user's accuracy, for purposes of calculating overall accuracy.

Table 10. Areas of map classes for the Minute Man National Historical Park vegetation map, as mapped and as estimated by accuracy assessment.

MAP CLASS NAME	MAP CLASS CODE	NUMBER OF POLYGONS OF CLASS MAPPED FOR MIMA	HECTARES OF MAP CLASS DEPICTED BY MIMA VEGETATION MAP	HECTARES OF MAP CLASS AT MIMA AS ESTIMATED FROM ACCUACY ASSESSMENT	ESTIMATED HECTARES OF MAP CLASS OVER-MAPPED (+) OR UNDER-MAPPED (-)
Norway Maple Forest	NOM	6	4.2	9.2	- 5.0
Northern Hardwood - Oak Forest	MDF	2	1.6	0.8	+ 0.8
Red Oak - Red Maple - Pine Forest	OMP	70	69.1	54.5	+ 14.6
Oak - Hickory Forest	OHH	88	117.5	69.4	+ 48.1
Pine - Oak Forest	POF	45	59.6	85.4	- 25.7
Forested Swamp	FS	30	46.6	74.0	- 27.4
Silver Maple Floodplain Forest	SIM	7	4.6	3.6	+ 1.0
Managed Wooded Pasture*	MWP	7	13.9	39.7	- 25.8
Abandoned Field	AF	14	15.3	15.2	+ 1.0
Transmission Right-of-way	TL	1	3.4	3.4	-----
Leatherleaf Bog	LLB	1	1.6	1.6	-----
Sedge - Mannagrass Fen	FEN	1	0.4	0.4	-----
Buttonbush Swamp	BBS	1	0.5	0.0	+ 0.5
Wet Meadow / Shrubland	WMS	30	67.5	71.7	- 4.2
Open Water	WA	6	5.4	5.4	-----
Other Agricultural Land	AG	9	36.9	27.7	+ 9.2
Cropland or Pasture	FD	47	34.3	20.2	+ 14.0
Residential*	UR	56	28.4	28.4	-----
Transportation and Roads – Paved	PV	6	2.8	2.8	-----
Transportation and Roads – Unpaved*	UT	7	17.5	17.5	-----
Totals		434	530.0	530.0	

*Map classes representing Managed Wooded Pasture, Residential, Transportation and Roads - Paved, and Transportation and Roads - Unpaved were not sampled in accuracy assessment and are assumed to have 100% user’s accuracy, for purposes of calculations.

Table 11. Accuracy assessment population contingency table for U.S. National Vegetation Classification division/formation level for the Minute Man National Historical Park vegetation map.

		FIELD CALL (REFERENCE DATA VALUE)										
MAP CLASS (SAMPLE DATA VALUE)		Eastern North American & Great Plains Cool Temperate Forest & Woodland	Eastern North American Flooded & Swamp Forest	Eastern North American Grassland & Shrubland	North American Bog & Fen	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh	Open Water	Other Agricultural Land	Cropland or Pasture	Residential	Transportation and Roads - Paved	User's Accuracy (% Correct)
USNVC FORMATION NAME	USNVC DIVISION NAME AND CODE											
Cool Temperate Forest & Woodland	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)	40.8	3.1	3.5								86
Temperate Flooded & Swamp Forest	Eastern North American Flooded & Swamp Forest (D011)	0.0	9.5			0.2						98
Temperate Grassland & Shrubland	Eastern North American Grassland & Shrubland (D024)	0.5		5.3		0.4						86
Temperate to Polar Bog & Fen	North American Bog & Fen (D029)				0.4							100
Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)		2.0			10.8						84
ANDERSON LEVEL II NAME AND CODE	Open Water (5) (includes North American Freshwater Aquatic Vegetation (D049))						1.0					100
	Other Agricultural Land (24)					1.7		5.2				75
	Cropland or Pasture (21)			2.2		0.4			3.8			59
	Residential (11)*									5.4		100
	Transportation and Roads (14)*										3.8	100
Producer's Accuracy (% Correct)		99	65	48	100	80	100	100	100	100	100	
Estimated overall accuracy at USNVC division/formation level = 85.9 %; at subclass level = 89.1%; at class level = 89.5 %.												

Row names and codes indicate map class to which sample points were allocated (sample data value). Column names indicate class to which sample points were found in the field (reference data value). Cell numbers indicate percentages of map estimated for each combination of sample data value and reference data value *Map classes representing, Residential, Transportation and Roads - Paved, and Transportation and Roads - Unpaved were not sampled in accuracy assessment and are assumed to have 100% user's accuracy, for purposes of calculating overall accuracy. Groups of cells within solid black boxes represent combinations that represent correctly mapped combinations at the USNVC subclass level; groups of cells within dashed boxes represent combinations that represent correctly mapped combinations at the USNVC class level.

The association descriptions (Appendix E) contain information on the USNVC associations present at MIMA ("Local Description") and range-wide ("Global Information"). The local descriptions are specific to their expressions at MIMA (Appendix E). The descriptions include three associations (Managed Wooded Pasture, Dogwood - Arrowwood Successional Wet Shrubland, and Upland/Wetland Transitional Forest) that were not observed during reconnaissance or classification plot work and not included in the 2006 preliminary vegetation map, but were identified during the AA. Managed Wooded Pasture was developed specifically for MIMA and therefore does not have any global information in the description.

Vascular plant species nomenclature within the local and global descriptions follows the nationally standardized list of Kartesz (1999), with very few exceptions. This nomenclature differs from that of PLANTS 3.5 Database (USDA-NRCS 2006) in only a very few cases and when this difference occurs, synonymy is indicated parenthetically in the local description information. Nomenclature for nonvascular plants (mosses) follows Anderson (1990) and Anderson et al. (1990). English names for associations and alliances use NatureServe Central

Ecology-accepted names and may differ slightly from PLANTS 3.5 Database (USDA-NRCS 2006) common names that are used within the local description information and throughout the rest of the report. Appendix D contains a list of all species seen during this plot sampling and/or during thematic accuracy assessment.

A dichotomous key was developed for these vegetation associations and vegetation map classes (Appendix F). The dichotomous key should be used in conjunction with the detailed vegetation association descriptions to confirm that the association selected with the key is appropriate.

Representative photographs of each vegetation association are provided after each description. An index to these photos is provided in Appendix H. A bibliography for the sources cited in the USNVC global vegetation descriptions is provided in Appendix I.

Project Products

Products of the vegetation classification and mapping project are shown in Table 12. All products have been delivered to the NPS by NatureServe with the initial report.

Table 12 . Summary of products resulting from the Minute Man National Historical Park vegetation classification and mapping project.

PRODUCT	FGDC-COMPLIANT SPATIAL METADATA
Aerial photos, including flight line map and photo index	Yes
Photomosaic in digital format	Yes
Annotated field forms with vegetation plot sampling data	Yes
Vegetation plot sampling data in the PLOTS 2.0 database	Yes
Differentially corrected GPS locations of vegetation plots	Yes
Annotated field forms with thematic accuracy assessment data	Yes
Thematic accuracy assessment data in the PLOTS 2.0 database	Yes
Differentially corrected GPS locations of thematic accuracy assessment sampling points	Yes
Digital photos representative of vegetation types	Yes
Final map of vegetation associations as paper copy and in digital format	Yes
Final report as paper copy and in digital format	Yes

Discussion

The MIMA vegetation classification and mapping project should provide an effective context for interpreting the vegetation resources and a baseline for future research. This project provides the most detailed study to date of the distribution and diversity of plant associations in MIMA. As with previous studies in the region, vegetation inventory within MIMA demonstrates the floristic diversity of plant communities established on low ridges, slopes, and along watercourses that have been heavily affected by settlement, including agriculture and development, since the 1600s. This section provides a discussion of the significant floristic resources and plant communities and the study's implications for natural resource management, interpretive goals, and future research.

Vegetation Classification and Characterization

This study at MIMA identified 27 USNVC vegetation associations that are mapped in 15 map classes. The map classes in the 2007 vegetation map include: (1) Abandoned Field; (2) Buttonbush Swamp; (3) Leatherleaf Bog; (4) Managed Wooded Pasture; (5) Norway Maple Forest; (6) Northern Hardwood - Oak Forest; (7) Oak - Hickory Forest; (8) Open Water; (9) Pine - Oak Forest; (10) Forested Swamp; (11) Red Oak - Red Maple - Pine Forest; (12) Sedge - Mannagrass Fen; (13) Silver Maple Floodplain Forest; (14) Transmission Right-of-way; and (15) Wet Meadow / Shrubland. The vegetation in the park is influenced by its environmental setting as well as past and present land uses.

The following map classes have a one-to-one relationship with the USNVC associations: (1) Buttonbush Swamp; (2) Leatherleaf Bog; (3) Managed Wooded Pasture; (4) Norway Maple Forest; (5) Northern Hardwood - Oak Forest (=Red Oak - Northern Hardwood Forest); (6) Open Water (=Water-lily Aquatic Wetland); (7) Pine - Oak Forest (=Mixed Oak - White Pine Forest); (8) Sedge - Mannagrass Fen; (9) Silver Maple Floodplain Forest; and (10) Transmission Right-of-way (=Sandplain Grassland). In addition, two land use category map classes, Open Water and Transmission Right-of-way, each contain an inclusion of an additional USNVC association, Water-lily Aquatic Wetland and Sandplain Grassland, respectively.

The following map classes have a one-to-many relationship with USNVC associations: (1) Abandoned Field (=Successional Old Field and Dogwood - Arrowwood Successional Wet Shrubland); (2) Oak - Hickory Forest (Dry Oak - Hickory Forest and Black Locust Successional Forest); (3) Forested Swamp (Red Maple - Ash Swamp, Red Maple - Blackgum Swamp, Red Maple - Tussock Sedge Wooded Marsh and Swamp White Oak Floodplain Forest); (4) Red Oak - Red Maple - Pine Forest (Oak - Red Maple Successional Forest and Upland / Wetland Transitional Forest); and (5) Wet Meadow / Shrubland (Alder Swamp, Bluejoint Wet Meadow, Cattail Marsh, Common Reed Marsh, Lake Sedge Wet Meadow, Purple Loosestrife Wetland, and Tussock Sedge Meadow). These map classes represent aggregated associations that could not be distinguished individually by photointerpretation due to the fact that the communities are interdigitated on the ground and many occur as very small patches (<0.5 ha).

Upland Map Classes

Only three of the upland forested map classes are widely distributed in MIMA, however they comprise most of the forested matrix, they are: (1) Oak - Hickory Forest map class (117.5 ha, 290.3

ac mapped); (2) Red Oak - Red Maple - Pine Forest map class (69.1 ha, 170.5 ac mapped); and (3) Pine - Oak Forest (59.6 ha, 147.3 ac mapped).

The Dry Oak - Hickory Forest is the most common association in the Oak - Hickory Forest map class. It occurs on drier sites where oaks (*Quercus* spp.) and hickories (*Carya* spp.) are dominant without eastern white pine (*Pinus strobus*) or red maple (*Acer rubrum*) as co-dominants in the canopy. This association is clearly expressed along the power line on the east side of the park, on Poplar and Fiske hills. Black Locust Successional Forest, dominated by non-native black locust (*Robinia pseudoacacia*), occurs in small patches near the Dry Oak - Hickory Forest and is also mapped in the Oak - Hickory Forest map class.

The Oak - Red Maple Successional Forest is the most common association in the Red Oak - Red Maple - Pine Forest map class. It occurs on sandy loam soils that have been subject to past agricultural uses. Hardwood dominance can vary, but the canopy often includes northern red oak (*Quercus rubra*) and may include substantial amounts of red maple, particularly in sites transitional to wetlands. In many cases, a period of open sunny conditions and soil disturbance has resulted in the colonization of eastern white pine (but <20% in the canopy). The transitional-to-wetland sites typically have Upland/Wetland Transitional Forest, which also has northern red oak and red maple in the canopy along with a fern-dominated herbaceous layer. This forest association is also in the Red Oak - Red Maple - Pine Forest map class.

The Pine - Oak Forest map class represents the Mixed Oak - White Pine Forest association. It can be distinguished from the other upland forest map classes by the prominence of eastern white pine in the canopy (>20% cover). It also has American beech (*Fagus grandifolia*) in the canopy along with white oak (*Quercus alba*) and black oak (*Quercus velutina*). This mixed pine – oak canopy forest is a matrix forest map class, covering 59.6 ha (147.3 ac) of the park. None of the other map classes have as much eastern white pine in the canopy.

Managed Wooded Pasture, an association unique to MIMA, covers 13.9 ha (34.3 ac) of the park and is maintained annually by mowing. The pastures are created and maintained on formerly cleared land, most of which had reverted to forest prior to management. The general character of Managed Wooded Pasture is grassland with scattered trees. Tree species vary from site to site and can include black oak, northern red oak, sugar maple (*Acer saccharum*), eastern redcedar (*Juniperus virginiana*), and occasionally white ash (*Fraxinus americana*) over successional old field grasses and forbs.

Norway Maple Forest (4.2 ha, 10.4 ac mapped) and Northern Hardwood - Oak Forest (1.6 ha, 4.0 ha mapped) are the least common upland forested map classes. Norway Maple Forest is a non-native association and conversion of this forest to Managed Wooded Pasture or a native forest association is recommended. The Northern Hardwood - Oak Forest is very small and the one example of it in the park is located along the upper south-facing, steep slope of a small hill. Soils are sandy loam and moderately rocky. Sugar maple dominates both the canopy and subcanopy. American basswood (*Tilia americana*), black locust (*Robinia pseudoacacia*), northern red oak, and shagbark hickory (*Carya ovata*) are also present but at low cover.

The most common non-forested upland map class found throughout the park is Abandoned Field (15.3 ha, 37.8 ac mapped) which includes the Successional Old Field and Dogwood - Arrowwood Successional Wet Shrubland associations. Successional Old Field is very common throughout the park. These grass-dominated sites are generally maintained as open fields to represent the historical landscape and can be found throughout the park. A few of these old fields are dominated by native grasses such as little bluestem (*Schizachyrium scoparium*) or common broom-sedge (*Andropogon virginicus*), but most are dominated by non-native species, including orchardgrass (*Dactylis glomerata*), timothy (*Phleum pratense*), and bentgrass (*Agrostis* spp.). The Dogwood – Arrowwood Successional Wet Shrubland is less common than Successional Old Field and occurs in seasonally flooded areas of the successional old fields. It can be identified by the abundance of dogwood (*Cornus* spp.) and arrowwood (*Viburnum* spp.) shrubs.

Wetland Map Classes

Forested Swamp is the most common wetland forested map class, with mapped occurrences covering 46.6 ha (115.2 ac). The accuracy assessment suggests that this vegetation type may be significantly under mapped at MIMA (*i.e.*, that there are more forested swamps than the map depicts) (Table 10). The class includes four associations: (1) Red Maple - Ash Swamp; (2) Red Maple - Blackgum Swamp; (3) Red Maple - Tussock Sedge Wooded Marsh; and (4) Swamp White Oak Floodplain Forest. Red Maple - Ash Swamp, a groundwater influenced wetland dominated by red maple, green ash (*Fraxinus pensylvanica*), and northern spicebush (*Lindera benzoin*), occurs along the east side of the Elm Brook wetland complex on both the north and south sides of Route 2A. It can be distinguished from the more common Red Maple - Blackgum Swamp, a shallow basin wetland, by the absence of blackgum (*Nyssa sylvatica*) from the canopy. Sweet pepperbush (*Clethra alnifolia*), swamp azalea (*Rhododendron viscosum*), and highbush blueberry (*Vaccinium corymbosum*) are characteristic shrubs in the Red Maple - Blackgum Swamp. Red Maple - Tussock Sedge Wooded Marsh, a small-patch wetland, is easily distinguished from the other associations in this map class by a relatively open canopy dominated by red maple and an herbaceous layer dominated by tussock sedge (*Carex stricta*). Swamp White Oak Floodplain Forest can be distinguished by the dominance of swamp white oak (*Quercus bicolor*) in the canopy. It occurs as small patches along the upper floodplain border along the Concord River.

The Silver Maple Floodplain Forest patches mapped in the Silver Maple Floodplain Forest map class (4.6 ha, 11.4 ac mapped) occur along the Concord River on both sides of North Bridge in two settings: one occurrence is along an elevated terrace bordering the river where the forest is flooded in the spring but dry during most of the growing season; and the other occurrence is lower on the floodplain and is also flooded during heavy runoff events during the growing season. These linear floodplain forest patches are limited within the park, but continue outside the boundary and may be part of a larger community occurrence in the area.

The most common wetland is the Wet Meadow / Shrubland map class (67.5 ha, 166.8 ac mapped). This map class includes very small examples (<0.5 ha, 1.2 ac) of Lake Sedge Wet Meadow, Alder Swamp, and Bluejoint Wet Meadow; also included are Cattail Marsh and Tussock Sedge Meadow. The examples of these associations in the park are small and mostly compromised by dense stands of

purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*) to the extent that the non-native Common Reed Marsh and Purple Loosestrife Wetland associations are included in the vegetation classification and map in the Wet Meadow / Shrubland map class.

The remaining wetland associations, each represented by a map class, Buttonbush Swamp, Leatherleaf Bog, and Sedge - Mannagrass Fen, are very small (<0.5 ha, 1.2 ac mapped) and found in only limited parts of MIMA. Water-lily Aquatic Wetland occurs in the Open Water map class and can be identified by the floating leaves of American white water-lily (*Nymphaea odorata*). These unique associations add to the biodiversity and wetland habitats of the park and should be monitored and managed for purple loosestrife and common reed expansion as well as invasion by other non-native plants.

Plant Species Records

A total of 398 vascular plant species have been recorded from the park in the 1992, 2004, and 2006 vegetation surveys. Appendix D provides a complete list of the 398 vascular plant species; 30 (7.5% of the total flora) of these are non-native. Nonvascular plant species were generally not recorded, with the exception of some records of broom mosses (*Dicranum* spp.) and sphagnum mosses (*Sphagnum* spp.).

Non-native Plant Species

Non-native plant species are dominant in six of the 27 vegetation associations at MIMA. Norway maple (*Acer platanoides*) and black locust form forests locally in the location of old house sites. Purple loosestrife is a dominant, with few other species, at one site in Merriam's Corner that had been an agricultural field 20 years ago. Purple loosestrife has also invaded an otherwise natural community at other sites in Silver Maple Floodplain Forests, Buttonbush Swamps, and Cattail Marshes. Similarly, there was only one area located within the park, on the slope of Fiske Hill, where common reed (*Phragmites australis*) is the major dominant. It is, however, locally abundant in the Elm Brook wetland complex where it grows in the Cattail Marsh and in the Lake Sedge Wet Meadow.

Other non-native species can be dominant within certain communities, but do not define the community types. Notable among these species is common buckthorn[‡] (*Rhamnus cathartica*) and glossy buckthorn[‡] (*Rhamnus frangula*). At least one of these buckthorn[‡] species is present in 22 of the 36 vegetation classification plots examined during this inventory. Garlic mustard (*Alliaria petiolata*) is also locally abundant, particularly along roadsides and trails. Japanese barberry (*Berberis thunbergii*) and winged burning bush (*Euonymus alatus*) are present at many sites, but seldom abundant. Multiflora rose (*Rosa multiflora*) is typical in old fields, especially the wetter ones such as Dogwood - Arrowwood Successional Wet Shrublands, where it can form nearly impenetrable thickets.

[‡] See Appendix J for more information on the distribution on *Rhamnus* species

Final Vegetation Map Production

The 2007 final vegetation map for MIMA includes 20 vegetation and land cover classes (Figure 16). This map is based on aerial photography that was acquired in April 2003, vegetation classification plot data collected in 2004, and AA data collected in 2006. Since that time, the vegetation continues to change due to natural and human related disturbances. Continued natural succession will influence the mapped vegetation. Management of non –native invasive species and woody plants will also alter the vegetation. Even with continual changes, the vegetation map produced by this project provides crucial baseline data for park resource managers.

Conclusions

The vegetation map units provide the user with a pragmatic balance between acceptable accuracy while retaining sufficient detail. It provides baseline data for long-term vegetation monitoring and can be used to inform management plans for the park. The vegetation map can be updated with additional field data over time. Newly developed environmental data layers can be interpreted with the aid of the aerial photos and orthophotos to further refine the map for the park.

The vegetation map, detailed vegetation association descriptions, and dichotomous key are essential tools for managing and monitoring the natural communities in the park. These standardized products provide a baseline for assessing the ecological integrity, acreages, and locations of the vegetation communities within the park. Keeping the map up-to-date should be a high priority for park resource managers because the vegetation will change in response to various disturbances, natural succession, and management. The vegetation map can be used to develop interpretive trails, field guides, and help resource managers identify priority areas for resource protection, restoration, and environmental education. The USNVC can also be used in conjunction with the vegetation map to help describe desired vegetation communities for future vegetation management projects and provide a framework for ecological integrity assessments.

Although this inventory did not emphasize sampling of detailed wildlife habitat or structural parameters, the delineation of physiognomic classes should aid in analyses of broad patterns in vegetation structural types for use in wildlife monitoring. This project should inform modeling and mapping efforts for wildlife habitat/use.

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1a. Forested.....2

2a. Stands in low, wet areas; wetland and floodplain forests.....3

3a. Adjacent to river.....**Silver Maple Floodplain Forest**

3b. Crowns uneven with lumpy texture.....**Forested Swamp**

2b. Hardwoods on drier, higher ground.....4

4a. Canopy dominated by popcorn shaped oak (*Quercus* spp.) crowns.....5

5a. Popcorn crown shape of oaks, hazy crowns of American beech (*Fagus grandifolia*), with $\geq$ 25% eastern white pine (*Pinus strobus*)

.....**Pine - Oak Forest**

5b. Dominance of popcorn crown shape of oaks (*Quercus* spp.) mixed with other hardwoods; black locust may be dominant in some stands....**Oak - Hickory Forest**

4b. Crowns are not popcorn shaped.....6

6a. Star shaped crowns of eastern white pine present.....7

7a. Younger, smaller trees. Canopy uniform with $\leq$ 50% star shaped crowns of eastern white pine extruding.....**Red Oak - Red Maple - Pine Forest**

7b. Columnar or conical crowns, compact, round, large, star-shaped, comprised of $\geq$ 50% white pine.....**Pine - Oak Forest**

6b. Star shaped crowns of eastern white pine (*Pinus strobus*) absent.....8

8a. Dominance of large billowy, compact crowns.....

.....**Northern Hardwood - Oak Forest**

8b. Canopy dominated by Norway maple (*Acer platanoides*).....

.....**Modified Successional Forest**

1b. Non-Forested vegetation.....9

9a. Scattered and open canopied popcorn shaped oak crowns and columnar eastern red-cedar (<i>Juniperus virginiana</i>) present over fields.....	Managed Wooded Pasture
9b. Shrublands and herbaceous dominated vegetation.....	10
10a. Shrublands.....	11
11a. Shrubs along streams and in temporally flooded areas, dominated by alders (<i>Alnus</i> spp.) and glossy buckthorn [†] (<i>Frangula alnus</i>)...	Wet Meadow / Shrubland
11b. Shrub fringing stands of open water.....	12
12a. Fringing shrubs.....	Buttonbush Swamp
12b. Flooded area with pink, fine textured shrubs.....	Leatherleaf Bog
10b. Herbaceous vegetation dominant.....	13
13a. Wet meadows, fens, and marshes.....	14
14a. Flooded area consisting of mucky sediments and low relief	Sedge - Mannagrass Fen
14b. Low, finely textured open meadows; stippled texture of <i>Carex stricta</i> tussocks; inundated with water and herbaceous marshes drained by braided streams; tan color, fine texture, traversed with finely braided streams.....	Wet Meadow / Shrubland
13b. Upland fields and transmission right-of-way.....	15
15a. Old fields.....	Abandoned Field
15b. Vegetation under utilities.....	Transmission Right-of-way

[†] See Appendix J for more information on the distribution on *Rhamnus* species

Appendix B. Vegetation classification plot sampling form for Minute Man National Historical Park

NATURESERVE NATIONAL PARK VEGETATION MAPPING PROGRAM: PLOT SURVEY FORM

Park Name: **Minute Man National Historical Park (MIMA)** State: **MA**

Plot Code _____ Polygon Code _____ Airphoto # _____	
Park sublocation (Surveysite) _____	
Quad Name _____	Quad Code _____
Survey Date: _____	Surveyors: _____ Sourcecode: _____
Provisional Community Name _____	
Classified Community Name _____ ELCODE: CEGL00	
Ecological System type _____	
Directions to Plot: _____	
Plot length _____ width _____ shape _____ Permanent (y/n) _____ Plot Photos (y/n) _____ Roll# _____ Frame# _____	
Plot representativeness _____	
GPS file name _____ Field UTM X _____ m E Field UTM Y _____ m N	
GPS unit used _____ datum _____ Error +/- _____ m	
Corrected UTM X _____ m E Corrected UTM Y _____ m UTMZone _____	

ENVIRONMENTAL DESCRIPTION

Elevation: _____ m / ft <i>include units!</i>			Aspect (use true, not magnetic, value):			
Slope	Degr	%	Topographic Position	Landform	Geology:	Geology:
					Bedrock	Surficial
Flat	0	0%	Crest/Summit/Ridge	Bar	Igneous	Bedrock
Gentle	1-5	1-9%	Upper/Shoulder Slope	Basin	Granitic	Talus
Modt.	6-14	10-25%	High Plateau	Beach	Dioritic	Glacial till
Som. Steep	15-26	26-49%	Middle Slope	Bluff/bank	Gabbroic	Moraine
Steep	27-45	50-100%	Slope step (terraced)	Channel	Metamorphic	Escher/outwash
V. Steep	46-69	101-275%	Lower Slope	Cliff	Slate/phyllite	Glacial delta
Abrupt	70-95	276-300%	Toe Slope	Cove	Schist	Lacustrine/
Overhang	>100	>300%	Low level/terrace	Delta	Gneiss	fluvial
			Channel wall	Dome	Marble	Marine
			Channel bed	Drumlin	Serpentine	Aeolian
			Depression	Dune	Sedimentary	
Record more exact measures if taken:				Escarpment	Shale	Other
				Escher	Limestone	
				Estuary	/Dolomite	
				Flat		
				Floodplain		
				Gorge		
				Hill		
					Other	

Cowardin System	Hydrologic regime	Salinity
___ Upland	___ Permanently Flooded	Coastal salt (>30 ppt)
___ Riverine	___ Semipermanently Flooded	Coastal brackish (5-30 ppt)
___ Palustrine	___ Seasonally Flooded	Fresh tidal (< 5 ppt)
___ Lacustrine		Inland salt
___ Estuarine		Inland brackish

Appendix B. Vegetation classification plot sampling form for Minute Man National Historical Park (continued).

Soil Taxon/Description:			Soil Profile notes Depth examined: _____ Horizons, colors, depth to obstruction, depth to water table, depth to mottling, etc.
Soil Texture ___ sand ___ sandy loam ___ loam ___ silt loam ___ silt ___ clay loam ___ clay ___ peat ___ muck	Soil Drainage ___ Rapidly drained ___ Well drained ___ Moderately well ___ Somewhat poorly ___ Poorly drained ___ Very poorly drained	Unvegetated Surface: <i>(please use cover scale below)</i> ___ Bedrock ___ Large rocks (cobbles, boulders > 10 cm) ___ Small rocks/gravel (0.2-10 cm) ___ Sand (0.1-2 mm) ___ Litter, duff ___ Wood (> 1 cm) ___ Bare soil ___ Water Other: _____	
Soil pH:	Soil stoniness ___ v. little (< 1%) ___ moderate (2-20%) ___ very stony (20-50%) ___ exceedingly stony (>50%)		

Additional environment notes:

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic class	Cover Classes: Strata & Unveg. Surface	Height Classes for Strata
<u>Trees and Shrubs</u>		___ Forest	5%	<0.5 m
% Evergreen: _____	___ Broad-leaved	___ Woodland	10%	0.5-1m
% Deciduous: _____	___ Needle-leaved	___ Shrubland	20%	1-2 m
___ Evergreen	___ Microphyllous	___ Dwarf Shrubland	30%	2-5 m
___ Cold-deciduous	___ Graminoid	___ Herbaceous	40%	5-10 m
___ Mixed	___ Forb	___ Nonvascular	50%	10-15 m
<u>Herbs</u>	___ Pteridophyte	___ Sparsely Vegetated	60%	15-20 m
___ Annual	___ Non-vascular		70%	20-35 m
___ Perennial			80%	35-50 m
			90%	>50 m
			100%	

Stratum	Height	Cover	Characteristic / diagnostic species <i>*please use height and cover classes from table above</i>
T1 Emergent			
T2 Canopy			
T3 Sub-canopy			
S1 Tall Shrub			
S2 Short Shrub			
H Herbaceous			
N Non-vascular			
V Vine/liana			

SPECIES/COVER VALUES

Starting with the uppermost stratum, list each species within the plot and its cover class. For forests and woodlands, on a separate line below each tree species, list the DBH of all trees >10 cm dbh, separating measurements with a comma. **Circle DBH units: cm / in**

[illegible]

*species cover classes (midpoint): < 1 **1** / 1-5% **3** / 6-10% **8** / 11-25% **18** / 26-50% **38** / 51-75% **63** / 76-100% **87**

ADDITIONAL NOTES *(continue as needed on reverse)*

Brief word picture of community:

Topographic sketch:

Adjacent vegetation type(s):

Known/inferred land-use history:

Animal use evidence

Natural disturbance evidence:

Invasive species notes:

Other anthropogenic disturbance comments

Other Comments

Appendix C. Data dictionary for fields in PLOTS 2.0 database.

Table 1 . Data dictionary for fields of the primary tables in the Plots 2.0 database.

TABLE	FIELD	DEFINITION	COMMENT
Plots	Plot Code	unique identifier assigned by PLOTS using 4-letter park code and sequential numbers	MIMA
Plots	Field Plot Name	plot as identified on field form	
Plots	County		
Plots	SubPlot	was plot a sub-unit of a larger plot?	
Plots	SubPlot Parent Code	identifier of larger plot if this is a subplot	n/a for MIMA
Plots	Air Photo Number	reference number for aerial photo that covers the plot area	
Plots	Polygon Code	identifier of polygon on vegetation map in which plot falls	
Plots	Map Unit	name of map class for polygon in which plot falls	
Plots	Classified Community Name	standard association name from the US National Vegetation Classification	
Plots	USNVC ELCODE	standard element code from the US National Vegetation Classification	
Plots	Sublocation	narrative for location of plot within the park	
Plots	Quad Name	name of USGS 7.5' quadrangle in which plot falls	
Plots	Quad Code	standardized code for USGS quadrangle	
Plots	Coord System	coordinates used for plot geograohic location: "1" if UTM, "2" if lat/long	
Plots	GPS File	name of file in which coordinates are stored	
Plots	GPS Techniques	type of GPS unit used to secure location plus any applicable comments	
Plots	Field UTM X	X UTM coordinate as recorded in field	
Plots	Field UTM Y	Y UTM coordinate as recorded in field	

Appendix C. Data dictionary for fields in PLOTS 2.0 database (continued).

Table C-1 (continued). Data dictionary for fields of the primary tables in the Plots 2.0 database.

TABLE	FIELD	DEFINITION	COMMENT
Plots	Corrected UTM X	corrected X UTM coordinate if post-processing is used	n/a for MIMA as no post-processing was used
Plots	Corrected UTM Y	corrected Y UTM coordinate if post-processing is used	n/a for MIMA as no post-processing was used
Plots	UTM Zone	UTM zone	19 for all of MMA
Plots	Survey Date	date field data were taken	
Plots	Surveyors	field personnel	
Plots	Plot Directions	detailed directions to plot using ground landmarks	
Plots	X Dimension	length of side of plot in m	
Plots	Y Dimension	width of plot in m	
Plots	Plot Shape	square, rectangular, round, etc.	Combination for MIMA
Plots	Photos	yes/no	
Plots	Roll Number	roll number for film photos	
Plots	Frame Number	frame number for film photos; file name for digital photos	
Plots	Permanent	is plot permanent? Yes/no	
Plots	Representativeness	narrative for how representative of community plot seems to be	
Plots	Elevation	plot average elevation above mean sea level	in meters
Plots	Elevation Units	"1" = meters, "2" = feet	
Plots	GPS Datum	Datum used by GPS	NAD83 for MIMA
Plots	GPS Accuracy	as recorded in field	
Plots	Slope	slope category (pick-list)	Flat = 0°; Gentle = 0-5°; Moderate = 6-14°; Somewhat steep = 15-25°; Steep = 27-45°; Very steep = 45-69°; Abrupt = 70-100°; Overhanging/sheltered = 100°
Plots	Precise Slope	slope measurement	in degrees
Plots	Slope range	range of slope, where uphill and downhill values are given	

Appendix C. Data dictionary for fields in PLOTS 2.0 database (continued).

Table C-1 (continued). Data dictionary for fields of the primary tables in the Plots 2.0 database.

TABLE	FIELD	DEFINITION	COMMENT
Plots	Aspect	aspect category (pick-list)	Flat; Variable; N 338-22°; NE 23-67°; E 68-112°; SE 113-157°; S 158-202°; SW 203-247°; W 248-292°; NW 293-337°
Plots	Precise Aspect	measured aspect in True degrees	
Plots	Topo Position	topographic position of plot (pick-list)	Crest/Summit/Ridge; Upper/Shoulder Slope High Plateau; Middle Slope; Slope step; Lower Slope; Toe slope; Low level/terrace; Channel wall; Channel bed; Depression
Plots	Landform	landform on which plot occurs (pick-list)	Bar; Basin; Beach; Bluff /bank; Channel; Cliff; Cove; Delta; Dome; Drumlin; Dune; Escarpment; Esker; Estuary; Flat; Floodplain; Gorge; Hill; Kame; Kettle; Lake /pond; Ledge; Moraine; Mountain; Outwash plain; Oxbow; Plain; Plateau; Ravine; Ridge; Saddle; Swale; Talus; Terrace; Valley; Other
Plots	Surficial Geology	geologic setting (pick-list)	Bedrock; Talus; Glacial till; Moraine; Esker/outwash; Glacial delta; Lacustrine/; fluvial; Marine; Aeolian; Other
Plots	Cowardin System	broad wetland classification from Cowardin 1979	Upland, Palustrine, Estuarine, Riverine, Lacustrine
Plots	Hydro Regime	hydrologic regime (wetlands only)	Permanently Flooded; Semipermanently Flooded; Seasonally Flooded; Saturated; Temporarily Flooded; Intermittently Flooded; Tidally Flooded
Plots	Salinity/Halinity		
Plots	Hydrology Evidence	notes on evidence used to deduce hydrologic regime	
Plots	Environmental Comments	narrative description of the habitat	
Plots	Landscape Comments	narrative description of the surrounding area	

Appendix C. Data dictionary for fields in PLOTS 2.0 database (continued).

Table C-1 (continued). Data dictionary for fields of the primary tables in the Plots 2.0 database.

TABLE	FIELD	DEFINITION	COMMENT
Plots	Soil Taxon/Description	narrative of soil profile	
Plots	Soil Texture	soil texture class	sand; sandy loam; loam; silt loam; silt; clay loam; clay; peat; muck
Plots	Soil Depth	depth to obstruction	
Plots	Soil Depth Units	1=meters, 2=cm, 3=feet, 4=inches	cm
Plots	Soil Drainage	drainage category (pick-list)	rapidly drained; well drained; moderately well drained; somewhat poorly drained; poorly drained; very poorly drained
Plots	% Bedrock	% unvegetated ground surface covered	
Plots	% Large Rocks	% unvegetated ground surface covered	
Plots	% Small Rocks	% unvegetated ground surface covered	
Plots	% Sand	% unvegetated ground surface covered	
Plots	% Litter, Duff	% unvegetated ground surface covered	
Plots	% Wood	% unvegetated ground surface covered	
Plots	% Water	% unvegetated ground surface covered	
Plots	% Bare Soil	% unvegetated ground surface covered	
Plots	% Other	if "other" is used as a ground surface cover category	
Plots	% Other Description	if "other" is used as a ground surface cover category	
Plots	Leaf Phenology	Of dominant stratum	Evergreen, Cold-deciduous, Mixed evergreen-cold-deciduous, Herb – annual, Herb – perennial
Plots	Leaf Type	Of dominant stratum	Broad-leaved, Needle-leaved, Microphyllous, Graminoid, Broad-leaved herbaceous, Pteridophyte, Nonvascular

Appendix C. Data dictionary for fields in PLOTS 2.0 database (continued).

Table C-1 (continued). Data dictionary for fields of the primary tables in the Plots 2.0 database.

TABLE	FIELD	DEFINITION	COMMENT
Plots	Physio Class	physiognomic class; applies to dominant stratum (highest stratum with at least 25% cover)	Forest (>60% tree canopy), Woodland (25%-60% open tree canopy), Shrubland (<25% trees, and shrubby cover >0.5 m tall greater than other strata), Dwarf Shrubland (<25% trees, and shrubby cover <0.5 m tall greater than other strata), Herbaceous (herb cover exceeds other strata), Nonvascular (nonvascular cover exceeds that of other strata), or Sparse vegetation (total vegetation <25%)
Plots	T1 Hgt	height of emergent tree layer	in meters if applicable
Plots	T1 Cover	% cover of emergent tree layer	cover classes (for all strata): 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%
Plots	T2 Hgt	height of tree canopy layer	
Plots	T2 Cover	% cover of tree canopy layer	
Plots	T3 Hgt	height of tree subcanopy layer	
Plots	T3 Cover	% cover of tree subcanopy layer	
Plots	S1 Hgt	height of tall shrub layer	
Plots	S1 Cover	% cover of tall shrub layer	
Plots	S2 Hgt	height of short shrub layer	
Plots	S2 Cover	% cover of short shrub layer	
Plots	S3 Hgt	height of dwarf shrub layer	
Plots	S3 Cover	% cover of dwarf shrub layer	
Plots	H Hgt	height of herb layer	
Plots	H Cover	% cover of herb layer	
Plots	N Cover	% cover of non-vascular layer	
Plots	V Hgt	height of vine layer, if present	
Plots	V Cover	% cover of vine layer	

Appendix C. Data dictionary for fields in PLOTS 2.0 database (continued).

Table C-1 (continued). Data dictionary for fields of the primary tables in the Plots 2.0 database.

TABLE	FIELD	DEFINITION	COMMENT
Plots	Other Measure1 Defined	Explanation of other measure of species presence	
Plots	Other Measure2 Defined	Explanation of other measurement used for species presence	
Plots	Animal Use Evidence		
Plots	Disturbance Comments	narrative on natural and anthropogenic disturbance	
Plots	Other Comments		
Plots	Update	When record was last updated (using Plots 2.0 interface)	does not apply to values directly manipulated in tables
Plots	User	initials of person entering record	
Plots	Species Counter	number of plant species recorded in plot	
Plots	Optional Fields Defined	narrative defining any optional fields that are used	Opt1: Basal area in m2/ha, rounded
Plots	Opt1	for MABI, basal area (m2/ha, rounded)	
Plots	Provisional Community Name	community name assigned in field or before final analyses	
Plots-Species	Plot Code	unique identifier assigned by PLOTS using 4-letter park code and sequential numbers	provides link to Plots table
Plots-Species	Plot Species Counter	Unique integer sequence for species within this plot	
Plots-Species	Plant Symbol	from USDA Plants db table	
Plots-Species	Scientific Name	Accepted Latin name of the plant species	
Plots-Species	Common Name		
Plots-Species	Family		
Plots-Species	Specimen Number	if collected	
Plots-Species	Used PLANTS	Yes if name came from the PLANTS database	

Appendix C. Data dictionary for fields in PLOTS 2.0 database (continued).

Table C-1 (continued). Data dictionary for fields of the primary tables in the Plots 2.0 database.

TABLE	FIELD	DEFINITION	COMMENT
Plots-Species	Source	From Plant List table: SS or NS	
Plots-Species	Within Plot	yes/no: Species is present within the Plot boundaries	
Plots-Species	Stratum Sort	Major sort order of strata	to sort from highest to lowest or vice versa
Plots-Species	Stratum	Stratum this species being recorded in	T1 = Emergent; T2 = Tree Canopy; T3 = Tree Subcanopy; S1 = Tall Shrub; S2 = Short Shrub; H = Herbaceous; N = Nonvascular plant; V = Vine/liana
Plots-Species	Strat-Simple	simplified stratum	Tree, Shrub, Herb, Non-vasc, Vine
Plots-Species	Diagnostic	yes/no: Species is a known diagnostic for the community	
Plots-Species	Range Cover	midpoint of cover class	cover classes (for all strata): < 1 / 1-5% / 6-10% / 11-25% / 26-50% / 51-75% / 76-100%
Plots-Species	Real Cover	if % cover measured directly	not used at MIMA
Plots-Species	Other Measure1	Other measure of species presence	
Plots-Species	Other Measure2	Other measure of species presence	not used at MIMA
Plots-Species	DBH	Diameter at breast height for all trees above 10 cm diameter (comma delimited)	recorded on field forms
Plots-Species	Update	When record was last updated (using Plots 2.0 interface)	does not apply to values directly manipulated in tables
Plots-Species	User	initials of person entering record	
Plots-Species	SciName-Field	scientific name used on field form	names standardized to Kartesz 1999 (updated NPS common names are in "Scientific Name" field)

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling

Nomenclature follows *the PLANTS 3.5 Database* developed by the Natural Resources Conservation Service in cooperation with the Biota of North America Program (USDA-NRCS 2006). Some common names listed in the PLANTS database were changed to reflect the common names used by ecologists and resource managers in this region. Plants observed in the field but not sampled are denoted with an asterisk (*). Exotic plants are denoted with an (°) (Merhoff et al. 2003). Plants recorded in the 1992 vegetation survey are denoted with a (⁹²) (Thompson and Jenkins 1992).

Table 2 . Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Aceraceae	<i>Acer platanoides</i> [°]	Norway maple
	<i>Acer pseudoplatanus</i> [°]	sycamore maple
	<i>Acer rubrum</i>	red maple
	<i>Acer saccharinum</i>	silver maple
	<i>Acer saccharum</i>	sugar maple
Acoraceae	<i>Acorus americanus</i> ⁽⁹²⁾	sweetflag
Agavaceae	<i>Agave</i> sp. [°]	agave
Alismataceae	<i>Alisma subcordatum</i>	American water plantain
	<i>Sagittaria latifolia</i>	broadleaf arrowhead
Amaranthaceae	<i>Amaranthus caudatus</i> [°]	foxtail amaranth
Anacardiaceae	<i>Toxicodendron radicans</i>	eastern poison ivy
Apiaceae	<i>Anthriscus sylvestris</i> [°]	wild chervil
	<i>Cicuta bulbifera</i>	bulblet-bearing water hemlock
	<i>Cicuta maculata</i> ^{(92)*}	spotted water hemlock
	<i>Daucus carota</i> [°]	Queen Anne's lace
	<i>Sium suave</i>	hemlock waterparsnip
Apocynaceae	<i>Apocynum androsaemifolium</i>	spreading dogbane
	<i>Vinca minor</i> [°]	common periwinkle
Aquifoliaceae	<i>Ilex mucronata</i>	catberry
	<i>Ilex verticillata</i>	common winterberry
Araceae	<i>Arisaema triphyllum</i>	Jack in the pulpit
	<i>Peltandra virginica</i>	green arrow arum
	<i>Symplocarpus foetidus</i>	skunk cabbage
Araliaceae	<i>Aralia nudicaulis</i>	wild sarsaparilla
	<i>Panax trifolius</i> ^{(92)*}	dwarf ginseng
Asclepiadaceae	<i>Asclepias incarnata</i>	swamp milkweed
	<i>Asclepias syriaca</i>	common milkweed

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Asclepiadaceae (cont.)	<i>Asclepias verticillata</i>	whorled milkweed
Asteraceae	<i>Achillea millefolium</i> ⁽⁹²⁾	common yarrow
	<i>Ambrosia artemisiifolia</i>	annual ragweed
	<i>Antennaria plantaginifolia</i> ⁽⁹²⁾	woman's tobacco
	<i>Aster</i> sp.	aster
	<i>Bidens tripartita</i>	threelobe beggarticks
	<i>Conyza canadensis</i> var. <i>canadensis</i>	Canadian horseweed
	<i>Erechtites hieraciifolius</i>	American burnweed
	<i>Erigeron annuus</i>	eastern daisy fleabane
	<i>Eutrochium dubium</i>	coastalplain joeypyeweed
	<i>Eutrochium maculatum</i> ⁽⁹²⁾	spotted joeypyeweed
	<i>Eurybia divaricata</i>	white wood aster
	<i>Euthamia graminifolia</i>	flat-top goldentop
	<i>Gnaphalium uliginosum</i>	marsh cudweed
	<i>Heliopsis helianthoides</i> *	smooth oxeye
	<i>Heliopsis</i> sp.	oxeye
	<i>Hieracium aurantiacum</i>	orange hawkweed
	<i>Hieracium canadense</i>	Canadian hawkweed
	<i>Hieracium paniculatum</i> ⁽⁹²⁾ *	Allegheny hawkweed
	<i>Hieracium scabrum</i> ⁽⁹²⁾ *	rough hawkweed
	<i>Hieracium venosum</i>	rattlesnakeweed
	<i>Hypochaeris radicata</i>	hairy catsear
	<i>Lactuca</i> sp.	lettuce
	<i>Mikania scandens</i>	climbing hempvine
	<i>Oclemena acuminata</i>	whorled wood aster
	<i>Packera aurea</i> ⁽⁹²⁾ *	golden ragwort
	<i>Prenanthes</i> sp.	rattlesnakeweed
	<i>Sericocarpus asteroides</i>	toothed whitetop aster
	<i>Solidago altissima</i>	Canada goldenrod
	<i>Solidago bicolor</i>	white goldenrod
	<i>Solidago caesia</i>	wreath goldenrod
	<i>Solidago canadensis</i>	Canada goldenrod
	<i>Solidago flexicaulis</i> *	zigzag goldenrod
	<i>Solidago gigantea</i> *	giant goldenrod
	<i>Solidago juncea</i>	early goldenrod
	<i>Solidago odora</i>	anisescented goldenrod
	<i>Solidago puberula</i>	downy goldenrod

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Asteraceae (cont.)	<i>Solidago rugosa</i>	wrinkleleaf goldenrod
	<i>Solidago sp.</i>	goldenrod
	<i>Sonchus arvensise</i>	field sowthistle
	<i>Symphyotrichum dumosum</i>	rice button aster
	<i>Symphyotrichum lateriflorum</i>	calico aster
	<i>Symphyotrichum puniceum</i>	purplestem aster
	<i>Tanacetum vulgaree*</i>	common tansy
Balsaminaceae	<i>Impatiens capensis</i>	jewelweed
	<i>Impatiens pallida</i>	pale touch-me-not
Berberidaceae	<i>Berberis thunbergiie</i>	Japanese barberry
Betulaceae	<i>Alnus serrulata</i>	hazel alder
	<i>Betula alleghaniensis</i>	yellow birch
	<i>Betula lenta</i>	sweet birch
	<i>Betula populifolia</i> (92)	gray birch
	<i>Carpinus caroliniana</i> (92)*	American hornbeam
	<i>Corylus americana</i>	American hazelnut
	<i>Corylus cornuta</i>	beaked hazelnut
	<i>Ostrya virginiana</i>	hophornbeam
Bignoniaceae	<i>Campsis radicans</i>	trumpet creeper
Boraginaceae	<i>Myosotis scorpioidese</i>	true forget-me-not
Brassicaceae	<i>Alliaria petiolatae</i>	garlic mustard
	<i>Arabis sp.</i>	rockcress
	<i>Cardamine pensylvanica</i>	Pennsylvania bittercress
	<i>Cardamine pratensis</i> (92)	cuckoo flower
Callitrichaceae	<i>Callitriche sp.</i>	water-starwort
Campanulaceae	<i>Lobelia cardinalis</i>	cardinalflower
Caprifoliaceae	<i>Lonicera morrowiie</i>	Morrow's honeysuckle
	<i>Sambucus nigra ssp. canadensis</i>	common elderberry
	<i>Sambucus racemosa var. racemosa*</i>	red elderberry
	<i>Viburnum acerifolium</i>	mapleleaf viburnum
	<i>Viburnum dentatum</i>	southern arrowwood
	<i>Viburnum lentago</i>	nannyberry
Caryophyllaceae	<i>Cerastium arvense</i>	field chickweed
	<i>Moehringia lateriflora</i> (92)*	bluntleaf sandwort
Celastraceae	<i>Celastrus orbiculatuse</i>	oriental bittersweet
	<i>Euonymus alatus</i>	winged burning bush
Ceratophyllaceae	<i>Ceratophyllum demersum</i> (92)*	coon's tail

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Cistaceae	<i>Helianthemum canadense</i>	longbranch frostweed
	<i>Lechea intermedia</i> (92)*	largepod pinweed
Cladoniaceae	<i>Cladina stellaris</i> *	star reindeer lichen
Clethraceae	<i>Clethra alnifolia</i>	coastal sweetpepperbush
Clusiaceae	<i>Hypericum boreale</i> (92)*	northern St. Johnswort
	<i>Hypericum ellipticum</i> (92)*	pale St. Johnswort
	<i>Hypericum perforatum</i>	common St. Johnswort
	<i>Triadenum virginicum</i>	Virginia marsh St. Johnswort
Convolvulaceae	<i>Calystegia sepium</i>	hedge false bindweed
	<i>Calystegia sp.</i>	false bindweed
	<i>Convolvulus sp.</i>	bindweed
Cornaceae	<i>Cornus alternifolia</i> (92)*	alternateleaf dogwood
	<i>Cornus amomum</i> (92)	silky dogwood
	<i>Cornus foemina</i> (92)	stiff dogwood
	<i>Cornus sericea</i>	redosier dogwood
Cornaceae (cont.)	<i>Cornus sp.</i>	dogwood
	<i>Nyssa sylvatica</i>	blackgum
Crassulaceae	<i>Hylotelephium telephium</i>	witch's moneybags
	<i>Penthorum sedoides</i>	ditch stonecrop
Cupressaceae	<i>Juniperus communis</i>	common juniper
	<i>Juniperus virginiana</i>	eastern redcedar
Cuscutaceae	<i>Cuscuta sp.</i>	dodder
Cyperaceae	<i>Carex athrostachya</i>	slenderbeak sedge
	<i>Carex atlantica</i> (92)*	prickly bog sedge
	<i>Carex brevior</i> (92)*	shortbeak sedge
	<i>Carex bromoides</i> (92)*	bromelike sedge
	<i>Carex brunnescens</i>	brownish sedge
	<i>Carex bullata</i> *	button sedge
	<i>Carex buxbaumii</i> *	Buxbaum sedge
	<i>Carex canescens</i>	silvery sedge
	<i>Carex cephalophora</i> (92)*	oval-leaf sedge
	<i>Carex debilis</i>	white edge sedge
	<i>Carex echinata</i> (92)*	star sedge
	<i>Carex folliculata</i> (92)*	northern long sedge
	<i>Carex gracillima</i>	graceful sedge
	<i>Carex grayi</i>	Gray's sedge

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Cyperaceae (cont).	<i>Carex gynandra</i>	nodding sedge
	<i>Carex lacustris</i>	hairy sedge
	<i>Carex lucorum</i>	Blue Ridge sedge
	<i>Carex lupulina</i>	hop sedge
	<i>Carex lurida</i> (92)*	shallow sedge
	<i>Carex pensylvanica</i>	Pennsylvania sedge
	<i>Carex rosea</i>	rosy sedge
	<i>Carex scoparia</i> (92)	broom sedge
	<i>Carex sp.</i>	sedge
	<i>Carex stipata</i> (92)*	owlfruit sedge
	<i>Carex stricta</i>	upright sedge
	<i>Carex swanii</i>	Swan's sedge
	<i>Carex tenera</i> (92)*	quill sedge
	<i>Carex trichocarpa</i>	hairyfruit sedge
	<i>Carex vesicaria</i> (92)*	blister sedge
	<i>Carex virescens</i> (92)*	ribbed sedge
	<i>Dulichium arundinaceum</i>	threeway sedge
	<i>Eleocharis acicularis</i> (92)*	needle spikerush
	<i>Eleocharis intermedia</i> (92)*	matted spikerush
	<i>Eleocharis obtusa</i> (92)*	blunt spikerush
	<i>Eleocharis robbinsii</i>	Robbins' spikerush
	<i>Eleocharis palustris</i> *	common spikerush
	<i>Eleocharis sp.</i>	spikerush
	<i>Eleocharis tenuis</i>	slender spikerush
	<i>Scirpus cyperinus</i>	woolgrass
	<i>Scirpus microcarpus</i>	panicled bulrush
Dennstaedtiaceae	<i>Dennstaedtia punctilobula</i>	eastern hayscented fern
	<i>Pteridium aquilinum</i>	western brackenfern
Dicranaceae	<i>Dicranum sp.</i>	dicranum moss
Dioscoreaceae	<i>Dioscorea villosa</i>	wild yam
Dryopteridaceae	<i>Athyrium filix-femina</i>	common ladyfern
	<i>Cystopteris fragilis</i>	brittle bladderfern
	<i>Deparia acrostichoides</i>	silver false spleenwort
	<i>Dryopteris carthusiana</i> (92)*	spinulose woodfern
	<i>Dryopteris cristata</i>	crested woodfern
	<i>Dryopteris intermedia</i>	intermediate woodfern
	<i>Dryopteris marginalis</i>	marginal woodfern

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Dryopteridaceae (cont.)	<i>Onoclea sensibilis</i>	sensitive fern
	<i>Polystichum acrostichoides</i> (92)*	Christmas fern
Equisetaceae	<i>Equisetum arvense</i>	field horsetail
	<i>Equisetum sp.</i>	horsetail
Ericaceae	<i>Arctostaphylos uva-ursi</i>	kinnikinnick
	<i>Chamaedaphne calyculata</i>	leatherleaf
	<i>Gaultheria procumbens</i> (92)	eastern teaberry
	<i>Gaylussacia baccata</i>	black huckleberry
	<i>Gaylussacia frondosa</i> (92)*	blue huckleberry
	<i>Kalmia angustifolia</i>	sheep laurel
	<i>Kalmia latifolia</i> (92)*	mountain laurel
	<i>Rhododendron periclymenoides</i> *	pink azalea
	<i>Rhododendron viscosum</i>	swamp azalea
	<i>Vaccinium angustifolium</i>	lowbush blueberry
	<i>Vaccinium corymbosum</i>	highbush blueberry
	<i>Vaccinium myrtilloides</i> *	velvetleaf huckleberry
	<i>Vaccinium pallidum</i>	Blue Ridge blueberry
	<i>Vaccinium sp.</i>	blueberry
Euphorbiaceae	<i>Acalypha rhomboidea</i>	Virginia threeseed mercury
Fabaceae	<i>Amphicarpaea bracteata</i>	American hogpeanut
	<i>Apios americana</i>	groundnut
	<i>Baptisia tinctoria</i>	horseflyweed
	<i>Desmodium paniculatum</i> (92)*	panicledleaf ticktrefoil
	<i>Lotus corniculatus</i>	birdfoot deervetch
	<i>Robinia pseudoacaciae</i>	black locust
	<i>Vicia cracca</i>	bird vetch
	<i>Vicia sp.e</i>	vetch
Fagaceae	<i>Castanea dentata</i>	American chestnut
	<i>Fagus grandifolia</i>	American beech
	<i>Quercus alba</i>	white oak
	<i>Quercus bicolor</i>	swamp white oak
	<i>Quercus coccinea</i>	scarlet oak
	<i>Quercus ilicifolia</i>	bear oak
	<i>Quercus palustris</i>	pin oak
	<i>Quercus rubra</i>	northern red oak
	<i>Quercus sp.</i>	oak
	<i>Quercus velutina</i>	black oak

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Geraniaceae	<i>Geranium maculatum</i>	spotted geranium
Grossulariaceae	<i>Ribes sp.</i>	currant
Halagoraceae	<i>Proserpinaca palustris</i> (92)*	marsh mermaidweed
Hydrocharitaceae	<i>Elodea canadensis</i>	Canadian waterweed
Hylocomiaceae	<i>Hylocomium sp.</i>	feathermoss
Iridaceae	<i>Iris pseudacorus</i> (92)*e	paleyellow iris
	<i>Iris versicolor</i>	harlequin blueflag
Juglandaceae	<i>Carya glabra</i> (92)	pignut hickory
	<i>Carya ovalis</i>	red hickory
	<i>Carya ovata</i>	shagbark hickory
	<i>Carya sp.</i>	hickory
	<i>Carya tomentosa</i>	mockernut hickory
	<i>Juglans cinerea</i>	butternut
	<i>Juglans nigra</i>	black walnut
Juncaceae	<i>Juncus canadensis</i> (92)*	Canadian rush
	<i>Juncus effusus</i>	common rush
	<i>Juncus greenei</i>	Greene's rush
Lamiaceae	<i>Glechoma hederaceae</i>	ground ivy
	<i>Lycopus americanus</i>	American water horehound
	<i>Lycopus sp.</i>	waterhorehound
	<i>Lycopus uniflorus</i> (92)*	northern bugleweed
	<i>Scutellaria galericulata</i>	marsh skullcap
Lauraceae	<i>Lindera benzoin</i>	northern spicebush
	<i>Sassafras albidum</i>	sassafras
Lemnaceae	<i>Lemna minor</i>	common duckweed
	<i>Wolffia borealis</i> *	northern watermeal
	<i>Wolffia columbiana</i>	Columbian watermeal
	<i>Wolffia sp.</i>	watermeal
Lentibulariaceae	<i>Utricularia geminiscapa</i> *	hiddenfruit bladderwort
	<i>Utricularia macrorhiza</i> *	common bladderwort
Liliaceae	<i>Convallaria majalise</i>	European lily of the valley
	<i>Lilium canadense</i>	Canada lily
	<i>Maianthemum canadense</i>	Canada mayflower
	<i>Maianthemum racemosum</i>	feathery false lily of the valley
	<i>Polygonatum biflorum</i>	smooth Solomon's seal
	<i>Polygonatum pubescens</i>	hairy Solomon's seal
	<i>Streptopus amplexifolius</i>	claspleaf twistedstalk

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Liliaceae (cont.)	<i>Uvularia sessilifolia</i>	sessileleaf bellwort
	<i>Veratrum viride</i> *	green false hellebore
Lycopodiaceae	<i>Lycopodium obscurum</i>	rare clubmoss
Lythraceae	<i>Decodon verticillatus</i> (92)*	swamp loosestrife
	<i>Lythrum salicariae</i>	purple loosestrife
Menispermaceae	<i>Menispermum canadense</i>	common moonseed
Monotropaceae	<i>Monotropa hypopitys</i> (92)*	pinemap
	<i>Monotropa uniflora</i>	Indianpipe
Myricaceae	<i>Comptonia peregrina</i> (92)*	sweet fern
Nymphaeaceae	<i>Nuphar lutea</i>	yellow pond-lily
	<i>Nymphaea odorata</i> (92)*	American white water-lily
Oleaceae	<i>Fraxinus americana</i>	white ash
	<i>Fraxinus pennsylvanica</i>	green ash
	<i>Ligustrum vulgare</i> (92)*e	European privet
Onagraceae	<i>Circaea lutetiana</i>	broadleaf enchanter's nightshade
	<i>Epilobium leptophyllum</i>	bog willowherb
	<i>Epilobium</i> sp.	willowherb
	<i>Ludwigia palustris</i>	marsh seedbox
	<i>Oenothera biennis</i>	common evening-primrose
Orchidaceae	<i>Cypripedium acaule</i>	moccasin flower
	<i>Spiranthes lacera</i> *	northern slender ladies'-tresses
Osmundaceae	<i>Osmunda cinnamomea</i>	cinnamon fern
	<i>Osmunda claytoniana</i> (92)	interrupted fern
	<i>Osmunda regalis</i>	royal fern
Oxalidaceae	<i>Oxalis stricta</i>	common yellow oxalis
Papaveraceae	<i>Chelidonium majuse</i>	celandine
Phytolaccaceae	<i>Phytolacca americana</i>	American pokeweed
Pinaceae	<i>Picea abiese</i>	Norway spruce
	<i>Pinus rigida</i> (92)	pitch pine
	<i>Pinus strobus</i>	eastern white pine
	<i>Pinus sylvestris</i> (92)*e	Scotch pine
	<i>Tsuga canadensis</i>	eastern hemlock
Plantaginaceae	<i>Plantago lanceolata</i>	narrowleaf plantain
Poaceae	<i>Agrostis giganteae</i>	redtop
	<i>Agrostis</i> sp.	bentgrass
	<i>Agrostis stoloniferae</i>	creeping bentgrass
	<i>Andropogon virginicus</i> *	broomsedge bluestem

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Poaceae (cont.)	<i>Anthoxanthum odoratum</i>	sweet vernalgrass
	<i>Brachyelytrum erectum</i>	bearded shorthusk
	<i>Calamagrostis canadensis</i>	bluejoint
	<i>Cinna arundinacea</i>	sweet woodreed
	<i>Dactylis glomeratae</i>	orchardgrass
	<i>Danthonia compressa</i>	flattened oatgrass
	<i>Danthonia spicata</i>	poverty oatgrass
	<i>Deschampsia flexuosa</i> (92)*	wavy hairgrass
	<i>Dichanthelium clandestinum</i>	deertongue
	<i>Dichanthelium sp.</i>	rosette grass
	<i>Digitaria ischaemum</i>	smooth crabgrass
	<i>Echinochloa crus-gallie</i>	barnyardgrass
	<i>Echinochloa walteri</i> (92)*	coast cockspur grass
	<i>Elymus repense</i>	quackgrass
	<i>Elymus riparius</i>	riverbank wildrye
	<i>Eragrostis spectabilis</i>	purple lovegrass
	<i>Festuca sp.</i>	fescue
	<i>Glyceria acutiflora</i> (92)*	creeping mannagrass
	<i>Glyceria canadensis</i>	rattlesnake mannagrass
	<i>Glyceria melicaria</i>	melic mannagrass
	<i>Glyceria obtusa</i> (92)*	Atlantic mannagrass
	<i>Glyceria sp.</i>	mannagrass
	<i>Glyceria striata</i> (92)*	fowl mannagrass
	<i>Holcus lanatus</i>	common velvetgrass
	<i>Leersia oryzoides</i>	rice cutgrass
	<i>Leersia virginica</i>	whitegrass
	<i>Panicum dichotomiflorum</i> (92)*	fall panicgrass
	<i>Panicum sp.</i>	panicgrass
	<i>Phalaris arundinacea</i>	reed canarygrass
	<i>Phleum pratense</i>	timothy
	<i>Phragmites australis</i>	common reed
	<i>Poa compressa</i>	Canada bluegrass
	<i>Poa palustris</i>	fowl bluegrass
	<i>Poa pratensis</i>	Kentucky bluegrass
	<i>Schizachyrium scoparium</i>	little bluestem
	<i>Setaria faberii</i>	Japanese bristlegrass
	<i>Setaria sp.</i>	bristlegrass

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Poaceae (cont.)	<i>Torreyochloa pallida</i> var. <i>fernaldii</i> *	Fernald's false mannagrass
	<i>Torreyochloa pallida</i> var. <i>pallida</i> *	pale false mannagrass
Polygonaceae	<i>Polygonum</i> sp.	knotweed
	<i>Polygonum amphibium</i> var. <i>emersum</i>	longroot smartweed
	<i>Polygonum amphibium</i>	water knotweed
	<i>Polygonum arifolium</i>	halberdleaf tearthumb
	<i>Polygonum cilinode</i>	fringed black bindweed
	<i>Polygonum cuspidatum</i>	Japanese knotweed
	<i>Polygonum hydropiperoides</i>	swamp smartweed
	<i>Polygonum pensylvanicum</i> (92)*	Pennsylvania smartweed
	<i>Polygonum sagittatum</i>	arrowleaf tearthumb
	<i>Polygonum virginianum</i>	jumpseed
	<i>Rumex acetosellae</i>	common sheep sorrel
	<i>Rumex crispus</i>	curly dock
Polytrichaceae	<i>Polytrichum commune</i>	polytrichum moss
	<i>Polytrichum</i> sp.	polytrichum moss
Pontederiaceae	<i>Pontederia cordata</i> (92)*	pickerelweed
Potamogetonaceae	<i>Potamogeton crispus</i> (92)*e	curly pondweed
	<i>Potamogeton</i> sp.	pondweed
Primulaceae	<i>Lysimachia hybrida</i> (92)*	lowland yellow loosestrife
	<i>Lysimachia nummulariae</i>	creeping jenny
	<i>Lysimachia quadriflora</i>	fourflower yellow loosestrife
	<i>Lysimachia quadrifolia</i>	whorled yellow loosestrife
	<i>Lysimachia terrestris</i>	earth loosestrife
	<i>Trientalis borealis</i>	starflower
Pyrolaceae	<i>Chimaphila maculata</i>	striped prince's pine
	<i>Chimaphila umbellata</i>	pipsissewa
	<i>Moneses uniflora</i> (92)*	single delight
	<i>Pyrola elliptica</i> (92)	waxflower shinleaf
Ranunculaceae	<i>Actaea rubra</i> (92)	red baneberry
	<i>Anemone quinquefolia</i>	nightcaps
	<i>Caltha palustris</i>	yellow marsh marigold
	<i>Ranunculus hispidus</i>	bristly buttercup
	<i>Ranunculus repens</i> *e	creeping buttercup
	<i>Ranunculus</i> sp.	buttercup
	<i>Thalictrum dioicum</i>	early meadow-rue
	<i>Thalictrum pubescens</i> *	king of the meadow

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Rhamnaceae	<i>Rhamnus frangulae</i>	glossy buckthorn
	<i>Rhamnus catharticae</i>	common buckthorn
Rosaceae	<i>Amelanchier canadensis</i>	Canadian serviceberry
	<i>Aronia melanocarpa</i>	black chokeberry
	<i>Geum aleppicum</i> *	yellow avens
	<i>Geum sp.</i>	avens
	<i>Malus pumila</i> *e	paradise apple
	<i>Malus sp.e</i>	apple
	<i>Potentilla canadensis</i>	dwarf cinquefoil
	<i>Potentilla norvegica</i>	Norwegian cinquefoil
	<i>Potentilla rectae</i>	sulphur cinquefoil
	<i>Potentilla simplex</i>	common cinquefoil
	<i>Prunus domesticae</i>	European plum
	<i>Prunus pensylvanica</i>	pin cherry
	<i>Prunus serotina</i>	black cherry
	<i>Prunus sp.</i>	plum
	<i>Prunus virginiana</i> (92)	chokecherry
	<i>Rosa multiflorae</i>	multiflora rose
	<i>Rosa palustris</i>	swamp rose
	<i>Rosa sp.</i>	rose
	<i>Rubus allegheniensis</i> *	Allegheny blackberry
	<i>Rubus flagellaris</i>	northern dewberry
	<i>Rubus hispidus</i>	bristly dewberry
	<i>Rubus idaeus</i>	American red raspberry
	<i>Rubus occidentalis</i>	black raspberry
	<i>Rubus sp.</i>	blackberry
	<i>Spiraea alba var. latifolia</i>	white meadowsweet
	<i>Spiraea tomentosa</i>	steeplesbush
Rubiaceae	<i>Cephalanthus occidentalis</i>	common buttonbush
	<i>Galium circaezans</i> (92)*	licorice bedstraw
	<i>Galium mollugo</i> (92)*e	false baby's breath
	<i>Galium palustre</i>	common marsh bedstraw
	<i>Galium sp.</i>	bedstraw
	<i>Galium tinctorium</i> (92)*	stiff marsh bedstraw
	<i>Mitchella repens</i>	partridgeberry
Salicaceae	<i>Populus tremuloides</i>	quaking aspen
	<i>Salix nigra</i>	black willow

Appendix D. Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling (continued).

Table D-1 (continued). Plants observed in Minute Man National Historical Park during vegetation classification plot and thematic accuracy assessment sampling.

FAMILY	SCIENTIFIC NAME	COMMON NAME
Santalaceae	<i>Comandra umbellata</i>	bastard toadflax
Scrophulariaceae	<i>Aureolaria pedicularia</i>	fernleaf yellow false foxglove
	<i>Chelone glabra</i>	white turtlehead
	<i>Gratiola neglecta</i> (92)*	clammy hedgehyssop
	<i>Linaria vulgaris</i> (92)	butter and eggs
	<i>Melampyrum lineare</i>	narrowleaf cowwheat
	<i>Nuttallanthus canadensis</i> (92)*	Canada toadflax
Smilacaceae	<i>Smilax herbacea</i>	smooth carrionflower
	<i>Smilax rotundifolia</i>	roundleaf greenbrier
Solanaceae	<i>Solanum dulcamarae</i>	climbing nightshade
	<i>Solanum rostratum</i>	buffalobur nightshade
Sparganiaceae	<i>Sparganium erectum</i> ssp. <i>stoloniferum</i> *e	simplestem bur-reed
	<i>Sparganium eurycarpum</i> *	broadfruit bur-reed
	<i>Sparganium</i> sp.	bur-reed
Sphagnaceae	<i>Sphagnum</i> sp.	sphagnum
Taxaceae	<i>Taxus canadensis</i>	Canada yew
Thelypteridaceae	<i>Thelypteris noveboracensis</i>	New York fern
	<i>Thelypteris palustris</i>	eastern marsh fern
	<i>Thelypteris simulata</i>	bog fern
Tiliaceae	<i>Tilia americana</i>	American basswood
	<i>Tilia cordatae</i>	littleleaf linden
Typhaceae	<i>Typha angustifoliae</i>	narrowleaf cattail
	<i>Typha latifolia</i>	broadleaf cattail
Ulmaceae	<i>Ulmus americana</i>	American elm
	<i>Ulmus rubra</i>	slippery elm
	<i>Ulmus</i> sp.	elm
Urticaceae	<i>Boehmeria cylindrica</i>	smallspike false nettle
	<i>Pilea pumila</i>	Canadian clearweed
Verbenaceae	<i>Verbena hastata</i>	swamp verbena
	<i>Verbena urticifolia</i>	white vervain
Violaceae	<i>Viola macloskeyi</i> ssp. <i>pallens</i> *	smooth white violet
	<i>Viola sagittata</i> var. <i>ovata</i> *	arrowleaf violet
	<i>Viola sororia</i>	common blue violet
Vitaceae	<i>Parthenocissus quinquefolia</i>	Virginia creeper
	<i>Vitis labrusca</i>	fox grape
	<i>Vitis</i> sp.	grape

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park

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**Appendix E. Global and Local descriptions for the USNVC vegetation associations in
Minute Man National Historical Park. (continued)**

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Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Black Locust Successional Forest

SYNONYMS

USNVC English Name: Black Locust Ruderal Forest
USNVC Scientific Name: *Robinia pseudoacacia* Ruderal Forest
USNVC Identifier: CEG007279
Map Class: Oak - Hickory Forest

LOCAL INFORMATION

Environmental Description: This community is located at an old house site where the house was removed as a part of the development of Minute Man National Historical Park. The site is flat with silt loam soils and few rocks. The soil surface was left with hummocks and hollows following the removal of the house.

Vegetation Description: The only tree in the canopy of this community is *Robinia pseudoacacia* (black locust) which is senescing at the site sampled and which has numerous dead branches in the crowns of the trees. Understory trees include *Ulmus americana* (American elm), *Acer platanoides* (Norway maple), and *Prunus serotina* (black cherry). There are few species in the shrub layer with the exception of *Rubus* (blackberry) spp. and saplings of *Ulmus americana* (American elm). The herbaceous layer is sparse and dominated by invasive species including *Alliaria petiolata* (garlic mustard), *Convallaria majalis* (European lily of the valley), and *Chelidonium majus* (celandine). Also present are *Carex swanii* (Swan's sedge), *Polygonum virginianum* (jumpseed), and *Onoclea sensibilis* (sensitive fern). There are also large patches of *Toxicodendron radicans* (eastern poison ivy) throughout the community.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Robinia pseudoacacia</i> (black locust)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer platanoides</i> (Norway maple), <i>Prunus serotina</i> (black cherry), <i>Ulmus americana</i> (American elm)
Herb (field)	Vine/Liana	<i>Toxicodendron radicans</i> (eastern poison ivy)
Herb (field)	Forb	<i>Alliaria petiolata</i> (garlic mustard), <i>Chelidonium majus</i> (celandine), <i>Convallaria majalis</i> (European lily of the valley), <i>Polygonum virginianum</i> (jumpseed)
Herb (field)	Graminoid	<i>Carex swanii</i> (Swan's sedge)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern)

Characteristic Species: *Robinia pseudoacacia* (black locust), *Rubus flagellaris* (northern dewberry), *Ulmus americana* (American elm)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

State	SRank	Rel	Conf	SName	Reference
MA	SNA	.	.	[not crosswalked]	.

Local Range: This community is limited at Minute Man National Historical Park to old house sites.

Classification Comments: Information not available.

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.09, MIMA.AA08, MIMA.AA41, MIMA.AA51, MIMA.AA86, MIMA.AA102, MIMA.AA107, MIMA.AA118.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Cool Temperate Forest & Woodland (1.B.2)
Division	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Northern & Central Native Ruderal Forest (G030)
Alliance	<i>Liriodendron tulipifera</i> - <i>Juglans nigra</i> - <i>Robinia pseudoacacia</i> Ruderal Forest Alliance (A3228)
Alliance (English name)	Tuliptree - Black Walnut - Black Locust Ruderal Forest Alliance
Association	<i>Robinia pseudoacacia</i> Ruderal Forest
Association (English name)	Black Locust Ruderal Forest
Ecological System(s)	Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898) Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269) Central Appalachian Dry Oak-Pine Forest (CES202.591)

GLOBAL DESCRIPTION

Concept Summary: This black locust semi-natural 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 redcedar), *Ulmus americana* (American elm), *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). The invasive non-native *Rosa multiflora* (multiflora rose) may be present as a shrub. 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.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Environmental Description: 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: 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 redcedar), *Ulmus americana* (American elm), *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). *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). The invasive species *Rosa multiflora* (multiflora rose) and *Elaeagnus umbellata* (autumn olive) are typically the most common shrubs. 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 *Ageratina altissima* (white snakeroot), *Dichanthelium clandestinum* (deertongue), *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila* (Canadian clearweed), *Solidago canadensis* (Canada goldenrod), and *Solidago rugosa* (wrinkleleaf goldenrod).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Robinia pseudoacacia</i> (black locust)

Characteristic Species: *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Rosa multiflora* (multiflora rose)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This black locust semi-natural forest is found locally throughout the eastern United States.

States/Provinces: AR, DE, IA, KY, MA, MS, NC, NJ, NY, OK, PA, TN, VA, VT, WV

Federal Lands: DOD (Camp Dawson); NPS (Blue Ridge Parkway, Bluestone, Buffalo River?, Cape Cod, George Washington Birthplace, Marsh-Billings-Rockefeller, Minute Man, Morristown, New River Gorge, Saratoga, Shenandoah, Vicksburg); USFS (George Washington, Jefferson, Nantahala, Ouachita, Ouachita (Mountains), Ozark, Pisgah)

CONSERVATION STATUS

Rank: GNA (ruderal) (24-Oct-2002)

Reasons: 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 conservation concern and does not receive a conservation status rank.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* Forest (CEGL006599)--can have *Robinia* as an important canopy component but is not dominated by it as is this type.
- *Prunus serotina* - *Sassafras albidum* - (*Fraxinus americana*) / *Juniperus virginiana* Forest (CEGL004133)
- *Robinia pseudoacacia* - *Celtis occidentalis* - (*Fraxinus americana*, *Liriodendron tulipifera*) Forest (CEGL007281)

Related Concepts:

- *Juglans nigra* - *Robinia pseudoacacia* / *Lonicera japonica* / *Verbesina alternifolia* Association (Rawinski et al. 1996)
- Successional black locust disturbed forests (CAP pers. comm. 1998)

SOURCES

Description Authors: D. Faber-Langendoen, mod. S.C. Gawler and L.A. Sneddon

References: Baalman 1965, CAP pers. comm. 1998, Ehrenfeld 1977, Elias 1980, Fleming and Coulling 2001, Gaertner 1955, Hoagland 2000, INAI unpubl. data, McDonald 1938, NRCS 2004, Rabie 2000, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst et al. 2007a



Figure E-1. Black Locust Successional Forest at Minute Man National Historical Park (MIMA.AA102). August 2006. NAD 1983 UTM easting 311866, northing 4702093.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Oak - Red Maple Successional Forest

SYNONYMS

USNVC English Name:	Northern Red Oak - Red Maple - Birch species – Eastern White Pine Ruderal Forest
USNVC Scientific Name:	<i>Quercus rubra</i> - <i>Acer rubrum</i> - <i>Betula</i> spp. - <i>Pinus strobus</i> Ruderal Forest
USNVC Identifier:	CEGL006506
Map Class:	Red Oak - Red Maple - Pine Forest

LOCAL INFORMATION

Environmental Description: This forest is one of the matrix types at Minute Man National Historical Park, occurring on well-drained upland soils of varying textures. Slope ranges from low to moderate. This forest typically develops after cutting or may develop as former cleared land reverts to forest, in the absence of fire.

Vegetation Description: This forest community is characterized by a mixture of *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), and *Pinus strobus* (eastern white pine), with varying amounts of *Fagus grandifolia* (American beech), *Quercus velutina* (black oak), and/or *Quercus alba* (white oak). While *Pinus strobus* (eastern white pine) is almost always present, its cover is variable, and the canopy ranges from strongly deciduous to mixed. *Fraxinus americana* (white ash), *Acer saccharum* (sugar maple), *Betula lenta* (sweet birch), and *Prunus serotina* (black cherry) are occasional associates. Invasive shrubs, including *Ramnus frangula* (glossy buckthorn[†]), *Rhamnus cathartica* (common buckthorn[†]), and *Berberis thunbergii* (Japanese barberry), are present in some areas. Native shrubs, including *Cornus alternifolia* (alternateleaf dogwood), *Gaylussacia baccata* (black huckleberry), and *Vaccinium angustifolium* (lowbush blueberry), may be present but are not abundant. Herb cover and composition are varied; typical species include *Carex debilis* (white edge sedge), *Carex swanii* (Swan's sedge), *Aralia nudicaulis* (wild sarsaparilla), *Athyrium filix-femina* (common ladyfern), *Polystichum acrostichoides* (Christmas fern), *Melampyrum lineare* (narrowleaf cowwheat), *Carex rosea* (rosy sedge), *Maianthemum canadense* (Canada mayflower), *Maianthemum racemosum* (feathery false lily of the valley), and *Solidago* (goldenrod) spp. Ground-layer vines, with low to moderate cover, include *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison ivy). The exotic species *Alliaria petiolata* (garlic mustard) and *Celastrus orbiculatus* (oriental bittersweet) may also occur in this community.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i> (eastern white pine)
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Quercus rubra</i> (northern red oak)

Characteristic Species: *Pinus strobus* (eastern white pine), *Quercus rubra* (northern red oak)

[†] See Appendix J for more information on the distribution on *Rhamnus* species

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
MA	SNR	.	.	[not crosswalked]	.

Local Range: Throughout the park.

Classification Comments: This mid-successional forest is closely related to Mixed Oak - White Pine Forest (CEGL006293) but differs in having red maple (*Acer rubrum*) (occasionally other non-oak trees) more common in the canopy than oaks (*Quercus* spp.) and in generally exhibiting an earlier-successional character.

Other Comments: Plot sampling in 2004 did not sufficiently capture this common forest type, as it was only after mapping and initial plot sampling that this type emerged as distinct from Mixed Oak - White Pine Forest (CEGL006293) here. The description was augmented with data from Thompson and Jenkins (1992).

Local Description Authors: S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.02, MIMA.03, MIMA.11, MIMA.AA26, MIMA.AA53, MIMA.AA56, MIMA.AA61, MIMA.AA62, MIMA.AA89, MIMA.AA90, MIMA.AA93, MIMA.AA94, MIMA.AA97, MIMA.AA108, MIMA.AA121.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Cool Temperate Forest & Woodland (1.B.2)
Division	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Northern & Central Native Ruderal Forest (G030)
Alliance	<i>Acer rubrum</i> - <i>Prunus serotina</i> - <i>Pinus strobus</i> Ruderal Forest Alliance (A3229)
Alliance (English name)	Red Maple – Black Cherry – Eastern White Pine Ruderal Forest Alliance
Association	<i>Quercus rubra</i> - <i>Acer rubrum</i> - <i>Betula</i> spp. - <i>Pinus strobus</i> Ruderal Forest
Association (English name)	Northern Red Oak - Red Maple - Birch species - Eastern White Pine Ruderal Forest
Ecological System(s)	Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563) Northern Atlantic Coastal Plain Hardwood Forest (CES203.475) Laurentian-Acadian Northern Pine-(Oak) Forest (CES201.719)

GLOBAL DESCRIPTION

Concept Summary: This deciduous to mixed forest of northern New England is a broadly defined community, usually developing after severe disturbance, including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development. While in some cases it is a

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

successional type, it may persist in some settings, particularly where soils are limited, for example along ridgelines. The canopy trees are mostly 40-100 years old. The canopy ranges from somewhat open to closed; the shrub, herb and bryoid layers are patchy and rarely extensive. Composition is variable depending on site history. The canopy is usually mostly deciduous, dominated by a heterogeneous mixture of *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech). Typically these occur in association with light-requiring, wind-dispersed trees such as *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry). Minor associates include *Picea rubens* (red spruce) and *Acer saccharum* (sugar maple). Understory species tend to reflect pre-disturbance conditions and include *Acer pensylvanicum* (striped maple), *Corylus cornuta* (beaked hazelnut), *Viburnum acerifolium* (mapleleaf viburnum), or *Hamamelis virginiana* (American witchhazel) in the shrub layer. *Vaccinium angustifolium* (lowbush blueberry) is a typical low shrub, although it does not form a coherent layer. *Pteridium aquilinum* (western brackenfern) is characteristic and may be abundant in the herbaceous layer; other common herbs include *Trientalis borealis* (starflower), *Maianthemum canadense* (Canada mayflower), *Deschampsia flexuosa* (wavy hairgrass), and *Aralia nudicaulis* (wild sarsaparilla). The bryophyte layer is of variable cover and may include *Polytrichum commune* (polytrichum moss) and *Dicranum polysetum* (dicranum moss). This association is differentiated from similar forests and woodlands by its thin canopy that usually includes early-successional species, particularly *Acer rubrum* (red maple), low abundance of tolerant hardwoods other than red oak, and the lack of a well-developed heath shrub layer (as is typical in oak-pine woodlands). Unlike oak and oak-pine forests to the south, *Quercus rubra* (northern red oak) is the only oak species present in any abundance.

Environmental Description: This deciduous to mixed forest of northern New England is a broadly defined community, usually developing after severe disturbance including clearing, pasturing, logging, fires, severe hurricanes, or simply heavily fragmented residential development. While in some cases it is a successional type, it may persist in some settings, particularly where soils are limited, for example along ridgelines.

Vegetation Description: Canopy trees are mostly 40-100 years old. The canopy ranges from somewhat open to closed; the shrub, herb, and bryoid layers are patchy and rarely extensive. Composition is variable depending on site history. The canopy is usually mostly deciduous, dominated by a heterogeneous mixture of *Quercus rubra* (northern red oak), *Pinus strobus* (eastern white pine), and *Fagus grandifolia* (American beech). Typically these occur in association with light-requiring, wind-dispersed trees such as *Acer rubrum* (red maple), *Populus tremuloides* (quaking aspen), *Populus grandidentata* (bigtooth aspen), *Betula papyrifera* (paper birch), *Betula populifolia* (gray birch), *Fraxinus americana* (white ash), and *Prunus serotina* (black cherry). Minor associates include *Picea rubens* (red spruce) and *Acer saccharum* (sugar maple). Understory species tend to reflect pre-disturbance conditions and include *Acer pensylvanicum* (striped maple), *Corylus cornuta* (beaked hazelnut), *Viburnum acerifolium* (mapleleaf viburnum), or *Hamamelis virginiana* (American witchhazel) in the shrub layer. *Vaccinium angustifolium* (lowbush blueberry) is a typical low shrub. *Pteridium aquilinum* (western brackenfern) is characteristic, and may be abundant, in the herbaceous layer; other common herbs include *Trientalis borealis* (starflower), *Maianthemum canadense*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

(Canada mayflower), *Deschampsia flexuosa* (wavy hairgrass), and *Aralia nudicaulis* (wild sarsaparilla). The bryophyte layer is of variable cover and may include *Polytrichum commune* (polytrichum moss) and *Dicranum polysetum* (dicranum moss).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i> (eastern white pine)
Tree canopy	Broad-leaved deciduous tree	<i>Fagus grandifolia</i> (American beech), <i>Quercus rubra</i> (northern red oak)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Tall shrub/sapling	Broad-leaved deciduous shr.	<i>Acer pensylvanicum</i> (striped maple), <i>Corylus cornuta</i> (beaked hazelnut), <i>Hamamelis virginiana</i> (American witchhazel), <i>Viburnum acerifolium</i> (mapleleaf viburnum)
Short shrub/sapling	Broad-leaved deciduous shr.	<i>Vaccinium angustifolium</i> (lowbush blueberry)
Herb (field)	Fern or fern ally	<i>Pteridium aquilinum</i> (western brackenfern)

Characteristic Species: *Fagus grandifolia* (American beech), *Pinus strobus* (eastern white pine), *Pteridium aquilinum* (western brackenfern), *Quercus rubra* (northern red oak), *Vaccinium angustifolium* (lowbush blueberry)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This forest occurs in northern and central New England.

States/Provinces: CT, MA, ME, NB, NH, NY, PA, RI, VT

Federal Lands: NPS (Acadia, Minute Man, Saratoga, Upper Delaware); USFWS (Assabet River, Eastern Massachusetts, Great Meadows, Moosehorn?, Oxbow)

CONSERVATION STATUS

Rank: GNR (2-Jul-1999)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: This association was first described from the Northern Appalachian-Acadian ecoregion, where it approaches a matrix landscape pattern in the southern portions of the region while being absent from areas to the north. Similar forests extend southward. Further work in Lower New England suggests that this type may represent an earlier successional version of *Pinus strobus* - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest (CEGL006293), and possibly of other later-successional types, distinguished by the preponderance of *Acer rubrum* (red maple) in the canopy.

Similar Associations:

- (*Pinus strobus*, *Quercus rubra*) / *Danthonia spicata* Acidic Bedrock Wooded Herbaceous Vegetation (CEGL005101)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

- *Betula lenta* - *Acer rubrum* / *Lycopodium annotinum* - *Dennstaedtia punctilobula* Forest (CEGL008503)
- *Pinus strobus* - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest (CEGL006293)
- *Quercus* (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest (CEGL006454)
- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134)
- *Quercus rubra* - *Acer saccharum* — *Fagus grandifolia* / *Viburnum acerifolium* Forest (CEGL006633)

Related Concepts: Information not available.

SOURCES

Description Authors: S.C. Gawler

References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Gawler 2002, Kuchler 1956, Moore and Taylor 1927, NRCS 2004, Sperduto 2000a, Thompson and Jenkins 1992



Figure E-2. Oak - Red Maple Successional Forest at Minute Man National Historical Park (MIMA.AA108). August 2006. NAD 83 UTM easting 312803, northing 4702040.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Norway Maple Forest

SYNONYMS

USNVC English Name: Norway Maple Ruderal Forest
USNVC Scientific Name: *Acer platanoides* Ruderal Forest
USNVC Identifier: CEG006407
Map Class: Norway Maple Forest

LOCAL INFORMATION

Environmental Description: This association occurs on sandy loam soils at an old home site. The house, sidewalks and other structures around the house were removed and the site was allowed to revegetate naturally. It is likely *Acer platanoides* (Norway maple) was present at the house and seeded into the abandoned lawn, garden and house site.

Vegetation Description: This upland forest is dominated by *Quercus alba* (white oak), *Quercus velutina* (black oak), and *Carya tomentosa* (mockernut hickory) with other subdominant hardwoods, including *Quercus coccinea* (scarlet oak), *Fraxinus americana* (white ash), and occasionally *Quercus rubra* (northern red oak), *Acer saccharum* (sugar maple), *Betula lenta* (sweet birch), or *Tilia americana* (American basswood). The canopy cover ranges from 60-70%. There is a moderately well-developed subcanopy (20-50%) with *Carya tomentosa* (mockernut hickory) and *Acer rubrum* (red maple). The shrub zone is also well-developed with saplings of *Carya tomentosa* (mockernut hickory) and small trees including *Acer rubrum* (red maple) and *Prunus serotina* (black cherry). Shrubs include the ericads *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium angustifolium* (lowbush blueberry), and *Gaylussacia baccata* (black huckleberry), but cover is fairly sparse, ranging from 1 to 15%. *Corylus americana* (American hazelnut) and *Sassafras albidum* (sassafras) are also present. The examples seen are not very weedy, but do include low cover of *Rhamnus* sp., *Ligustrum vulgare* (European privet), and/or *Berberis thunbergii* (Japanese barberry). The herbaceous layer is well-developed and dominated by *Carex pensylvanica* (Pennsylvania sedge) with *Danthonia spicata* (poverty oatgrass) and a diversity of composites, including *Sericocarpus asteroides* (toothed whitetop aster), *Hieracium venosum* (rattlesnake weed), *Solidago caesia* (wreath goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago juncea* (early goldenrod), *Solidago flexicaulis* (zigzag goldenrod), and *Solidago odora* (anisescented goldenrod). Other associated herbs include *Schizachyrium scoparium* (little bluestem), *Carex cephalophora* (oval-leaf sedge), *Chimaphila umbellata* (pipsissewa), *Galium circaezans* (licorice bedstraw), *Lechea intermedia* (largepod pinweed), *Maianthemum racemosum* (feathery false lily of the valley), *Pteridium aquilinum* (western brackenfern), *Maianthemum canadense* (Canada mayflower), and *Trientalis borealis* (starflower).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i> (eastern white pine)
Tree canopy	Broad-leaved deciduous tree	<i>Acer platanoides</i> (Norway maple), <i>Ulmus americana</i> (American elm)
Herb (field)	Forb	<i>Alliaria petiolata</i> (garlic mustard), <i>Convallaria</i>

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

majalis (European lily of the valley), *Vinca minor* (common periwinkle)

Characteristic Species: *Acer platanoides* (Norway maple), *Ulmus americana* (American elm)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
MA	SNA	.	.	[not crosswalked]	.

Local Range: This association is distributed across the park but is most clearly expressed at two locations: along the slope to the pond on the east side of Poplar Hill and at the hill summit along the powerline on the east side of the park.

Classification Comments: This community intergrades with *Pinus strobus* - *Quercus (rubra, velutina)* - *Fagus grandifolia* Forest (CEGL006293) and is defined by having a more open canopy, little or no pine in the canopy (usually <15%), the presence and sometimes dominance of *Carya tomentosa* (mockernut hickory) in the canopy and subcanopy, and an abundance of *Carex pensylvanica* (Pennsylvania sedge), as well as a lack of *Fagus grandifolia* (American beech). There are several locations along the upper slope of Fiske Hill where there is a low abundance of *Carya tomentosa* (mockernut hickory); these appear intermediate between these two communities.

Classification Comments: Information not available.

Other Comments: Description augmented with information from Thompson and Jenkins (1992).

Local Description Authors: R.E. Zaremba and S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.10, MIMA.AA68, MIMA.AA72, MIMA.AA74, MIMA.AA79, MIMA.AA105.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Cool Temperate Forest & Woodland (1.B.2)
Division	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Northern & Central Exotic Ruderal Forest (G032)
Alliance	<i>Acer platanoides</i> - <i>Ailanthus altissima</i> - <i>Pinus</i> spp. Exotic Ruderal Forest Alliance (A3230)
Alliance (English name)	Norway Maple - Tree-of-Heaven - Pine species Exotic Ruderal Forest Alliance
Association	<i>Acer platanoides</i> Ruderal Forest
Association (English name)	Norway Maple Ruderal Forest
Ecological System(s)	Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL DESCRIPTION

Concept Summary: This association represents forests in the northeastern United States strongly dominated by the invasive tree *Acer platanoides* (Norway maple), often 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. *Acer platanoides* (Norway maple) is the overwhelmingly dominant tree, typically forming a closed or nearly closed canopy. In some stands native trees, including *Fraxinus americana* (white ash) and *Acer saccharum* (sugar maple) (the latter especially susceptible to exclusion by 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). This is a very species-poor vegetation type.

Environmental Description: Most documented stands are at low elevations, on flat or rolling topography both above and below the glacial boundary.

Vegetation Description: This association represents forests in the northeastern United States strongly dominated by the invasive tree *Acer platanoides* (Norway maple), often to the exclusion of virtually all other canopy species. *Acer platanoides* (Norway maple) is the overwhelmingly dominant tree, typically forming a closed or nearly closed canopy. In some stands native trees, including *Fraxinus americana* (white ash) and *Acer saccharum* (sugar maple) (the latter especially susceptible to exclusion by Norway maple), may be present in very limited amounts. Other stands may have non-native associates, including *Pinus nigra* (Austrian pine) (black pine), *Pinus sylvestris* (Scotch pine) (Scotch pine), or *Robinia pseudoacacia* (black locust) (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). This is a very species-poor vegetation type.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Acer platanoides</i> (Norway maple)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Rosa multiflora</i> (multiflora rose)
Herb (field)	Forb	<i>Alliaria petiolata</i> (garlic mustard)

Characteristic Species: *Acer platanoides* (Norway maple)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is found in the northeastern United States, perhaps extending into southern Ontario, Canada. Its westward extent has not been determined, but it may extend to Wisconsin.

States/Provinces: CT?, MA, MD?, NJ, NY, ON?, PA?, VA?

Federal Lands: NPS (Boston Harbor Islands, Minute Man, Sagamore Hill)

CONSERVATION STATUS

Rank: GNA (invasive) (6-Dec-2005)

Reasons: This is a non-native vegetation type dominated by an invasive tree species.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: This association is intended for those forests so invaded by *Acer platanoides* (Norway maple) that the pre-invasion forest type cannot be distinguished. Forests that have been invaded, but where sufficient native trees and other flora still exist to determine the pre-invasion forest type, are classified as degraded examples of those pre-invasion types.

Similar Associations: Information not available.

Related Concepts: Information not available.

SOURCES

Description Authors: S.C. Gawler

References: Anderson 1999c, Eastern Ecology Working Group n.d., Elliman 2003, Soil Conservation Service 1987, Thompson and Jenkins 1992, Wyckoff and Webb 1996



Figure E-3. Norway Maple Forest in Minute Man National Historical Park (MIMA.AA72). August 2006. NAD 1983 UTM easting 311346, northing 4702525.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Red Oak - Northern Hardwood Forest

SYNONYMS

USNVC English Name: Northern Red Oak - Sugar Maple - American Beech / Mapleleaf Viburnum Forest
USNVC Scientific Name: *Quercus rubra* - *Acer saccharum* - *Fagus grandifolia* / *Viburnum acerifolium* Forest
USNVC Identifier: CEGLO06633
Map Class: Northern Hardwood - Oak Forest

LOCAL INFORMATION

Environmental Description: This community is located along the upper south-facing, steep slope of a small hill. Soils are sandy loam and moderately rocky. The canopy is dense and there are few species in the understory despite 10% cover of bare soil.

Vegetation Description: This forest community is dominated by *Acer saccharum* (sugar maple) in both the canopy and subcanopy. *Tilia americana* (American basswood), *Robinia pseudoacacia* (black locust), *Quercus rubra* (northern red oak), and *Carya ovata* (shagbark hickory) are also present but at low cover. The shrub layer is poorly developed with *Acer saccharum* (sugar maple), *Ulmus americana* (American elm), and *Tilia americana* (American basswood). The only common species in the herbaceous layer are *Eurybia divaricata* (white wood aster) and *Carex swanii* (Swan's sedge). The total cover of herbaceous plants is 15%.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> (sugar maple), <i>Quercus rubra</i> (northern red oak), <i>Tilia americana</i> (American basswood)
Herb (field)	Forb	<i>Eurybia divaricata</i> (white wood aster)
Herb (field)	Graminoid	<i>Carex swanii</i> (Swan's sedge)

Characteristic Species: *Acer saccharum* (sugar maple), *Tilia americana* (American basswood)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S4*	B	.	Red Oak - Sugar Maple Transition Forest	Swain and Kearsley 2001

Local Range: This community was seen only at the Wayside, the small woods west of the Hawthorne House.

Classification Comments: The most notable feature of this community is the abundance of *Acer saccharum* (sugar maple), which otherwise is only an occasional species seen in Mixed Oak - White Pine Forest (CEGL006293).

Other Comments: This forest example is dissected by a heavily-used trail that ascends to the hill summit. A new trail was laid out with stakes when the site was sampled and will further dissect the

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

small site. This hill has probably been forested for many years but has been subjected to regular visitation associated with the historic house. As a result, the community is highly altered.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.04, MIMA.AA14, MIMA.AA28.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Cool Temperate Forest & Woodland (1.B.2)
Division	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)
Macrogroup	Laurentian & Acadian Northern Hardwood - Conifer Mesic Forest (M014)
Group	Laurentian & Acadian Hardwood Forest (G743)
Alliance	<i>Quercus rubra</i> - <i>Acer saccharum</i> Forest Alliance (A3241)
Alliance (English name)	Northern Red Oak - Sugar Maple Forest Alliance
Association	<i>Quercus rubra</i> - <i>Acer saccharum</i> - <i>Fagus grandifolia</i> / <i>Viburnum acerifolium</i> Forest
Association (English name)	Northern Red Oak - Sugar Maple - American Beech / Mapleleaf Viburnum Forest
Ecological System(s)	Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563) Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)

GLOBAL DESCRIPTION

Concept Summary: Transitional between temperate and boreal regions, these mesic forests of oak and northern hardwoods, sometimes mixed with hemlock or pine, are distributed across the glaciated northeastern United States. They occur on slightly acidic, well-drained loamy and often rocky soils of intermediate fertility, most often positioned on midslopes and coves. Soil depth is often shallow, but some stands occur on deep tills. Most are at low to mid elevations, usually under 520 m (1700 feet), but in the southern portion of their distribution they may range up to 765 m (2500 feet). The deciduous-to-mixed canopy is mostly closed, and the lower layers are variable in extent. Tall shrubs are well-represented, although scattered, with occasional denser patches. Herbs are sparse and bryoids are nearly absent. Ericads and other dwarf-shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast. Canopy composition is a variable mixture of *Quercus rubra* (northern red oak) (usually at least 30% of the canopy), *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and in some stands *Pinus strobus* (eastern white pine) or *Tsuga canadensis* (eastern hemlock). Conifers generally make up less than 20% of the canopy cover, and even in mixed stands the cover of deciduous trees exceeds that of conifers. Minor canopy associates include *Fraxinus americana* (white ash), *Tilia americana* (American basswood), *Betula lenta* (sweet birch), *Juglans cinerea* (butternut), and *Ulmus americana* (American elm). *Acer pensylvanicum* (striped maple) is common as a small tree; in the central and southern portions of the distribution, *Cornus florida* (flowering dogwood) and *Prunus*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

serotina (black cherry) are common small trees as well. *Corylus cornuta* (beaked hazelnut), *Viburnum acerifolium* (mapleleaf viburnum), and *Hamamelis virginiana* (American witchhazel) are standard shrubs, with *Kalmia latifolia* (mountain laurel) and *Lindera benzoin* (northern spicebush) occasional in all but the northern portions of the range. Typical species in the herb layer include *Gaultheria procumbens* (eastern teaberry), *Maianthemum canadense* (Canada mayflower), *Aralia nudicaulis* (wild sarsaparilla), *Trientalis borealis* (starflower), *Uvularia sessilifolia* (sessileleaf bellwort), *Medeola virginiana* (Indian cucumber), *Brachyelytrum erectum* (bearded shorthusk), *Dryopteris intermedia* (intermediate woodfern), *Polystichum acrostichoides* (Christmas fern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Pteridium aquilinum* (western brackenfern), and *Thelypteris noveboracensis* (New York fern). On more nutrient-rich soils, the herb layer may contain *Solidago caesia* (wreath goldenrod), *Caulophyllum thalictroides* (blue cohosh), *Dryopteris marginalis* (marginal woodfern), and *Eurybia divaricata* (white wood aster). This association is distinguished from northern hardwood forests by its greater amount of oak, from other oak forests by its greater prominence of northern hardwoods and lack of dwarf-shrub ericads, and from hemlock-hardwoods by the relatively low importance of hemlock.

Environmental Description: Transitional between temperate and boreal regions, these mesic forests of oak, beech, and maple are distributed across the glaciated northeastern United States. They occur on slightly acidic, well-drained loamy and often rocky soils of intermediate fertility, most often positioned on mid-slopes and coves. Soil depth is often shallow, but some occur on deep tills. Most are at low to mid elevations, usually under 1700 feet, but in the southern portion of their distribution they may range up to 2500 feet.

Vegetation Description: The deciduous-to-mixed canopy is mostly closed, and the lower layers are variable in extent. Tall shrubs are well represented, although scattered, with occasional denser patches. Herbs are sparse, and bryoids are nearly absent. Ericads and other dwarf-shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast. Canopy composition is a variable mixture of *Quercus rubra* (northern red oak) (usually at least 30% of the canopy), *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and, in some stands, *Pinus strobus* (eastern white pine) or *Tsuga canadensis* (eastern hemlock). In mixed stands, the cover of deciduous trees exceeds that of conifers. Minor canopy associates include *Fraxinus americana* (white ash), *Tilia americana* (American basswood), *Betula lenta* (sweet birch), *Juglans cinerea* (butternut), and *Ulmus americana* (American elm). *Acer pensylvanicum* (striped maple) is common as a small tree; in the central and southern portions of the distribution, *Cornus florida* (flowering dogwood) and *Prunus serotina* (black cherry) are common small trees as well. *Corylus cornuta* (beaked hazelnut), *Viburnum acerifolium* (mapleleaf viburnum), and *Hamamelis virginiana* (American witchhazel) are standard shrubs, with *Kalmia latifolia* (mountain laurel) and *Lindera benzoin* (northern spicebush) occasional in all but the northern portions of the range. Typical species in the herb layer include *Gaultheria procumbens* (eastern teaberry), *Maianthemum canadense* (Canada mayflower), *Aralia nudicaulis* (wild sarsaparilla), *Trientalis borealis* (starflower), *Uvularia sessilifolia* (sessileleaf bellwort), *Medeola virginiana* (Indian cucumber), *Brachyelytrum erectum* (bearded shorthusk), *Dryopteris intermedia* (intermediate woodfern), *Polystichum acrostichoides* (Christmas fern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Pteridium aquilinum* (western brackenfern), and *Thelypteris*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

noveboracensis (New York fern). On more nutrient-rich soils, the herb layer may contain *Solidago caesia* (wreath goldenrod), *Caulophyllum thalictroides* (blue cohosh), and *Eurybia divaricata* (white wood aster).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> (sugar maple), <i>Fagus grandifolia</i> (American beech), <i>Quercus rubra</i> (northern red oak)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer pensylvanicum</i> (striped maple), <i>Cornus florida</i> (flowering dogwood), <i>Prunus serotina</i> (black cherry)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Corylus cornuta</i> (beaked hazelnut), <i>Hamamelis virginiana</i> (American witchhazel), <i>Viburnum acerifolium</i> (mapleleaf viburnum)
Herb (field)	Forb	<i>Aralia nudicaulis</i> (wild sarsaparilla), <i>Trientalis borealis</i> (starflower)
Herb (field)	Fern or fern ally	<i>Dennstaedtia punctilobula</i> (eastern hayscented fern)

Characteristic Species: *Acer pensylvanicum* (striped maple), *Acer rubrum* (red maple), *Aralia nudicaulis* (wild sarsaparilla), *Cornus florida* (flowering dogwood), *Corylus cornuta* (beaked hazelnut), *Dennstaedtia punctilobula* (eastern hayscented fern), *Hamamelis virginiana* (American witchhazel), *Polystichum acrostichoides* (Christmas fern), *Prunus serotina* (black cherry), *Pteridium aquilinum* (western brackenfern), *Quercus rubra* (northern red oak), *Trientalis borealis* (starflower), *Viburnum acerifolium* (mapleleaf viburnum)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association occurs in New England and adjacent Canada and in New Jersey.

States/Provinces: MA, ME:S4, NB, NH, NJ, NY, PA, RI, VT:S4

Federal Lands: NPS (Marsh-Billings-Rockefeller, Minute Man, Saratoga); USFS (Finger Lakes)

CONSERVATION STATUS

Rank: G4G5 (7-Dec-2005)

Reasons: This association is well-distributed in the northeastern U.S. in its large-patch setting.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Acer saccharum* - *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* Forest (CEGL006252)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

- *Acer saccharum* - *Betula alleghaniensis* - *Quercus rubra* / *Viburnum acerifolium* Forest (CEGL006943)
- *Acer saccharum* - *Pinus strobus* / *Acer pensylvanicum* Forest (CEGL005005)
- *Pinus strobus* - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest (CEGL006293)
- *Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Ruderal Forest (CEGL006506)
- *Quercus rubra* - *Acer saccharum* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - (*Cladrastis kentukea*) Forest (CEGL007698)
- *Quercus rubra* - *Quercus alba* - (*Quercus velutina*, *Acer rubrum*) / *Viburnum acerifolium* Forest (CEGL002462)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum* / *Dryopteris intermedia* Forest (CEGL006109)
- *Tsuga canadensis* - *Fagus grandifolia* - *Quercus rubra* Forest (CEGL006088)

Related Concepts:

- CNE mesic hardwood forest on acidic bedrock/till (Rawinski 1984)
- Mesic Red Oak-Northern Hardwood Forest (Thompson 1996)
- Northern Red Oak: 55 (Eyre 1980)

SOURCES

Description Authors: S.C. Gawler

References: Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Gawler 2002, Metzler and Barrett 2001, NRCS 2004, Rawinski 1984, Sperduto 2000a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000.

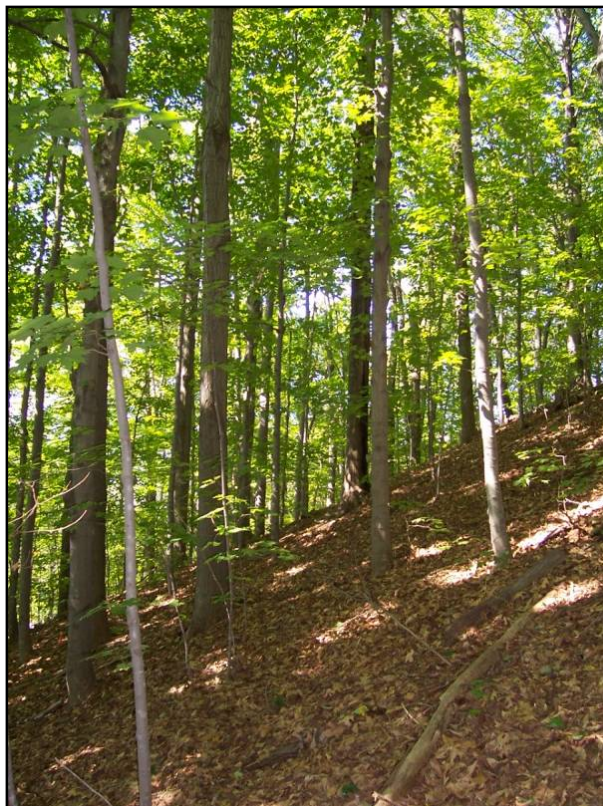


Figure E-4. Red Oak - Northern Hardwood Forest at Minute Man National Historical Park (MIMA.04). July 2004. NAD 1983 UTM easting 308112, northing 4703394.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Dry Oak - Hickory Forest

SYNONYMS

USNVC English Name:	(White Oak, Northern Red Oak, Black Oak) / Mapleleaf Viburnum Forest
USNVC Scientific Name:	<i>Quercus (alba, rubra, velutina)- Carya spp. / Viburnum acerifolium</i> Forest
USNVC Identifier:	CEGL006336
Map Class:	Oak - Hickory Forest

LOCAL INFORMATION

Environmental Description: This upland forest community occurs on upper slopes and hill summits. Examples are located on east-facing slopes. Soils are sandy loam, rocky and well-drained. There is some evidence of past logging at these sites but few early-successional species, suggesting recent cutting or disturbances that opened the canopy.

Vegetation Description: This upland forest is dominated by *Quercus alba* (white oak), *Quercus velutina* (black oak), and *Carya tomentosa* (mockernut hickory) with other subdominant hardwoods including *Quercus coccinea* (scarlet oak), *Fraxinus americana* (white ash), and occasionally *Betula lenta* (sweet birch) or *Tilia americana* (American basswood). The canopy cover ranges from 60-70%. There is a moderately well-developed subcanopy (20-50%) with *Carya tomentosa* (mockernut hickory) and *Acer rubrum* (red maple). The shrub zone is also well-developed with saplings of *Carya tomentosa* (mockernut hickory) and small trees including *Acer rubrum* (red maple) and *Prunus serotina* (black cherry). Shrubs include the ericads *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium angustifolium* (lowbush blueberry), and *Gaylussacia baccata* (black huckleberry), but cover is fairly sparse, ranging from 1 to 15%. *Corylus* (hazelnut) species are also present. The examples seen are not very weedy, but do include low cover of *Rhamnus* sp., *Ligustrum vulgare* (European privet), and/or *Berberis thunbergii* (Japanese barberry). The herbaceous layer is well-developed and dominated by *Carex pensylvanica* (Pennsylvania sedge) with a diversity of composites including *Sericocarpus asteroides* (toothed whitetop aster), *Solidago caesia* (wreath goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago juncea* (early goldenrod), and *Solidago odora* (anisescented goldenrod). *Maianthemum canadense* (Canada mayflower) and *Trientalis borealis* (starflower) are frequent.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Carya tomentosa</i> (mockernut hickory), <i>Fraxinus americana</i> (white ash), <i>Quercus alba</i> (white oak), <i>Quercus coccinea</i> (scarlet oak), <i>Quercus velutina</i> (black oak), <i>Tilia americana</i> (American basswood)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Carya tomentosa</i> (mockernut hickory)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia baccata</i> (black huckleberry), <i>Vaccinium angustifolium</i> (lowbush blueberry), <i>Vaccinium pallidum</i> (Blue Ridge blueberry)
Herb (field)	Forb	<i>Sericocarpus asteroides</i> (toothed whitetop aster), <i>Solidago caesia</i> (wreath goldenrod)
Herb (field)	Graminoid	<i>Carex pensylvanica</i> (Pennsylvania sedge)

Characteristic Species: *Carex pensylvanica* (Pennsylvania sedge), *Carya tomentosa* (mockernut hickory), *Gaylussacia baccata* (black huckleberry), *Pteridium aquilinum* (western brackenfern), *Quercus alba* (white oak), *Quercus velutina* (black oak)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
MA	S4*	B	.	Oak - Hickory Forest	Swain and Kearsley 2001

Local Range: This association was seen at two locations at Minute Man National Historical Park, south of Hartwell Tavern parking lot and at the hill summit along the powerline on the east side of the park.

Classification Comments: This community intergrades with *Pinus strobus* - *Quercus (rubra, velutina)* - *Fagus grandifolia* Forest (CEGL006293) and is defined by having a more open canopy, the dominance of *Carya tomentosa* (mockernut hickory) in the canopy and subcanopy, and an abundance of *Carex pensylvanica* (Pennsylvania sedge), as well as a lack of *Fagus grandifolia* (American beech). There are several locations along the upper slope of Fiske Hill where there is a low abundance of *Carya tomentosa* (mockernut hickory); these appear intermediate between these two communities.

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.17, MIMA.25, MIMA.AA33, MIMA.AA82, MIMA.AA83, MIMA.AA84, MIMA.AA85, MIMA.AA95, MIMA.AA98, MIMA.AA104, MIMA.AA106, MIMA.AA109.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Cool Temperate Forest & Woodland (1.B.2)
Division	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)
Macrogroup	Appalachian & Northeastern Oak - Hardwood & Pine Forest (M502)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	<i>Quercus alba</i> - (<i>Quercus rubra</i> , <i>Carya</i> spp.) Forest Alliance (A0239)
Alliance (English name)	White Oak - (Northern Red Oak, Hickory species) Forest Alliance
Association	<i>Quercus (alba, rubra, velutina)</i> - <i>Carya</i> spp. / <i>Viburnum acerifolium</i> Forest
Association (English name)	(White Oak, Northern Red Oak, Black Oak) – Hickory species / Mapleleaf Viburnum Forest
Ecological System(s)	Northeastern Interior Dry-Mesic Oak Forest (CES202.592)

GLOBAL DESCRIPTION

Concept Summary: This oak-hickory forest occurs on well-drained loamy sand of midslopes in the northeastern United States. This vegetation is ecologically transitional between dry-rich oak-hickory forests of relatively high diversity and dry, acidic oak species-poor forests. *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak) are prominent in the canopy. *Quercus prinus* (chestnut oak) and *Quercus coccinea* (scarlet oak) are canopy associates in the southern portion of the range. Typical hickory species include *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), and *Carya ovalis* (red hickory). Other canopy associates may include *Acer rubrum* (red maple), *Sassafras albidum* (sassafras), and *Amelanchier arborea* (common serviceberry). At the northern range limit of this type, *Pinus strobus* (eastern white pine) and *Betula lenta* (sweet birch) also occur as minor associates. *Cornus florida* (flowering dogwood) is a characteristic understory tree in portions of the range. The shrub layer is characterized by *Viburnum acerifolium* (mapleleaf viburnum), with other frequent associates including *Hamamelis virginiana* (American witchhazel), *Vaccinium corymbosum* (highbush blueberry), *Corylus cornuta* (beaked hazelnut), and *Corylus americana* (American hazelnut). A dwarf-shrub layer may be common, but is generally not abundant, and is characterized by *Vaccinium pallidum* (Blue Ridge blueberry) and *Gaylussacia baccata* (black huckleberry), with *Vaccinium angustifolium* (lowbush blueberry) occurring more frequently to the north. The herbaceous layer is characterized by *Carex pensylvanica* (Pennsylvania sedge), *Carex rosea* (rosy sedge), *Maianthemum racemosum* (feathery false lily of the valley), *Aralia nudicaulis* (wild sarsaparilla), *Hieracium venosum* (rattlesnakeweed), *Solidago bicolor* (white goldenrod), *Desmodium glutinosum* (pointedleaf ticktrefoil), *Desmodium paniculatum* (panicledleaf ticktrefoil), *Melampyrum lineare* (narrowleaf cowwheat), *Chimaphila maculata* (striped prince's pine), *Eurybia divaricata* (white wood aster), *Danthonia spicata* (poverty oatgrass), *Aureolaria* (false foxglove) spp., *Pteridium aquilinum* (western brackenfern), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Helianthemum canadense* (longbranch frostweed).

Environmental Description: This forest type occurs on well-drained loamy sand of midslopes and other dry-mesic sites.

Vegetation Description: This vegetation is ecologically transitional between dry-rich oak-hickory forests of relatively high diversity and dry, acidic oak-species-poor forests. *Quercus rubra* (northern red oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak) are prominent in the canopy. Typical hickory species include *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), and *Carya ovalis* (red hickory). Other canopy associates may

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

include *Acer rubrum* (red maple), *Quercus prinus* (chestnut oak), *Sassafras albidum* (sassafras), and *Amelanchier arborea* (common serviceberry). *Pinus strobus* (eastern white pine), *Tsuga canadensis* (eastern hemlock), and *Betula lenta* (sweet birch) may also occur as minor associates. *Cornus florida* (flowering dogwood) is a characteristic understory tree in portions of the range. The shrub layer is typically rather sparse and characterized by *Viburnum acerifolium* (mapleleaf viburnum), with other frequent associates including *Hamamelis virginiana* (American witchhazel), *Vaccinium corymbosum* (highbush blueberry), *Kalmia latifolia* (mountain laurel), *Corylus cornuta* (beaked hazelnut), and *Corylus americana* (American hazelnut). A dwarf-shrub layer may be common but generally not abundant, characterized by *Vaccinium pallidum* (Blue Ridge blueberry) and *Gaylussacia baccata* (black huckleberry), with *Vaccinium angustifolium* (lowbush blueberry) occurring more frequently to the north. The herbaceous layer is characterized by *Carex pensylvanica* (Pennsylvania sedge), *Maianthemum racemosum* (feathery false lily of the valley), *Dryopteris marginalis* (marginal woodfern), *Aralia nudicaulis* (wild sarsaparilla), *Hieracium venosum* (rattlesnakeweed), *Solidago bicolor* (white goldenrod), *Desmodium glutinosum* (pointedleaf ticktrefoil), *Desmodium paniculatum* (panickedleaf ticktrefoil), *Melampyrum lineare* (narrowleaf cowwheat), *Chimaphila maculata* (striped prince's pine), *Eurybia divaricata* (white wood aster), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), *Dennstaedtia punctilobula* (eastern hayscented fern), *Aureolaria* (false foxglove) spp., *Pteridium aquilinum* (western brackenfern), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Helianthemum canadense* (longbranch frostweed). The invasive species *Microstegium vimineum* (Nepalese browntop) and *Berberis thunbergii* (Japanese barberry) may also be present in this forest type.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus alba</i> (white oak), <i>Quercus prinus</i> (chestnut oak), <i>Quercus rubra</i> (northern red oak), <i>Quercus velutina</i> (black oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Cornus florida</i> (flowering dogwood)
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia baccata</i> (black huckleberry)
Herb (field)	Graminoid	<i>Carex pensylvanica</i> (Pennsylvania sedge)

Characteristic Species: *Aralia nudicaulis* (wild sarsaparilla), *Carex pensylvanica* (Pennsylvania sedge), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Cornus florida* (flowering dogwood), *Gaylussacia baccata* (black huckleberry), *Maianthemum racemosum* (feathery false lily of the valley), *Quercus prinus* (chestnut oak), *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum acerifolium* (mapleleaf viburnum)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

DISTRIBUTION

Range: This association occurs from Maine to Maryland.

States/Provinces: CT, DE:S3?, MA, MD, ME, NH, NJ:S4S5, NY, PA, RI, VT

Federal Lands: NPS (Boston Harbor Islands, Cape Cod, Delaware Water Gap, Fort Necessity, Gettysburg, Minute Man, Morristown, Sagamore Hill, Saratoga, Upper Delaware, Weir Farm); USFWS (Assabet River, Great Meadows)

CONSERVATION STATUS

Rank: G4G5 (24-Jan-2005)

Reasons: This type is not naturally rare and has a wide geographic distribution. Mature stands, however, are uncommon and most stands are subject to logging disturbances or even complete destruction if located in rapidly developing suburban areas.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Acer saccharum* - *Betula alleghaniensis* - *Quercus rubra* / *Viburnum acerifolium* Forest (CEGL006943)
- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus* spp. Forest (CEGL006236)
- *Pinus strobus* - *Quercus (rubra, velutina)* - *Fagus grandifolia* Forest (CEGL006293)--can intergrade with this type in New England but is characterized by *Fagus grandifolia* (more or less absent in CEGL006336), a greater amount of *Pinus strobus* in the canopy (usually >20%), and little or no *Carya*.
- *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acid Forest (CEGL002067)--also contains *Actaea racemosa* and can occur on cherty limestone, and *Quercus velutina* is not characteristic. (Note that the USNVC (2015) uses the name *Carya alba* in synonymy with *Carya tomentosa* of USDA-NRCS (2015)).
- *Quercus alba* - *Quercus rubra* - *Carya alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475)--southern analogue of CEGL006336; is more diverse and occupies soils with slightly higher base status. *Quercus velutina* is not as characteristic of this type. A number of southern herbs such as *Aristolochia serpentaria* are not found in CEGL006336; northern species such as *Corylus cornuta*, *Vaccinium angustifolium*, and *Aralia nudicaulis* are not found in CEGL008475.
- *Quercus coccinea* - *Quercus velutina* / *Sassafras albidum* / *Vaccinium pallidum* Forest (CEGL006375)--lacks *Viburnum acerifolium* and *Cornus florida* and in general is less diverse and occurring on relatively more nutrient-poor soils.
- *Quercus prinus* - *Quercus (rubra, velutina)* / *Vaccinium angustifolium* Forest (CEGL006282)
- *Quercus velutina* - *Quercus alba* - *Carya (glabra, ovata)* Forest (CEGL002076)--also contains *Quercus ellipsoidalis* or *Quercus macrocarpa* and is of shorter stature and more open canopy.
- *Quercus velutina* / *Carex pensylvanica* Forest (CEGL002078)--is drier and more infertile, and lacks *Viburnum acerifolium*, *Hamamelis virginiana* and other shrubs.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Related Concepts:

- *Quercus (alba, rubra, velutina) / Cornus florida - Viburnum acerifolium* Forest (Bartgis 1986)
- *Quercus alba - Quercus coccinea - Carya glabra / Cornus florida / Viburnum acerifolium* Forest (VDNH 2003)
- Mesic Coastal Plain mixed oak forest (Breden 1989)
- SNE mesic central hardwood forest on acidic till (Rawinski 1984)

SOURCES

Description Authors: S.L. Neid and L.A. Sneddon, mod. S.C. Gawler

References: Bartgis 1986, Berdine 1998, Breden 1989, Breden et al. 2001, Clancy 1996, Damman 1977, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fike 1999, Fleming et al. 2001, Fleming pers. comm., Gawler 2002, Harrison 2004, Hunt 1997a, MENHP 1991, McCoy and Fleming 2000, Metzler and Barrett 2001, NRCS 2004, Patterson pers. comm., Rawinski 1984, Soil Conservation Service 1987, Sperduto 1997b, Sperduto and Nichols 2004, Swain and Kearsley 2001, VDNH 2003



Figure E-5. Dry Oak - Hickory Forest at Minute Man National Historical Park (a) (MIMA.AA 106). August 2006. NAD 1983 UTM easting 310858, northing 4702833.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-6. Dry Oak - Hickory Forest at Minute Man National Historical Park (b) (MIMA.17). July 2004. NAD 1983 UTM easting 313820, northing 4702013

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Mixed Oak - White Pine Forest

SYNONYMS

USNVC English Name:	Eastern White Pine - (Northern Red Oak, Black Oak) American Beech Forest
USNVC Scientific Name:	<i>Pinus strobus</i> - <i>Quercus (rubra, velutina)</i> - <i>Fagus grandifolia</i> Forest
USNVC Identifier:	CEGL006293
Map Class:	Pine - Oak Forest

LOCAL INFORMATION

Environmental Description: This community occurs on gently sloping to moderately sloping mid to upper slopes of small hills with sandy loam soils. Sites generally have well-drained soils with few rocks. Many sites may have been cleared and used for row crops; others, in steeper sites, were likely pastures.

Vegetation Description: This association forms much of the matrix forest at the park and supports a dense canopy dominated by a mixture of oak species and *Pinus strobus* (eastern white pine). *Quercus rubra* (northern red oak) is the most typical oak, but *Quercus velutina* (black oak) and *Quercus alba* (white oak) are also common. Other frequent trees in the canopy include *Fagus grandifolia* (American beech) and *Acer rubrum* (red maple); *Fraxinus americana* (white ash), *Carya tomentosa* (mockernut hickory), *Quercus coccinea* (scarlet oak), and *Pinus rigida* (pitch pine) are occasional. The subcanopy is highly variable. In some areas with high cover of *Pinus strobus* (eastern white pine), there may be no trees in the subcanopy. Areas with less abundant *Pinus strobus* (eastern white pine) support a range of species at low cover, including *Acer rubrum* (red maple), *Ulmus americana* (American elm), and *Fagus grandifolia* (American beech). *Juniperus virginiana* (eastern redcedar) is occasionally present. The shrub layer is generally sparse with a range of species, including *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Prunus virginiana* (chokecherry), *Prunus serotina* (black cherry), and *Pinus strobus* (eastern white pine). Most occurrences have ericaceous shrubs, including *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium angustifolium* (lowbush blueberry), *Gaylussacia baccata* (black huckleberry), and *Kalmia angustifolia* (sheep laurel), the cover of which is generally low but may be extensive in places. The herbaceous layer is also generally sparse (1-10% cover). Common species include *Aralia nudicaulis* (wild sarsaparilla), *Maianthemum canadense* (Canada mayflower), *Pteridium aquilinum* (western brackenfern), *Maianthemum racemosum* (feathery false lily of the valley), *Carex rosea* (rosy sedge), and *Trientalis borealis* (starflower). *Toxicodendron radicans* (eastern poison ivy) is sometimes present. In many occurrences, *Rhamnus* sp. is abundant.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i> (eastern white pine)
Tree canopy	Broad-leaved deciduous tree	<i>Fagus grandifolia</i> (American beech),

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

		<i>Quercus alba</i> (white oak), <i>Quercus rubra</i> (northern red oak), <i>Quercus velutina</i> (black oak)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Ulmus americana</i> (American elm)
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia baccata</i> (black huckleberry), <i>Prunus serotina</i> (black cherry)
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium angustifolium</i> (lowbush blueberry), <i>Vaccinium pallidum</i> (Blue Ridge blueberry)
Herb (field)	Forb	<i>Aralia nudicaulis</i> (wild sarsaparilla), <i>Maianthemum canadense</i> (Canada mayflower), <i>Trientalis borealis</i> (starflower)

Characteristic Species: *Fagus grandifolia* (American beech), *Pinus strobus* (eastern white pine), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S5*	B	.	White Pine - Oak Forest	Swain and Kearsley 2001

Local Range: This is the matrix forest type at Minute Man National Historical Park that occurs at sites with sandy loam soils.

Classification Comments: This community type is highly variable with a range of dominant canopy species, probably defined by the available seeds in nearby forest remnants when the site was released from agriculture or logging. It is closely related to Dry Oak-Hickory Forest (CEGL006336) but has a lower abundance of hickories and a greater abundance of *Fagus grandifolia* (American beech), as well as more *Pinus strobus* (eastern white pine) (this type is generally a mixed forest with >20% pine in the canopy, while Dry Oak-Hickory Forest usually has less, if any, pine).

Other Comments: Most sites for this community were probably used for intensive agriculture for many years. Some locations may have been used as woodlots for many decades after release from more intensive land uses. Some of these areas were heavily logged about 60 years ago. Description augmented with information from Thompson and Jenkins (1992).

Local Description Authors: R.E. Zaremba and S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.05, MIMA.06, MIMA.12, MIMA.36, MIMA.AA23, MIMA.AA48, MIMA.AA52, MIMA.AA58, MIMA.AA60, MIMA.AA63, MIMA.AA65, MIMA.AA69, MIMA.AA71, MIMA.AA80, MIMA.AA88, MIMA.AA92, MIMA.AA101, MIMA.AA103, MIMA.AA112, MIMA.AA115, MIMA.AA119, MIMA.AA120.

Minute Man National Historical Park Inventory Notes: Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Cool Temperate Forest & Woodland (1.B.2)
Division	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)
Macrogroup	Appalachian & Northeastern Oak - Hardwood & Pine Forest (M502)
Group	Northeastern Oak - Hickory Forest & Woodland (G650)
Alliance	<i>Pinus strobus</i> - <i>Quercus alba</i> Allegheny Forest & Woodland Alliance (A4128)
Alliance (English name)	Eastern White Pine - White Oak Allegheny Forest & Woodland Alliance
Association	<i>Pinus strobus</i> - <i>Quercus (rubra, velutina)</i> - <i>Fagus grandifolia</i> Forest
Association (English name)	Eastern White Pine - (Northern Red Oak, Black Oak) – American Beech Forest
Ecological System(s)	Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563) Northeastern Interior Dry-Mesic Oak Forest (CES202.592) Central Appalachian Dry Oak-Pine Forest (CES202.591)

GLOBAL DESCRIPTION

Concept Summary: This mixed white pine - oak forest of the northeastern U.S. occurs on dry-mesic to mesic, acidic, nutrient-poor, sandy loam to sandy soils. In the northern glaciated portion of the range, the forest occurs on outwash plains or moraines, as well as along mid and lower slopes and within protected ravines, and on protected ridges or upper slopes of shale, sandstone or other sedimentary rock, occasionally underlain by metamorphic or igneous rock. Along the unglaciated plateau, this community occurs on rolling topography underlain by sandstone. It occurs at elevations below 915 m (3000 feet) throughout the range. The tree canopy is dominated by a mixture of *Pinus strobus* (eastern white pine) and oaks, including *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Quercus prinus* (chestnut oak) (usually in minor amounts), and primarily in the southern portions of the range, *Quercus coccinea* (scarlet oak). Oak species drop out at the northern extreme of the type's range, leaving only *Quercus rubra* (northern red oak). *Fagus grandifolia* (American beech) is characteristic over much of the range of this type but is absent in some areas. Other less frequent canopy associates may include *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Carya tomentosa* (mockernut hickory), *Pinus rigida* (pitch pine), *Populus tremuloides* (quaking aspen), *Fraxinus americana* (white ash), *Ulmus americana* (American elm), *Tsuga canadensis* (eastern hemlock), and at the northern range limit may include *Betula papyrifera* (paper birch) and *Populus grandidentata* (bigtooth aspen). The variable subcanopy may include *Hamamelis virginiana* (American witchhazel) or *Prunus serotina* (black cherry); other species such as *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), and *Nyssa sylvatica* (blackgum) may be present in the central and southern portions of the range. It

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

has a sparse to well-developed, generally ericaceous shrub layer. The herb layer ranges from sparse to moderately dense cover. In disturbed settings, *Rhamnus* sp. (buckthorn⁵) may be an abundant shrub[‡]. The bryophyte layer is not well-documented. This association is differentiated from mixed oak-pine forests to the south by *Fagus grandifolia* (American beech) and the absence of southern-ranging species *Liriodendron tulipifera* (tuliptree), *Galax urceolata* (beetleweed), *Trillium catesbaei* (bashful wakerobin), *Halesia tetraptera* (mountain silverbell), and others. The absence of *Ilex glabra* (inkberry) and the unimportance of *Quercus alba* (white oak) differentiate this type from a closely related association of northeastern coastal areas, *Pinus strobus* - *Quercus alba* / *Ilex glabra* Forest (CEGL006382). Earlier successional versions in New England have less pine (usually) and more *Betula* (birch) spp. and *Acer rubrum* (red maple) and are separated as *Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* (eastern white pine) Ruderal Forest (CEGL006506).

Environmental Description: This mixed white pine - oak forest occurs on dry-mesic to mesic, acidic, nutrient-poor, sandy loam to sandy soils along mid and lower slopes, and along the unglaciated plateau on rolling topography underlain by sandstone. In the northern glaciated portion of the range, the forest occurs on outwash plains or moraines, as well as along mid and lower slopes and within protected ravines, and on protected ridges of shale, sandstone, or other sedimentary rock, occasionally underlain by metamorphic or igneous rock. Along the unglaciated plateau, this community occurs on rolling topography underlain by sandstone. It occurs at elevations below 915 m (3000 feet) throughout the range.

Vegetation Description: The tree canopy is dominated by a mixture of *Pinus strobus* (eastern white pine) and oaks, including *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Quercus prinus* (chestnut oak) (usually in minor amounts), and primarily in the southern portions of the range, *Quercus coccinea* (scarlet oak). Oak species drop out at the northern extreme of the type's range, leaving only *Quercus rubra* (northern red oak). *Fagus grandifolia* (American beech) is characteristic but not always present. Other less frequent canopy associates may include *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Carya tomentosa* (mockernut hickory), *Populus tremuloides* (quaking aspen), *Fraxinus americana* (white ash), *Ulmus americana* (American elm), *Tsuga canadensis* (eastern hemlock), and at the northern range limit may include *Betula papyrifera* (paper birch) and *Populus grandidentata* (bigtooth aspen). The variable subcanopy may include *Hamamelis virginiana* (American witchhazel) or *Prunus serotina* (black cherry); other species such as *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), and *Nyssa sylvatica* (blackgum) may be present in the central and southern portions of the range. The sparse to well-developed, generally ericaceous shrub layer includes *Gaylussacia* (huckleberry) spp. (usually *Gaylussacia baccata*), *Kalmia latifolia* (mountain laurel), *Vaccinium* (blueberry) spp. (typically *Vaccinium pallidum* (Blue Ridge blueberry) and/or *Vaccinium angustifolium*), and sometimes *Kalmia angustifolia* (sheep laurel), as well as *Rubus* (blackberry) spp., *Corylus americana* (American hazelnut), *Rhododendron periclymenoides* (pink azalea), *Gaultheria procumbens* (eastern teaberry), *Sassafras albidum* (sassafras), and *Viburnum prunifolium* (blackhaw). The herb layer ranges from sparse to moderately dense cover, with species including *Aralia nudicaulis* (wild

⁵ See Appendix J for more information on the distribution on *Rhamnus* species.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

sarsaparilla), *Ageratina altissima* (white snakeroot), *Amphicarpaea bracteata* (American hogpeanut), *Brachyelytrum erectum* (bearded shorthusk), *Carex communis* (fibrousroot sedge), *Carex woodii* (pretty sedge), *Carex pensylvanica* (Pennsylvania sedge), *Carex lucorum* (Blue Ridge sedge), *Carex debilis* (white edge sedge), *Melampyrum lineare* (narrowleaf cowwheat), *Pteridium aquilinum* (western brackenfern), *Trientalis borealis* (starflower), *Gaultheria procumbens* (eastern teaberry), *Chimaphila maculata* (striped prince's pine), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Galium latifolium* (purple bedstraw), *Goodyera pubescens* (downy rattlesnake plantain), *Hieracium venosum* (rattlesnakeweed), *Houstonia purpurea* (Venus' pride), *Maianthemum racemosum* (feathery false lily of the valley), *Maianthemum canadense* (Canada mayflower), *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), *Monotropa uniflora* (Indianpipe), *Poa cuspidata* (early bluegrass), *Polygonatum biflorum* (smooth Solomon's seal), *Polystichum acrostichoides* (Christmas fern), and/or *Viola hastata* (halberdleaf yellow violet). In disturbed settings, *Rhamnus* sp. (buckthorn[†]) may be an abundant shrub. The bryophyte layer is not well-documented but supports *Leucobryum glaucum* (leucobryum moss) and *Polytrichum commune* (polytrichum moss) in occurrences in the northern portion of the range (Acadia National Park).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i> (eastern white pine)
Tree canopy	Broad-leaved deciduous tree	<i>Quercus alba</i> (white oak), <i>Quercus prinus</i> (chestnut oak), <i>Quercus rubra</i> (northern red oak), <i>Quercus velutina</i> (black oak)
Tree subcanopy	Broad-leaved deciduous tree	<i>Prunus serotina</i> (black cherry)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Hamamelis virginiana</i> (American witchhazel)
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i> (mountain laurel)
Herb (field)	Forb	<i>Aralia nudicaulis</i> (wild sarsaparilla), <i>Maianthemum canadense</i> (Canada mayflower), <i>Trientalis borealis</i> (starflower)
Herb (field)	Graminoid	<i>Carex pensylvanica</i> (Pennsylvania sedge)

Characteristic Species: *Fagus grandifolia* (American beech), *Pinus strobus* (eastern white pine), *Quercus rubra* (northern red oak)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

[†] See Appendix J for more information on the distribution on *Rhamnus* species

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

DISTRIBUTION

Range: This community occurs in New England south and west to Pennsylvania and West Virginia and possibly New Jersey. Total acreage for all subsections is approximately 230,000 square km.

States/Provinces: MA, ME, NH, NJ?, NY, PA, RI, VT:S3, WV

Federal Lands: NPS (Acadia, Delaware Water Gap, Minute Man, Saratoga, Upper Delaware); USFS (Finger Lakes); USFWS (Assabet River, Great Meadows, Oxbow)

CONSERVATION STATUS

Rank: G5 (31-Jan-2007)

Reasons: This vegetation occurs as large patches of the matrix forest type and ranges across most northeastern states. Pristine or old-growth examples are few, but in general this forest type has recovered to mid- to late-successional stages following large-scale clearing by European settlers.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: In the northern part of this type's range, it can be similar to *Tsuga canadensis* - *Fagus grandifolia* - *Quercus rubra* Forest (CEGL006088), which is distinguished by having *Tsuga canadensis* (eastern hemlock) as the principal canopy conifer. However, examples of both types may have *Pinus strobus* (eastern white pine) and *Tsuga canadensis* (eastern hemlock) present. In the southern part of this type's range, drier expressions overlap conceptually with *Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest (CEGL008539) to the south, and the overlap between those two needs clarification.

Similar Associations:

- *Pinus strobus* - (*Pinus resinosa*) - *Quercus rubra* Forest (CEGL002480)
- *Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest (CEGL008539)
- *Pinus strobus* - *Quercus alba* / *Ilex glabra* Forest (CEGL006382)
- *Quercus* (*alba*, *rubra*, *velutina*) / *Viburnum acerifolium* Forest (CEGL006336)--has less pine, more hickory, and little or no beech, but can intergrade to this type.
- *Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Ruderal Forest (CEGL006506)
- *Quercus rubra* - *Acer saccharum* - *Fagus grandifolia* / *Viburnum acerifolium* Forest (CEGL006633)
- *Tsuga canadensis* - *Fagus grandifolia* - *Quercus rubra* Forest (CEGL006088)

Related Concepts:

- Eastern White Pine: 21 (Eyre 1980)
- Mesic Pine-Oak Forest (Thompson 1996)
- Pine-Oak-Heath Sandplain Forest (Thompson 1996)
- SNE dry central hardwood forest on acidic bedrock or till (Rawinski 1984)
- SNE dry oak/pine forests on acidic bedrock or till (Rawinski 1984)
- SNE mesic oak/pine forest on sandy/gravelly soil (Rawinski 1984)
- White Pine - Northern Red Oak - Red Maple: 20 (Eyre 1980)
- White pine-oak-beech dry forest (large patch to matrix) (CAP pers. comm. 1998)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

SOURCES

Description Authors: L.A. Sneddon, mod. E. Largay and S.C. Gawler

References: Breden et al. 2001, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1993, Eyre 1980, Fike 1999, Gawler 2002, Kuchler 1956, Lundgren 2001, Moore and Taylor 1927, NRCS 2004, Rawinski 1984, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000



Figure E-7. Mixed Oak - White Pine Forest at Minute Man National Historical Park (a) (MIMA.36). August 2004. NAD 1983 UTM easting 313864, northing 4701826.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-8. Mixed Oak - White Pine Forest at Minute Man National Historical Park (b) (MIMA.AA69). August 2006. NAD 1983 UTM easting 313459, northing 4702578.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Upland / Wetland Transitional Forest

SYNONYMS

USNVC English Name: Northern Red Oak - Yellow Birch / Cinnamon Fern Forest
USNVC Scientific Name: *Quercus rubra* - *Betula alleghaniensis* / *Osmunda cinnamomea* Forest
USNVC Identifier: CEGL006000
Map Class: Red Oak - Red Maple - Pine Forest

LOCAL INFORMATION

Environmental Description: This vegetation occurs on lower slopes or flat plains, generally adjacent to wetlands. The mineral soils are somewhat poorly drained, commonly sandy loams, and typically seasonally wet but dry at the surface for much of the growing season.

Vegetation Description: *Acer rubrum* (red maple) typically dominates but in contrast to red maple swamp types, is mixed with other species more typical of uplands. Associated trees include *Quercus rubra* (northern red oak), *Pinus strobus* (eastern white pine), *Prunus serotina* (black cherry), and *Fraxinus pennsylvanica* (green ash). Shrubs typically include non-natives such as *Lonicera morrowii* (Morrow's honeysuckle), *Rhamnus* sp. (buckthorn)[†], and *Rosa multiflora* (multiflora rose); natives such as *Viburnum dentatum* (southern arrowwood) and *Lindera benzoin* (northern spicebush) may be present as well. The vine *Toxicodendron radicans* (eastern poison ivy) is usually present. The herb layer is typically a heterogeneous mixture of wetland-preferential and upland-preferential plants. Species included *Onoclea sensibilis* (sensitive fern), *Athyrium filix-femina* (common ladyfern), *Arisaema triphyllum* (Jack in the pulpit), *Maianthemum canadense* (Canada mayflower), *Maianthemum racemosum* (feathery false lily of the valley), *Eurybia divaricata* (white wood aster), and *Ranunculus hispidus* (bristly buttercup). Herbaceous species composition can vary over short distances with only minor changes in topography.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Quercus rubra</i> (northern red oak), <i>Pinus strobus</i> (eastern white pine), <i>Ulmus</i> sp. (elm)
Shrub/sapling (tall & short)	Broad-leaved deciduous shr.	<i>Rhamnus</i> sp. (buckthorn) [†] , <i>Viburnum dentatum</i> (southern arrowwood)
Herb (field)	Forb	<i>Maianthemum canadense</i> (Canada mayflower), <i>Arisaema triphyllum</i> (Jack in the pulpit), <i>Eurybia divaricata</i> (white wood aster)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern),

[†] See Appendix J for more information on the distribution on *Rhamnus* species.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Athyrium filix-femina (common ladyfern)

Characteristic Species: Individual species are not characteristic but the combination of wetland and upland species is.

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
MA	SNR	.	.	[not crosswalked]	.

Local Range: Scattered locations throughout the Park.

Classification Comments: Intermediate in hydrology and flora between Oak – Red Maple Successional Forest (*Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Ruderal Forest, CEG006506) and red maple swamps (*Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest, CEG006406 and *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest, CEG006156).

Other Comments: Information not available.

Local Description Authors: S. C Gawler

Plots and Accuracy Assessment Points: MIMA.AA12, MIMA.AA59, and MIMA.AA100

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Cool Temperate Forest & Woodland (1.B.2)
Division	Eastern North American & Great Plains Cool Temperate Forest & Woodland (D008)
Macrogroup	Appalachian, Interior & Northeastern Mesic Forest (M883)
Group	Appalachian & Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	<i>Quercus rubra</i> - <i>Acer saccharum</i> – <i>Betula lenta</i> Forest Alliance (A3303)
Alliance (English name)	Northern Red Oak - Sugar Maple – Sweet Birch Forest Alliance
Association	<i>Quercus rubra</i> - <i>Betula alleghaniensis</i> / <i>Osmunda cinnamomea</i> Forest
Association (English name)	Northern Red Oak - Yellow Birch / Cinnamon Fern Forest
Ecological System(s)	Northern Atlantic Coastal Plain Hardwood Forest (CES203.475)

GLOBAL DESCRIPTION

Concept Summary: This lower slope, wetland transitional forest of southern New England to New Jersey generally occurs immediately upslope from seasonally flooded acidic swamps or small drainages. It occurs on somewhat poorly drained mineral soils, with a soil moisture regime of moist to somewhat wet. The tree canopy is nearly closed, with tree height reflecting moisture availability. Dominant species include *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Quercus rubra* (northern red oak), and *Quercus velutina* (black oak). Occasionally *Quercus alba* (white oak),

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Quercus palustris (pin oak), *Fagus grandifolia* (American beech), and *Tsuga canadensis* (eastern hemlock) may occur. The shrub layer includes *Hamamelis virginiana* (American witchhazel), *Vaccinium corymbosum* (highbush blueberry), *Clethra alnifolia* (coastal sweetpepperbush), *Kalmia latifolia* (mountain laurel), and *Lindera benzoin* (northern spicebush). The herbaceous layer is nearly continuous and dominated by *Osmunda cinnamomea* (cinnamon fern), *Thelypteris noveboracensis* (New York fern), *Arisaema triphyllum* (Jack in the pulpit), and *Uvularia sessilifolia* (sessileleaf bellwort).

Environmental Description: This vegetation occurs on lower slopes, generally adjacent to wetlands. Mineral soils are somewhat poorly drained and moist to somewhat wet sandy loams. The substrate is often rocky.

Vegetation Description: The tree canopy is nearly closed, with tree height reflecting moisture availability. Dominant species include *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Quercus rubra* (northern red oak), and *Quercus velutina* (black oak). Occasionally *Quercus alba* (white oak), *Quercus palustris* (pin oak), *Fagus grandifolia* (American beech), and *Tsuga canadensis* (eastern hemlock) may occur. *Liriodendron tulipifera* (tuliptree) is a common associate in the southern portion of the range. The shrub layer includes *Hamamelis virginiana* (American witchhazel), *Vaccinium corymbosum* (highbush blueberry), *Clethra alnifolia* (coastal sweetpepperbush), *Kalmia latifolia* (mountain laurel), and *Lindera benzoin* (northern spicebush). The herbaceous layer is nearly continuous and dominated by *Osmunda cinnamomea* (cinnamon fern), *Thelypteris noveboracensis* (New York fern), *Arisaema triphyllum* (Jack in the pulpit), and *Uvularia sessilifolia* (sessileleaf bellwort). *Impatiens capensis* (jewelweed), *Veratrum viride* (green false hellebore), and *Symplocarpus foetidus* (skunk cabbage) may also occur where this vegetation grades into a wetland forest.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Betula alleghaniensis</i> (yellow birch), <i>Quercus velutina</i> (black oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Clethra alnifolia</i> (coastal sweetpepperbush), <i>Hamamelis virginiana</i> (American witchhazel), <i>Lindera benzoin</i> (northern spicebush), <i>Vaccinium corymbosum</i> (highbush blueberry)
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i> (mountain laurel)
Herb (field)	Forb	<i>Arisaema triphyllum</i> (Jack in the pulpit), <i>Uvularia sessilifolia</i> (sessileleaf bellwort)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern), <i>Thelypteris noveboracensis</i> (New York fern)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Characteristic Species: *Arisaema triphyllum* (Jack in the pulpit), *Betula alleghaniensis* (yellow birch), *Osmunda cinnamomea* (cinnamon fern), *Quercus rubra* (northern red oak), *Thelypteris noveboracensis* (New York fern), *Uvularia sessilifolia* (sessileleaf bellwort)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: The association occurs in Connecticut, Massachusetts, New Hampshire, New Jersey, and Rhode Island.

States/Provinces: CT, MA, ME, NH, NJ, NY, RI

Federal Lands: NPS (Boston Harbor Islands, Minute Man, Morristown, Saratoga); USFWS (Assabet River, Great Meadows, Oxbow)

CONSERVATION STATUS

Rank: GNR (1-Dec-1997)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: The lack of surface water and drier soil conditions during the growing season (relative to adjacent, seasonally flooded wetlands) make this forest suitable for species found more frequently in uplands.

Similar Associations:

- *Fagus grandifolia* - *Betula lenta* - *Quercus (alba, rubra)* / *Carpinus caroliniana* Forest (CEGL006921)

Related Concepts:

- CNE mesic hardwood forest on acidic bedrock/till (Rawinski 1984)
- Stream thicket community (Ehrenfeld 1977)

SOURCES

Description Authors: S.L. Neid, mod. L.A. Sneddon

References: Damman and Kershner 1977, Eastern Ecology Working Group n.d., Ehrenfeld 1977, Golet et al. 1993, Metzler and Barrett 2001, NRCS 2004, Rawinski 1984, Sperduto 2000b, Sperduto and Nichols 2004

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-9. Upland / Wetland Transitional Forest at Minute Man National Historical Park (MIMA.AA100). August 2006. NAD 1983 UTM easting 314417, northing 4702052.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Swamp White Oak Floodplain Forest

SYNONYMS

USNVC English Name: Swamp White Oak - Red Maple / American Hornbeam Forest
USNVC Scientific Name: *Quercus bicolor* - *Acer rubrum* / *Carpinus caroliniana* Forest
USNVC Identifier: CEG006386
Map Class: Forested Swamp

LOCAL INFORMATION

Environmental Description: This association occurs along the upper border of the floodplain along the Concord River. In most areas there is either an old eroded escarpment marking the upper edge of this community or some other type of barrier to prevent flooding, such as the embankment that supports a road. This community is flooded during extreme high water in the spring, but not flooded during most of the growing season. Soils are silty loam with a few rocks from erosion from adjacent upland sites. There are some local deposits of water-borne debris but also debris from roadside sources. The canopy is dense and there is a well-developed shrub layer and an abundance of vines.

Vegetation Description: The canopy of this association is dominated by *Quercus bicolor* (swamp white oak) with lower cover of *Acer saccharinum* (silver maple). Some sites support *Fraxinus pennsylvanica* (green ash) and *Acer rubrum* (red maple). The understory is well-developed with *Ulmus americana* (American elm), *Acer saccharinum* (silver maple), and *Acer rubrum* (red maple). Shrubs are locally abundant and include *Cephalanthus occidentalis* (common buttonbush) and *Cornus* (dogwood) sp., as well as *Rhamnus frangula* (glossy buckthorn[†]) and *Rhamnus cathartica* (common buckthorn[†]). Vines are common and include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), *Menispermum canadense* (common moonseed) and *Vitis* (grape) sp.. The herbaceous layer is well-developed and dominated by *Boehmeria cylindrica* (smallspike false nettle), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), and *Thelypteris palustris* (eastern marsh fern). Other common species include *Cinna arundinacea* (sweet woodreed), *Elymus riparius* (riverbank wildrye), *Carex grayi* (Gray's sedge), *Carex gynandra* (nodding sedge), *Carex debilis* (white edge sedge), and *Circaea lutetiana* (broadleaf enchanter's nightshade). Some areas are dominated by *Lysimachia nummularia* (creeping jenny).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Acer saccharinum</i> (silver maple)
Tree canopy	Broad-leaved deciduous tree	<i>Quercus bicolor</i> (swamp white oak)
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cephalanthus occidentalis</i> (common buttonbush), <i>Rhamnus frangula</i> (glossy buckthorn [†]), <i>Rhamnus cathartica</i> (common buckthorn [†])
Herb (field)	Forb	<i>Boehmeria cylindrica</i> (smallspike)

[†] See Appendix J for more information on the distribution on *Rhamnus* species.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Herb (field)	Fern or fern ally	false nettle) <i>Onoclea sensibilis</i> (sensitive fern), <i>Osmunda regalis</i> (royal fern), <i>Thelypteris palustris</i> (eastern marsh fern)
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Characteristic Species: *Cinna arundinacea* (sweet woodreed), *Fraxinus pennsylvanica* (green ash), *Menispermum canadense* (common moonseed), *Quercus bicolor* (swamp white oak)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S3*	B	.	Alluvial Red Maple Swamp	Swain and Kearsley 2001

Local Range: This association is found along the upper border of the floodplain along the Concord River.

Classification Comments: This type intergrades with Silver Maple Floodplain Forest (CEGL006176) and is defined by its concentration of *Quercus bicolor* (swamp white oak). In some areas there may be only a few individuals of *Quercus bicolor* (swamp white oak) at the upper edge of Silver Maple Floodplain Forest. These areas should be considered a part of the Silver Maple Floodplain Forest.

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.01, MIMA.24, MIMA.AA11, MIMA.AA15.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Temperate Flooded & Swamp Forest (1.B.3)
Division	Eastern North American Flooded & Swamp Forest (D011)
Macrogroup	Central & Appalachian Swamp Forest (M503)
Group	North Central Flatwoods & Swamp Forest (G597)
Alliance	<i>Quercus palustris</i> - <i>Quercus bicolor</i> Floodplain Swamp Forest Alliance (A3408)
Alliance (English name)	Pin Oak - Swamp White Oak Floodplain Swamp Forest Alliance
Association	<i>Quercus bicolor</i> - <i>Acer rubrum</i> / <i>Carpinus caroliniana</i> Forest
Association (English name)	Swamp White Oak - Red Maple / American Hornbeam Forest
Ecological System(s)	Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This swamp white oak floodplain forest of lower floodplains and terraces occurs within 50 km of the coast in New Hampshire and northeastern Massachusetts. Sediments are silty, of marine or recent origin, and somewhat enriched. The canopy is characterized by *Quercus bicolor* (swamp white oak) as a dominant; *Acer rubrum* (red maple) or *Acer saccharinum* (silver maple) may also be important in the canopy. Additional canopy or subcanopy associates include

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Ulmus americana (American elm), *Fraxinus pennsylvanica* (green ash), *Betula nigra* (river birch), and occasionally *Carya ovata* (shagbark hickory). An understory of *Carpinus caroliniana* (American hornbeam) may be present. The shrub layer is characterized by some combination of *Cornus amomum* (silky dogwood), *Cephalanthus occidentalis* (common buttonbush), *Viburnum dentatum* (southern arrowwood), *Ilex verticillata* (common winterberry), *Rhamnus frangula* (glossy buckthorn[†]), *Rhamnus cathartica* (common buckthorn[†]), and *Viburnum lentago* (nannyberry). Vines are frequently present and may include *Toxicodendron radicans* (eastern poison ivy), *Menispermum canadense* (common moonseed), and *Parthenocissus quinquefolia* (Virginia creeper). The lower floodplain is more poorly drained and characterized by *Carex stricta* (upright sedge), *Carex crinita* (fringed sedge), *Boehmeria cylindrica* (smallspike false nettle), *Iris versicolor* (harlequin blueflag), *Lysimachia terrestris* (earth loosestrife), *Cinna arundinacea* (sweet woodreed), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), and *Thelypteris palustris* (eastern marsh fern), while the drier terrace is characterized by *Athyrium filix-femina* (common ladyfern), *Elymus riparius* (riverbank wildrye), *Carex debilis* (white edge sedge), *Solidago rugosa* (wrinkleleaf goldenrod), and *Thelypteris noveboracensis* (New York fern). Key diagnostic features include *Quercus bicolor* (swamp white oak) as a codominant canopy species.

Environmental Description: This swamp white oak floodplain forest of lower floodplains and terraces occurs within 50 km of the coast in New Hampshire and northeastern Massachusetts with somewhat enriched and silty sediments of marine or recent origin.

Vegetation Description: The canopy is characterized by *Quercus bicolor* (swamp white oak) as a dominant; *Acer rubrum* (red maple) or *Acer saccharinum* (silver maple) may also be important in the canopy. Additional canopy or subcanopy associates include *Ulmus americana* (American elm), *Fraxinus pennsylvanica* (green ash), *Betula nigra* (river birch), and occasionally *Carya ovata* (shagbark hickory). An understory of *Carpinus caroliniana* (American hornbeam) may be present. The shrub layer is characterized by some combination of *Cornus amomum* (silky dogwood), *Cephalanthus occidentalis* (common buttonbush), *Viburnum dentatum* (southern arrowwood), *Ilex verticillata* (common winterberry), *Rhamnus frangula* (glossy buckthorn[†]), *Rhamnus cathartica* (common buckthorn[†]), and *Viburnum lentago* (nannyberry). Vines are frequently present and may include *Toxicodendron radicans* (eastern poison ivy), *Menispermum canadense* (common moonseed), and *Parthenocissus quinquefolia* (Virginia creeper). The lower floodplain is more poorly drained and characterized by *Carex stricta* (upright sedge), *Carex crinita* (fringed sedge), *Boehmeria cylindrica* (smallspike false nettle), *Iris versicolor* (harlequin blueflag), *Lysimachia terrestris* (earth loosestrife), *Cinna arundinacea* (sweet woodreed), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), and *Thelypteris palustris* (eastern marsh fern), while the drier terrace is characterized by *Athyrium filix-femina* (common ladyfern), *Elymus riparius* (riverbank wildrye), *Carex debilis* (white edge sedge), *Solidago rugosa* (wrinkleleaf goldenrod), and *Thelypteris noveboracensis* (New York fern).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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[†] See Appendix J for more information on the distribution on *Rhamnus* species

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Tree canopy	Broad-leaved deciduous tree	<i>Quercus bicolor</i> (swamp white oak)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Acer saccharum</i> (sugar maple)
Tall shrub/sapling	Broad-leaved deciduous shr.	<i>Cornus amomum</i> (silky dogwood), <i>Ilex verticillata</i> (common winterberry), <i>Viburnum dentatum</i> (southern arrowwood)
Short shrub/sapling	Broad-leaved deciduous shr.	<i>Cephalanthus occidentalis</i> (common buttonbush)
Herb (field)	Forb	<i>Boehmeria cylindrica</i> (smallspike false nettle)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern), <i>Osmunda regalis</i> (royal fern), <i>Thelypteris palustris</i> (eastern marsh fern)

Characteristic Species: *Quercus bicolor* (swamp white oak)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This association occurs in the coastal lowlands region of the northeastern U.S., from New Hampshire south to New Jersey.

States/Provinces: MA, NH, NJ, NY, PA

Federal Lands: NPS (Minute Man, Saratoga)

CONSERVATION STATUS

Rank: GNR (1-Dec-1997)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Acer rubrum* - *Prunus serotina* / *Cornus amomum* Forest (CEGL006503)--*Acer rubrum*-dominated floodplain forest, lacks *Quercus bicolor*.
- *Tilia americana* - *Acer saccharum* - *Acer nigrum* / *Laportea canadensis* Forest (CEGL006405)--enriched floodplain forest of coastal areas, but lacks *Quercus bicolor*.

Related Concepts:

- *Quercus bicolor*/*Onoclea sensibilis* (Type 8) (Sperduto and Crowley 2002a)
- Southern New England stream bottom forest (Rawinski 1984)

SOURCES

Description Authors: S.L. Neid, mod. S.C. Gawler

References: Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Metzler and Barrett 2001, NRCS 2004, Rawinski 1984, Sperduto 1997b, Sperduto 2000a, Sperduto and Crowley 2002a, Swain and Kearsley 2001

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-10. Swamp White Oak Floodplain Forest at Minute Man National Historical Park (MIMA.24). August 2004. NAD 1983 UTM easting 306417, northing 4704301.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Red Maple - Tussock Sedge Wooded Marsh

SYNONYMS

USNVC English Name: Red Maple / Tussock Sedge - Sensitive Fern Woodland
USNVC Scientific Name: *Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Woodland
USNVC Identifier: CEG006119
Map Class Name: Forested Swamp

LOCAL INFORMATION

Environmental Description: This association occurs at the margins of a large wetland complex where groundwater flowing from the upland mixes with the saturated soils bordering a stream. The substrate is a mixture of peat and muck and saturated. There are small pockets of deep muck mixed with patches of more stable substrate which supports *Acer rubrum* (red maple). *Carex stricta* (upright sedge) grows in tussocks that form a stable substrate that supports other species. The substrate is saturated throughout the year, although it can be extremely wet and loose in the spring and following heavy rain.

Vegetation Description: This association is characterized by an open canopy of *Acer rubrum* (red maple) at 40-70% cover with no other trees and a nearly uniform cover of *Carex stricta* (upright sedge). Common associates include *Spiraea alba* var. *latifolia* (white meadowsweet), *Symplocarpus foetidus* (skunk cabbage), *Galium palustre* (common marsh bedstraw), *Cicuta bulbifera* (bulblet-bearing water hemlock), *Polygonum arifolium* (halberdleaf tearthumb), and *Dryopteris cristata* (crested woodfern). Occurrences generally have low diversity and a very consistent assemblage of species.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea alba</i> var. <i>latifolia</i> (white meadowsweet)
Herb (field)	Forb	<i>Cicuta bulbifera</i> (bulblet bearing water hemlock), <i>Galium palustre</i> (common marsh bedstraw), <i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)	Graminoid	<i>Carex stricta</i> (upright sedge)

Characteristic Species: *Acer rubrum* (red maple), *Calamagrostis canadensis* (bluejoint), *Carex stricta* (upright sedge), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Polygonum arifolium* (halberdleaf tearthumb)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S5*	B	.	Red Maple Swamp	Swain and Kearsley 2001

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Local Range: This association is found along the eastern margin of the Elm Brook Wetland Complex. In most locations there are only a few individuals of *Acer rubrum* (red maple) with characteristic associates. In at least two locations, there are larger concentrations of *Carex stricta* (upright sedge) where there must be significant seepage entering the wetland complex from upland sites.

Classification Comments: Information not available.

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.14, MIMA.16.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Temperate Flooded & Swamp Forest (1.B.3)
Division	Eastern North American Flooded & Swamp Forest (D011)
Macrogroup	Northern Flooded & Swamp Forest (M504)
Group	Northern Conifer & Hardwood Acidic Swamp (G045)
Alliance	<i>Acer rubrum</i> Wooded Marsh Alliance (A0653)
Alliance (English name)	Red Maple Wooded Marsh Alliance
Association	<i>Acer rubrum</i> / <i>Carex stricta</i> - <i>Onoclea sensibilis</i> Woodland
Association (English name)	Red Maple / Tussock Sedge - Sensitive Fern Woodland
Ecological System(s)	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574) North-Central Appalachian Acidic Swamp (CES202.604) Northeastern Interior Dry-Mesic Oak Forest (CES202.592)

GLOBAL DESCRIPTION

Concept Summary: This association is a partly wooded, deciduous-canopy wetland of the northeastern United States. It occurs on muck soils or mineral soils with a surface organic layer in poorly drained depressions influenced by groundwater. It is also common in those streamside and lakeside settings where the hydrology is that of a basin setting rather than a floodplain. The community is typically flooded in spring, with pools and small streams persisting throughout much of the growing season; soils may remain saturated or may become dry on the surface over the course of the growing season. Hummock-and-hollow topography may be pronounced. The canopy consists of scattered trees, with as little as 25% overall cover. The shrub layer is patchy and may be extensive in places. The herb layer is typically well-developed, with ferns and graminoids dominant. The bryophyte cover is variable. *Acer rubrum* (red maple) is dominant in the canopy, often with many standing dead trees, and may be the only canopy species present. Associated trees may include *Fraxinus nigra* (black ash), *Ulmus americana* (American elm), and occasional *Pinus strobus* (eastern white pine), *Tsuga canadensis* (eastern hemlock), or *Picea rubens* (red spruce). The shrub layer is characterized by *Vaccinium corymbosum* (highbush blueberry), *Spiraea alba* var. *latifolia* (white meadowsweet), and *Ilex verticillata* (common winterberry). The herbaceous layer is typically

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

dominated by the graminoids or the ferns. *Sphagnum* (sphagnum) spp. are the characteristic bryophytes, with non-sphagnum mosses as associates. These woodlands are ecologically similar to both *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220) and *Picea rubens* - *Acer rubrum* / *Nemopanthus mucronatus* Forest (CEGL006198), but those are closed-canopy wetlands. This association does not include red maple wooded wetlands on deeper peat soils [see *Acer rubrum* / *Alnus incana* - *Ilex verticillata* / *Osmunda regalis* Woodland (CEGL006395) and *Acer rubrum* - *Larix laricina* / *Rhamnus alnifolia* Woodland (CEGL006118)].

Environmental Description: This association is a partly wooded, deciduous-canopy wetland of central and northern New England. It occurs on muck soils or mineral soils with a surface organic layer, in poorly drained depressions influenced by groundwater. It is also common in those streamside and lakeside settings where the hydrology is that of a basin setting rather than a floodplain. The community is typically flooded in spring, with pools and small streams persisting throughout much of the growing season; soils may remain saturated, or may become dry on the surface over the course of the growing season. Hummock-and-hollow topography may be pronounced.

Vegetation Description: The canopy consists of scattered trees, with as little as 25% overall cover. The shrub layer is patchy and may be extensive in places. The herb layer is typically well-developed, with ferns and graminoids dominant. The bryophyte cover is variable. *Acer rubrum* (red maple) is dominant in the canopy, often with many standing dead trees. Associated trees may include *Fraxinus nigra* (black ash), *Ulmus americana* (American elm), and occasional *Pinus strobus* (eastern white pine), *Tsuga canadensis* (eastern hemlock), or *Picea rubens* (red spruce). The shrub layer is characterized by *Vaccinium corymbosum* (highbush blueberry), *Spiraea alba* var. *latifolia* (white meadowsweet), and *Ilex verticillata* (common winterberry). Other shrubs may be locally common, including *Ilex mucronata* (= *Nemopanthus mucronatus*) (catberry), *Viburnum nudum* var. *cassinoides* (withe-rod), *Viburnum dentatum* (southern arrowwood), *Lyonia ligustrina* (maleberry), *Alnus incana* (gray alder), *Ilex laevigata* (smooth winterberry), and the creeping *Rubus hispidus* (bristly dewberry). The herbaceous layer is typically dominated by the graminoids *Carex stricta* (upright sedge), *Carex lacustris* (hairy sedge), or *Calamagrostis canadensis* (bluejoint) or the ferns *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), or *Osmunda claytoniana* (interrupted fern). Less abundant herbs include *Carex intumescens* (greater bladder sedge), *Carex folliculata* (northern long sedge), *Carex canescens* (silvery sedge), *Carex trisperma* (threeseeded sedge), *Glyceria striata* (fowl mannagrass), *Osmunda regalis* (royal fern), *Dryopteris cristata* (crested woodfern), *Thelypteris palustris* (eastern marsh fern), *Lycopodium uniflorum* (northern bugleweed), *Symplocarpus foetidus* (skunk cabbage), *Galium palustre* (common marsh bedstraw), *Cicuta bulbifera* (bulblet-bearing water hemlock), *Caltha palustris* (yellow marsh marigold), and *Impatiens capensis* (jewelweed). *Sphagnum* (sphagnum) spp. are the characteristic bryophytes, with non-sphagnum mosses as associates.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

		winterberry), <i>Vaccinium corymbosum</i> (highbush blueberry)
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea alba</i> var. <i>latifolia</i> (white meadowsweet)
Herb (field)	Graminoid	<i>Calamagrostis Canadensis</i> (bluejoint), <i>Carex lacustris</i> (hairy sedge), <i>Carex stricta</i> (upright sedge)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern), <i>Osmunda cinnamomea</i> (cinnamon fern), <i>Osmunda claytoniana</i> (interrupted fern)

Characteristic Species: *Acer rubrum* (red maple), *Ilex verticillata* (common winterberry), *Onoclea sensibilis* (sensitive fern), *Spiraea alba* var. *latifolia* (white meadowsweet), *Vaccinium corymbosum* (highbush blueberry)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This wetland is found in central and northern New England, south to Pennsylvania and New Jersey.

Federal Lands: NPS (Cape Cod, Minute Man); USFWS (Erie, Great Meadows, Great Swamp, Moosehorn, Oxbow)

CONSERVATION STATUS

Rank: G3G5 (1-Dec-1997)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Acer rubrum* / *Carex lacustris* Woodland (CEGL006105)
- *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220)
- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156)

Related Concepts:

- *Acer rubrum* / *Vaccinium corymbosum* / *Carex intumescens* Alluvial Forest (Barrett and Enser 1997)
- Palustrine Broad-leaved Deciduous Forested Wetlands (PFO1) (Cowardin et al. 1979)
- Red Maple: 108 (Eyre 1980)
- Red maple wooded sedge/fern marsh (CAP pers. comm. 1998)
- Southern New England stream bottom forest (Rawinski 1984)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

SOURCES

Description Authors: S.C. Gawler

References: Barrett and Enser 1997, CAP pers. comm. 1998, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Fike 1999, Gawler 2002, Golet et al. 1993, Hunt 1999, Metzler and Barrett 2001, Moore and Taylor 1927, Rawinski 1984, Sperduto 2000a, Sperduto 2000b, Swain and Kearsley 2001, Thompson and Sorenson 2000



Figure E-11. Red Maple - Tussock Sedge Wooded Marsh at Minute Man National Historical Park (MIMA.14). July 2004. NAD 1983 UTM easting 310737, northing 4703107.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Red Maple - Blackgum Swamp

SYNONYMS

USNVC English Name: Red Maple / Swamp Azalea - Coastal Sweet-pepperbush Forest
USNVC Scientific Name: *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest
USNVC Identifier: CEGL006156
Map Class: Forested Swamp

LOCAL INFORMATION

Environmental Description: This association occurs in shallow basins with poor drainage. The substrate is very rocky with over 50% of the surface covered with exposed stones. There is a mosaic of small pools and rivulets with mounds of mineral soil and old root bases. Soils are mucky in and around the pools and clay loam in less saturated areas.

Vegetation Description: This association has a well-developed canopy dominated by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), with lower concentrations of *Pinus strobus* (eastern white pine), *Quercus rubra* (northern red oak), and *Quercus alba* (white oak). The understory is also well-developed and dense with *Ulmus americana* (American elm), *Acer rubrum* (red maple), and other scattered hardwoods, including *Quercus bicolor* (swamp white oak), *Betula alleghaniensis* (yellow birch), and *Carya tomentosa* (mockernut hickory). The shrub layer is well-developed. It is dominated by *Clethra alnifolia* (coastal sweetpepperbush), *Rhododendron viscosum* (swamp azalea), *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), and *Viburnum dentatum* (southern arrowwood). The herbaceous layer is diverse with large patches of *Symplocarpus foetidus* (skunk cabbage) and *Maianthemum canadense* (Canada mayflower). Other common herbaceous associates include *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Onoclea sensibilis* (sensitive fern), and *Arisaema triphyllum* (Jack in the pulpit). *Parthenocissus quinquefolia* (Virginia creeper) and *Toxicodendron radicans* (eastern poison ivy) are also common. Additional species seen in this community include *Carex debilis* (white edge sedge), *Carex echinata* (star sedge), *Carex folliculata* (northern long sedge), *Gaylussacia frondosa* (blue huckleberry), *Panax trifolius* (dwarf ginseng), *Packera aurea* (golden ragwort), *Thelypteris palustris* (eastern marsh fern), and *Viola macloskeyi* ssp. *pallens* (smooth white violet). There are patches of *Sphagnum* (sphagnum) and other mosses around the bases of trees on the mounds. There are low concentrations of *Rhamnus* sp. (buckthorn[†]) throughout the forest.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Nyssa sylvatica</i> (blackgum)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Betula</i>

[†] See Appendix J for more information on the distribution on *Rhamnus* species.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

		<i>alleghaniensis</i> (yellow birch), <i>Quercus bicolor</i> (swamp white oak), <i>Ulmus americana</i> (American elm)
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Clethra alnifolia</i> (coastal sweetpepperbush), <i>Ilex verticillata</i> (common winterberry), <i>Rhododendron viscosum</i> (swamp azalea), <i>Viburnum dentatum</i> (southern arrowwood)
Herb (field)	Vine/Liana	<i>Parthenocissus quinquefolia</i> (Virginia creeper), <i>Toxicodendron radicans</i> (eastern poison ivy)
Herb (field)	Forb	<i>Arisaema triphyllum</i> (Jack in the pulpit), <i>Maianthemum canadense</i> (Canada mayflower), <i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)

Characteristic Species: *Nyssa sylvatica* (blackgum), *Rhododendron viscosum* (swamp azalea), *Vaccinium corymbosum* (highbush blueberry)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S5*	B	.	Red Maple Swamp	Swain and Kearsley 2001

Local Range: The community occurs in the Bloody Angle east of Old Bedford Road. There is a small example of this community near the *Cephalanthus occidentalis* (common buttonbush) swamp on Route 2A (also in the Bloody Angle) and an early-successional example around the small pond south of Merriam's Corner.

Classification Comments: This community is represented by very small examples at the park. Within the Bloody Angle, the boardwalk runs through the center of the example. This association occurs at several locations in this area, but it intergrades with more upland Mixed Oak - White Pine Forest at most locations with barely enough area to put in a 20x20-meter plot.

Other Comments: Species list augmented with data from Thompson and Jenkins (1992).

Local Description Authors: R.E. Zaremba and S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.07, MIMA.30, MIMA.AA42, MIMA.AA45, MIMA.AA75, MIMA.AA76, MIMA.AA77.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Temperate Flooded & Swamp Forest (1.B.3)
Division	Eastern North American Flooded & Swamp Forest (D011)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Macrogroup	Northern Flooded & Swamp Forest (M504)
Group	Northern Conifer & Hardwood Acidic Swamp (G045)
Alliance	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> Saturated Forest Alliance (A2058)
Alliance (English name)	Red Maple - Blackgum Saturated Forest Alliance
Association	<i>Acer rubrum</i> / <i>Rhododendron viscosum</i> - <i>Clethra alnifolia</i> Forest
Association (English name)	Red Maple / Swamp Azalea - Coastal Sweet-pepperbush Forest
Ecological System(s)	North-Central Appalachian Acidic Swamp (CES202.604) Northern Atlantic Coastal Plain Maritime Forest (CES203.302)

GLOBAL DESCRIPTION

Concept Summary: This red maple swamp occurs in poorly drained depressions containing acidic, tannic water without substantial nutrient input from overland flow. The core of distribution is the North Atlantic Coast and adjacent Lower New England / Northern Piedmont ecoregions. Soils are organic and hummock-hollow microtopography is evident. *Acer rubrum* (red maple) dominates the canopy often with abundant *Nyssa sylvatica* (blackgum). The subcanopy varies from sparse to fairly well-developed and may feature *Ulmus americana* (American elm) or occasionally *Quercus bicolor* (swamp white oak), along with additional *Acer rubrum* (red maple). The shrub layer is characterized by *Vaccinium corymbosum* (highbush blueberry), *Clethra alnifolia* (coastal sweetpepperbush), *Ilex verticillata* (common winterberry), *Rhododendron viscosum* (swamp azalea), *Leucothoe racemosa* (swamp doghobble), and on the Atlantic Coastal Plain *Ilex glabra* (inkberry) may also be present. The herbaceous layer is not particularly diverse, characterized by *Osmunda cinnamomea* (cinnamon fern), *Symplocarpus foetidus* (skunk cabbage), *Carex intumescens* (greater bladder sedge), *Osmunda regalis* (royal fern), *Arisaema triphyllum* (Jack in the pulpit), and *Onoclea sensibilis* (sensitive fern). *Sphagnum* (sphagnum) mosses make up the bryophyte layer. This community is differentiated from *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014) by the absence or infrequent occurrence of *Tsuga canadensis* (eastern hemlock), *Betula alleghaniensis* (yellow birch), *Ilex mucronata* (= *Nemopanthus mucronatus*) (catberry), *Carex trisperma* (threeseeded sedge), *Clintonia borealis* (bluebead), and by the presence of species with more southern affinities such as *Clethra alnifolia* (coastal sweetpepperbush), *Ilex glabra* (inkberry), and *Rhododendron viscosum* (swamp azalea).

Environmental Description: These are poorly drained basins with acidic, nutrient-poor, peat soils. There is little overland flow or groundwater contribution to the water budget.

Vegetation Description: This type includes red maple basin swamp of Lower New England and adjacent areas. These swamps occur in poorly drained depressions characterized by acidic, tannic water that does not receive substantial nutrient input from overland flow or groundwater seepage. *Acer rubrum* (red maple) dominates the canopy. Other common species that generally occur in low abundance include *Betula alleghaniensis* (yellow birch), *Fraxinus* (ash) spp., *Ulmus americana* (American elm), *Nyssa sylvatica* (blackgum), *Tsuga canadensis* (eastern hemlock), or *Pinus strobus* (eastern white pine). The shrub layer is well-developed and often dense. *Vaccinium corymbosum* (highbush blueberry) and *Ilex verticillata* (common winterberry) are common and abundant. *Clethra alnifolia* (coastal sweetpepperbush), *Alnus incana* (gray alder), *Lindera benzoin* (northern spicebush), *Viburnum dentatum* (southern arrowwood), *Viburnum nudum* var. *cassinoides* (withe-rod), *Spiraea alba* var. *latifolia* (white meadowsweet), *Rosa palustris* (swamp rose), *Ilex mucronata*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

(=*Nemopanthus mucronatus*) (catberry), and *Rhododendron viscosum* (swamp azalea) are frequent but less abundant, and on the Atlantic Coastal Plain *Ilex glabra* (inkberry), *Rhododendron maximum* (great laurel), and *Leucothoe racemosa* (swamp doghobble) may also be present. The herbaceous layer has scattered herbs and commonly includes *Osmunda cinnamomea* (cinnamon fern), *Symplocarpus foetidus* (skunk cabbage), *Veratrum viride* (green false hellebore), *Thelypteris palustris* (eastern marsh fern), *Dryopteris cristata* (crested woodfern), *Lycopus uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Calla palustris* (water arum), *Carex folliculata* (northern long sedge), *Carex stricta* (upright sedge), *Carex intumescens* (greater bladder sedge), *Osmunda regalis* (royal fern), and *Onoclea sensibilis* (sensitive fern). Hummock-and-hollow microtopography is evident, and tree seedlings and upland species occur on the hummocks, such as *Coptis trifolia* (threeleaf goldthread), *Aralia nudicaulis* (wild sarsaparilla), *Trientalis borealis* (starflower), and *Gaultheria procumbens* (eastern teaberry). *Sphagnum* (sphagnum) mosses are dominant or abundant in hollows and at the bases of hummocks. This community is differentiated from *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014) by the absence or low abundance of *Nyssa sylvatica* (blackgum) and *Picea rubens* (red spruce).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Tree subcanopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i> (yellow birch), <i>Quercus bicolor</i> (swamp white oak), <i>Ulmus americana</i> (American elm)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry), <i>Vaccinium corymbosum</i> (highbush blueberry)
Herb (field)	Forb	<i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)

Characteristic Species: *Acer rubrum* (red maple), *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: Information not available.

States/Provinces: CT, MA, NH, NJ:S4S5, NY:S2, RI

Federal Lands: NPS (Boston Harbor Islands, Cape Cod, Fire Island, Minute Man, Weir Farm); USFWS (Assabet River, Great Meadows, Great Swamp, Oxbow, Parker River)

CONSERVATION STATUS

Rank: GNR (1-Dec-1997)

Reasons: Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Acer rubrum* - *Betula alleghaniensis* / *Lindera benzoin* Forest (CEGL006936)
- *Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (CEGL006406)
- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014)
- *Acer rubrum* / *Alnus incana* - *Ilex verticillata* / *Osmunda regalis* Woodland (CEGL006395)
- *Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Woodland (CEGL006119)
- *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220)

Related Concepts:

- *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Community (Metzler and Barrett 1996)
- Inland Red Maple Swamp (Breden 1989)
- Southern New England acidic seepage swamp, Blackgum swamp (Rawinski 1984)

SOURCES

Description Authors: S.L. Neid and L.A. Sneddon

References: Breden 1989, Breden et al. 2001, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Golet et al. 1993, Hopping 2000, Metzler and Barrett 1996, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Sperduto 2000a, Swain and Kearsley 2001, Thompson and Jenkins 1992

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-12. Red Maple - Blackgum Swamp at Minute Man National Historical Park (a) (MIMA.07). July 2004. NAD 1983 UTM easting 310954, northing 4702685.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-13. Red Maple - Blackgum Swamp at Minute Man National Historical Park (b) (MIMA.AA76). August 2006. NAD 1983 UTM easting 311689, northing 4702497.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Red Maple - Ash Swamp

SYNONYMS

USNVC English Name:	Red Maple - (Green Ash, White Ash) / Northern Spicebush / Skunk-cabbage Forest
USNVC Scientific Name:	<i>Acer rubrum</i> - <i>Fraxinus (pennsylvanica, americana)</i> / <i>Lindera benzoin</i> / <i>Symplocarpus foetidus</i> Forest
USNVC Identifier:	CEGL006406
Map Class:	Forested Swamp

LOCAL INFORMATION

Environmental Description: This association occurs at the base of an upland slope at the border of a peat-based wetland, where groundwater seeps into the wetland. The substrate is very rocky with exposed boulders and stones covering more than 50% of the soil surface. The soils are silt and muck. There are small mounds throughout the community with accumulations of mineral soil and tip-up mounds, where more upland species are found. There are local pools of standing water.

Vegetation Description: This closed-canopy wetland forest is dominated by *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash). *Ulmus americana* (American elm) is occasionally found in the canopy. The subcanopy is well-developed (30-40% cover) and dominated by *Ulmus americana* (American elm), *Acer rubrum* (red maple), and *Fraxinus pennsylvanica* (green ash). *Lindera benzoin* (northern spicebush) dominates the shrub layer with *Ilex verticillata* (common winterberry) and *Rhamnus* sp. (buckthorn[†]). The herbaceous layer is diverse and dominated by ferns, including *Osmunda cinnamomea* (cinnamon fern), *Onoclea sensibilis* (sensitive fern), and *Thelypteris noveboracensis* (New York fern). *Symplocarpus foetidus* (skunk cabbage) is common along the borders of the mucky pools. There are small, localized concentrations of *Sphagnum* (sphagnum) spp. and other mosses around the base of many of the trees. The community is generally not very weedy but does have local concentrations of *Berberis thunbergii* (Japanese barberry), *Alliaria petiolata* (garlic mustard), and *Celastrus orbiculatus* (oriental bittersweet), as well as *Rhamnus* sp. (buckthorn[†]).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Fraxinus pennsylvanica</i> (green ash), <i>Ulmus americana</i> (American elm)
Tall shrub/sapling	Broad-leaved deciduous shr.	<i>Rhamnus</i> sp. (buckthorn [†]), <i>Ilex verticillata</i> (common winterberry), <i>Lindera benzoin</i> (northern spicebush)
Herb (field)	Forb	<i>Symplocarpus foetidus</i> (skunk

[†] See Appendix J for more information on the distribution on *Rhamnus* species.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Herb (field)	Fern or fern ally	cabbage) <i>Onoclea sensibilis</i> (sensitive fern), <i>Osmunda cinnamomea</i> (cinnamon fern), <i>Thelypteris noveboracensis</i> (New York fern)
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Characteristic Species: *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Lindera benzoin* (northern spicebush)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S5*	B	.	Red Maple Swamp	Swain and Kearsley 2001

Local Range: This community is limited to the east side of the Elm Brook wetland complex on both the north and south sides of Route 2A.

Classification Comments: There is a distinct slope within this community. The higher elevation parts of the community intergrade with the successional upland oak-pine forest.

Other Comments: It is not possible, because of stones, to set metal stakes or to dig a 30-cm soil pit.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.13, MIMA.32, MIMA.AA02, MIMA.AA27, MIMA.AA32, MIMA.AA78.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Temperate Flooded & Swamp Forest (1.B.3)
Division	Eastern North American Flooded & Swamp Forest (D011)
Macrogroup	Northern Flooded & Swamp Forest (M504)
Group	Northern Conifer & Hardwood Acidic Swamp (G045)
Alliance	<i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> Northeastern Swamp Forest Alliance (A3706)
Alliance (English name)	Red Maple - Green Ash Northeastern Swamp Forest Alliance
Association	<i>Acer rubrum</i> - <i>Fraxinus (pennsylvanica, americana)</i> / <i>Lindera benzoin</i> / <i>Symplocarpus foetidus</i> Forest
Association (English name)	Red Maple - (Green Ash, White Ash) / Northern Spicebush / Skunk-cabbage Forest
Ecological System(s)	North-Central Appalachian Acidic Swamp (CES202.604) Central Appalachian Stream and Riparian (CES202.609)

GLOBAL DESCRIPTION

Concept Summary: 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 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

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

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. *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 sweetpepperbush), *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 arrowwood), 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) 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* (calliergon 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: 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: *Acer rubrum* (red maple) dominates the canopy; *Fraxinus pennsylvanica* (green ash) or *Fraxinus americana* (white ash) are usually also found 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),

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

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 sweetpepperbush), *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 arrowwood), 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* (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* (smallspike 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) mosses are common on hummocks but do not in general form extensive carpets. Additional nonvascular species can include *Plagiomnium cuspidatum* (toothed plagiomnium moss) and *Calliargon* (calliargon 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:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry), <i>Lindera benzoin</i> (northern spicebush)
Herb (field)	Forb	<i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)

Characteristic Species: *Acer rubrum* (red maple), *Clethra alnifolia* (coastal sweetpepperbush), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Lindera benzoin* (northern

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

spicebush), *Osmunda cinnamomea* (cinnamon fern), *Rhododendron viscosum* (swamp azalea), *Symplocarpus foetidus* (skunk cabbage)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This vegetation occurs in southern New England south through the mid-Atlantic states to Virginia.

States/Provinces: CT, DC, DE?, MA, MD, NH, NJ:S3S5, NY, PA, RI, VA, VT

Federal Lands: NPS (Appomattox Court House, C&O Canal, Delaware Water Gap, Fort Necessity, Gateway, George Washington Parkway, Minute Man, Morristown, Prince William, Rock Creek, Saratoga, Upper Delaware, Weir Farm, Wolf Trap); USFWS (Great Meadows?)

CONSERVATION STATUS

Rank: G4G5 (30-Jan-2007)

Reasons: 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.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 1 - Strong

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.

Similar Associations:

- *Acer rubrum* - *Betula alleghaniensis* / *Lindera benzoin* Forest (CEGL006936)
- *Acer rubrum* - *Fraxinus nigra* - (*Tsuga canadensis*) / *Tiarella cordifolia* Forest (CEGL006502)
- *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220)
- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156)

Related Concepts:

- Inland Red Maple Swamp (Breden 1989)
- Palustrine Broad-leaved Deciduous Forested Wetlands (PFO1) (Cowardin et al. 1979)
- Red or Silver Maple-Green Ash Swamp (Thompson 1996)
- Southern New England stream bottom forest (Rawinski 1984)

SOURCES

Description Authors: L.A. Sneddon, mod. S.C. Gawler and G.P. Fleming

References: Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Ehrenfeld 1977, Enser 1993, Golet et al. 1993, Harrison 2004, Metzler and Barrett 2001, NRCS 2001b, NRCS 2004, Rawinski 1984, Reschke 1990, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-14. Red Maple - Ash Swamp at Minute Man National Historical Park (a) (MIMA.32). August 2004. NAD 1983 UTM easting 310543, northing 4702530.



Figure E-15. Red Maple - Ash Swamp at Minute Man National Historical Park (b) (MIMA.AA32). August 2006. NAD 1983 UTM easting 309803, northing 4703024.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Silver Maple Floodplain Forest

SYNONYMS

USNVC English Name: Silver Maple / Sensitive Fern - Small-spike False Nettle Forest
USNVC Scientific Name: *Acer saccharinum* / *Onoclea sensibilis* - *Boehmeria cylindrica* Forest
USNVC Identifier: CEGL006176
Map Class: Silver Maple Floodplain Forest

LOCAL INFORMATION

Environmental Description: This association occurs along the floodplain of the Concord River in two settings: one occurrence is along an elevated terrace bordering the river where the forest is flooded in the spring but dry during most of the growing season; the other occurrence is lower on the floodplain of the river and is also flooded during heavy runoff events during the growing season. Soils are deep and silty, poorly consolidated, and held together when the site is saturated only by the mass of tree roots. The occurrence higher on the floodplain has a closed canopy and is characterized by localized accumulations of woody debris. The occurrence lower on the floodplain has small pools of water that persist through the growing season and support grasses and species of *Polygonum* (knotweed). These sites were probably logged during the winter for many years but have not been logged for at least 60 to 70 years, such that many of the trees have very large diameters.

Vegetation Description: This association is dominated by *Acer saccharinum* (silver maple) growing as scattered large trees. The occurrences high on the floodplain have a closed canopy with *Fraxinus pennsylvanica* (green ash) as a subdominant. The occurrences lower on the floodplain are open-canopy (10-20% cover) with only *Acer saccharinum* (silver maple). There are smaller trees of both *Acer saccharinum* (silver maple) and *Fraxinus pennsylvanica* (green ash) in the understory. The herb and shrub layers are a mixture of native and invasive alien species. The invasive *Lythrum salicaria* (purple loosestrife) is abundant in the lower floodplain sites and only occasional in the shadier upper floodplain sites. *Cephalanthus occidentalis* (common buttonbush) occurs along the outer edge of this community, bordering the river. *Cornus amomum* (silky dogwood) is common but not dominant. The invasive shrubs *Rhamnus* sp. (buckthorn[†]) and *Lonicera morrowii* (Morrow's honeysuckle) are locally common. The herbaceous layer can be open or densely vegetated. Common species include *Boehmeria cylindrica* (smallspike false nettle), *Pilea pumila* (Canadian clearweed), *Osmunda regalis* (royal fern), and *Onoclea sensibilis* (sensitive fern). *Lysimachia nummularia* (creeping jenny) is locally abundant and can form a mat at some sites. Other common associates include *Toxicodendron radicans* (eastern poison ivy), *Bidens tripartita* (threelobe beggarticks), *Impatiens capensis* (jewelweed), *Poa palustris* (fowl bluegrass), *Carex gynandra* (nodding sedge), *Carex lupulina* (hop sedge), and *Thelypteris palustris* (eastern marsh fern). In wetter locations, *Polygonum* (knotweed) spp. and *Ludwigia palustris* (marsh seedbox) may be common.

[†] See Appendix J for more information on the distribution on *Rhamnus* species

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharinum</i> (silver maple), <i>Fraxinus pennsylvanica</i> (green ash)
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cephalanthus occidentalis</i> (common buttonbush)
Herb (field)	Forb	<i>Bidens tripartita</i> (threelobe\ beggarticks), <i>Boehmeria cylindrica</i> (smallspike false nettle), <i>Lysimachia</i> <i>nummularia</i> (creeping jenny), <i>Lythrum</i> <i>salicaria</i> (purple loosestrife)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern)

Characteristic Species: *Acer saccharinum* (silver maple), *Boehmeria cylindrica* (smallspike false nettle), *Ludwigia palustris* (marsh seedbox), *Lysimachia nummularia* (creeping jenny)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S2*	U	.	Small-River Floodplain Forest	Swain and Kearsley 2001

Local Range: The association is found along the Concord River on both sides of North Bridge.

Classification Comments: The two occurrences along the lower floodplain appear to be structurally and floristically different, with less canopy cover and more herbs that tolerate long periods of inundation. There is currently not enough data to justify separating these two variants into different associations.

Other Comments: Species list from 2004 sampling augmented with that of Thompson and Jenkins (1992).

Local Description Authors: R.E. Zaremba and S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.20, MIMA.22, MIMA.29, MIMA.AA04, MIMA.AA05, MIMA.AA07, MIMA.AA09, MIMA.AA10.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Tree Vegetation (1)
Subclass	Temperate & Boreal Forest & Woodland (1.B)
Formation	Temperate Flooded & Swamp Forest (1.B.3)
Division	Eastern North American Flooded & Swamp Forest (D011)
Macrogroup	Northern Flooded & Swamp Forest (M504)
Group	Silver Maple - Green Ash - Black Ash Floodplain Forest (G653)
Alliance	<i>Acer saccharinum</i> - <i>Acer rubrum</i> - <i>Ulmus americana</i> Floodplain Forest Alliance (A3715)
Alliance (English name)	Silver Maple –Red Maple – American Elm Floodplain Forest Alliance
Association	<i>Acer saccharinum</i> / <i>Onoclea sensibilis</i> - <i>Boehmeria cylindrica</i>

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

	Forest
Association (English name)	Silver Maple / Sensitive Fern - Small-spike False Nettle Forest
Ecological System(s)	Laurentian-Acadian Floodplain Forest (CES201.587) Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: These silver maple floodplain forests of the northeastern United States are typical of river bottoms, lake plains, and the inner floodplain of medium to large rivers, mostly at less than 245 m (800 feet) elevation. They are most typical of third- and fourth-order rivers. They are subjected to spring flooding of high frequency and duration; their soils are poorly drained and deep. They are generally associated with calcareous or sedimentary bedrock and with fine-grained surficial deposits but may occur in coarser soils or tills. The canopy ranges from closed to somewhat open (in small inclusions, it may be quite sparse) and is high and arching. Shrubs are few; the herb layer is very well-developed. Bryoids are minor. The overall effect is of tall, well-spaced trees over a lush carpet of herbs. The canopy is strongly dominated by *Acer saccharinum* (silver maple). Associated trees include *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and occasionally *Quercus bicolor* (swamp white oak) or *Quercus macrocarpa* (bur oak). *Prunus serotina* (black cherry), *Picea glauca* (white spruce), and *Acer rubrum* (red maple) have been occasionally noted northward. The herb layer is seasonally variable, with spring ephemerals succeeded by dense cover of mixed ferns, forbs and graminoids. Summer-dominant herbs include *Onoclea sensibilis* (sensitive fern) and *Boehmeria cylindrica* (smallspike false nettle). This type differs from *Acer saccharinum* - (*Populus deltoides*) / *Matteuccia struthiopteris* - *Laportea canadensis* Forest (CEGL006147) in its somewhat more poorly drained soils, longer flood duration, and the reduced importance of *Matteuccia struthiopteris* (ostrich fern) relative to *Onoclea sensibilis* (sensitive fern) along with generally higher herb layer richness. It generally lacks *Populus deltoides* (eastern cottonwood) and *Salix nigra* (black willow) in the canopy. It may be bordered on its upland edge by terrace forests dominated by *Acer saccharum* (sugar maple).

Environmental Description: These silver maple floodplain forests of the northeastern United States are typical of river bottoms, lake plains, and the inner floodplain of medium to large rivers, mostly at less than 800 feet elevation. They are most typical of third- and fourth-order rivers. They are subjected to spring flooding of high frequency and duration; their soils are poorly drained and deep. They are generally associated with calcareous or sedimentary bedrock and with fine-grained surficial deposits, but may occur in coarser soils or tills.

Vegetation Description: The canopy ranges from closed to somewhat open and is high and arching. Shrubs are few; the herb layer is very well-developed. Bryoids are minor. The overall effect is of tall, well-spaced trees over a lush carpet of herbs. The canopy is strongly dominated by *Acer saccharinum* (silver maple). Associated trees include *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and occasionally *Quercus bicolor* (swamp white oak) or *Quercus macrocarpa* (bur oak). *Prunus serotina* (black cherry), *Picea glauca* (white spruce), and *Acer rubrum* (red maple) have been occasionally noted northward. The herb layer is seasonally variable, with spring ephemerals, including *Erythronium americanum* (dogtooth violet), *Sanguinaria canadensis* (bloodroot), and *Arisaema triphyllum* (Jack in the pulpit), succeeded by dense cover of mixed ferns, forbs and graminoids. Summer-dominant herbs include *Onoclea sensibilis* (sensitive fern) and *Boehmeria*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

cylindrica (smallspike false nettle). *Matteuccia struthiopteris* (ostrich fern) and *Laportea canadensis* (Canadian woodnettle) may be present but are not abundant; other typical species include *Pilea pumila* (Canadian clearweed), *Lycopus uniflorus* (northern bugleweed), *Scutellaria lateriflora* (blue skullcap), *Thelypteris palustris* (eastern marsh fern), *Osmunda regalis* (royal fern), *Thalictrum pubescens* (king of the meadow), *Bidens tripartita* (threelobe beggarticks), *Ludwigia palustris* (marsh seedbox), *Calamagrostis canadensis* (bluejoint), and *Cinna* (woodreed) spp. In disturbed sites, non-native herbs such as *Lysimachia nummularia* (creeping jenny) and *Lythrum salicaria* (purple loosestrife) may occur.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharinum</i> (silver maple)
Herb (field)	Forb	<i>Boehmeria cylindrica</i> (smallspike false nettle)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern)

Characteristic Species: *Acer saccharinum* (silver maple), *Boehmeria cylindrica* (smallspike false nettle)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: Information not available.

States/Provinces: CT, MA, ME:S3, NB, NH, NJ?, NY, VT

Federal Lands: NPS (Minute Man, Saratoga); USFWS (Carlton Pond?, Great Meadows?)

CONSERVATION STATUS

Rank: GNR (1-Dec-1997)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Acer saccharinum* - (*Populus deltoides*) / *Matteuccia struthiopteris* - *Laportea canadensis* Forest (CEGL006147)
- *Acer saccharinum* Temporarily Flooded Forest [Placeholder] (CEGL007304)

Related Concepts:

- *Acer saccharinum*/*Boehmeria-Onoclea*, Type 3 (Sperduto and Crowley 2002a)
- Lakeside Floodplain Forest (Thompson 1996)
- Lakeside/large riverbottom floodplain forest (NAP pers. comm. 1998)
- Palustrine Broad-leaved Deciduous Forested Wetland, Seasonally Flooded (PFO1C) (Cowardin et al. 1979)
- Riverine Floodplain Forest (Thompson 1996)
- Silver Maple - American Elm: 62 (Eyre 1980)
- Southern New England floodplain forest (Rawinski 1984)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

SOURCES

Description Authors: S.C. Gawler

References: Breden et al. 2001, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Fike 1999, Gawler 2002, Metzler 1984, Metzler and Barrett 2001, NAP pers. comm. 1998, NRCS 2004, Rawinski 1984, Spurduto 2000b, Spurduto and Crowley 2002a, Spurduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000



Figure E-16. Silver Maple Floodplain Forest at Minute Man National Historical Park (a) (MIMA.22). August 2004. NAD 1983 UTM easting 306539, northing 4704412.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-17. Silver Maple Floodplain Forest at Minute Man National Historical Park (b) (MIMA.AA5). August 2006. NAD 1983 UTM easting 306783, northing 4704718.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Managed Wooded Pasture

SYNONYMS

USNVC English Name: (Northern Red Oak, Black Oak) - (Sugar Maple, White Ash, Eastern White Pine) / (Timothy, Fescue species, Orchard Grass)
Ruderal Wooded Herbaceous Vegetation

USNVC Scientific Name: *Quercus (rubra, velutina)* - (*Acer saccharum*, *Fraxinus americana*, *Pinus strobus*) / (*Phleum pratense*, *Festuca* spp., *Dactylis glomerata*) Ruderal Wooded Herbaceous Vegetation

USNVC Identifier: C EGL006668

Map Class: Managed Wooded Pasture

Local Information

Environmental Description: Managed Wooded Pasture is created and maintained on formerly cleared land, most of which had reverted to forest prior to management. Topography is generally flat and soils are usually well-drained.

Vegetation Description: The general character of Managed Wooded Pasture is grassland with scattered trees. Tree cover varies from about 10% to a high as 30%. Tree species vary from site to site and include *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Acer saccharum* (sugar maple), *Juniperus virginiana* (eastern redcedar), and occasionally *Fraxinus americana* (white ash), *Pinus strobus* (eastern white pine), or *Tsuga canadensis* (eastern hemlock). Shrubs are sparse or absent. The herb layer varies widely depending on the recent history of the site. Grasses, both native and introduced, are most prominent and management encourages them. Typical grasses can include *Schizachyrium scoparium* (little bluestem), *Festuca* sp. (fescue), *Phleum pratense* (timothy), *Dactylis glomerata* (orchardgrass), and *Anthoxanthum odoratum* (sweet vernalgrass). Forbs are primarily old-field species such as *Solidago* spp. (goldenrod), *Symphotrichum* spp. (aster), *Hieracium aurantiacum* (orange hawkweed), *Achillea millefolium* (common yarrow), and *Linaria vulgaris* (butter and eggs).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus velutina</i> (black oak) <i>Quercus rubra</i> (northern red oak) <i>Acer saccharum</i> (sugar maple) <i>Fraxinus americana</i> (white ash)
Herb (field)	Graminoid	<i>Schizachyrium scoparium</i> (little bluestem) <i>Anthoxanthum odoratum</i> (sweet vernalgrass), <i>Festuca</i> sp. (fescue), <i>Phleum pratense</i> (timothy), <i>Dactylis glomerata</i> (orchardgrass)
Herb (field)	Forb	<i>Solidago canadensis</i> (Canada goldenrod), <i>Solidago altissima</i> (tall goldenrod), <i>Symphotrichum lateriflorum</i> (calico aster), <i>Achillea millefolium</i> (common yarrow)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Characteristic Species: Tree species vary from site to site. The herb layer varies widely depending on the recent history of the site.

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
MA	SNA	.	.	[not crosswalked]	.

Local Range: In various places around the Park where former pastures are now being opened and managed.

Classification Comments: Resembles the old-field association *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Herbaceous Vegetation (CEGL006107), but with fewer shrubs and with tree cover.

Other Comments: Global information is not included for this community because it is a nonstandard association in the USNVC, created specifically for Minute Man National Historical Park.

Local Description Authors: S. C. Gawler

Plots and Accuracy Assessment Points: MIMA.AA01, MIMA.AA39, MIMA.AA47, MIMA.AA50, MIMA.AA64.

Minute Man National Historical Park Inventory Notes: Managed as “wooded pasture” by the park.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Temperate & Boreal Shrubland & Grassland (2.B)
Formation	Temperate Grassland & Shrubland (2.B.2)
Division	Eastern North American Grassland & Shrubland (D024)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Northern & Central Ruderal Meadow & Shrubland (G059)
Alliance	None recognized
Alliance (English name)	None recognized
Association	<i>Quercus (rubra, velutina)</i> - (<i>Acer saccharum</i> , <i>Fraxinus americana</i> , <i>Pinus strobus</i>) / (<i>Phleum pratense</i> , <i>Festuca</i> spp., <i>Dactylis glomerata</i>) Ruderal Wooded Herbaceous Vegetation
Association (English name)	(Northern Red Oak, Black Oak) - (Sugar Maple, White Ash, Eastern White Pine) / (Timothy, Fescue species, Orchard Grass) Ruderal Wooded Herbaceous Vegetation
Ecological System(s)	Information not available.

GLOBAL DESCRIPTION

No global information available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-18. Managed Wooded Pasture at Minute Man National Historical Park (a) (MIMA.AA01). August 2006. NAD 1983 UTM easting 306757, northing 4704847.



Figure E-19. Managed Wooded Pasture at Minute Man National Historical Park (b) (MIMA.AA50). August 2006. NAD 1983 UTM easting 311218, northing 4702866.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-20. Managed Wooded Pasture at Minute Man National Historical Park (c) (MIMA.AA39). August 2006. NAD 1983 UTM easting 310858, northing 4702833.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Successional Old Field

SYNONYMS

USNVC English Name: Orchard Grass - Timothy - Fescue species - Goldenrod species Ruderal Herbaceous Vegetation
USNVC Scientific Name: *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. – *Solidago* spp. Ruderal Herbaceous Vegetation
USNVC Identifier: CEG006107
Map Class: Abandoned Field

LOCAL INFORMATION

Environmental Description: This association occurs on a range of sites within the park that are mowed to maintain open grassy areas. Some of these areas are lawns that are regularly mowed through the growing season. Some are mowed only once to keep woody species from becoming well-established. Some of these areas are maintained as a part of the historical landscape. At one area the topsoil was removed before the site was acquired by the park service. Soils are generally sandy loam and well-drained, although some grasslands are maintained in more mesic settings as well.

Vegetation Description: This association is highly variable depending on soil type, past land use, and recent management. Dominant grasses include *Agrostis stolonifera* (creeping bentgrass), *Andropogon virginicus* (broomsedge bluestem), *Phleum pratense* (timothy), and *Dactylis glomerata* (orchardgrass). Other common associates include *Daucus carota* (Queen Anne's lace), *Oenothera biennis* (common evening-primrose), *Asclepias syriaca* (common milkweed), *Hypericum perforatum* (common St. Johnswort), and *Potentilla recta* (sulphur cinquefoil).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Daucus carota</i> (Queen Anne's lace), <i>Oenothera biennis</i> (common evening-primrose)
Herb (field)	Graminoid	<i>Agrostis stolonifera</i> (creeping bentgrass), <i>Andropogon virginicus</i> (broomsedge bluestem), <i>Dactylis glomerata</i> (orchardgrass), <i>Phleum pratense</i> (timothy)

Characteristic Species: *Andropogon virginicus* (broomsedge bluestem), *Dactylis glomerata* (orchardgrass), *Daucus carota* (Queen Anne's lace), *Oenothera biennis* (common evening-primrose), *Phleum pratense* (timothy)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	SNR*	B	1	Cultural Grassland	Swain and Kearsley 2000

Local Range: This association is found at numerous sites along Route 2A, around the Visitors Center and the Headquarters building, and in some of the abandoned fields off Route 2A.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Classification Comments: This association is highly variable at Minute Man National Historical Park and characterized by non-native species. *Andropogon virginicus* (broomsedge bluestem) is a native grass but occurs at the park as an associate in these old fields, not as a dominant.

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.38, MIMA.AA110, MIMA.AA99

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Temperate & Boreal Shrubland & Grassland (2.B)
Formation	Temperate Grassland & Shrubland (2.B.2)
Division	Eastern North American Grassland & Shrubland (D024)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Northern & Central Ruderal Meadow & Shrubland (G059)
Alliance	<i>Dactylis glomerata</i> - <i>Festuca</i> spp. - <i>Solidago canadensis</i> Mesic Ruderal Meadow Alliance (A1190)
Alliance (English name)	Orchardgrass - Fescue species - Canada Goldenrod Mesic Ruderal Meadow Alliance
Association	<i>Dactylis glomerata</i> - <i>Phleum pratense</i> - <i>Festuca</i> spp. – <i>Solidago</i> spp. Ruderal Herbaceous Vegetation
Association (English name)	Orchard Grass - Timothy - Fescue species - Goldenrod species Ruderal Herbaceous Vegetation
Ecological System(s)	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This broadly defined vegetation type includes pastures and post-agricultural fields and is largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. The fields are typically mowed at least annually. Physiognomically, these grasslands are generally comprised of mid-height (1-3 feet tall) grasses and forbs, with occasional scattered shrubs. Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states and at higher elevations (610-1220 m [2000-4000 feet]) in the southeastern states. Dominant grasses vary from site to site but generally feature the nominal species. Other graminoid associates may include *Agrostis stolonifera* (creeping bentgrass), *Agrostis hyemalis* (winter bentgrass), *Elymus repens* (quackgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Lolium perenne* (perennial ryegrass), *Poa pratensis* (Kentucky bluegrass), *Poa compressa* (Canada bluegrass), *Schizachyrium scoparium* (little bluestem) (not in abundance), and *Anthoxanthum odoratum* (sweet vernalgrass). Forbs scattered among the grasses are varied but include *Hieracium* (hawkweed) spp., *Oxalis stricta* (common yellow oxalis), *Achillea millefolium* (common yarrow), *Asclepias syriaca* (common milkweed), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago nemoralis* (gray goldenrod), *Solidago juncea* (early goldenrod), *Solidago canadensis* (Canada goldenrod), *Solidago altissima*, *Euthamia graminifolia* (flat-top goldentop), *Cerastium*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

arvense (field chickweed), *Oenothera biennis* (common evening-primrose), *Potentilla simplex* (common cinquefoil), *Symphyotrichum lateriflorum* (calico aster), *Symphyotrichum novae-angliae* (New England aster), *Symphyotrichum lanceolatum* (white panicle aster), *Daucus carota* (Queen Anne's lace), *Ambrosia artemisiifolia* (annual ragweed), *Vicia cracca* (bird vetch), *Trifolium* (clover) spp., and many others.

Environmental Description: This association occurs on pastures and land that has been tilled. Generally the fields are mowed at least annually.

Vegetation Description: In addition to *Dactylis glomerata* (orchardgrass) and *Phleum pratense* (timothy), these grassy fields are characterized by graminoids including *Agrostis stolonifera* (creeping bentgrass), *Agrostis hyemalis* (winter bentgrass), *Elymus repens* (quackgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Lolium perenne* (perennial ryegrass), *Poa pratensis* (Kentucky bluegrass), *Poa compressa* (Canada bluegrass), *Schizachyrium scoparium* (little bluestem) (not in abundance), and *Anthoxanthum odoratum* (sweet vernalgrass). Forbs scattered among the grasses are varied but include *Hieracium* (hawkweed) spp., *Oxalis stricta* (common yellow oxalis), *Achillea millefolium* (common yarrow), *Asclepias syriaca* (common milkweed), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago nemoralis* (gray goldenrod), *Solidago juncea* (early goldenrod), *Solidago canadensis* (Canada goldenrod), *Solidago altissima*, *Euthamia graminifolia* (flat-top goldentop), *Cerastium arvense* (field chickweed), *Oenothera biennis* (common evening-primrose), *Potentilla simplex* (common cinquefoil), *Symphyotrichum lateriflorum* (calico aster), *Symphyotrichum novae-angliae* (New England aster), *Symphyotrichum lanceolatum* (white panicle aster), *Daucus carota* (Queen Anne's lace), *Ambrosia artemisiifolia* (annual ragweed), *Vicia cracca* (bird vetch), *Trifolium* (clover) spp., and many others.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Rumex acetosella</i> (common sheep sorrel)
Herb (field)	Graminoid	<i>Dactylis glomerata</i> (orchardgrass), <i>Festuca rubra</i> (red fescue), <i>Phleum pratense</i> (timothy)

Characteristic Species: *Achillea millefolium* (common yarrow), *Anthoxanthum odoratum* (sweet vernalgrass), *Dactylis glomerata* (orchardgrass), *Euthamia graminifolia* (flat-top goldentop), *Phleum pratense* (timothy), *Rumex acetosella* (common sheep sorrel), *Solidago canadensis* (Canada goldenrod), *Solidago canadensis* var. *scabra* (tall goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This vegetation is quite wide-ranging in northeastern and midwestern states and possibly occurs at higher elevations in the southeastern states.

States/Provinces: CT, DE, KY, MA, MD, ME, NB?, NH, NJ, NS?, NY, PA, QC?, RI, TN, VA, VT, WV

Federal Lands: NPS (Allegheny Portage Railroad, Appomattox Court House, Booker T. Washington, Boston Harbor Islands, Cape Cod, Colonial, Delaware Water Gap, Fire Island, Fort Necessity, Fredericksburg-Spotsylvania, Friendship Hill, Gateway, George Washington Birthplace,

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Gettysburg, Johnstown Flood, Marsh-Billings-Rockefeller, Minute Man, Morristown, Petersburg, Richmond, Saint-Gaudens, Saratoga, Upper Delaware, Valley Forge, Weir Farm); USFWS (Aroostook, Assabet River, Carlton Pond, Erie, Great Meadows, Moosehorn, Nulhegan Basin, Oxbow, Parker River)

CONSERVATION STATUS

Rank: GNA (modified/managed) (8-Dec-2005)

Reasons: This vegetation type includes pasture and post-agricultural fields and is largely composed of non-native grasses and herbs (generally of European origin).

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Herbaceous Vegetation (CEGL006333) is similar to this type but is dominated by warm-season grasses.

Similar Associations:

- *Lolium* (*arundinaceum*, *pratense*) Herbaceous Vegetation (CEGL004048)
- *Phleum pratense* - *Bromus pubescens* - *Helenium autumnale* Herbaceous Vegetation (CEGL004018)
- *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Herbaceous Vegetation (CEGL006333)--has a greater component of native species and occurs on drier soils.

Related Concepts: Information not available.

SOURCES

Description Authors: S.C. Gawler

References: Clark 1986, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d., Edinger et al. 2002, Ehrenfeld 1977, Elliman 2003, Keever 1979, NRCS 2004, Newbold et al. 1988, Perles et al. 2006a, Perles et al. 2006b, Perles et al. 2006c, Perles et al. 2007, Sneddon et al. 1995, TDNH unpubl. Data.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-21. Successional Old Field at Minute Man National Historical Park (a) (MIMA.38) August 2004. NAD 1983 UTM easting 313628, northing 4702057.



Figure E-22. Successional Old Field at Minute Man National Historical Park (b) (MIMA.AA110) August 2006. NAD 1983 UTM easting 314195, northing 4701857.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Sandplain Grassland

SYNONYMS

USNVC English Name:	Lowbush Blueberry / Little Bluestem - Blue Ridge Sedge Shrub Herbaceous Vegetation
USNVC Scientific Name:	<i>Vaccinium angustifolium</i> / <i>Schizachyrium scoparium</i> – <i>Carex lucorum</i> Shrub Herbaceous Vegetation
USNVC Identifier:	CEGL006393
Map Class:	Transmission Right-of-way

LOCAL INFORMATION

Environmental Description: This association occurs along a powerline that is managed by mowing, selective cutting, and possibly herbicide application. The powerline may have been bulldozed at one time to clear the vegetation and level the ground for the right-of-way. The soils are sandy and very well drained.

Vegetation Description: This community is highly variable and dominated by native grasses, *Carex pensylvanica* (Pennsylvania sedge), and ericads, composites, and members of the pea family. Dominants include *Schizachyrium scoparium* (little bluestem), *Danthonia spicata* (poverty oatgrass), *Pteridium aquilinum* (western brackenfern), *Vaccinium pallidum* (Blue Ridge blueberry), and *Vaccinium angustifolium* (lowbush blueberry). *Comptonia peregrina* (sweet fern) is locally common. Frequent associates include *Baptisia tinctoria* (horseflyweed), *Symphotrichum dumosum* (rice button aster), *Sericocarpus asteroides* (toothed whitetop aster), *Solidago juncea* (early goldenrod), *Solidago odora* (anisescented goldenrod), *Solidago puberula* (downy goldenrod), *Eragrostis spectabilis* (purple lovegrass), *Helianthemum* (frostweed) sp., *Lechea intermedia* (largepod pinweed), *Nuttallanthus canadensis* (Canada toadflax), *Viola sagittata* var. *ovata* (arrowleaf violet), and *Lysimachia quadrifolia* (whorled yellow loosestrife). In one area, *Arctostaphylos uva-ursi* (kinnikinnick) is dominant. *Aureolaria pedicularia* (fernleaf yellow false foxglove) is also locally abundant. The moss *Polytrichum commune* (polytrichum moss) and lichens are locally abundant.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium angustifolium</i> (lowbush blueberry), <i>Vaccinium pallidum</i> (Blue Ridge blueberry)
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Arctostaphylos uva-ursi</i> (kinnikinnick)
Herb (field)	Forb	<i>Baptisia tinctoria</i> (horseflyweed), <i>Sericocarpus asteroides</i> (toothed whitetop aster), <i>Solidago juncea</i> (early goldenrod), <i>Symphotrichum dumosum</i> (rice button aster)
Herb (field)	Graminoid	<i>Carex pensylvanica</i> (Pennsylvania

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

sedge), *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem)

Characteristic Species: *Baptisia tinctoria* (horseflyweed), *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem), *Sericocarpus asteroides* (toothed whitetop aster)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
MA	S1*	B	.	Sandplain Grassland	Swain and Kearsley 2001

Local Range: This community is found only along the powerline right-of-way on the east side of Minute Man National Historical Park north of Route 2A.

Classification Comments: This community is highly variable over very short distances. Parts of the area appear to be grasslands; parts are heathland or shrub thicket. Additional sampling would be needed to document this variability.

Other Comments: The community was created and has been maintained by the management of the powerline right-of-way. While not completely natural, this habitat does support a diversity of native species not found elsewhere in the park. Many of the species currently found in the sandy well-drained soil under the powerlines may have originally been a part of the open dry oak-hickory forest through which the right-of-way was constructed. This description is augmented with information from Thompson and Jenkins (1992).

Local Description Authors: R.E. Zaremba and S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.18, MIMA.AA81.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Temperate & Boreal Shrubland & Grassland (2.B)
Formation	Temperate Grassland & Shrubland (2.B.2)
Division	Eastern North American Grassland & Shrubland (D024)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	North-Central Appalachian Acidic Scrub & Grassland (G789)
Alliance	<i>Vaccinium angustifolium</i> – <i>Vaccinium pallidum</i> Sand Barrens Alliance (A3913)
Alliance (English name)	Lowbush Blueberry - Blue Ridge Blueberry Sand Barrens Alliance
Association	<i>Vaccinium angustifolium</i> / <i>Schizachyrium scoparium</i> – <i>Carex lucorum</i> Shrub Herbaceous Vegetation
Association (English name)	Lowbush Blueberry / Little Bluestem - Blue Ridge Sedge Shrub Herbaceous Vegetation
Ecological System(s)	Northeastern Interior Pine Barrens (CES202.590)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL DESCRIPTION

Concept Summary: This type includes shrub-herbaceous sandplain grasslands along the Coastal Plain from southern Maine through Connecticut. It occurs on flat sandy plains or on deep outwash deposits on sites that are away from direct maritime influence. Vegetation is dominated by *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem), *Carex lucorum* (Blue Ridge sedge) or *Carex pensylvanica* (Pennsylvania sedge), and *Vaccinium angustifolium* (lowbush blueberry). Associated species can include *Lechea maritima* (beach pinweed), *Piptatherum pungens* (mountain ricegrass), *Solidago bicolor* (white goldenrod), *Liatris scariosa* var. *novae-angliae* (New England blazing star), *Viola sagittata* (arrowleaf violet), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Asclepias tuberosa* (butterfly milkweed), *Baptisia tinctoria* (horseflyweed), *Carex vestita* (velvet sedge), *Ionactis linariifolius* (flaxleaf whitetop aster), *Sericocarpus asteroides* (toothed whitetop aster), and *Calystegia spithamea* (low false bindweed). Scattered patches of *Arctostaphylos uva-ursi* (kinnikinnick), *Comptonia peregrina* (sweet fern), *Gaylussacia baccata* (black huckleberry), and *Photinia melanocarpa* (black chokeberry) are common, as well as scattered individuals of *Pinus rigida* (pitch pine), *Betula populifolia* (gray birch), and *Prunus pensylvanica* (pin cherry). Soils are extremely well-drained and acidic. Where this community occurs, native tree cover has been eliminated, with subsequent regular management through burning and/or cutting. In pre-settlement times, this community appears to have been maintained via a natural fire regime. This vegetation has been used extensively for blueberry production in certain locations; cover of *Vaccinium* (blueberry) has been greatly enhanced by fire and herbicide use. This community can also be found along some powerline rights-of-way where few or no herbicides are used.

Environmental Description: This type includes shrub-herbaceous sandplain grasslands along the Coastal Plain from southern Maine through Connecticut. It occurs on flat sandy plains or on deep outwash deposits on sites that are away from direct maritime influence. Soils are extremely well-drained and acidic.

Vegetation Description: Vegetation is dominated by *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem), *Carex lucorum* (Blue Ridge sedge) or *Carex pensylvanica* (Pennsylvania sedge), and *Vaccinium angustifolium* (lowbush blueberry). Associated species can include *Lechea maritima* (beach pinweed), *Piptatherum pungens* (mountain ricegrass), *Solidago bicolor* (white goldenrod), *Liatris scariosa* var. *novae-angliae* (New England blazing star), *Viola sagittata* (arrowleaf violet), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Asclepias tuberosa* (butterfly milkweed), *Baptisia tinctoria* (horseflyweed), *Carex vestita* (velvet sedge), *Ionactis linariifolius* (flaxleaf whitetop aster), *Sericocarpus asteroides* (toothed whitetop aster), and *Calystegia spithamea* (low false bindweed). Scattered patches of *Arctostaphylos uva-ursi* (kinnikinnick), *Comptonia peregrina* (sweet fern), *Gaylussacia baccata* (black huckleberry), and *Photinia melanocarpa* (black chokeberry) are common, as well as scattered individuals of *Pinus rigida* (pitch pine), *Betula populifolia* (gray birch), and *Prunus pensylvanica* (pin cherry).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium angustifolium</i> (lowbush blueberry)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Herb (field)

Graminoid

Carex lucorum (Blue Ridge sedge),
Carex pensylvanica (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem)

Characteristic Species: *Carex lucorum* (Blue Ridge sedge), *Carex pensylvanica* (Pennsylvania sedge), *Danthonia spicata* (poverty oatgrass), *Schizachyrium scoparium* (little bluestem), *Vaccinium angustifolium* (lowbush blueberry)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is found in near-coastal southern Maine through Massachusetts to Connecticut and New York.

States/Provinces: CT?, MA, ME:S1, NH, NY

Federal Lands: NPS (Minute Man)

CONSERVATION STATUS

Rank: GNR (1-Dec-1997)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: The one viable Maine occurrence is in conservation ownership and is managed for the rare community, rare animals, and rare plants found there. Prescribed burning is a major management tool. This type appears to have been historically more common from southern Maine, New Hampshire, and eastern Massachusetts, but nearby sites that might have supported this community have either been developed or are in commercial blueberry production, where pesticide use precludes development of this community (Gawler 2001). It is related to pitch pine barrens vegetation, but without trees.

Similar Associations:

- *Gaylussacia baccata* - *Vaccinium angustifolium* - *Arctostaphylos uva-ursi* / *Schizachyrium littorale* Dwarf-shrubland (CEGL006066)
- *Morella pensylvanica* / *Schizachyrium littorale* - *Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067)

Related Concepts: Information not available.

SOURCES

Description Authors: S.C. Gawler

References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Gawler 1991, Gawler 2001, Gawler 2002, Metzler and Barrett 2001, Swain and Kearsley 2001, Thompson and Jenkins 1992, Vickery 1990

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-23. Sandplain Grassland at Minute Man National Historical Park (MIMA.18). September 2004. NAD 1983 UTM easting 313775, northing 4702009.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Leatherleaf Bog

SYNONYMS

USNVC English Name: Leatherleaf - (Dwarf Huckleberry) - Swamp-loosestrife / Virginia Chainfern Dwarf-shrubland
USNVC Scientific Name: *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) – *Decodon verticillatus* / *Woodwardia virginica* Dwarf-shrubland
USNVC Identifier: C EGL006008
Map Class: Leatherleaf Bog

LOCAL INFORMATION

Environmental Description: This association occurs in a small basin. The community occurs on a floating mat of peat. The site is referred to as "Cranberry Bog" but neither *Vaccinium macrocarpon* (cranberry) nor *Vaccinium oxycoccos* (small cranberry) are present. The bog is moated and has remnants of a system of ditches. One part of the bog has shrubs and is moderately diverse. The other part of the bog is dominated by *Chamaedaphne calyculata* (leatherleaf) with few other associates, probably reflecting either recent management or severe management in the past.

Vegetation Description: This association is dominated by *Chamaedaphne calyculata* (leatherleaf) growing in 100% cover of *Sphagnum* (sphagnum). Other common associates include *Triadenum virginicum* (Virginia marsh St. Johnswort), *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), and *Glyceria canadensis* (rattlesnake mannagrass). In the more diverse example, other associates include *Eleocharis tenuis* (slender spikerush), *Dulichium arundinaceum* (threeway sedge), *Carex canescens* (silvery sedge), and *Photinia melanocarpa* (black chokeberry). *Rhamnus* sp. (buckthorn[†]) is also present but in low concentration.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rhododendron viscosum</i> (swamp azalea), <i>Vaccinium corymbosum</i> (highbush blueberry)
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Chamaedaphne calyculata</i> (leatherleaf)
Herb (field)	Graminoid	<i>Carex canescens</i> (silvery sedge), <i>Dulichium arundinaceum</i> (threeway sedge), <i>Eleocharis tenuis</i> (slender spikerush), <i>Glyceria canadensis</i> (rattlesnake mannagrass)

Characteristic Species: *Triadenum virginicum* (Virginia marsh St. Johnswort)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

[†] See Appendix J for more information on the distribution on *Rhamnus* species

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	SNR*	I	.	Kettlehole Level Bog	Swain and Kearsley 2001
MA	SNR*	I	.	Level Bog	Swain and Kearsley 2001

Local Range: Found only at the Cranberry Bog on the south side of Route 2A on the east side of the park.

Classification Comments: Information not available.

Other Comments: It is unclear what this community looked like many years ago before roads were built and the site was managed presumably as a cranberry bog. Currently the site is defined by two roads and subject to high levels of road runoff, including salt and other pollutants. The bog is dominated by native species, but there are concentrations of *Phragmites australis* (common reed) in one corner of the basin.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.25, MIMA.26, MIMA.AA116

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Bog & Fen (2.C.2)
Division	North American Bog & Fen (D029)
Macrogroup	North American Boreal & Sub-Boreal Acidic Bog & Fen (M876)
Group	Eastern North American Sub-Boreal Acidic Bog & Fen (G745)
Alliance	<i>Chamaedaphne calyculata</i> Sub-Boreal Dwarf-shrub Acidic Peatland Alliance (A3450)
Alliance (English name)	Leatherleaf Sub-Boreal Dwarf-shrub Acidic Peatland Alliance
Association	<i>Chamaedaphne calyculata</i> - (<i>Gaylussacia dumosa</i>) – <i>Decodon verticillatus</i> / <i>Woodwardia virginica</i> Dwarf-shrubland
Association (English name)	Leatherleaf - (Dwarf Huckleberry) - Swamp-loosestrife / Virginia Chainfern Dwarf-shrubland
Ecological System(s)	Atlantic Coastal Plain Northern Bog (CES203.893) North-Central Interior and Appalachian Acidic Peatland (CES202.606)

GLOBAL DESCRIPTION

Concept Summary: This dwarf-shrub quaking or floating bog occurs in the southern portion of the glaciated Northeast, extending west to the Western Allegheny Plateau. It occupies oligotrophic, peat-accumulating basins. *Chamaedaphne calyculata* (leatherleaf) is strongly dominant, with associate species including *Kalmia angustifolia* (sheep laurel), *Kalmia polifolia* (bog laurel), *Vaccinium oxycoccos* (small cranberry), *Vaccinium macrocarpon* (cranberry), *Gaylussacia dumosa* (dwarf huckleberry) (on the coast), and *Gaylussacia baccata* (black huckleberry). Associate shrubs generally occur with low cover, although they may be locally common. Scattered tall shrubs, such as *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Larix laricina* (tamarack), *Picea mariana* (black spruce), and *Acer rubrum* (red maple), may occur but

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

always with low cover. Herbaceous cover is quite low but can include *Carex trisperma* (threeseeded sedge), *Pogonia ophioglossoides* (snakemouth orchid), *Calopogon tuberosus* (tuberous grasspink), *Eriophorum virginicum* (tawny cottongrass), *Drosera rotundifolia* (roundleaf sundew), *Drosera intermedia* (spoonleaf sundew), *Sarracenia purpurea* (purple pitcherplant), and *Woodwardia virginica* (Virginia chainfern) scattered throughout and with *Carex canescens* (silvery sedge), *Carex limosa* (mud sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Utricularia cornuta* (horned bladderwort), *Rhynchospora alba* (white beaksedge), and sometimes *Scheuchzeria palustris* (rannoch-rush) occurring in wetter fen windows. Edges of floating mats tend to receive more nutrient enrichment and support such species as *Peltandra virginica* (green arrow arum), *Decodon verticillatus* (swamp loosestrife), and *Dulichium arundinaceum* (threeway sedge). The bryophyte layer is well-developed, dominated by *Sphagnum capillifolium* (peat moss), *Sphagnum magellanicum* (Magellan's peat moss), *Sphagnum rubellum* (red peat moss), and *Sphagnum fuscum* (tawny peat moss) with *Sphagnum bartlettianum* (Bartlett's peat moss), *Sphagnum cuspidatum* (toothed peat moss), *Sphagnum fallax* (tricky peat moss), and *Sphagnum recurvum* (recurved peat moss) also occurring in some examples.

Environmental Description: This dwarf-shrub quaking or floating bog occupies oligotrophic, peat-accumulating basins.

Vegetation Description: *Chamaedaphne calyculata* (leatherleaf) is strongly dominant, with associate species including *Kalmia angustifolia* (sheep laurel), *Kalmia polifolia* (bog laurel), *Vaccinium oxycoccos* (small cranberry), *Vaccinium macrocarpon* (cranberry), *Gaylussacia dumosa* (dwarf huckleberry) (near the coast), and *Gaylussacia baccata* (black huckleberry). Associate shrubs generally occur with low cover, although they may be locally common. Scattered tall shrubs, such as *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Lyonia ligustrina* (maleberry), *Larix laricina* (tamarack), *Picea mariana* (black spruce), and *Acer rubrum* (red maple), may occur but always with low cover. Herbaceous cover is quite low but can include *Carex trisperma* (threeseeded sedge), *Pogonia ophioglossoides* (snakemouth orchid), *Calopogon tuberosus* (tuberous grasspink), *Eriophorum virginicum* (tawny cottongrass), *Decodon verticillatus* (swamp loosestrife), *Drosera rotundifolia* (roundleaf sundew), *Drosera intermedia* (spoonleaf sundew), *Sarracenia purpurea* (purple pitcherplant), and *Woodwardia virginica* (Virginia chainfern) scattered throughout and with *Carex canescens* (silvery sedge), *Carex limosa* (mud sedge), *Carex folliculata* (northern long sedge), *Carex atlantica* (prickly bog sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Utricularia cornuta* (horned bladderwort), *Rhynchospora alba* (white beaksedge), and sometimes *Scheuchzeria palustris* (rannoch-rush) occurring in wetter fen windows. Edges of floating mats tend to receive more nutrient enrichment and support such species as *Peltandra virginica* (green arrow arum), *Decodon verticillatus* (swamp loosestrife), and *Dulichium arundinaceum* (threeway sedge). The bryophyte layer is well-developed, dominated by *Sphagnum capillifolium* (sphagnum), *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum rubellum* (sphagnum), and *Sphagnum fuscum* (sphagnum) with *Sphagnum bartlettianum* (Bartlett's sphagnum), *Sphagnum cuspidatum* (toothed sphagnum), *Sphagnum fallax* (sphagnum), and *Sphagnum recurvum* (recurved sphagnum) also occurring in some examples.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Dwarf-shrub	<i>Chamaedaphne calyculata</i> (leatherleaf)
Herb (field)	Forb	<i>Drosera rotundifolia</i> (roundleaf sundew)

Characteristic Species: *Chamaedaphne calyculata* (leatherleaf), *Drosera rotundifolia* (roundleaf sundew), *Eriophorum virginicum* (tawny cottongrass), *Rhynchospora alba* (white beaksedge), *Sarracenia purpurea* (purple pitcherplant), *Vaccinium macrocarpon* (cranberry)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: Information not available.

States/Provinces: CT, MA, ME, NH, NJ:S1, NY, OH, ON:S3, PA, RI

Federal Lands: NPS (Cape Cod, Delaware Water Gap?, Minute Man, Upper Delaware); USFWS (Assabet River, Nomans Land Island?)

CONSERVATION STATUS

Rank: G5 (1-Dec-1997)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 1 - Strong

Comments: Information not available.

Similar Associations:

- *Chamaedaphne calyculata* / *Eriophorum virginicum* / *Sphagnum rubellum* Dwarf-shrubland (CEGL006513)

Related Concepts:

- Glacial Bog (Breden 1989)

SOURCES

Description Authors: S.L. Neid and L.A. Sneddon, mod. S.C. Gawler

References: Anderson 1982, Breden 1989, Breden et al. 2001, Damman and French 1987, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fike 1999, Gawler 2002, Lynn and Karlin 1985, Metzler and Barrett 2001, Perles et al. 2007, Radis 1986, Sperduto 2000b, Sperduto and Nichols 2004, Swain and Kearsley 2000.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-24. Leatherleaf Bog at Minute Man National Historical Park (a) (MIMA.26). September 2004. NAD 1983 easting 313477, northing 4701935.



Figure E-25. Leatherleaf Bog at Minute Man National Historical Park (b) (MIMA.AA116). August 2006. NAD 1983 UTM easting 313469, northing 4701972.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Sedge - Mannagrass Fen

SYNONYMS

USNVC English Name: Silvery Sedge - Tawny Cotton-grass / Peatmoss species
Herbaceous Vegetation
USNVC Scientific Name: *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp.
Herbaceous Vegetation
USNVC Identifier: CEG006549
Map Class: Sedge - Mannagrass Fen

LOCAL INFORMATION

Environmental Description: This association occurs on a floating mat of *Sphagnum* (sphagnum) at one side of a small pond. The mat is quaking and well-consolidated.

Vegetation Description: This herbaceous community is dominated by *Carex canescens* (silvery sedge) and *Glyceria canadensis* (rattlesnake mannagrass) growing in nearly 100% cover of *Sphagnum* (sphagnum). *Spiraea tomentosa* (steeplebush), *Juncus effusus* (common rush), and *Carex atlantica* (prickly bog sedge) are also common. Shrub cover is low, varying from 5 to 20%. Other frequent associates include *Triadenum virginicum* (Virginia marsh St. Johnswort) and *Lysimachia terrestris* (earth loosestrife). There are scattered individuals of *Acer rubrum* (red maple) throughout the mat. *Carex bullata* (button sedge) and *Carex buxbaumii* (Buxbaum's sedge) are both found in this fen.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea tomentosa</i> (steeplebush)
Herb (field)	Graminoid	<i>Carex atlantica</i> (prickly bog sedge), <i>Carex canescens</i> (silvery sedge), <i>Glyceria canadensis</i> (rattlesnake mannagrass), <i>Juncus effusus</i> (common rush)

Characteristic Species: *Carex atlantica* (prickly bog sedge), *Carex canescens* (silvery sedge)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	SNR	.	.	[not crosswalked]	.

Local Range: This association is found at only one site at Minute Man National Historical Park, adjacent to a small pond south of Route 2A at Merriam's Corner.

Classification Comments: Information not available.

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.08, MIMA.AA55.

Minute Man National Historical Park Inventory Notes: Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Bog & Fen (2.C.2)
Division	North American Bog & Fen (D029)
Macrogroup	North American Boreal & Sub-Boreal Acidic Bog & Fen (M876)
Group	Eastern North American Sub-Boreal Acidic Bog & Fen (G745)
Alliance	<i>Dulichium arundinaceum</i> - <i>Carex canescens</i> Sub-Boreal Acidic Fen Alliance (A3452)
Alliance (English name)	Threeway Sedge - Silvery Sedge Sub-Boreal Acidic Fen Alliance
Association	<i>Carex canescens</i> - <i>Eriophorum virginicum</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation
Association (English name)	Silvery Sedge - Tawny Cotton-grass / Peatmoss species Herbaceous Vegetation
Ecological System(s)	North-Central Appalachian Seepage Fen (CES202.607) High Allegheny Wetland (CES202.069) Southern and Central Appalachian Bog and Fen (CES202.300)

GLOBAL DESCRIPTION

Concept Summary: This mixed-sedge peatland type is known from higher elevations in the Central Appalachians and scattered northward in New England. It is a weakly acidic fen type that occurs on temporarily flooded, semipermanently flooded, and saturated peat. It forms part of successional beaver-influenced wetland mosaics and often contains dead snags or moss-covered downed wood. Hummock-and-hollow microtopography is well-developed. The vegetation is dominated by low to medium-height sedges over a well-developed mat of *Sphagnum* (sphagnum) spp. or *Polytrichum* (polytrichum moss) spp. Dominant sedges include *Carex canescens* (silvery sedge) and *Eriophorum virginicum* (tawny cottongrass). Associates include *Carex utriculata* (Northwest Territory sedge), *Carex atlantica* (prickly bog sedge), *Juncus effusus* (common rush), *Juncus canadensis* (Canadian rush), *Juncus brevicaudatus* (narrowpanicle rush), *Rubus hispidus* (bristly dewberry), *Scirpus cyperinus* (woolgrass), *Glyceria canadensis* (rattlesnake manna grass), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lysimachia terrestris* (earth loosestrife), *Thelypteris palustris* (eastern marsh fern), and *Photinia melanocarpa* (black chokeberry).

Environmental Description: This mixed-sedge peatland type is known from higher elevations in the Central Appalachians and scattered northward in New England. It is a weakly acidic fen type that occurs on temporarily flooded, semipermanently flooded, and saturated peat. It forms part of successional beaver-influenced wetland mosaics and often contains dead snags or moss-covered downed wood. Hummock-and-hollow microtopography is well-developed.

Vegetation Description: The vegetation is dominated by low to medium-height sedges over a well-developed mat of *Sphagnum* (sphagnum) spp. or *Polytrichum* (polytrichum moss) spp. Dominant sedges include *Carex canescens* (silvery sedge) and *Eriophorum virginicum* (tawny cottongrass). Associates include *Carex utriculata* (Northwest Territory sedge), *Carex atlantica* (prickly bog sedge), *Juncus effusus* (common rush), *Juncus brevicaudatus* (narrowpanicle rush), *Juncus*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

canadensis (Canadian rush), *Scirpus cyperinus* (woolgrass), *Glyceria canadensis* (rattlesnake mannagrass), *Rubus hispidus* (bristly dewberry), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lysimachia terrestris* (earth loosestrife), *Thelypteris palustris* (eastern marsh fern), and *Photinia melanocarpa* (black chokeberry). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 16 taxa per 400 square meters for 9 plots in West Virginia (Byers et al. 2007).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex canescens</i> (silvery sedge), <i>Eriophorum virginicum</i> (tawny cottongrass)

Characteristic Species: *Carex canescens* (silvery sedge), *Carex utriculata* (Northwest Territory sedge), *Eriophorum virginicum* (tawny cottongrass)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This mixed-sedge peatland type is known from higher elevations in the Central Appalachians and scattered northward in New England.

States/Provinces: MA, PA?, WV:S2

Federal Lands: NPS (Minute Man); USFS (Monongahela); USFWS (Canaan Valley)

CONSERVATION STATUS

Rank: GNR (8-Jul-1999)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: Information not available.

Similar Associations:

- *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534)
- *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation (CEGL006552)

Related Concepts:

- *Carex canescens* / *Polytrichum* spp. - *Sphagnum* spp. herbaceous peatland (Byers et al. 2007)
- *Carex canescens* herbaceous community (Walbridge and Lang 1982)
- *Carex canescens* meadow (Walbridge 1982)
- *Polytrichum* - *Carex canescens* community (Wieder et al. 1981)
- *Polytrichum* - *Juncus effusus* - *Carex* (*canescens*, *brunnescens*) hummock bog (Fortney 1975)
- *Sphagnum* - *Glyceria* - *Carex* (*canescens*, *brunnescens*) bog (Fortney 1975)

SOURCES

Description Authors: S.C. Gawler, mod. E.A. Byers

References: Byers et al. 2007, Eastern Ecology Working Group n.d., Fortney 1975, Walbridge 1982, Walbridge and Lang 1982, Wieder et al. 1981

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-26. Sedge - Mannagrass Fen at Minute Man National Historical Park (a) (MIMA.08). September 2004. NAD 1983 UTM easting 309347, northing 4702953.



Figure E-27. Sedge - Mannagrass Fen at Minute Man National Historical Park (b) (MIMA.AA55). September 2004. NAD 1983 UTM easting 309359, northing 4702941.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Dogwood - Arrowwood Successional Wet Shrubland

SYNONYMS

USNVC English Name: (Silky Dogwood, Red-osier Dogwood) - Southern Arrow-wood – Multiflora Rose Ruderal Shrubland
USNVC Scientific Name: *Cornus (amomum, sericea)* - *Viburnum dentatum* – *Rosa multiflora* Ruderal Shrubland
USNVC Identifier: CEGL006576
Map Class: Abandoned Field

LOCAL INFORMATION

Environmental Description: This wet shrubland occurs in low-lying areas of old fields or pastures. It typically floods early in the growing season, but it is generally dry for much of the year. Soils are mineral, not peat-based, and often fine-textured.

Vegetation Description: Tall shrubs dominate these wet shrublands, with tall herbs in openings among the shrubs. Dominant species vary from site to site, but include shrub *Cornus* spp. (dogwood), *Viburnum dentatum* (southern arrowwood), *Rhamnus* sp. (buckthorn[†]), and *Rosa multiflora* (multiflora rose), the latter often forming virtually impenetrable thickets. Associated species include *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago canadensis* (Canada goldenrod), *Euthamia graminifolia* (flat-top goldentop), *Polygonum arifolium* (halberdleaf tearthumb), *Impatiens capensis* (jewelweed), and *Lythrum salicaria* (purple loosestrife).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Cornus</i> sp. (dogwood), <i>Rosa multiflora</i> (multiflora rose), <i>Rhamnus</i> sp. (buckthorn [†])
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Viburnum dentatum</i> (southern arrowwood)
Herb (field)	Forb	<i>Solidago rugosa</i> (wrinkleleaf goldenrod), <i>Solidago canadensis</i> (Canada goldenrod), <i>Impatiens capensis</i> (jewelweed), <i>Lythrum salicaria</i> (purple loosestrife)

Characteristic Species: *Viburnum dentatum* (southern arrowwood), *Rosa multiflora* (multiflora rose), *Solidago rugosa* (wrinkleleaf goldenrod)

Other Noteworthy Species: None documented.

[†] See Appendix J for more information on the distribution on *Rhamnus* species.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	SNA	.	.	[not crosswalked]	.
NY	SNA			[not crosswalked]	.

Local Range: Throughout the park.

Classification Comments: Superficially similar to shrubby upland old fields, and sometimes contiguous with them, but dominated by wetland shrubs and herbs and very apparently seasonally flooded.

Other Comments: None.

Local Description Authors: S. C. Gawler

Plots and Accuracy Assessment Points: MIMA.AA22, MIMA.AA38.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Wet Meadow and Marsh (M069)
Group	Northern & Central Shrub Swamp (G167)
Alliance	<i>Cornus sericea</i> - <i>Salix</i> spp. Shrubland Alliance (A3656)
Alliance (English name)	Red-osier Dogwood - Willow species Shrubland Alliance
Association	<i>Cornus (amomum, sericea)</i> - <i>Viburnum dentatum</i> - <i>Rosa multiflora</i> Ruderal Shrubland
Association (English name)	(Silky Dogwood, Red-osier Dogwood) - Southern Arrow-wood - Multiflora Rose Ruderal Shrubland
Ecological System(s)	Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)

GLOBAL DESCRIPTION

Concept Summary: This tall successional shrub community typically floods early in the growing season and may be saturated to near the surface for some of the growing season, but it is generally dry for much of the year. It typically occurs in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands or impoundments. The vegetation is dominated by tall shrubs, usually 2-4 m in height. This is a successional community in transition between a successional old field and a modified successional forest. Vegetation can be highly variable, and no one species is dominant. *Cornus amomum* (silky dogwood), *Cornus sericea* (redosier dogwood), *Viburnum dentatum* (southern arrowwood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry), and *Rubus hispidus* (bristly dewberry) are all typically present and abundant. *Salix* (willow) spp. may also be present but are less common. Scattered individuals of *Acer rubrum* (red maple) or *Fraxinus pennsylvanica* (green ash) may also occur within the shrubland. Herbaceous species are inversely proportional to shrub cover; they can be

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

dense where the shrub canopy is open. Species can include *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Eutrochium maculatum* (spotted joeypyeweed), *Phragmites australis* (common reed), *Phalaris arundinacea* (reed canarygrass), *Apocynum cannabinum* (Indianhemp), *Vernonia* (ironweed) sp., and *Onoclea sensibilis* (sensitive fern).

Environmental Description: This tall, modified, wet successional shrubland occurs in low-lying areas of old fields or pastures, or the edges of beaver-impacted wetlands and impoundments. It typically floods early in the growing season and may be saturated to near the surface for some of the growing season, but it is generally dry for much of the year.

Vegetation Description: The structure of this association varies from abandoned wet fields with tall and short shrubs (>25% cover) with herbaceous vegetation in the interstices (<25% cover), to dense "closed-canopy" tall shrublands with sparse ground-layer vegetation. Vegetation can be highly variable, and no one species is dominant. *Cornus amomum* (silky dogwood), *Cornus sericea* (redosier dogwood), *Viburnum dentatum* (southern arrowwood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry), and *Rubus hispidus* (bristly dewberry) are all typically present and abundant. *Salix* (willow) spp. may also be present but are less common. Scattered individuals of *Acer rubrum* (red maple) or *Fraxinus pennsylvanica* (green ash) may also occur within the shrubland but form less than 25% cover. Herbaceous species are inversely proportional to shrub cover; they can be dense where the shrub canopy is open. Species can include *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Eutrochium maculatum* (spotted joeypyeweed), *Phragmites australis* (common reed), *Phalaris arundinacea* (reed canarygrass), *Apocynum cannabinum* (Indianhemp), *Vernonia* (ironweed) sp., and *Onoclea sensibilis* (sensitive fern).

Most Abundant Species: Vegetation can be highly variable, and no one species is dominant.

Characteristic Species: Information not available.

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This successional shrubland occurs throughout the northeastern United States.

States/Provinces: CT?, MA, NJ, NY, PA

Federal Lands: NPS (Minute Man, Roosevelt-Vanderbilt); USFWS (Erie, Great Swamp?)

CONSERVATION STATUS

Rank: GNA (ruderal) (12-Feb-2007)

Reasons: This association is a successional community occurring on abandoned old fields and pastures and, therefore, does not receive a conservation status rank.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: Information not available.

Similar Associations:

- *Alnus incana* - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrubland (CEGL006062)-- is an alluvial shrub swamp type with a prominent alder component.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

- *Cornus amomum* - *Salix* spp. - *Toxicodendron vernix* - *Rhamnus lanceolata* Fen Shrubland (CEGL005087)--is a tall shrub fen.
- *Cornus sericea* - *Cornus amomum* - *Photinia melanocarpa* - *Viburnum lentago* Fen Shrubland (CEGL005088)--is a tall shrub fen.
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186)--is a midwestern circumneutral shrub swamp type that does not contain alder and is dominated by *Salix* spp. and *Cornus sericea*.
- *Elaeagnus umbellata* - *Cornus racemosa* - *Rosa multiflora* - *Juniperus virginiana* Shrubland (CEGL006451)--is an upland successional shrubland occurring on abandoned old fields and pastures.
- *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Shrubland (CEGL006571)--is a successional wet meadow that has shrub-dominated and herb-dominated expressions, but because the shrubs are usually only about 1 m tall, this gives the impression of a wet meadow type rather than a shrubland. *Cornus* can occur in both types but is not dominant in the *Spiraea* - *Rubus* type.

Related Concepts: Information not available.

SOURCES

Description Authors: E. Largay and S. Gawler

References: Eastern Ecology Working Group n.d.



Figure E-28. Dogwood - Arrowwood Successional Wet Shrubland at Minute Man National Historical Park (a) (MIMA.AA38). August 2006. NAD 1983 UTM easting 309722, northing 4702995.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-29. Dogwood - Arrowwood Successional Wet Shrubland at Minute Man National Historical Park (b) (MIMA.AA 22). August 2006. NAD 1983 UTM easting 309874, northing 4703473.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Buttonbush Swamp

SYNONYMS

USNVC English Name: Common Buttonbush - Swamp-loosestrife Shrubland
USNVC Scientific Name: *Cephalanthus occidentalis* - *Decodon verticillatus* Shrubland
USNVC Identifier: CEG006069
Map Class: Buttonbush Swamp

LOCAL INFORMATION

Environmental Description: This association occurs in two settings at Minute Man National Historical Park: in a small basin bordering a road with water about 1-1.25 m deep and in a wet meadow bordering the Concord River in water 40 to 50 cm deep. The substrate at both locations is loose muck. In the occurrence along the roadside, the water is fed by groundwater and runoff. Along the Concord River, there is a gradual flow associated with the river.

Vegetation Description: Both examples of this association are dominated by *Cephalanthus occidentalis* (common buttonbush). *Lythrum salicaria* (purple loosestrife) is present at low cover at the roadside site but abundant along the Concord River. At the roadside site, there are only a few other associates, including *Leersia oryzoides* (rice cutgrass), *Lemna minor* (common duckweed), and *Potamogeton* sp. (pondweed). Along the Concord River, *Polygonum amphibium* (water knotweed) is abundant. Other associates include *Lemna minor* (common duckweed), *Wolffia columbiana* (Columbian watermeal), *Acorus calamus* (calamus), and *Dulichium arundinaceum* (threeway sedge).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cephalanthus occidentalis</i> (common buttonbush)
Herb (field)	Forb	<i>Lythrum salicaria</i> (purple loosestrife)
Herb (field)	Graminoid	<i>Leersia oryzoides</i> (rice cutgrass)
Floating aquatic	Aquatic herb (floating & submerg.)	<i>Lemna minor</i> (common duckweed)

Characteristic Species: *Cephalanthus occidentalis* (common buttonbush), *Lemna minor* (common duckweed)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S5*	B	.	Shrub Swamp	Swain and Kearsley 2001

Local Range: This association occurs at two locations: along the Concord River and along Route 2A at the Bloody Angle.

Classification Comments: Although the two occurrences at Minute Man National Historical Park are in different settings and have some differences in associates, it is appropriate to group them. The occurrence along the Concord River has been altered by the invasion of *Lythrum salicaria* (purple loosestrife).

Other Comments: Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.23, MIMA.39.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Wet Meadow and Marsh (M069)
Group	Northern & Central Shrub Swamp (G167)
Alliance	<i>Cephalanthus occidentalis</i> - <i>Decodon verticillatus</i> Semipermanently Flooded Shrub Swamp Alliance (A3670)
Alliance (English name)	Common Buttonbush - Swamp-loosestrife Semipermanently Flooded Shrub Swamp Alliance
Association	<i>Cephalanthus occidentalis</i> - <i>Decodon verticillatus</i> Shrubland
Association (English name)	Common Buttonbush - Swamp-loosestrife Shrubland
Ecological System(s)	Laurentian-Acadian Floodplain Forest (CES201.587) Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This buttonbush swamp occurs in the northeastern United States. These swamps experience prolonged or semi-permanent 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 arrowwood) 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* (American waterplantain), *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 lutea* ssp. *variegata* (variegated yellow pond-lily). Bryophytes, if present, cling to shrub bases and include *Warnstorfia*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

fluitans (warnstorfia moss), *Drepanocladus aduncus* (drepanocladus moss), or *Sphagnum fallax* (sphagnum). In disturbed areas, this wetland type may be invaded by *Lythrum salicaria* (purple loosestrife).

Environmental Description: This association includes buttonbush swamps that experience prolonged or semi-permanent 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: This association includes buttonbush swamps of the eastern and northeastern United States. These swamps experience prolonged or semi-permanent 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* (redosier dogwood) closer to upland borders, or *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), or *Viburnum dentatum* (southern arrowwood) 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* (American waterplantain), *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 lutea* ssp. *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:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Cephalanthus occidentalis</i> (common buttonbush)
Herb (field)	Graminoid	<i>Dulichium arundinaceum</i> (threeway sedge)

Characteristic Species: *Cephalanthus occidentalis* (common buttonbush), *Dulichium arundinaceum* (threeway sedge), *Osmunda regalis* (royal fern), *Sparganium americanum* (American bur-reed), *Vaccinium corymbosum* (highbush blueberry)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This association is found throughout the northeastern United States (an estimated 450,000 square km based on subsection attribution).

States/Provinces: CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VA, VT, WV?

Federal Lands: NPS (Boston Harbor Islands, Cape Cod, Delaware Water Gap, Minute Man, Saratoga, Weir Farm); USFWS (Assabet River?, Chesapeake Marshlands, Great Meadows, Great Swamp, Oxbow).

CONSERVATION STATUS

Rank: G4G5 (31-Jan-2007)

Reasons: 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.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: This type may be synonymous with *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190), although it also ranges south of the glaciation boundary in the east. CEGL002190 is distributed from the Western Allegheny Plateau (TNC Ecoregion 49) and Great Lakes (TNC Ecoregion 48) west to the Central Tallgrass Prairie (TNC Ecoregion 36), while this type occurs from the Central Appalachian Forest (TNC Ecoregion 59) and High Allegheny Plateau (TNC Ecoregion 60) east.

Similar Associations:

- *Cephalanthus occidentalis* - (*Leucothoe racemosa*) / *Carex joorii* Shrubland (CEGL004075)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191)
- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190)

Related Concepts:

- Buttonbush Swamp (Kettle Basin Shrub Swamp) (Thompson 1996)
- Buttonbush semipermanently flooded shrub swamp (CAP pers. comm. 1998)
- Palustrine Broad-leaved Deciduous Scrub-Shrub Wetland, Seasonally Flooded (PSS1C) (Cowardin et al. 1979)

SOURCES

Description Authors: S.L. Neid, mod. E. Southgate, L.A. Sneddon, S.C. Gawler, E. Largay

References: Bowman 2000, Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Elliman 2003, Enser 1999, Fike 1999, Fleming et al. 2001, Gawler 2002, Harrison 2004, Hopping 2000, J. Harrison pers. comm., Karanaukas 2001, Metzler and Barrett 2001, NRCS 2004, Nichols et al. 2001, Sperduto 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

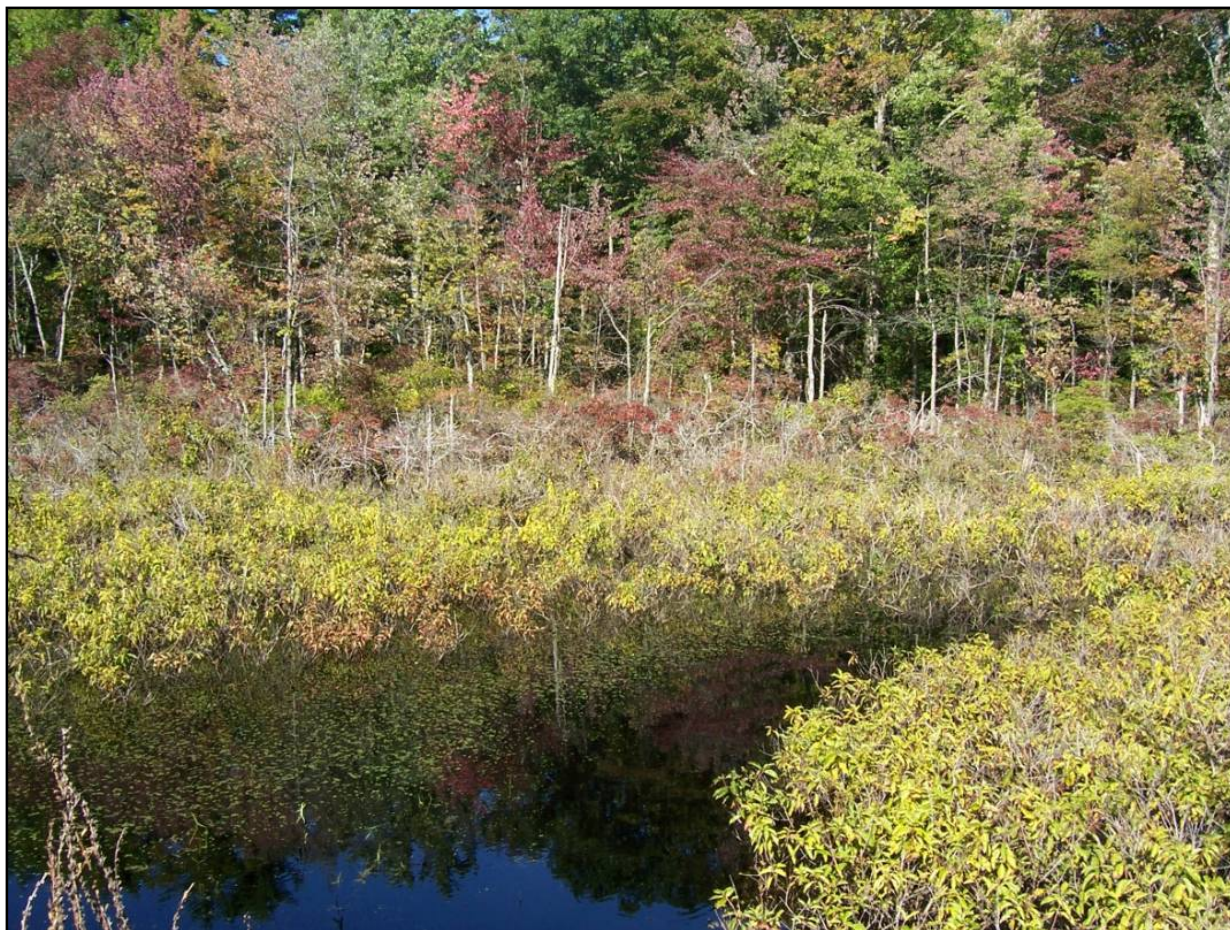


Figure E-30. Buttonbush Swamp at Minute Man National Historical Park (MIMA.39). August 2004. NAD 1983 UTM easting 310991, northing 4702549.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Alder Swamp

SYNONYMS

USNVC English Name: Hazel Alder Swamp Shrubland
 USNVC Scientific Name: *Alnus serrulata* Swamp Shrubland
 USNVC Identifier: CEGL005082
 Map Class: Wet Meadow / Shrubland

LOCAL INFORMATION

Environmental Description: This association occurs as a narrow band along the border of a small pond with a peat mat. Soils are saturated and mucky. The adjacent uplands are low with sandy soils.

Vegetation Description: This association is dominated by *Alnus serrulata* (hazel alder) and *Cornus sericea* (redosier dogwood) which form an impenetrable mass of branches under a sparse canopy of *Acer rubrum* (red maple). Other shrubs include *Rosa palustris* (swamp rose), *Betula papyrifera* (paper birch), and *Viburnum dentatum* (southern arrowwood). The herbaceous layer is patchy and includes *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Onoclea sensibilis* (sensitive fern), *Ludwigia palustris* (marsh seedbox), and *Symplocarpus foetidus* (skunk cabbage). *Lythrum salicaria* (purple loosestrife) and *Rhamnus* sp. (buckthorn[†]) is common. *Solanum dulcamara* (climbing nightshade) is also common.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus serrulata</i> (hazel alder), <i>Cornus sericea</i> (redosier dogwood), <i>Rosa palustris</i> (swamp rose)
Herb (field)	Forb	<i>Ludwigia palustris</i> (marsh seedbox), <i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)	Graminoid	<i>Leersia oryzoides</i> (rice cutgrass), <i>Leersia virginica</i> (whitegrass)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern)

Characteristic Species: *Alnus serrulata* (hazel alder), *Cornus sericea* (redosier dogwood), *Polygonum arifolium* (halberdleaf tearthumb), *Solanum dulcamara* (climbing nightshade)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S5*	B	.	Shrub Swamp	Swain and Kearsley 2001

Local Range: This association was seen only at the borders of the small pond south of Merriam's Corner. There may be other examples along the border of the Elm Brook Wetland Complex.

Classification Comments: This community is extremely small at this site. The plot covered most of the example.

[†] See Appendix J for more information on the distribution on *Rhamnus* species

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.27, MIMA.AA30

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Wet Meadow and Marsh (M069)
Group	Northern & Central Shrub Swamp (G167)
Alliance	<i>Alnus</i> spp. - <i>Salix</i> spp. Lakeshore & Depression Shrubland Alliance (A3685)
Alliance (English name)	Alder species - Willow species Lakeshore & Depression Shrubland Alliance
Association	<i>Alnus serrulata</i> Swamp Shrubland
Association (English name)	Hazel Alder Swamp Shrubland
Ecological System(s)	Central Appalachian River Floodplain (CES202.608) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)

GLOBAL DESCRIPTION

Concept 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* (redosier dogwood), *Rosa palustris* (swamp rose), *Physocarpus opulifolius* (common ninebark), *Viburnum dentatum* (southern arrowwood), 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 canadensis* (common 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 beggartick), *Galium tinctorium* (stiff marsh bedstraw), *Cicuta maculata* (spotted water hemlock), *Peltandra virginica* (green arrow arum), and *Carex stricta* (upright sedge).

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Environmental Description: 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: 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 arrowwood), *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 canadensis* (common 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 beggartick), *Galium tinctorium* (stiff marsh bedstraw), *Cicuta maculata* (spotted water hemlock), *Peltandra virginica* (green arrow arum), and *Carex stricta* (upright sedge).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Alnus incana</i> (gray alder)
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus serrulata</i> (hazel alder), <i>Physocarpus opulifolius</i> (common ninebark), <i>Viburnum dentatum</i> (southern arrowwood)
Herb (field)	Forb	<i>Peltandra virginica</i> (green arrow arum)
Herb (field)	Graminoid	<i>Calamagrostis Canadensis</i> (bluejoint)
Herb (field)	Fern or fern ally	<i>Osmunda regalis</i> (royal fern)

Characteristic Species: *Alnus serrulata* (hazel alder), *Cornus amomum* (silky dogwood), *Physocarpus opulifolius* (common ninebark), *Viburnum dentatum* (southern arrowwood)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This alder swamp is found widely throughout the northeastern United States, ranging from central New England south to New Jersey, and west to Ohio and Pennsylvania.

States/Provinces: CT, DE, MA, MD?, ME, NH, NJ, NY, OH, PA, QC?, RI, VA, VT

Federal Lands: NPS (Appomattox Court House, Delaware Water Gap, Fredericksburg-Spotsylvania, Minute Man, Petersburg, Richmond)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

CONSERVATION STATUS

Rank: G4G5 (22-Mar-1999)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: This type overlaps with *Alnus incana* Swamp Shrubland (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* (= *Nemopanthus mucronatus*) (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.

Similar Associations:

- *Alnus incana* Swamp Shrubland (CEGL002381)
- *Alnus serrulata* Southeastern Seasonally Flooded Shrubland (CEGL008474)

Related Concepts:

- Smooth alder shrub thicket (CAP pers. comm. 1998)

SOURCES

Description Authors: L.A. Sneddon, mod. D. Faber-Langendoen and S.C. Gawler

References: Anderson 1996, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Fike 1999, Swain and Kearsley 2001

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-31. Alder Swamp at Minute Man National Historical Park (MIMA.27). August 2004. NAD 1983 UTM easting 309378, northing 4702958.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Cattail Marsh

SYNONYMS

USNVC English Name: (Narrowleaf Cattail, Broadleaf Cattail) - (Clubbrush species)
Eastern Herbaceous Vegetation
USNVC Scientific Name: *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Eastern
Herbaceous Vegetation
USNVC Identifier: CEG006153
Map Class: Wet Meadow / Shrubland

LOCAL INFORMATION

Environmental Description: This association occurs in a small roadside basin with groundwater seepage and road runoff and at the border of a small stream. Soils are peaty and saturated.

Vegetation Description: This association is characterized by *Typha latifolia* (broadleaf cattail) mixed with ferns, typically *Onoclea sensibilis* (sensitive fern) and *Thelypteris palustris* (eastern marsh fern). The species composition can be highly variable but is most often dominated by *Typha* (cattail), ferns, *Symplocarpus foetidus* (skunk cabbage), and composites. Cover can vary locally from dense *Typha* (cattail) to more open areas dominated by *Symplocarpus* (skunk cabbage) and *Solidago* (goldenrod) with only scattered *Typha*. Common associates include *Thelypteris palustris* (eastern marsh fern), *Carex stricta* (upright sedge), *Symplocarpus foetidus* (skunk cabbage), *Onoclea sensibilis* (sensitive fern), *Euthamia graminifolia* (flat-top goldentop), and *Eutrochium dubium* (coastalplain joeypyeweed). *Lythrum salicaria* (purple loosestrife) is scattered throughout the occurrence.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Lythrum salicaria</i> (purple loosestrife), <i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)	Graminoid	<i>Carex stricta</i> (upright sedge), <i>Typha latifolia</i> (broadleaf cattail)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern), <i>Thelypteris palustris</i> (eastern marsh fern)

Characteristic Species: *Thelypteris palustris* (eastern marsh fern)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	SNR	.	.	[not crosswalked]	.

Local Range: There is one dense stand of *Typha latifolia* (broadleaf cattail) at a small wetland on the south side of Route 2A on the east side of the park near the powerline.

Classification Comments: Information not available.

Other Comments: One plot sampled for this association is in a small, dense stand of *Typha* (cattail) along a roadside. There are other areas within Minute Man National Historical Park that might be included in this association, but they are highly invaded by either *Phragmites australis* (common

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

reed) or *Lythrum salicaria* (purple loosestrife). Before the expansion of these invasive species, these wetlands were probably dominated by *Typha* (cattail) spp. *Typha* (cattail) continues to persist at these sites but in low cover.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.19, MIMA.31, MIMA.AA16, MIMA.AA24, MIMA.AA34, MIMA.AA36, MIMA.AA49, MIMA.AA99.

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Wet Meadow and Marsh (M069)
Group	Eastern North American Freshwater Marsh (G125)
Alliance	<i>Typha angustifolia</i> - <i>Typha latifolia</i> - (<i>Schoenoplectus</i> spp.) Deep Marsh Herbaceous Alliance (A1436)
Alliance (English name)	Narrowleaf Cattail - Broadleaf Cattail) - (Bulrush species) Deep Marsh Herbaceous Alliance
Association	<i>Typha</i> (<i>angustifolia</i> , <i>latifolia</i>) - (<i>Schoenoplectus</i> spp.) Eastern Herbaceous Vegetation
Association (English name)	(Narrowleaf Cattail, Broadleaf Cattail) - (Bulrush species)\ Eastern Herbaceous Vegetation
Ecological System(s)	Laurentian-Acadian Freshwater Marsh (CES201.594)

GLOBAL DESCRIPTION

Concept 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 rostrata* (beaked sedge), *Carex pellita* (woolly 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

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Thelypteris palustris (eastern marsh fern), *Asclepias incarnata* (swamp milkweed), *Onoclea sensibilis* (sensitive fern), *Symplocarpus foetidus* (skunk cabbage), *Calla palustris* (water arum), *Impatiens capensis* (jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), and *Verbena hastata* (swamp verben). 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* var. *latifolia* (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: 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: 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 rostrata* (beaked sedge), *Carex pellita* (woolly 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 *Thelypteris palustris* (eastern marsh fern), *Asclepias incarnata* (swamp milkweed), *Onoclea sensibilis* (sensitive fern), *Symplocarpus foetidus* (skunk cabbage), *Calla palustris* (water arum), *Impatiens capensis* (jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), and *Verbena hastata* (swamp verben). 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* var. *latifolia* (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.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Typha angustifolia</i> (narrowleaf cattail), <i>Typha latifolia</i> (broadleaf cattail), <i>Typha x glauca</i> (blue cattail)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Characteristic Species: *Onoclea sensibilis* (sensitive fern), *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus americanus* (chairmaker's bulrush), *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This association occurs throughout the northeastern U.S. from Maine to North Carolina.

States/Provinces: CT, DE, MA, MD, ME:S5, NC, NH:S4?, NJ:S5, NY, PA:S5, RI, VA, VT, WV

Federal Lands: NPS (Acadia, Blue Ridge Parkway?, Boston Harbor Islands, Cape Cod, Delaware Water Gap, Johnstown Flood, Minute Man, Saint-Gaudens, Saratoga, Upper Delaware); USFS (Nantahala?, Pisgah?); USFWS (Aroostook, Assabet River, Carlton Pond?, Erie, Great Meadows, Great Swamp, Moosehorn, Nomans Land Island, Nulhegan Basin, Oxbow, Pondicherry?, Prime Hook)

CONSERVATION STATUS

Rank: G5 (1-Dec-1997)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

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.

Similar Associations:

- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229)
- *Typha* spp. - *Schoenoplectus tabernaemontani* - Mixed Herbs Southern Great Lakes Shore Herbaceous Vegetation (CEGL005112)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233)

Related Concepts:

- Cattail Marsh (Thompson 1996)
- Cattail marsh (CAP pers. comm. 1998)
- Palustrine Narrow-leaved Persistent Emergent Wetland, Permanently Flooded (PEM5H) (Cowardin et al. 1979)
- Robust Emergent Marsh (Breden 1989)
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984)
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984)

SOURCES

Description Authors: S.C. Gawler

References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Clancy 1996, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Grace and

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Wetzel 1981, Harrison 2004, Metzler and Barrett 2001, NRCS 2004, Northern Appalachian Ecology Working Group 2000, Rawinski 1984, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000



Figure E-32. Cattail Marsh at Minute Man National Historical Park (a) (MIMA.19). September 2004. NAD 1983 UTM easting 313736, northing 4701876.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-33. Cattail Marsh at Minute Man National Historical Park (b) (MIMA.AA49) August 2006. September 2004. NAD 1983 UTM easting 310343, northing 4702969.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Lake Sedge Wet Meadow

SYNONYMS

USNVC English Name: Northwest Territory Sedge - Lake Sedge - (Blister Sedge, Upright Sedge) Herbaceous Vegetation
 USNVC Scientific Name: *Carex utriculata* - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Herbaceous Vegetation
 USNVC Identifier: CEG002257
 Map Class: Wet Meadow / Shrubland

LOCAL INFORMATION

Environmental Description: This association occurs in a large wet meadow bordering a small stream, flooded in the spring and saturated throughout the year. The substrate is peat and is spongy even during the summer with a few deep holes with mucky substrate.

Vegetation Description: This community is dominated by *Carex lacustris* (hairy sedge) which often appears to be growing in a monoculture. Other common associates, but at very low cover, are *Calamagrostis canadensis* (bluejoint), *Solidago canadensis* (Canada goldenrod), *Polygonum sagittatum* (arrowleaf tearthumb), *Impatiens capensis* (jewelweed), *Verbena hastata* (swamp verbena), and *Lycopus americanus* (American water horehound). *Lythrum salicaria* (purple loosestrife) is present at low concentration.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Impatiens capensis</i> (jewelweed), <i>Polygonum sagittatum</i> (arrowleaf tearthumb), <i>Solidago canadensis</i> (Canada goldenrod)
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint), <i>Carex lacustris</i> (hairy sedge)

Characteristic Species: *Carex lacustris* (hairy sedge), *Solidago canadensis* (Canada goldenrod), *Verbena hastata* (swamp verbena)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	SNR	.	.	[not crosswalked]	.

Local Range: This community is found in the northeastern part of the Elm Brook Wet Meadow Complex where it occurs in several acres in good condition. The same community is heavily invaded by *Phragmites australis* (common reed) farther to the north and by *Phragmites australis* (common reed) and *Lythrum* (loosestrife) to the south.

Classification Comments: Information not available.

Other Comments: It appears that this community can persist for at least a few years in the shade of both *Phragmites australis* (common reed) and *Lythrum salicaria* (purple loosestrife).

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.15., MIMA.AA33

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Wet Meadow and Marsh (M069)
Group	Laurentian & Northeast Wet Meadow (G771)
Alliance	<i>Carex</i> spp. - <i>Calamagrostis canadensis</i> Eastern Wet Meadow Herbaceous Alliance (A4107)
Alliance (English name)	Sedge spp. - Bluejoint Eastern Wet Meadow Herbaceous Alliance
Association	<i>Carex utriculata</i> - <i>Carex lacustris</i> - (<i>Carex vesicaria</i> , <i>Carex stricta</i>) Herbaceous Vegetation
Association (English name)	Northwest Territory Sedge - Lake Sedge - (Blister Sedge, Upright Sedge) Herbaceous Vegetation
Ecological System(s)	Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687) North-Central Interior Wet Meadow-Shrub Swamp (CES202.701) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582) High Allegheny Wetland (CES202.069)

GLOBAL DESCRIPTION

Concept Summary: This broad-leaved wet sedge meadow type occurs in the upper central midwestern and northeastern regions of the United States. Stands occur on floodplains, shallow bays of lakes and streams, and upland depressions. Soils are mineral or well-decomposed peat. Flooding is variable but typically is seasonal. The vegetation is dominated by tall sedges. Shrubs may have up to 25% cover. *Carex lacustris* (hairy sedge) forms almost mono-dominant stands. Occasionally other emergents, such as *Typha latifolia* (broadleaf cattail) or *Sagittaria* (arrowhead) spp., may co-dominate. In Wisconsin this type is common in the northwest, where it typically intermingles with tall shrubs, especially *Salix* (willow) spp. (e.g., *Salix petiolaris* (meadow willow)). Common herbaceous associates at low cover include *Doellingeria umbellata* (parasol whitetop), *Calamagrostis canadensis* (bluejoint), *Carex stricta* (upright sedge), *Solidago canadensis* (Canada goldenrod), *Polygonum sagittatum* (arrowleaf tearthumb), *Verbena hastata* (swamp verbena), *Impatiens capensis* (jewelweed), *Eutrochium maculatum* (spotted joeypyeweed), and *Muhlenbergia glomerata* (spiked muhly).

This northern tall sedge community is found in the mixed conifer - hardwood zone of the Great Lakes region and north into the boreal regions of eastern Canada, with outliers in the Allegheny Mountains region of West Virginia and Maryland. Sites are found on floodplains, shallow bays of lakes and streams, beaver meadows, ditches, and occasionally in isolated basins, or on semi-floating mats. Hydrology is seasonally to semipermanently flooded. Substrate is mineral soil or well-

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

decomposed peat. Tall coarse-leaved sedges dominate the vegetation layer, often creating a tussocky hummock microtopography. Shrubs can cover up to 25% of the area. Pools with submergents may also be present. Dominant graminoids include a number of Carices, including *Carex aquatilis* (water sedge), *Carex lacustris* (hairy sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex rostrata* (beaked sedge), *Carex utriculata* (Northwest Territory Sedge), *Carex vesicaria* (blister sedge), and, locally, *Carex stricta* (upright sedge). Other graminoids include *Calamagrostis canadensis* (bluejoint), *Scirpus atrovirens* (green bulrush), *Scirpus cyperinus* (woolgrass), and, in wetter areas, *Eleocharis palustris* (= *Eleocharis smallii*) (common spikerush) and *Equisetum fluviatile* (water horsetail). Forbs include *Acorus calamus* (calamus), *Symphyotrichum lanceolatum* var. *lanceolatum* (= *Aster simplex*) (white panicle aster), *Campanula aparinoides* (marsh bellflower), *Eutrochium maculatum* (spotted joeypyeweed), *Iris virginica* var. *shrevei* (= *Iris shrevei*) (southern blue flag), *Lycopus uniflorus* (northern bugleweed), *Poa palustris* (fowl bluegrass), *Polygonum amphibium* (water knotweed), *Comarum palustre* (= *Potentilla palustris*) (purple marshlocks), and others. Diagnostic features include the general dominance by coarse-leaved sedges, wet, somewhat peaty soil conditions, and the mix of sub-boreal herbs with more temperate herbs.

Environmental Description: Sites are found on floodplains, shallow bays of lakes and streams, beaver meadows, ditches, and occasionally in isolated basins, or on semi-floating mats. Hydrology is seasonally to semipermanently flooded. Substrate is mineral soil or well-decomposed peat (Curtis 1959, Harris et al. 1996).

Vegetation Description: Tall coarse-leaved sedges dominate the vegetation layer, often creating a tussocky hummock microtopography. Shrubs can cover up to 25% of the area. Pools with submergents may also be present. Dominant graminoids include a number of Carices, including *Carex aquatilis* (water sedge), *Carex lacustris* (hairy sedge), *Carex lasiocarpa*, *Carex rostrata* (beaked sedge), *Carex utriculata* (Northwest Territory Sedge), *Carex vesicaria* (blister sedge), and, locally, *Carex stricta* (upright sedge). Other graminoids include *Calamagrostis canadensis* (bluejoint), *Scirpus atrovirens* (green bulrush), *Scirpus cyperinus* (woolgrass), and, in wetter areas, *Eleocharis palustris* (= *Eleocharis smallii*) (common spikerush) and *Equisetum fluviatile* (water horsetail). Forbs include *Acorus calamus* (calamus), *Symphyotrichum lanceolatum* var. *lanceolatum* (= *Aster simplex*) (white panicle aster), *Campanula aparinoides* (marsh bellflower), *Eutrochium maculatum* (spotted joeypyeweed), *Iris virginica* var. *shrevei* (= *Iris shrevei*) (southern blue flag), *Lycopus uniflorus* (northern bugleweed), *Poa palustris* (fowl bluegrass), *Polygonum amphibium* (water knotweed), *Comarum palustre* (= *Potentilla palustris*) (purple marshlocks), and others. Diagnostic features include the general dominance by coarse-leaved sedges, wet, somewhat peaty soil conditions, and the mix of sub-boreal herbs with more temperate herbs.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex</i> spp. (sedges)

Characteristic Species: *Carex* spp. (sedges)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

DISTRIBUTION

Range: This northern tall sedge community is found in the mixed conifer - hardwood zone of the Great Lakes and northeastern region of the United States and north into Canada, extending from Maine to Manitoba, south to Michigan.

States/Provinces: MB, ME, MI, MN, ND, ON, QC?, SD, VA?, WI, WV, WY

Federal Lands: NPS (Minute Man, Saratoga); USFS (Chippewa, Monongahela); USFWS (Canaan Valley)

CONSERVATION STATUS

Rank: G4G5 (3-Oct-1996)

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: Expansion of the range of this type eastward to Massachusetts and West Virginia is based on the presence of *Carex utriculata*. Curtis (1959) suggested that differential species for northern sedge meadows in Wisconsin may be *Symphyotrichum puniceum* (= *Aster puniceus*), *Campanula aparinoides*, *Glyceria canadensis*, *Scirpus atrovirens*, and *Solidago uliginosa*, among others, but this list needs further study. *Carex stricta* is restricted to eastern North American temperate and boreal regions.

Similar Associations:

- *Carex lacustris* (CEGL002256)--a midwestern coarse-sedge type.
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258)--a narrow-leaved sedge type.

Related Concepts:

- *Carex lacustris* fen (Byers et al. 2007)

SOURCES

Description Authors: D. Faber-Langendoen, mod. E.A. Byers

References: Bakowsky and Lee 1996, Byers et al. 2007, Epstein pers. comm., Greenall 1996, INAI unpubl. data, NRCS 2004, WNHIP unpubl. data

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-34. Lake Sedge Wet Meadow at Minute Man National Historical Park (a) (MIMA.15). September 2004. NAD 1983 UTM easting 310766, northing 4703192.



Figure E-35. Lake Sedge Wet Meadow at Minute Man National Historical Park (b) (MIMA.AA33) August 2006. NAD 1983 UTM easting 310809, northing 4703219.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Bluejoint Wet Meadow

SYNONYMS

USNVC English Name: **Bluejoint – Sedge species Laurentian & Northeast Wet Meadow**
 USNVC Scientific Name: ***Calamagrostis canadensis* – *Carex* spp. Laurentian & Northeast Wet Meadow**
 USNVC Identifier: **CEGL005448**
 Map Class: **Wet Meadow / Shrubland**

LOCAL INFORMATION

Environmental Description: This association occurs on saturated peat substrate that is flooded in the spring and following heavy rainfall. During the summer the substrate may be dry for several months.

Vegetation Description: This community is dominated by *Calamagrostis canadensis* (bluejoint) with *Impatiens capensis* (jewelweed) and *Polygonum arifolium* (halberdleaf tearthumb). *Carex lacustris* (hairy sedge), *Carex stricta* (upright sedge), and *Typha latifolia* (broadleaf cattail) may also be present. At some sites, *Phalaris arundinacea* (reed canarygrass) is also common.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Impatiens capensis</i> (jewelweed), <i>Polygonum arifolium</i> (halberdleaf tearthumb)
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint)

Characteristic Species: *Calamagrostis canadensis* (bluejoint), *Impatiens capensis* (jewelweed), *Polygonum arifolium* (halberdleaf tearthumb)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S4*	B	.	Shallow Emergent Marsh	Swain and Kearsley 2001

Local Range: This association is found only along the Concord River in the wet meadow between the swamp white oak forest and silver maple swamp and the *Carex stricta* (upright sedge) meadow and buttonbush swamp.

Classification Comments: At this site, this community intergrades with the *Carex stricta* (upright sedge) meadow, and in areas it is difficult to assign to one community or another. Other parts of this site are dominated by *Phalaris arundinacea* (reed canarygrass) but also support *Calamagrostis canadensis* (bluejoint) and are included in this community.

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.34, MIMA.AA13

Minute Man National Historical Park Inventory Notes: Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Wet Meadow and Marsh (M069)
Group	Laurentian & Northeast Wet Meadow (G771)
Alliance	<i>Carex</i> spp. - <i>Calamagrostis canadensis</i> Eastern Wet Meadow Herbaceous Alliance (A4107)
Alliance (English name)	Sedge spp. - Bluejoint Eastern Wet Meadow Herbaceous Alliance
Association	<i>Calamagrostis canadensis</i> – <i>Carex</i> spp. Laurentian & Northeast Wet Meadow
Association (English name)	Bluejoint - Sedge species Laurentian & Northeast Wet Meadow
Ecological System(s)	Laurentian-Acadian Floodplain Forest (CES201.587) Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687) Eastern Boreal Floodplain (CES103.588) North-Central Interior Wet Meadow-Shrub Swamp (CES202.701) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582) Central Appalachian River Floodplain (CES202.608) High Allegheny Wetland (CES202.069)

GLOBAL DESCRIPTION

Concept Summary: This wet meadow vegetation is widespread in the Laurentian-Acadian and other regions of the northeastern United States and southeastern Canada. Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, levees and lakeshores. Soils are typically mineral soil or well-decomposed peat, with a thick root mat. Water regime varies between temporarily and seasonally flooded. Graminoid cover is typically dense and can form hummocky microtopography. *Calamagrostis canadensis* (bluejoint) is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis* (water sedge), *Carex lacustris* (hairy sedge), *Carex utriculata* (Northwest Territory sedge), and *Carex stricta* (upright sedge). In fen transitions, *Carex lasiocarpa* (woollyfruit sedge) can be present. *Agrostis gigantea* (redtop) (= *Agrostis alba*), *Glyceria grandis* (American mannagrass), *Poa palustris* (fowl bluegrass), *Poa compressa* (Canada bluegrass), *Scirpus cyperinus* (woolgrass), and *Typha latifolia* (broadleaf cattail) are sometimes abundant. Forbs include *Campanula aparinoides* (marsh bellflower), *Epilobium leptophyllum* (bog willowherb), *Eupatorium perfoliatum* (common boneset), *Eutrochium maculatum* (spotted joeypyeweed), *Impatiens capensis* (jewelweed), *Iris versicolor* (harlequin blueflag), *Polygonum amphibium* (water knotweed), and *Comarum palustre* (= *Potentilla palustris*) (purple marshlocks). Scattered shrubs, such as *Viburnum nudum* (possumhaw), *Viburnum dentatum* (southern arrowwood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Cornus amomum* (silky dogwood), *Alnus incana* (gray alder), or *Alnus serrulata* (hazel alder), may be present. *Phalaris arundinacea* (reed canarygrass) and/or *Lythrum salicaria* (purple loosestrife) may be present, especially in disturbed examples.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Environmental Description: Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, levees and lakeshores. Soils are typically mineral soil or well-decomposed peat or peat silt loam with a thick root mat. Water regime varies between temporarily and seasonally flooded.

Vegetation Description: Graminoid cover is typically dense and can form hummocky microtopography. *Calamagrostis canadensis* (bluejoint) is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis* (water sedge), *Carex lacustris* (hairy sedge), *Carex utriculata* (Northwest Territory sedge), and *Carex stricta* (upright sedge). In fen transitions, *Carex lasiocarpa* (woollyfruit sedge) can be present. *Agrostis gigantea* (redtop) (= *Agrostis alba*), *Glyceria grandis* (American mannagrass), *Poa palustris* (fowl bluegrass), *Poa compressa* (Canada bluegrass), *Scirpus cyperinus* (woolgrass), and *Typha latifolia* (broadleaf cattail) are sometimes abundant. Forbs include *Campanula aparinoides* (marsh bellflower), *Epilobium leptophyllum* (bog willowherb), *Eupatorium perfoliatum* (common boneset), *Eutrochium maculatum* (spotted joeypyeweed), *Impatiens capensis* (jewelweed), *Iris versicolor* (harlequin blueflag), *Polygonum amphibium* (water knotweed), and *Comarum palustre* (= *Potentilla palustris*) (purple marshlocks). Scattered shrubs, such as *Viburnum nudum* (possumhaw), *Viburnum dentatum* (southern arrowwood), *Spiraea alba* var. *latifolia* (white meadowsweet), *Cornus amomum* (silky dogwood), *Alnus incana* (gray alder), or *Alnus serrulata* (hazel alder), may be present. *Phalaris arundinacea* (reed canarygrass) and/or *Lythrum salicaria* (purple loosestrife) may be present, especially in disturbed examples.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint)

Characteristic Species: *Calamagrostis canadensis* (bluejoint)

Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4	plant	

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This wet meadow vegetation is widely distributed in the Laurentian-Acadian and northeast regions of northeastern and midwestern U.S. and adjacent Canada. It ranges from Maine south to West Virginia and west to Minnesota.

States/Provinces: CT, DE, MA, MD, ME, MI, MN, NH, NJ, NY, PA, QC, RI, VT, WI, WV:S2

Federal Lands: NPS (Apostle Islands, Isle Royale, Minute Man, Pictured Rocks, Saint-Gaudens, Valley Forge, Voyageurs); USFS (Monongahela); USFWS (Assabet River?, Canaan Valley, Great Meadows?)

CONSERVATION STATUS

Rank: G4G5 (31-Mar-2000)

Reasons: This type is widespread throughout the northeastern and upper midwestern United States and central/southern Canada.

CLASSIFICATION INFORMATION

Status: Standard

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Confidence: 2 - Moderate

Comments: This type can grade into sedge meadows. A guideline of <50% sedges may be suggested as a criterion for the definition of this type compared to sedge meadow types. Harris et al. (1996) suggest that the bluejoint meadow type is drier than sedge meadows and less peaty than shore fens.

Similar Associations:

- *Calamagrostis canadensis* - *Doellingeria umbellata* - *Spartina pectinata* Herbaceous Vegetation (CEGL006427)
- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519)
- *Carex utriculata* - *Carex lacustris* - (*Carex vesicaria*, *Carex stricta*) Herbaceous Vegetation (CEGL002257)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258)--Dominance of sedges versus grasses is much higher.
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474)
- *Phleum pratense* - (*Calamagrostis canadensis*) Semi-natural Herbaceous Vegetation (CEGL005249)

Related Concepts:

- *Calamagrostis canadensis* herbaceous community (Walbridge and Lang 1982)
- *Calamagrostis canadensis* meadow (Walbridge 1982)
- *Calamagrostis canadensis* wet meadow (Fortney 1975)
- *Calamagrostis canadensis* wet meadow (Byers et al. 2007)
- Canada bluejoint-tussock sedge meadow (CAP pers. comm. 1998)
- Meadow marsh: bluejoint grass (W13) (Harris et al. 1996)
- Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979)
- SNE low-energy riverbank community (Rawinski 1984)
- Shallow Emergent Marsh (Thompson 1996)

SOURCES

Description Authors: D. Faber-Langendoen

References: Breden et al. 2001, Byers et al. 2007, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Fike 1999, Fortney 1975, Gawler 2002, Harris et al. 1996, Rawinski 1984, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Walbridge 1982, Walbridge and Lang 1982

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-36. Bluejoint Wet Meadow at Minute Man National Historical Park (a) (MIMA.34). August 2004. NAD 1983 UTM easting 310726, northing 4703058.



Figure E-37. Bluejoint Wet Meadow at Minute Man National Historical Park (b) (MIMA.AA13). August 2006. NAD 1983 UTM easting 306654, northing 4704117.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Tussock Sedge Meadow

SYNONYMS

USNVC English Name: Tussock Sedge - Inflated Sedge Herbaceous Vegetation
 USNVC Scientific Name: *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation
 USNVC Identifier: CEG006412
 Map Class: Wet Meadow / Shrubland

LOCAL INFORMATION

Environmental Description: This association occurs in a wet meadow bordering the Concord River. The substrate is peat and is saturated during the spring and following heavy rainfall but can be dry during the summer. There is a high cover of partially decayed organic material on the soil surface.

Vegetation Description: This association is dominated by *Carex stricta* (upright sedge) growing in tussocks. At the edges of the tussocks, frequent species include *Thelypteris palustris* (eastern marsh fern), *Carex vesicaria* (blister sedge), *Leersia oryzoides* (rice cutgrass), *Polygonum hydropiperoides* (swamp smartweed), *Asclepias syriaca* (common milkweed), *Osmunda regalis* (royal fern), *Onoclea sensibilis* (sensitive fern), *Lysimachia terrestris* (earth loosestrife), and *Scirpus cyperinus* (woolgrass). *Spiraea alba* var. *latifolia* (white meadowsweet) is scattered throughout. There is a low concentration of *Lythrum salicaria* (purple loosestrife).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea alba</i> var. <i>latifolia</i> (white meadowsweet)
Herb (field)	Forb	<i>Lysimachia terrestris</i> (earth loosestrife)
Herb (field)	Graminoid	<i>Carex stricta</i> (upright sedge)
Herb (field)	Fern or fern ally	<i>Thelypteris palustris</i> (eastern marsh fern)

Characteristic Species: *Carex stricta* (upright sedge), *Spiraea alba* var. *latifolia* (white meadowsweet), *Thelypteris palustris* (eastern marsh fern)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S4*	B	.	Shallow Emergent Marsh	Swain and Kearsley 2001

Local Range: This association is found in a band within the wet meadow along the Concord River between the Swamp White Oak Swamp and the Buttonbush Swamp. It forms a large open wetland unit with the Buttonbush Swamp type.

Classification Comments: In some areas, this community intergrades with Bluejoint Wet Meadow and with other graminoid communities along the border of the meadow.

Other Comments: Species list augmented with list from Thompson and Jenkins (1992).

Local Description Authors: R.E. Zaremba and S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.21.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Wet Meadow and Marsh (M069)
Group	Laurentian & Northeast Wet Meadow (G771)
Alliance	<i>Carex</i> spp. - <i>Calamagrostis canadensis</i> Eastern Wet Meadow Herbaceous Alliance (A4107)
Alliance (English name)	Sedge spp. - Bluejoint Eastern Wet Meadow Herbaceous Alliance
Association	<i>Carex stricta</i> - <i>Carex vesicaria</i> Herbaceous Vegetation
Association (English name)	Tussock Sedge - Inflated Sedge Herbaceous Vegetation
Ecological System(s)	Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582) High Allegheny Wetland (CES202.069)

GLOBAL DESCRIPTION

Concept Summary: These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended. The physiognomy is strongly herbaceous or, in some cases, herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta* (upright sedge), in its tussock form, is the usual dominant. *Carex vesicaria* (blister sedge), *Carex utriculata* (Northwest Territory sedge), and *Calamagrostis canadensis* (bluejoint) may also be locally abundant. Associated graminoids include *Carex atlantica* (prickly bog sedge), *Carex canescens* (silvery sedge), *Carex comosa* (longhair sedge), *Carex folliculata* (northern long sedge), *Carex scoparia* (broom sedge), *Carex stipata* (owlfruit sedge), *Carex vulpinoidea* (fox sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), and *Scirpus cyperinus* (woolgrass); forbs and ferns include *Asclepias incarnata* (swamp milkweed), *Thelypteris palustris* (eastern marsh fern), *Eutrochium maculatum* (spotted joeypyeweed), *Campanula aparinoides* (marsh bellflower), *Osmunda regalis* (royal fern), *Comarum palustre* (purple marshlocks), *Lysimachia terrestris* (earth loosestrife), *Angelica atropurpurea* (purplestem angelica), *Eupatorium perfoliatum* (common boneset), *Lycopus americanus* (American water horehound), *Polygonum hydropiperoides* (swamp smartweed), *Galium obtusum* (bluntleaf bedstraw), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), and others. *Lythrum salicaria* (purple loosestrife) may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana* (gray alder), *Myrica gale* (sweetgale), *Ilex*

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

verticillata (common winterberry), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba* var. *latifolia* (white meadowsweet) are often present. Bryophytes, where present, include *Sphagnum magellanicum* (Magellan's peat moss), *Sphagnum girgensohnii* (Girgensohn's peat moss), *Sphagnum palustre* (prairie peat moss), *Drepanocladus aduncus* (drepanocladus moss), and others. This association is differentiated from other wet meadows by the strong dominance of *Carex stricta* (upright sedge).

Environmental Description: These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended.

Vegetation Description: The physiognomy is strongly herbaceous, or in some cases herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta* (upright sedge), in its tussock form, is the usual dominant. *Carex vesicaria* (blister sedge), *Carex utriculata* (Northwest Territory sedge), and *Calamagrostis canadensis* (bluejoint) may also be locally abundant. Associated graminoids include *Carex atlantica* (prickly bog sedge), *Carex canescens* (silvery sedge), *Carex comosa* (longhair sedge), *Carex folliculata* (northern long sedge), *Carex scoparia* (broom sedge), *Carex stipata* (owlfruit sedge), *Carex vulpinoidea* (fox sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), and *Scirpus cyperinus* (woolgrass); forbs and ferns include *Asclepias incarnata* (swamp milkweed), *Thelypteris palustris* (eastern marsh fern), *Eutrochium maculatum* (spotted joeypyeweed), *Campanula aparinoides* (marsh bellflower), *Osmunda regalis* (royal fern), *Comarum palustre* (purple marshlocks), *Lysimachia terrestris* (earth loosestrife), *Angelica atropurpurea* (purplestem angelica), *Eupatorium perfoliatum* (common boneset), *Lycopus americanus* (American water horehound), *Galium obtusum* (bluntleaf bedstraw), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), and others. *Lythrum salicaria* (purple loosestrife) may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana* (gray alder), *Myrica gale* (sweetgale), *Ilex verticillata* (common winterberry), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba* var. *latifolia* (white meadowsweet) are often present. Bryophytes, where present, include *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum girgensohnii* (Girgensohn's sphagnum), *Sphagnum palustre* (prairie sphagnum), *Sphagnum affine* (sphagnum), *Drepanocladus aduncus* (drepanocladus moss), and others.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Calamagrostis Canadensis</i> (bluejoint), <i>Carex stricta</i> (upright sedge), <i>Carex utriculata</i> (Northwest Territory sedge), <i>Carex vesicaria</i> (blister sedge)

Characteristic Species: *Carex stricta* (upright sedge), *Leersia oryzoides* (rice cutgrass)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Scirpus ancistrochaetus</i> (barbedbristle bulrush)	G3		plant

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This tussock sedge meadow is found in northern New England, the Adirondack Mountains, and parts of the Appalachians (over an estimated 356,000 square km based on acreage of subsections).

States/Provinces: CT, DE, MA, MD, ME:S3, NH, NJ, NY:S4, PA, RI, VT:S4, WV:S3

Federal Lands: NPS (Acadia, Delaware Water Gap, Fort Necessity, Minute Man); USFS (Monongahela); USFWS (Aroostook?, Assabet River?, Carlton Pond?, Great Meadows?, Great Swamp, Moosehorn?, Oxbow, Parker River?)

CONSERVATION STATUS

Rank: G4G5 (31-Jan-2007)

Reasons: This association is widely distributed throughout New England and northern New York in its small-patch setting and extends sporadically southward.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Information not available.

Similar Associations:

- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258)

Related Concepts:

- *Carex (stricta - atlantica)* Herbaceous Vegetation (Hall 2005)
- *Carex (stricta - folliculata)* - (*C. atlantica*) Herbaceous Vegetation (Hall 2005)
- *Carex stricta* herbaceous community (Walbridge and Lang 1982)
- *Carex stricta* meadow (Walbridge 1982)
- *Carex stricta* wet meadow (CAP pers. comm. 1998)
- *Carex stricta* wet meadow (Bartgis 1983)
- *Carex stricta* wet meadow (Byers et al. 2007)
- Coastal Plain Intermittent Pond (Breden 1989)
- Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979)
- Sedge (*Carex stricta* / *Carex emoryi*) wet meadow (Putnam 1995)
- Sedge Meadow (Thompson 1996)
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984)
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984)
- Tussock sedge meadow (NAP pers. comm. 1998)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

SOURCES

Description Authors: S.C. Gawler, mod. E.A. Byers

References: Bartgis 1983, Breden 1989, Breden et al. 2001, Byers et al. 2007, CAP pers. comm. 1998, Cowardin et al. 1979, Curtis 1959, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Hall 2005, Harrison 2004, Metzler and Barrett 2001, NAP pers. comm. 1998, Northern Appalachian Ecology Working Group 2000, Putnam 1995, Rawinski 1984, Spurduto 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000, Walbridge 1982, Walbridge and Lang 1982



Figure E-38. Tussock Sedge Meadow at Minute Man National Historical Park (MIMA.21). September 2004. NAD 1983 UTM easting 306488, northing 4704261.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Common Reed Marsh

SYNONYMS

USNVC English Name: Common Reed Eastern North America Temperate Ruderal Herbaceous Vegetation
USNVC Scientific Name: *Phragmites australis* Eastern North America Temperate Ruderal Herbaceous Vegetation
USNVC Identifier: CEGL004141
Map Class: Wet Meadow / Shrubland

LOCAL INFORMATION

Environmental Description: This community is found in a damp area at the border of an old pasture. The substrate is highly organic from the decomposition of *Phragmites australis* (common reed).

Vegetation Description: This community is dominated by tall and dense *Phragmites australis* (common reed) with low concentrations of *Impatiens capensis* (jewelweed), *Solidago canadensis* (Canada goldenrod), and *Symphyotrichum lateriflorum* (calico aster).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Impatiens capensis</i> (jewelweed), <i>Solidago canadensis</i> (Canada goldenrod)
Herb (field)	Graminoid	<i>Phragmites australis</i> (common reed)

Characteristic Species: Information not available.

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S4*	B	.	Deep Emergent Marsh	Swain and Kearsley 2001

Local Range: This community is located at the southwestern border of the large meadow on Fiske Hill.

Classification Comments: Information not available.

Other Comments: There are numerous other areas at Minute Man National Historical Park that support dense stands of *Phragmites australis* (common reed), including much of the Elm Brook Wet Meadow Complex. These other areas still support other plant communities that persist under the shade of *Phragmites australis* (common reed). This association was reserved for those sites that are dominated by only *Phragmites australis* (common reed).

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.35.

Minute Man National Historical Park Inventory Notes: Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Ruderal Wet Meadow and Marsh (M303)
Group	Northern and Central Ruderal Wet Meadow and Marsh (G556)
Alliance	<i>Phragmites australis</i> Ruderal Herbaceous Alliance (A1431)
Alliance (English name)	Common Reed Ruderal Herbaceous Alliance
Association	<i>Phragmites australis</i> Eastern North America Temperate Ruderal Herbaceous Vegetation
Association (English name)	Common Reed Eastern North America Temperate Ruderal Herbaceous Vegetation
Ecological System(s)	Southeastern Coastal Plain Interdunal Wetland (CES203.258) Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582) Laurentian-Acadian Freshwater Marsh (CES201.594) North-Central Interior Freshwater Marsh (CES202.899)

GLOBAL DESCRIPTION

Concept 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* (common reed), with few or no other vascular plants present.

Environmental Description: Stands occur in semipermanently flooded marshes, ditches, impoundments, etc. that have often been disturbed by human activity.

Vegetation Description: The vegetation is often 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* (common reed), with few or no other vascular plants present.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Phragmites australis</i> (common reed)

Characteristic Species: *Phragmites australis* (common reed)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

DISTRIBUTION

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.

States/Provinces: AL, AR, CT, DE, FL, GA, IA, IN, LA, MA, MD, ME, MI, MN, MS, NC, NH, NJ, NY, OH, ON, PA, RI, SC, TX, VA, VT, WI, WV

Federal Lands: NPS (Assateague Island, Boston Harbor Islands, Cape Cod, Indiana Dunes, Minute Man, Saratoga, Upper Delaware, Voyageurs); USFWS (Alligator River, Aransas, Bon Secour, Brazoria, Great Dismal Swamp, Great Meadows, Great Swamp, Matagorda Island, Nomans Land Island?, Oxbow, Parker River, Prime Hook)

CONSERVATION STATUS

Rank: GNA (invasive) (23-Nov-1997)

Reasons: 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.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 1 - Strong

Comments: This is not a native community but is the result of the invasion of alien *Phragmites australis* (common reed) into natural or semi-natural vegetation. The vegetation has variable hydrology and, unless *Phragmites australis* (common 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 the *Phragmites australis* (common reed) Tidal Herbaceous Alliance (A1477).

Similar Associations:

- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187)
- *Phragmites australis* Western North America Temperate Semi-natural Herbaceous Vegetation (CEGL001475)

Related Concepts:

- *Phragmites australis* community (Metzler and Barrett 1992)
- *Phragmites australis* tidal marsh association (Clancy 1993b)
- Inland Emergent Marsh (Chapman et al. 1989)
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984)
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984)

SOURCES

Description Authors: D. Faber-Langendoen

References: Bailey 1997, Bailey 1998, Bell et al. 2002, Chapman et al. 1989, Clancy 1993b, Harris et al. 1996, INAI unpubl. data, Metzler and Barrett 1992, Metzler and Barrett 2001, NRCS 2004,

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Nelson 1986, Rawinski 1984, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d., Swain and Kearsley 2001



Figure E-39. Common Reed Marsh at Minute Man National Historical Park (MIMA.35). August 2004. NAD 1983 UTM easting 314117, northing 4701967.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Purple Loosestrife Wetland

SYNONYMS

USNVC English Name: Purple Loosestrife Ruderal Herbaceous Vegetation
USNVC Scientific Name: *Lythrum salicaria* Ruderal Herbaceous Vegetation
USNVC Identifier: CEGL006403
Map Class: Wet Meadow / Shrubland

LOCAL INFORMATION

Environmental Description: This community is found in silty organic soils that are seasonally saturated.

Vegetation Description: This community is dominated by *Lythrum salicaria* (purple loosestrife) growing in a dense, nearly uniform stand. Common, but at low cover, are *Impatiens capensis* (jewelweed), *Onoclea sensibilis* (sensitive fern), and *Thelypteris palustris* (eastern marsh fern). Also found throughout the community at very low cover are *Galium* (bedstraw) spp., *Polygonum arifolium* (halberdleaf tearthumb), and *Polygonum hydropiperoides* (swamp smartweed). The sampled site was a tilled farm field in the 1960s.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Impatiens capensis</i> (jewelweed)
		<i>Lythrum salicaria</i> (purple loosestrife)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern)

Characteristic Species: *Lythrum salicaria* (purple loosestrife)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	SNA	.	.	[not crosswalked]	.

Local Range: One occurrence is located on the south side of Route 2A in Merriam's Corner.

Classification Comments: There are many sites at Minute Man National Historical Park with heavy cover of *Lythrum salicaria* (purple loosestrife), but most of these sites can be identified as a native community that has been invaded by *Lythrum salicaria* (purple loosestrife). This association is reserved for areas dominated by *Lythrum salicaria* (purple loosestrife) without any species that are characteristic of the native community that formerly occupied the site. It is likely that this area was a tilled field 30 years ago, when it was released from agriculture and invaded by *Lythrum salicaria* (purple loosestrife).

Other Comments: Information not available.

Local Description Authors: R.E. Zaremba

Plots and Accuracy Assessment Points: MIMA.37, MIMA.AA03, MIMA.AA29, MIMA.AA31, MIMA.AA35, MIMA.AA43, MIMA.AA96,

Minute Man National Historical Park Inventory Notes: Information not available.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL INFORMATION

USNVC Classification

Class	Mesomorphic Shrub & Herb Vegetation (2)
Subclass	Shrub & Herb Wetland (2.C)
Formation	Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland (2.C.4)
Division	Eastern North American Freshwater Wet Meadow, Riparian, & Marsh (D323)
Macrogroup	Eastern North American Ruderal Wet Meadow and Marsh (M303)
Group	Northern and Central Ruderal Wet Meadow and Marsh (G556)
Alliance	<i>Lythrum salicaria</i> Ruderal Herbaceous Alliance (A3030)
Alliance (English name)	Purple Loosestrife Ruderal Herbaceous Alliance
Association	<i>Lythrum salicaria</i> Ruderal Herbaceous Vegetation
Association (English name)	Purple Loosestrife Ruderal Herbaceous Vegetation
Ecological System(s)	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This association consists of wetlands heavily invaded by *Lythrum salicaria* (purple loosestrife) with few or no species indicating the former more native association analog. *Lythrum* (loosestrife) makes up at least 75% of the vegetation cover and may approach 100%. The sparse associates include common wetland plants such as *Impatiens capensis* (jewelweed), *Onoclea sensibilis* (sensitive fern), *Thelypteris palustris* (eastern marsh fern), *Carex stricta* (upright sedge), and *Typha* (cattail) spp. Shrubs are sparse or absent.

Environmental Description: Information not available.

Vegetation Description: *Lythrum salicaria* makes up at least 75% of the vegetation cover and may approach 100%. The sparse associates include common wetland plants such as *Impatiens capensis* (jewelweed), *Onoclea sensibilis* (sensitive fern), *Thelypteris palustris* (eastern marsh fern), *Carex stricta* (upright sedge), and *Typha* (cattail) spp. Shrubs are sparse or absent.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Lythrum salicaria</i> (purple loosestrife)

Characteristic Species: *Lythrum salicaria* (purple loosestrife)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine

DISTRIBUTION

Range: This association is known from the northeastern U.S.

States/Provinces: MA, NY

Federal Lands: NPS (Minute Man, Saratoga?)

CONSERVATION STATUS

Rank: GNA (invasive) (7-Dec-2005)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Reasons: This community represents vegetation which has invaded native wetlands. It is not a conservation priority and does not receive a conservation rank.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 3 - Weak

Comments: This association is reserved for areas strongly dominated by *Lythrum salicaria* (purple loosestrife) and consequently without a suite of associated species that indicate the native community that formerly occupied the site.

Similar Associations: Information not available.

Related Concepts: Information not available.

SOURCES

Description Authors: S.C. Gawler

References: Eastern Ecology Working Group n.d., NRCS 2004



Figure E-40. Purple Loosestrife Wetland at Minute Man National Historical Park (a) (MIMA.37). September 2004. NAD 1983 UTM easting 309463, northing 4703124.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-41. Purple Loosestrife Wetland at Minute Man National Historical Park (b) (MIMA.AA31). August 2006. NAD 1983 UTM easting 308941, northing 4703318.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Common Name (Park-specific): Water-lily Aquatic Wetland

SYNONYMS

USNVC English Name: Broadleaf Pond-lily – American White Water-lily Herbaceous Vegetation
USNVC Scientific Name: *Nuphar advena* - *Nymphaea odorata* Herbaceous Vegetation
USNVC Identifier: C EGL002386
Map Class: Open Water

LOCAL INFORMATION

Environmental Description: This association is found in a few shallow small ponds with very mucky substrate. The upper 20 cm of the water is clear. In most of the ponds, there is no firm bottom for at least 1.5 m. At one occurrence, the water level drops over the season, exposing shoreline which is colonized by herbs typical of drawdown pondshores.

Vegetation Description: This sparse aquatic community is dominated by *Nuphar lutea* (yellow pond-lily) with *Eleocharis robbinsii* (Robbins' spikerush), *Pontederia cordata* (pickerelweed), and *Potamogeton* (pondweed) spp. Other species in the community include *Eleocharis acicularis* (needle spikerush), *Eleocharis tenuis* (slender spikerush), *Polygonum amphibium* (water knotweed), and *Leersia oryzoides* (rice cutgrass).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Eleocharis robbinsii</i> (Robbins' spikerush)
Floating aquatic	Aquatic herb (floating & submergent)	<i>Nuphar lutea</i> (yellow pondlily)

Characteristic Species: *Eleocharis robbinsii* (Robbins' spikerush), *Nuphar lutea* (yellow pond-lily)

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
MA	S4*	B	.	Shallow Emergent Marsh	Swain and Kearsley 2001

Local Range: This association was sampled only at the small pond south of Route 2A at Merriam's Corner. It also is mapped in the small pond north of Fiske Hill, along the Concord River, and two other very small ponds.

Classification Comments: The pond north of Fiske Hill is described in Thompson and Jenkins (1992) as a drawdown pond with a ring of *Decodon verticillatus* (swamp loosestrife) and mixed herb species. This suggests that it might be better classified as another association, perhaps *Decodon verticillatus* / *Triadenum virginicum* Shrubland (CEGL006087), but more detailed information (including species cover to determine dominance) would be needed to determine this.

Other Comments: Open water with pond-lilies can occur as inclusions within areas mapped as wetland shrub swamp.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

USDA-NRCS (2015) uses the name *Nuphar lutea* ssp. *advena* in synonymy with *Nuphar advena* (USNVC 2015). In accordance with the differences between the two standards, the former name is used in reference to the plant taxon, and the latter is used in USNVC vegetation names.

Local Description Authors: R.E. Zaremba and S.C. Gawler

Plots and Accuracy Assessment Points: MIMA.28., MIMA.AA113

Minute Man National Historical Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC Classification

Class	Hydromorphic Vegetation (5)
Subclass	Freshwater Aquatic Vegetation (5.B)
Formation	Temperate & Boreal Freshwater Aquatic Vegetation (5.B.2)
Division	North American Freshwater Aquatic Vegetation (D049)
Macrogroup	Eastern North American Freshwater Aquatic Vegetation (M108)
Group	Eastern North American Freshwater Aquatic Vegetation (G114)
Alliance	<i>Nymphaea odorata</i> - <i>Nuphar</i> spp. - <i>Brasenia schreberi</i> Herbaceous Alliance (A4064)
Alliance (English name)	American White Water-lily - Pond-lily species - Watershield Herbaceous Alliance
Association	<i>Nuphar advena</i> - <i>Nymphaea odorata</i> Herbaceous Vegetation
Association (English name)	Broadleaf Pond-lily – American White Water-lily Herbaceous Vegetation
Ecological System(s)	Atlantic Coastal Plain Northern Bog (CES203.893) Great Lakes Freshwater Estuary and Delta (CES202.033) Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687) East Gulf Coastal Plain Large River Floodplain Forest (CES203.489) Northern Great Lakes Coastal Marsh (CES201.722) North-Central Interior Floodplain (CES202.694) North-Central Interior Freshwater Marsh (CES202.899) Texas-Louisiana Coastal Prairie Pondshore (CES203.541) Laurentian-Acadian Freshwater Marsh (CES201.594) Red River Large Floodplain Forest (CES203.065) Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018) West Gulf Coastal Plain Large River Floodplain Forest (CES203.488) South-Central Interior Large Floodplain (CES202.705) South-Central Interior Small Stream and Riparian (CES202.706)

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

GLOBAL DESCRIPTION

Concept 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 lutea ssp. 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 duckmeal), *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: 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 lutea ssp. advena* (yellow pond-lily) is rooted in sandy substrate (Schmalzer and DeSelm 1982).

Vegetation Description: This community is dominated by rooted, floating-leaved aquatic species, with both submergent and emergent aquatics also present. *Nuphar lutea ssp. 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 duckmeal), *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 lutea ssp. advena* (yellow pond-lily).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Floating aquatic	Aquatic herb (floating & submergent)	<i>Nuphar lutea ssp. advena</i> (yellow pond-lily)

Characteristic Species: *Nuphar lutea ssp. advena* (yellow pond-lily)

Other Noteworthy Species: Information not available.

USFWS Wetland System: Lacustrine

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

DISTRIBUTION

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.

States/Provinces: AL, AR, CT, DE, FL, GA, IA:SU, IL, IN, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, NH, NJ:S4, NY, OH, OK, ON, PA, RI, SC, TN, TX, VA, VT, WI, WV

Federal Lands: DOD (Fort Benning); NPS (Acadia, Carl Sandburg Home, Effigy Mounds, Indiana Dunes, Minute Man, Natchez Trace, Obed, Ozark, 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, Reelfoot)

CONSERVATION STATUS

Rank: G4G5 (15-Oct-2002)

Reasons: 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.

CLASSIFICATION INFORMATION

Status: Standard

Confidence: 2 - Moderate

Comments: Can occur in mostly natural ponded wetlands as well as anthropogenic wetland sites 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 lutea* ssp. *advena* (yellow pond-lily).

Similar Associations:

- *Equisetum fluviatile* - (*Eleocharis palustris*) Herbaceous Vegetation (CEGL005258)
- *Nuphar advena* Tidal Herbaceous Vegetation (CEGL004472)
- *Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation (CEGL002001)

Related Concepts:

- Freshwater Marsh (Nelson 1985)
- Inland Emergent Marsh (Chapman et al. 1989)
- L5D2aI1a. *Nuphar lutea* (Foti et al. 1994)
- New England coastal plain pondshore (Rawinski 1984)
- Open Water/Aquatic Bed Veg., Natural Impoundment Pond (Ambrose 1990a)
- Open water marsh with floating-leaved plants (NAP pers. comm. 1998)

SOURCES

Description Authors: D. Faber-Langendoen, mod. C.W. Nordman, S.C. Gawler, M. Pyne

References: Ambrose 1990a, Anderson 1982, Breden et al. 2001, Chapman et al. 1989, Clancy 1996, FNAI 1990, Fike 1999, Fleming et al. 2001, Foti et al. 1994, Gawler 2002, Harrison 2004, Hoagland 2000, INAI unpubl. data, Midwestern Ecology Working Group n.d., NAP pers. comm. 1998, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1985, Peet et al. unpubl. data 2002,

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)

Penfound 1953, Rawinski 1984, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Schotz pers. comm., Sperduto and Nichols 2004, Swain and Kearsley 2001, TDNH unpubl. data, Thompson and Jenkins 1992, WNHIP unpubl. data, Zandoni et al. 1979



Figure E-42. Water-lily Aquatic Wetland at Minute Man National Historical Park (a) (MIMA.28). August 2004. NAD 1983 UTM easting 309363, northing 4702966.

Appendix E. Global and Local descriptions for the USNVC vegetation associations in Minute Man National Historical Park. (continued)



Figure E-43. Water-lily Aquatic Wetland at Minute Man National Historical Park (b) (MIMA.AA113). August 2006. NAD 1983 UTM easting 312207, northing 470205.

Appendix F. Dichotomous field key to the USNVC vegetation associations in Minute Man National Historical Park

1

- Forests or woodlands—total tree cover over 25% 2
- Not forests or woodlands—total tree cover less than 25% 15

2

- Upland forests or woodlands..... 3
- Wetland forests or woodlands of saturated soils or seasonally wet soils..... 8

3

- Tree cover varies from 10% to as high as 30%; maintained grassland with scattered trees.....**Managed Wooded Pasture (CEGL006888)**

Map Class: Managed Wooded Pasture

- Tree cover greater than 30%.....4

4

- Forests dominated by native species..... 5
- Forests dominated by non-native species (Norway maple (*Acer platanoides*) or black locust (*Robinia pseudoacacia*))..... 14

5

- Forests dominated by oaks other than northern red oak (*Quercus rubra*), hickory (*Carya* spp.), and sometimes white ash (*Fraxinus americana*), not dominated by eastern white pine (*Pinus strobus*), northern red oak, red maple (*Acer rubrum*), or sugar maple (*Acer saccharum*), and with pine making up less than 20% of the canopy 6

Dry Oak - Hickory Forest (CEGL006336)

Map Class: Oak - Hickory Forest

- Forests dominated by eastern white pine, northern red oak, red maple, or sugar maple 6

6

- Forests dominated by sugar maple with northern red oak and American basswood (*Tilia americana*) associated..... **Red Oak - Northern Hardwood Forest (CEGL006633)**

Appendix F. Dichotomous field key to the USNVC vegetation associations in Minute Man National Historical Park (continued).

Map Class: Northern Hardwood - Oak Forest

Mixed hardwoods which may support sugar maples (*Acer saccharum*) and American basswood (*Tilia americana*), but not in abundance; red maple (*Acer rubrum*) and/or northern red oak (*Quercus rubra*), mixed with eastern white pine (*Pinus strobus*), are dominants..... 7

7

Oaks more abundant in canopy than red maple, typically somewhat later successional forests

.....**Mixed Oak - White Pine Forest (CEGL006293)**

Map Class: Pine - Oak Forest

Earlier successional species, particularly red maple, or sometimes white ash and/or black cherry (*Prunus serotina*), more abundant in canopy than oaks

..... **Oak - Red Maple Successional Forest (CEGL006506)**

Map Class: Red Oak - Red Maple - Pine Forest

8

Wetland forests with swamp white oak (*Quercus bicolor*) common in the canopy

..... **Swamp White Oak Floodplain Forest (CEGL006386)**

Map Class: Forested Swamp

Wetland forests dominated by other trees..... 9

9

Wetland forest dominated by maples..... 10

Transitional upland/wetland forest dominated by red maple with upland tree species such as *Quercus rubra* (northern red oak), eastern white pine (*Pinus strobus*), and black cherry (*Prunus serotina*) codominant **Upland / Wetland Transitional Forest (CEGL006000)**

Map Class: Red Oak - Red Maple - Pine Forest

10

Wetland forests or open woodlands dominated by silver maple (*Acer saccharinum*)

.....**Silver Maple Floodplain Forest (CEGL006176)**

Map Class: Silver Maple Floodplain Forest

Appendix F. Dichotomous field key to the USNVC vegetation associations in Minute Man National Historical Park (continued).

Wetland forests dominated by red maple..... 11

11

Transitional upland/wetland forest dominated by red maple with upland tree species such as northern red oak (*Quercus rubra*), eastern white pine (*Pinus strobus*), and black cherry (*Prunus serotina*) codominant **Upland / Wetland Transitional Forest (CEGL006000)**

Map Class: Red Oak - Red Maple - Pine Forest

Upland tree species absent; red maple wetland forest and woodlands 12

12

Wetland woodland dominated by red maple and upright (tussock) sedge (*Carex stricta*)

..... **Red Maple - Tussock Sedge Wooded Marsh (CEGL006119)**

Map Class: Forested Swamp

Wetland forests with a closed canopy dominated by red maple 13

13

Wetland forest dominated by red maple with an understory dominated by northern spicebush (*Lindera benzoin*)..... **Red Maple - Ash Swamp (CEGL006406)**

Map Class: Forested Swamp

Wetland forest dominated by red maple with blackgum (*Nyssa sylvatica*)

..... **Red Maple - Blackgum Swamp (CEGL006156)**

Map Class: Forested Swamp

14

Forests dominated by black locust (*Robinia pseudoacacia*)

..... **Black Locust Successional Forest (CEGL007279)**

Map Class: Oak - Hickory Forest

Forests dominated by Norway maple (*Acer platanoides*)

..... **Norway Maple Forest (CEGL006407)**

Map Class: Norway Maple Forest

Appendix F. Dichotomous field key to the USNVC vegetation associations in Minute Man National Historical Park (continued).

15

Shrublands..... 16

Herbaceous vegetation 19

16

Wetlands dominated by ericaceous shrubs, with leatherleaf (*Chamaedaphne calyculata*) prominent

Leatherleaf Bog (CEGL006008) Map Class: Leatherleaf Bog

Leatherleaf not prominent..... 17

17

Wetlands dominated by common buttonbush (*Cephalanthus occidentalis*), sometimes occurring as a fringe with an open-water center **Buttonbush Swamp (CEGL006069)**

Map Class: Buttonbush Swamp

Wetlands not dominated by common buttonbush..... 18

18

Wetland shrubland along small pond; soils are saturated and mucky dominated by alder (*Alnus* spp.) and dogwood (*Cornus* spp.).....**Alder Swamp (CEGL005082)**

Map Class: Wet Meadow / Shrubland

Wet shrublands of abandoned old fields with tall herbs in openings; variable species include

dogwood (*Cornus* spp.), southern arrowwood (*Viburnum dentatum*), common buckthorn[†] (*Rhamnus cathartica*), and multiflora rose (*Rosa multiflora*);herbs include goldenrods (*Solidago* spp.), halberdleaf tearthumb (*Polygonum arifolium*), jewelweed (*Impatiens capensis*), and purple loosestrife (*Lythrum salicaria*).....

.....**Dogwood - Arrowwood Successional Wet Shrubland (CEGL006576)**

Map Class: Abandoned Field

19

Wetland herbaceous vegetation 20

[†] See Appendix J for more information on the distribution on *Rhamnus* species.

Appendix F. Dichotomous field key to the USNVC vegetation associations in Minute Man National Historical Park (continued).

Upland herbaceous vegetation 28

20

Wetlands dominated by purple loosestrife (*Lythrum salicaria*)

..... **Purple Loosestrife Wetland (CEGL006403)**

Map Class: Wet Meadow / Shrubland

Wetlands not dominated by purple loosestrife..... 21

21

Wetland herbaceous vegetation with a high cover of *Sphagnum* mosses and various low *Carex* sedge species..... **Sedge - Mannagrass Fen (CEGL006549)**

Map Class: Sedge - Mannagrass Fen

Wetland herbaceous vegetation without a high cover of *Sphagnum* 22

22

Wetland herbaceous vegetation dominated by *Carex* species 23

Wetland herbaceous vegetation not dominated by *Carex* species 24

23

Wetland herbaceous vegetation dominated by upright (tussock) sedge (*Carex stricta*)

..... **Tussock Sedge Meadow (CEGL006412)**

Map Class: Wet Meadow / Shrubland

Wetland herbaceous vegetation dominated by hairy sedge (*Carex lacustris*)

..... **Lake Sedge Wet Meadow (CEGL002257)**

Map Class: Wet Meadow / Shrubland

24

Vegetation dominated by emergent and floating species including yellow pond-lily (*Nuphar* sp.).....

..... **Water-lily Aquatic Wetland (CEGL002386)**

Map Class: Open Water

Vegetation not dominated by emergent or floating species..... 25

Appendix F. Dichotomous field key to the USNVC vegetation associations in Minute Man National Historical Park (continued).

25

Wetland herbaceous vegetation dominated by cattails (*Typha latifolia*, *T. angustifolia*)

..... **Cattail Marsh (CEGL006153)**

Map Class: Wet Meadow / Shrubland

Wetland herbaceous vegetation not dominated by cattails or *Carex* species..... 26

26

Wetland herbaceous vegetation dominated by graminoids other than *Carex*..... 27

Wetland herbaceous vegetation dominated by sensitive fern (*Onoclea sensibilis*) and skunk cabbage (*Symplocarpus foetidus*), cattails present..... **Cattail Marsh (CEGL006153)**

Map Class: Wet Meadow / Shrubland

27

Wetland herbaceous vegetation dominated by common reed (*Phragmites australis*) with few other species **Common Reed Marsh (CEGL004141)**

Map Class: Wet Meadow / Shrubland

Wetland herbaceous vegetation dominated by bluejoint grass (*Calamagrostis canadensis*)

.....**Bluejoint Wet Meadow (CEGL005448)**

Map Class: Wet Meadow / Shrubland

28

Upland herbaceous vegetation dominated by non-native grasses (timothy (*Phleum pratense*), orchardgrass (*Dactylis glomerata*), redtop (*Agrostis gigantea*), fescue (*Festuca* spp.), etc..... 29

Upland herbaceous vegetation dominated by native grasses (including little bluestem, (*Schizachyrium scoparium*), sedges and ericads **Sandplain Grassland (CEGL006393)**

Map Class: Transmission Right-of-way

29

Trees absent to sparse (10% cover).....**Successional Old Field (CEGL006107)**

Map Class: Abandoned Field

Tree cover varies from 10% to 30%; maintained grassland with scattered trees.....

**Appendix F. Dichotomous field key to the USNVC vegetation associations in Minute
Man National Historical Park (continued).**

.....**Managed Wooded Pasture (CEGL006888)**

Map Class: Managed Wooded Pasture

Appendix G. Accuracy assessment data form for Minute Man National Historical Park

NATIONAL PARK VEGETATION MAPPING PROGRAM: ACCURACY ASSESSMENT POINT

IDENTIFIERS/LOCATORS – Minute Man National Historical Park (MIMA) - MA

Field Point Code _____ Database Point Code _____	
Primary Map Unit _____ Assoc Code/Name _____	
Secondary Map Unit _____ Assoc Code/Name _____	
Other Map Unit / Assoc within 50 m _____	
Key or Classification Comments: _____	
GPS file name _____ Field UTM X _____ m E Field UTM Y _____ m N	
GPS Error _____ m GPS unit: Garmin GPSMAP 60CSx, WAAS enabled, internal processing	
<i>please do not complete the following information when in the field</i>	
Corrected UTM X _____ m E Corrected UTM Y _____ m N UTM Zone <u>19</u>	
Survey Date _____ Surveyors _____	Area surveyed: 25 m radius circle _____ other (describe) _____
Park Site Name: _____	
Quad Name: _____ Quad Code _____	

ENVIRONMENTAL DESCRIPTION

Elevation _____ m Slope _____ Aspect _____	
Topographic Position _____	
Landform _____	
Environmental Comments (including hydrology): 	Unvegetated Surface: <i>(please use the cover scale below)</i> _____ Bedrock _____ Litter, duff _____ Wood (> 1 cm) _____ Large rocks (cobbles, boulders > 10 cm) _____ Small rocks (gravel, 0.2-10 cm)

Appendix G. Accuracy assessment data form for Minute Man National Historical Park (continued).

	___ Sand (0.1-2 mm) ___ Bare soil ___ Other: _____
--	--

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic class	Cover Scale for Unvegetated Surface	
<u>Trees and Shrubs</u>			01	5%
___ Evergreen	___ Broad-leaved	___ Forest	02	10%
___ Cold-deciduous	___ Needle-leaved	___ Woodland	03	20%
___ Mixed evergreen - cold-deciduous	___ Mixed Broad/Needle leaved	___ Shrubland	04	30%
___ % evergreen ___ % deciduous	___ Graminoid	___ Dwarf Shrubland	05	40%
	___ Forb	___ Herbaceous	06	50%
<u>Herbs</u>	___ Pteridophyte	___ Nonvascular	07	60%
___ Annual		___ Sparsely Vegetated	08	70%
___ Perennial			09	80%
			10	90%
			11	100%

Stratum	Height	Cover	Dominant / characteristic species	Cover
		Class	(mark dominants "D" and diagnostic or characteristic species "**")	Class
T1 Emergent	___	___	_____	

T2 Canopy	___	___	_____	

**Appendix G. Accuracy assessment data form for Minute Man National Historical Park
(continued).**

T3 Sub-canopy	_____	_____	
S1 Tall shrub	_____	_____	
S2 Short Shrub	_____	_____	
S3 Dwarf-shrub	_____	_____	
H Herbaceous	_____	_____	
N Non-vascular	_____	_____	

Appendix G. Accuracy assessment data form for Minute Man National Historical Park (continued).

V Vine/liana				
Comments	Cover Scale:		Height Scale:	
	Strata and Species		Strata	
	01	5%	01	<0.5 m
	02	10%	02	0.5-1 m
	03	20%	03	1-2 m
	04	30%	04	2-5 m
	05	40%	05	5-10 m
	06	50%	06	10-15 m
	07	60%	07	15-20 m
	08	70%	08	20-35 m
	09	80%	09	35-50 m
	10	90%	10	>50 m
	11	100%		

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Appendix J. Follow-up Work on *Rhamnus* Identification

Background

Northeast Temperate Network's (NETN) plant ecologist, Kate Miller, reviewed the March 12th 2012 vegetation inventory project deliverables for Minute Man National Historical Park (MIMA) provided by NatureServe. During her review, Kate questioned the identifications of invasive buckthorn species made during the original vegetation classification plot visits and accuracy assessment (AA) after comparing them to the results of a park-wide invasive plant survey completed in 2003 (pre veg inventory) and vegetation monitoring data collected by NETN beginning in 2006 (post veg inventory). The vegetation inventory project (2004 for plot surveys; 2006 for accuracy assessments) recorded common buckthorn (*Rhamnus cathartica*) as the most frequently observed species whereas data from sampling in 2003 (Aguis 2003; Figs. 1 and 2) and ongoing vegetation monitoring by NETN since 2006 (Table 1; Tierney et al. 2016) found glossy buckthorn (*Frangula alnus*) more frequently in the park. In 2004, vegetation classification plots and accuracy assessment points were visited by two different botanists.

Since both species of noxious weeds are very important to resource management, we felt it necessary to further address the discrepancy in buckthorn species abundance between these three closely aligned (spatially and temporarily) studies. It was determined that a NETN botanist would revisit both vegetation classification plots and accuracy assessment points to examine current conditions. This appendix outlines the procedures that were taken to assess this discrepancy and describes any of the changes to the data products that were made.

Methods

In October 2016, NETN's forest crew leader, Camilla Seirup, revisited all of the original vegetation classification plots (22) and a subset of AA points (19 of 50; 38%) for which at least one species of buckthorn was present in 2004/2006. GPS coordinates provided by the vegetation mapping project were used to navigate to each site. While we expected that we might not visit the exact same location that was initially surveyed in 2004 due to GPS accuracy limitations, our assumption was that our 2016 surveys (described below) would be located close enough to the original sites to provide a satisfactory comparison.

In order to verify presence and absence of each buckthorn species originally recorded in 2004/2006, the 2016 revisit documented buckthorn species presence, growth stage (seedling [$<2\text{m}$], shrub [2-5m], tall shrub [$>5\text{m}$, DBH $< 3\text{ cm}$], small tree [$>5\text{m}$, DBH 3-10 cm], tree [$> 5\text{m}$, DBH $> 10\text{ cm}$] and relative density (low, medium, high) at each location. Taking into account realistic growth rates, we considered the presence of any individuals taller than 5m (tall shrub or larger) in 2016 to strongly support the presence of the same buckthorn species 10 years ago. Verification of species presence was less conclusive when based on the shrub (2-5m) growth stage, even when considered in combination with density. We assumed the presence of new seedlings ($< 2\text{m}$ tall) in 2016 to indicate a more recent invasion of the species and thus were unable to verify which species was present in 2004/2006. Data collected by NETN's forest crew leader is reported in Tables 2 and 3.

Appendix J – Follow-up Work on *Rhamnus* Identification (continued).

Results and Changes made to the project deliverables

Our forest crew lead (Camilla Seirup) checked the species identifications of buckthorns in all 22 plots and 19 AA sites on Oct 26 2016. All life stages were reported in the 22 main plots monitored in 2016.

Our success in verifying 2004/2006 buckthorn species identification at 22 vegetation classification plots and 19 accuracy assessment points was mixed. In general, the species identifications made at vegetation classification plots in 2004 were supported by the 2016 data. There were only two plots (MIMA.09 & MIMA.32) where 2016 data were interpreted to be in conflict with 2004 data (Table 2). Agreement between accuracy assessment point visits with 2016 data was harder to decipher for 8 of 19 points. We were unable to verify the species identifications in 2006 with 2016 data at these 8 AA points (Table 3).

Given the amount of time that has passed between surveys, the low abundance (percent cover) observed, and the possibility of other events affecting species presence between surveys, it is our belief that the botanist conducting the original 2004 survey of plots accurately identified glossy and common buckthorn. As such, no changes were made to the original buckthorn species assignments for vegetation classification plots data and species determinations should be taken at face value. However, due to a large number of discrepancies that cannot entirely be explained, it is our feeling that identification of the buckthorn species at accuracy assessment points in this report should be used with caution. No changes were made in the report or any of the deliverables, but it is our recommendation that buckthorn occurrence be considered as an “exotic buckthorn species”.

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Table J-3. Relative frequency and abundance (percent cover) of glossy and common buckthorn observed in standardized plots monitored annually by NETN's forest health monitoring program (Tierney et al. 2016).

Year	Panel	Glossy (<i>Frangula alnus</i>)			Common (<i>Rhamnus cathartica</i>)		
		% Quad Cover	% Quad Freq.	# Plots	% Quad Cover	% Quad Freq.	#Plots
2006	1	3.14	44.64	9	0.44	12.50	2
2008	3	12.23	65.00	10	0.10	12.50	2
2010	1	7.75	55.36	8	0.20	25.00	3
2012	3	12.19	66.25	10	0.20	25.00	3
2014	1	7.61	54.69	9	0.01	12.50	2
2016	3	13.64	71.25	10	0.01	12.50	3

Appendix J – Follow-up Work on *Rhamnus* Identification (continued).

Table J-2. Abundance of glossy and common buckthorn recorded during 2004 and 2016 visits to 22 vegetation inventory plots. Species ID conflicts were assessed by taking into consideration the presence, growth stage, and % cover of each species during each visit.

Plot	Glossy (<i>Frangula alnus</i>)		Common (<i>Rhamnus catharticus</i>)		2004 Species ID?
	2004 (% cover)	2016 (stage, % cover)	2004 (% cover)	2016 (stage, % cover)	
MIMA.01	15	shrub, high	0	shrub, low	supported
MIMA.02	0	seedling, low	1	seedling, low	neutral
MIMA.03	0	seedling, low	1		neutral
MIMA.05	0	seedling, low	1	shrub, med	supported
MIMA.07	2	shrub, low	0		supported
MIMA.09	0	tall shrub, low	1	shrub, low	unsupported
MIMA.11	0	shrub, low	3	tree, med	supported
MIMA.12	0	shrub, low	1	tree, low	supported
MIMA.13	5	shrub, low/med	0		supported
MIMA.14	10	shrub, med/low	0	shrub, low	supported
MIMA.16	10	shrub, low	0		supported
MIMA.17	0	shrub, low	2	shrub, low	neutral
MIMA.19	1	shrub, low	0		supported
MIMA.20	1	shrub, low	0		supported
MIMA.22	1	seedling, low	0		neutral
MIMA.24	0	shrub, med	5	tall shrub, low	supported
MIMA.25	1	seedling, low	0		neutral
MIMA.27	5	tall shrub, low	0		supported
MIMA.30	5	tall shrub, low/med	0		supported
MIMA.32	10	tree, med	0	tree, med	unsupported
MIMA.33	0	shrub, low	1		neutral
MIMA.36	0	shrub, med	65	tall shrub, med	supported

Appendix J – Follow-up Work on *Rhamnus* Identification (continued).

Table J-3. Abundance of glossy and common buckthorn recorded during 2004 and 2016 visits to 19 vegetation inventory accuracy assessment points. Species ID conflicts were assessed by taking into consideration the presence, growth stage, and % cover of each species during each visit.

AA	Glossy (<i>Frangula alnus</i>)		Common (<i>Rhamnus catharticus</i>)		2004 Species ID?
	2006 (% cover)	2016 (stage, % cover)	2006 (% cover)	2016 (stage, % cover)	
AA.012	N	shrub, med	Y	small tree, med	supported
AA.015	N	shrub, high	Y		unsupported
AA.027	N	shrub, med	Y	small tree, med	supported
AA.030	N	shrub, high	Y		unsupported
AA.032	N	shrub, high	Y	small tree, low	supported
AA.033	N	shrub, low	Y	shrub, low	supported
AA.038	N	shrub, med	Y		unsupported
AA.045	N	shrub , med	Y		unsupported
AA.048	N		Y		unclear
AA.051	N	shrub, low	Y	shrub, low	supported
AA.056	N	shrub, med	Y	small tree, low	supported
AA.058	N	shrub, med	Y	small tree, low	supported
AA.060	N	shrub, med	Y		unsupported
AA.061	N	shrub, low	Y		unsupported
AA.068	N	shrub, low	Y	tree, low	supported
AA.072	N	shrub, med	Y		unsupported
AA.098	N	seedling, low	Y	tall shrub, med	supported
AA.115	N	shrub, low	Y		unsupported
AA.119	N	shrub, med	Y	tall shrub, low	Supported

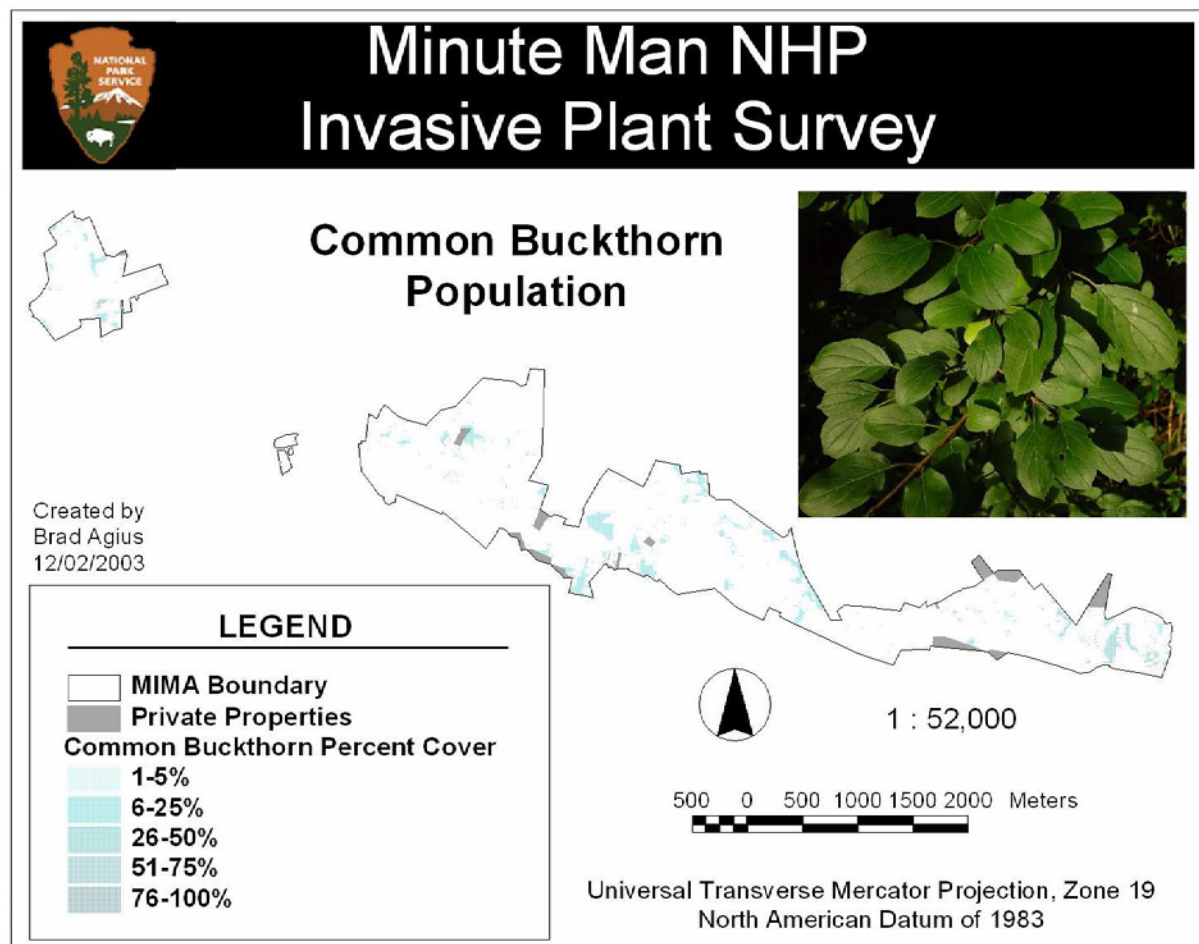


Figure J-1. Minute Man National Historical Park Invasive Plant Survey: Common Buckthorn (*Rhamnus cathartica*) Map. From pg 38 of Aguis 2003.

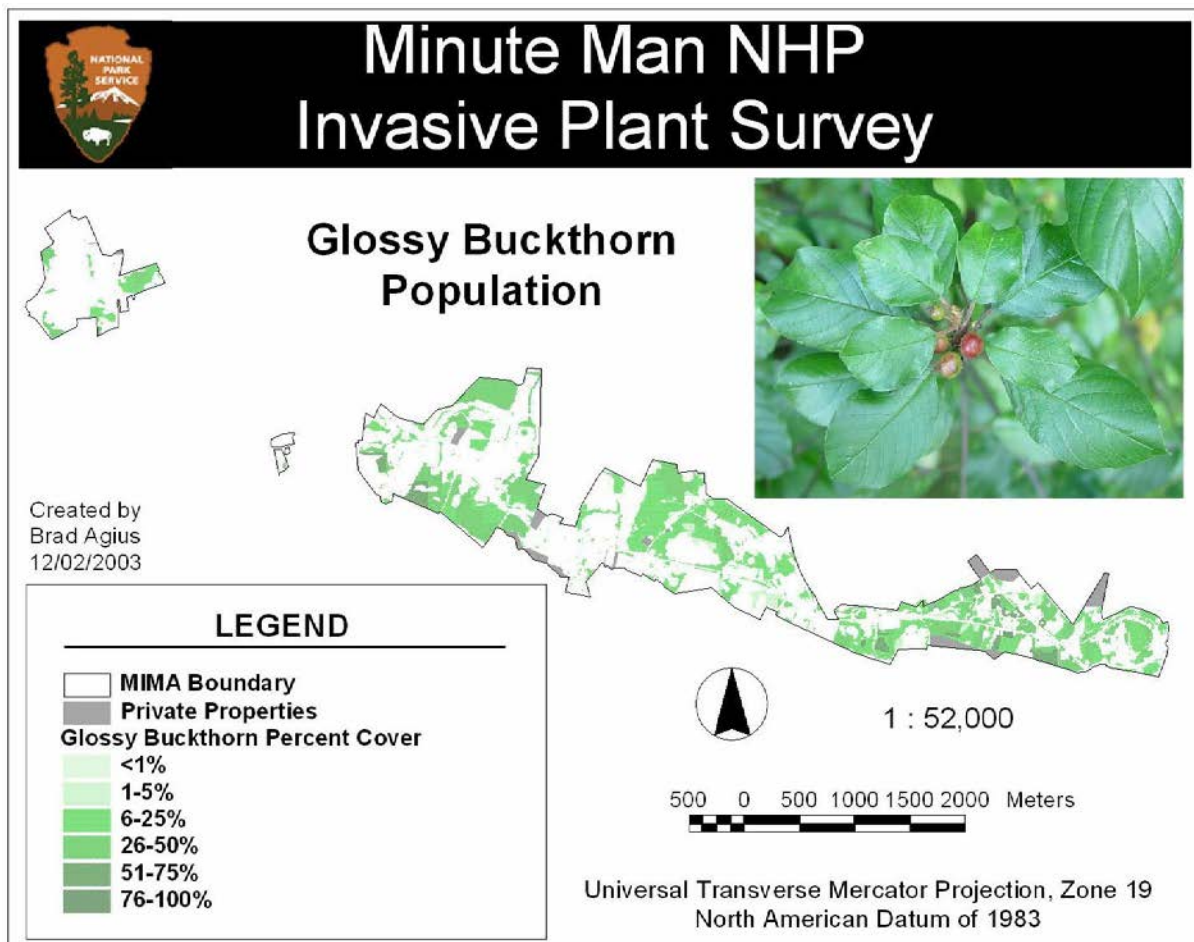


Figure J-2. Minute Man National Historical Park Invasive Plant Survey: Glossy Buckthorn (*Frangula alnus*) Map. From pg 40 of Aguis 2003.

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