

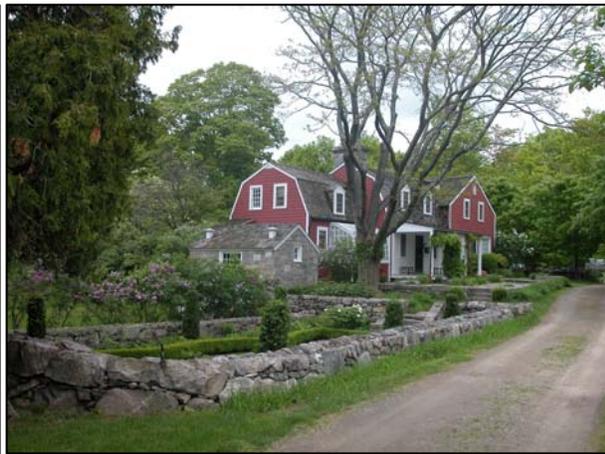
National Park Service  
U.S. Department of the Interior

Northeast Region  
Philadelphia, Pennsylvania



## Vegetation Classification and Mapping at Weir Farm National Historic Site, Connecticut

Technical Report NPS/NER/NRTR—2008/130



**ON THE COVER**

Weir Farm National Historic Site. Clockwise from upper left: Browsed Northeastern Dry Oak - Hickory Forest; Northeastern Buttonbush Shrub Swamp adjacent to pond; Burlingham House Visitor's Center; White baneberry plants in Semi-rich Northern Hardwood Forest.

Photographs by: K. J. Metzler.

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Technical Report NPS/NER/NRTR—2008/130

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U.S. Department of the Interior  
National Park Service  
Northeast Region  
Philadelphia, Pennsylvania

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## Executive Summary

Vegetation classification and mapping was conducted at Weir Farm National Historic Site during the fall of 2003 and the summers of 2004 and 2005, creating a current digital geospatial vegetation database for the park. There are nine natural vegetation types that occur in the park; four upland forest types, one upland non-vascular type, two forested wetland types, and two wetland shrub thicket types that reflected the soil moisture conditions of the site. In addition, four anthropogenic vegetation types occurred; one successional forest and three non-forested types (two in mowed upland fields, and one herbaceous wetland seep). Each of these is described in detail in this report.

The vegetation reflects the land use history, ongoing management, and varied environmental settings of the park. Deciduous forest is the primary vegetation, with non-forested vegetation occurring only in areas too wet to support trees and in man-made fields maintained by mowing. A man-made pond adds to the diversity of the site.

The Northeastern Dry Oak - Hickory Forest covers the largest acreage of the park, intergrading with the Lower New England Slope Chestnut Oak Forest on areas with shallow soils. In many areas, the floristic difference between these two types is subtle, with few indicator species present to distinguish between types.

The natural vegetation structure throughout the site has been heavily altered by over-browse of white-tailed deer (*Odocoileus virginianus*), with a near elimination of the shrub layer and a low diversity of herbaceous plants. This lack of both structural and floristic diversity made the recognition and classification (using TWINSpan) of the vegetation difficult. In this regard, familiarity with the vegetation types within this region and the presence of representative species in the herbaceous layer were the only clues to distinguish between the types.

Nonnative invasive plants occur throughout, albeit in small numbers, with the control of their spread due to the diligence of NPS staff. No Federal Endangered or Threatened species occur within Weir Farm; but a single small population of blackhaw (*Viburnum prunifolium*, State Special Concern) occurs on the eastern edge of the site. A map showing the locations of the vegetation associations within the park was created following the USGS/NPS Vegetation Mapping Program protocols (TNC and ESRI 1994a, b, c). Each association was cross-walked to the US National Vegetation Classification (USNVC) in order to provide a regional and global context for the park's vegetation. A dichotomous field key to the vegetation types was also developed to assist with field recognition and classification.

This project documents the vegetation associations of Weir Farm National Historic Site based on previous work, supplemented by 2004/2005 field sampling and mapping on both 2001 black and white photography and 2004 false-color infrared aerial photography. This inventory completes one of 12 basic inventory data sets for the park.

Keywords: vegetation association, classification and mapping, Weir Farm National Historic Site.



## Introduction and General Background

One of the goals of the National Park Service's (NPS) Inventory and Monitoring Program is to provide the information and expertise needed by park managers for effective, long-term management of the natural resources held in trust (NPS 2003). The program recommends that 12 basic natural resource inventories be developed for each park that contains significant natural resources. These inventories provide crucial baseline information needed for proper park natural and cultural resource stewardship. A map of each park's vegetation, based on aerial photography less than five years old, is one of the 12 inventories recommended by the program (NPS 2003). To ensure that vegetation mapping is standardized across the National Park Service (NPS), The Nature Conservancy (TNC), in conjunction with NatureServe, the Federal Geographic Data Committee (FGDC), and the Ecological Society of America (ESA) Vegetation Subcommittee, developed a protocol for creating vegetation maps in national parks. This protocol was adopted by the United States Geological Survey (USGS)/NPS Vegetation Mapping Program as the standard (TNC and ESRI 1994a, b, c) and has been implemented at Weir Farm National Historic Site by ecologists from the State of Connecticut Department of Environmental Protection (Connecticut DEP), Geological and Natural History Survey.

The goal of the mapping effort at Weir Farm National Historic Site was to produce an up-to-date digital geospatial vegetation database for the park, descriptions of the vegetation associations in the park, and a dichotomous key for their recognition. Baseline information on plant community composition and rarity is critical to developing desired conditions and park management goals relating to native plant communities, nonnative plant and insect species, or effects of deer browse and other disturbances. The identification and description of plant communities also provide habitat information important to understanding associated organisms, including animals, protozoans, bacteria, and fungi. A map of vegetation communities may allow inferences about the location and abundance of species that are characteristic of each community.

This report also describes the park's vegetation in the context of a regional and national vegetation classification. TNC, in conjunction with NatureServe, the FGDC, and the ESA Vegetation Subcommittee, developed the US National Vegetation Classification (USNVC) in order to standardize vegetation classification and facilitate the comparison of vegetation types throughout the United States and internationally. The USNVC is a systematic approach to classifying existing natural vegetation using physiognomics and floristics. This classification system has a hierarchical structure (Grossman et al. 1998).

The basic unit of vegetation classification in the USNVC is the association. An association is defined as a plant community type that is relatively homogeneous in composition and structure and occurs in a uniform habitat. For example, Mesic Sugar Maple - Ash - Oak - Hickory Forest is a common association typically found on dry, rich, and often very rocky slopes. Associations are also assigned global rarity ranks that indicate their conservation status and relative risk of extirpation (Grossman et al. 1998).

Several associations that share one or more dominant or characteristic species can be grouped to form an alliance. Alliances are generally more wide-ranging geographically than associations, covering multiple habitats and a broader species composition. An association with a 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.

One level above alliance is the formation, representing vegetation types that share a common physiognomy within broadly defined environmental factors (Grossman et al. 1998). For example, lowland or submontane cold-deciduous forest is a common formation that encompasses numerous forest types in the northeastern and midwestern United States, including the Northern Red Oak – Sugar Maple Forest Alliance. Formation level vegetation types can be determined through aerial photointerpretation, and their delineation within a park is one of the first steps in vegetation mapping.

## Project Area

### Location and Regional Setting

Congress established the Weir Farm National Historic Site in 1990 with the major purpose of preserving and interpreting the historically significant properties and landscapes associated with the life and work of the American painter J. Alden Weir. Weir Farm National Historic Site is composed of two disconnected parcels, 24 and 3.6 ha (59.3 and 8.9 ac) in size, in the towns of Ridgefield and Wilton, Connecticut. Adjoining Weir Farm is additional open space, owned by the Weir Farm Art Center and the Town of Ridgefield (10.9 ha [26.9 ac]).

Weir Farm National Historic Site is located within the Hudson Highlands subsection of the Eastern Broadleaf Forest Province ecoregion (Keys et al. 1995, Figure 1). The Connecticut portion of this subsection is characterized by low, rolling to locally rugged hills of moderate elevation (generally 76–228 m [249–748 ft] mean sea level composed primarily of metamorphic gneisses and schists). Soils are derived from glacial till in the upland areas and from stratified deposits of sand and gravel in the valleys. This portion of the subsection has a mean annual temperature of about 10°C (50°F), precipitation is evenly distributed (annual average of about 114 cm [45 in]), and the average frost-free season is about 160 days.

In the Hudson Highlands Section, the characteristic forest vegetation on well-drained soils is a mixture of oaks (*Quercus alba*, *Q. rubra*, *Q. velutina*), hickories (*Carya ovata*, *C. cordiformis*, *C. glabra/ovalis*), tuliptree (*Liriodendron tulipifera*), sweet birch (*Betula lenta*), white ash (*Fraxinus americana*), and eastern hemlock (*Tsuga canadensis*). On excessively drained soils Scarlet and chestnut oaks (*Quercus coccinea*, *Q. prinus*) are locally dominant, and on poorly drained soils red maple (*Acer rubrum*) and green ash (*Fraxinus pennsylvanica*) predominate.

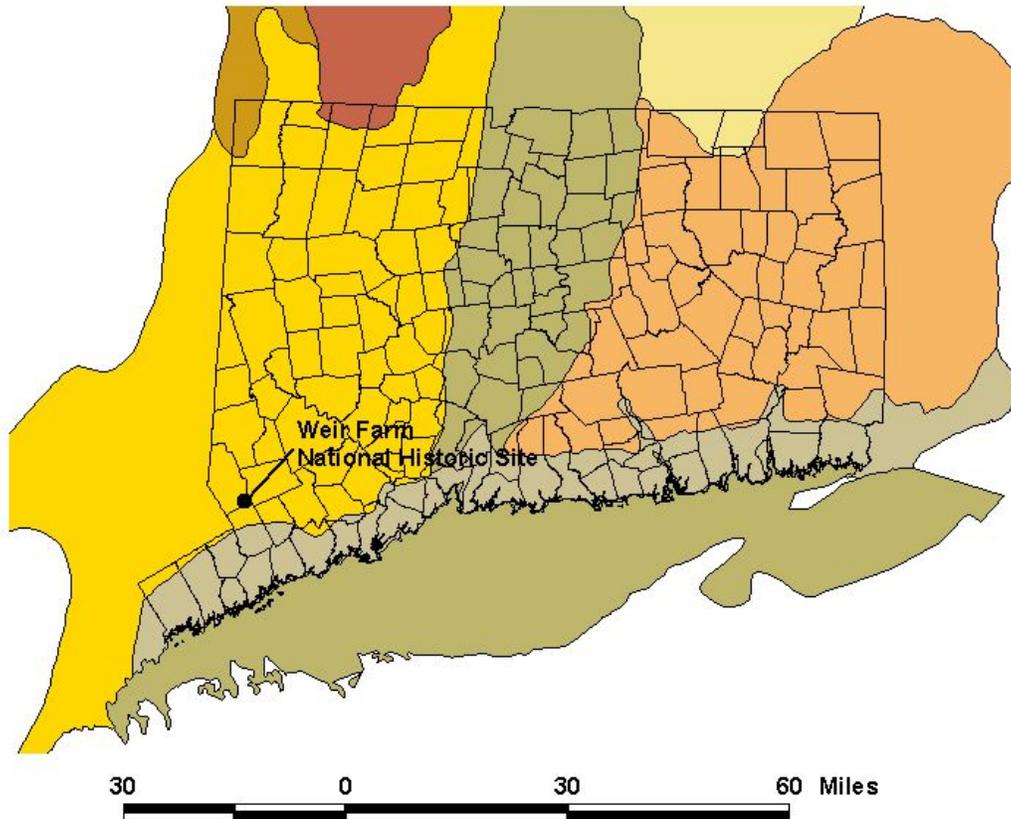
### Park Environmental Attributes

The two parcels that make up Weir Farm National Historic Site differ in access and habitat diversity. The main parcel (24.03 ha [59.38 ac]), excluding the historic site that contains a gallery, museum, and several historic fields, is wooded with a mixed upland forest of oak, hickory, maple, and birch. Forested wetlands and intermittent watercourses dissect much of this parcel and a small man-made pond, regulated by an earthen dam, occurs in the eastern portion. Weir Farm is a popular destination for artists and hikers with the entire site easily accessed by a well-maintained network of trails.

By contrast, the northern parcel (3.63 ha [8.97 ac]) has no public access. With the exception of an unoccupied residence, this parcel is characterized by a dry to mesic oak, hickory, maple, and birch forest. There are no wetlands or watercourses in the northern parcel.

Although factors such as bedrock geology, surficial materials, soils, and land use history have had a profound effect on the present vegetation found at Weir Farm, its small size and geological uniformity limits ecological diversity. The entire site is underlain by crystalline gneiss that is blanketed by glacial till from the Wisconsinan era. Soil depth and drainage provide the greatest variability, ranging from scattered areas of somewhat excessively drained sandy loams and bedrock outcrops to small, very poorly drained depressions of peats and mucks. This variability

# Weir Farm National Historic Site Ridgefield / Wilton, Connecticut



- U.S. Forest Service Subsections**
- Berkshire / Vermont Uplands
  - Hudson Highlands
  - Lower Connecticut River Valley
  - Southern New England Coastal Hills & Plains
  - Southern New England Coastal Lowland
  - Taconic Mountains
  - Worcester / Manadnock Plateau

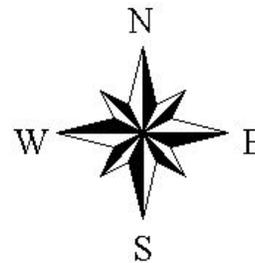


Figure 1. Location of Weir Farm National Historic Site, Litchfield County, Connecticut, within the U.S. Forest Service Ecoregions (Keys et al. 1995).

mirrors the composition of the forest vegetation with oaks (*Quercus spp.*) and sweet birch (*Betula lenta*) dominating the upland soils replaced by red maple (*Acer rubrum*) in the wetlands.

In addition, the white-tailed deer (*Odocoileus virginianus*) population within Weir Farm has impacted the vegetation of Weir Farm, particularly through the over-browsing of shrubs and herbaceous plants. In this part of Connecticut, deer densities have reached a level where vegetation structure and species diversity has been significantly altered to the detriment of the ecosystem (Connecticut DEP, Howard Kilpatrick, pers. comm.).

Invasive plants are pervasive throughout Weir Farm National Historic Site, although many species have had some control through the diligence of NPS staff. Although widespread throughout, concentrated populations of Japanese stiltgrass (*Microstegium vimineum*) occur along roadsides, and garlic mustard (*Alliaria petiolata*) occurs in areas of recent disturbance. Invasive plant species present within Weir Farm and methods for their control are listed in the Discussion section under the Distribution, Threats, and Management Recommendations for Nonnative Invasive Plant Species heading.



## Materials and Methods

### Planning and Scoping

The sequence of steps presented below was used to develop a vegetation classification and map for Weir Farm National Historic Site. Methodology was based on procedures developed by Environmental Systems Research Institute (ESRI) and TNC for the USGS/NPS Vegetation Mapping Program. Work conducted by the international network of Natural Heritage Programs that culminated in the publication of *International Classification of Ecological Communities: Terrestrial Vegetation of the United States* (Grossman et al. 1998) has been revised and refined since 1998 and is now managed by NatureServe in continued collaboration with the network of Natural Heritage Programs. This classification was coupled with the closely associated vegetation classification for Connecticut (Metzler and Barrett 2006) and field data collected during the summers of 2003 and 2004 to form the standard for this report.

The National Park Service (NPS) determined the primary roles of each participant. North Carolina State University's Center for Earth Observation (NCSU-CEO) developed a digital orthophoto mosaic of the park and assessed positional accuracy. The State Geological and Natural History Survey of the Connecticut DEP developed and implemented a vegetation classification sampling design based on photointerpretation and field inspection and developed the vegetation classification and vegetation key. NatureServe reviewed the classification, developed links between park vegetation types and the National Vegetation Classification System, and provided oversight to ensure the mapping effort was consistent with the USGS/NPS Vegetation Mapping Program. Using this classification, the Connecticut State Survey prepared the vegetation map by field-delineating the mapping units using GPS technology, with every polygon within Weir Farm visited by State Survey staff.

### Preliminary Data Collection and Review of Existing Information

In 1976, an ecological inventory (Weissman 1976) was performed on TNC property (the Weir Nature Preserve) adjoining Weir Farm. This was followed by a preliminary ecological survey of the main portion of the Weir Farm National Historic Site (Natural Diversity Data Base 1991) that was conducted as part of the Weir Farm General Management Plan (1995). The 1991 survey described the vegetation and their ecological habitats and provided a map delineating the fields, a recently logged area, and the five major vegetation types that are described in this report. The 1991 report also reported invasive plants concerns and observed heavy browse by white-tailed deer. More recently, the Brooklyn Botanical Garden conducted a botanical inventory of Weir Farm (Glenn 1998), in which several previously unrecorded State-listed plants were found.

### Aerial Photography Acquisition and Processing

Classifying vegetation to the association level requires aerial photography that is less than five years old and that is of sufficient resolution and detail to make it possible to classify the images to the association level. No such imagery for Weir Farm National Historic Site was identified, so in 2003 the NPS signed an agreement with the USDA Forest Service (William Frament, USDA Forest Service Northeastern Area State and Private Forestry, Durham, NH) to obtain new 'leaf-off' photography. The 2003 photography was evaluated following acquisition and was found to

be unacceptable for the intended purpose. Consequently, new photography was requested and obtained in 2004. Due to the delay in obtaining appropriate photography, the vegetation mapping process was started with older, existing photography until the new 1:8,000 scale color infrared aerial photography became available.

The photography was delivered to NCSU where the photos were inventoried, scanned, and placed in the air photo archive maintained at NCSU for the NPS Northeast Region Inventory and Monitoring Program. Associated data and information, including the camera calibration certificate, a shapefile of the photo centers, and a hard copy air photo index were also stored in the archive.

NCSU scanned the three color infrared aerial photographs at 600 dpi with 24-bit color depth and produced a photo mosaic. The scanned images of the air photos were imported into ERDAS Imagine 8.7 (.img) (Leica Geosystems Geospatial Imaging 2003) format where a photo block was created using as a reference USGS digital elevation models (DEM) and USGS digital orthophoto quadrangles (DOQQs).

In preparation for this step, the DEM was resampled from 30 meters to 10 meters and the DOQQs were mosaicked. The photo block was manipulated until it could be triangulated with a root mean square error of less than 1. At this point, single frame orthophotos (one for each air photo) were generated within Imagine and exported to Imagine .lan format. Then the .lan files were imported into ER Mapper's native (.ers) version 6.4 (Earth Resource Mapping Ltd. 2003) format, and an ER Mapper algorithm was created which contains the color balancing information and the cutlines created for the final mosaic. In ER Mapper a band interleaved by line (.bil) image and header file of the final mosaic was generated, the .bil image was imported into Imagine .img format, and, finally, the .img image was compressed using MrSID version 1.4 (LizardTech, Inc. 2000) software with a 20:1 compression ratio.

A metadata record for the mosaic was prepared according to current FGDC standards (FGDC 1998a). Metadata were produced in notepad and parsed using the USGS metadata compiler program (MP) to locate errors and omissions (USGS 2004). After all errors and omissions were corrected, MP was used to generate final TXT, HTML, and XML versions of each metadata record, and these are stored in the air photo archive. Key information for the Weir Farm National Historic Site mosaic is summarized in Table 1.

To facilitate the vegetation mapping that was already underway when the mosaic was completed, the mosaic was delivered to the State Geological and Natural History Survey of Connecticut in the Connecticut State Plane coordinate system (NAD83, feet). The final vegetation mapping products will be delivered in the appropriate UTM projection (NAD83, meters) according to national vegetation mapping standards.

Table 1. Summary of key information for the Weir Farm National Historic Site mosaic.

Title of metadata record:	Weir Farm National Historic Site Color Infrared Orthorectified Photomosaic (ERDAS Imagine 8.7 IMG and MrSID version 1.4 formats)
Publication date of mosaic (from metadata):	December 1, 2004
Date aerial photography was acquired:	May 12, 2004 (leaf-off conditions)
Vendor that provided aerial 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 delivered:	3
Archive location of air photos, camera calibration certificate, shapefile of photo centers, and hard copy air photo index:	North Carolina State University, Center for Earth Observation
Scanning specifications:	600 dpi, 24-bit color depth
Horizontal positional accuracy of mosaic:	3.85 meters, meets Class 2 National Map Accuracy Standard
Number of ground control points upon which estimated accuracy is based:	11
Method of calculating positional accuracy:	Root mean square error (RMSE)
Archive location of mosaic and metadata:	North Carolina State University, Center for Earth Observation
Format(s) of archived mosaic:	.img (uncompressed); MrSID (20:1 compression)

### Photointerpretation

Photointerpretation using the 2003 photos acquired for this project was not possible for reasons discussed above. Therefore, ecologists at the State Geological and Natural History Survey of Connecticut completed photointerpretation based on a review of Connecticut DEP 2001 black and white, 1:12,000 aerial photographs and field reconnaissance guided by NPS staff.

A formation-level vegetation map was not prepared during this project for several reasons. State Survey ecologists were familiar with vegetation of Weir Farm based upon previous vegetation mapping (Natural Diversity Data Base 1991) and the resultant vegetation map could be used to determine the location of vegetation sampling points. Since the area of natural vegetation of Weir Farm is small, the entire site was visited with the placement of vegetation plots guided by the 1991 map and the variability of vegetation and environmental condition observed on-site. Polygons that represented other land uses, such as residential and domestic grounds, managed fields, pond, and public roads, were noted and delineated using shape files supplied by the Weir Farm staff and attributed with names modified from the Anderson Level II categories (Anderson et al. 1976).

## Field Data Collection and Classification

Fieldwork followed methodology developed by TNC in conjunction with the USGS/NPS Vegetation Mapping Program (TNC and ESRI 1994b). The protocol suggested that each vegetation association should be sampled at least three times in order to capture the naturally occurring variation within the park, with roads, residential, and other Anderson Level II categories not sampled. The following is a summary of these methods as applied to Weir Farm National Historic Site.

Within sampled polygons, location of plots (Figure 2) suitable for vegetation description was based on the ability to collect information in the area that best represented the existing vegetation (Mueller-Dombois and Ellenberg 1974). All vegetation data were collected following NatureServe's accepted natural heritage sampling protocols (Strakosch-Walz 2000), with 20×20-m (65.6×65.6-ft) plots in forests and woodlands, 10×10-m (32.8×32.8-ft) plots in shrublands, and 5×5-m (16.4×16.4-ft) plots in herbaceous vegetation. The plot sampling data form used in this project is shown in Appendix A. The vegetation was visually divided into one of eight applicable strata: tree canopy (variable height), tree subcanopy (>5 m [16.4 ft] in height), tall shrub (2–5 m [6.6–16.4 ft]), short shrub (<2 m [6.6 ft]), dwarf shrub, herbaceous, non-vascular, and vines, as appropriate. The percent cover was estimated for each species in each stratum using modified Braun–Blanquet cover classes (Strakosch-Walz 2000). Specimens of species that were not identifiable in the field were collected for later identification. In addition to floristic information, the following environmental variables were recorded at each plot: slope, aspect, topographic position, hydrologic regime, soil stoniness, average soil texture, and soil drainage. Any unvegetated area of the plot was characterized by the exposed substrate. Observations were made to establish whether plots were representative of the surrounding vegetation. Other significant environmental information, such as landscape context, herbivory, stand health, recent disturbance, or evidence of historic disturbance was also obtained. The location of each plot was recorded with a Trimble Geoexplorer 2 global positioning system (GPS) unit in Connecticut State Plane Coordinates, with the datum set to North America 1983 (Conus). These data were re-projected to Universal Transverse-Mercator (UTM) coordinate system for the final map. Plot sampling was conducted in the fall of 2003 and spring of 2004. Data from the 29 vegetation plots were then entered into the NatureServe PLOTS 2.0 Database System on a Microsoft Access platform in 2005. Species were assigned standardized codes based on *The PLANTS database*, Version 3.5, developed by the Natural Resource Conservation Service in cooperation with the Biota of North America Program (USDA, NRCS 2004). For this report, some common names listed in *The PLANTS database* were changed to reflect the common names typically used by ecologists and resource managers in this region.

The common and scientific names of plants observed during the vegetation plot sampling are listed in Appendix B. Some tree and shrub seedlings and immature herbaceous plants could only be identified to the genus level and are therefore listed in the Appendix as such. Plot data, including a list of all species and their percent cover values, were exported from the PLOTS database into Excel in order to format them for PC-ORD version 4.0 Multivariate Analysis software (McCune and Mefford 1997).

## Location of Vegetation Plots

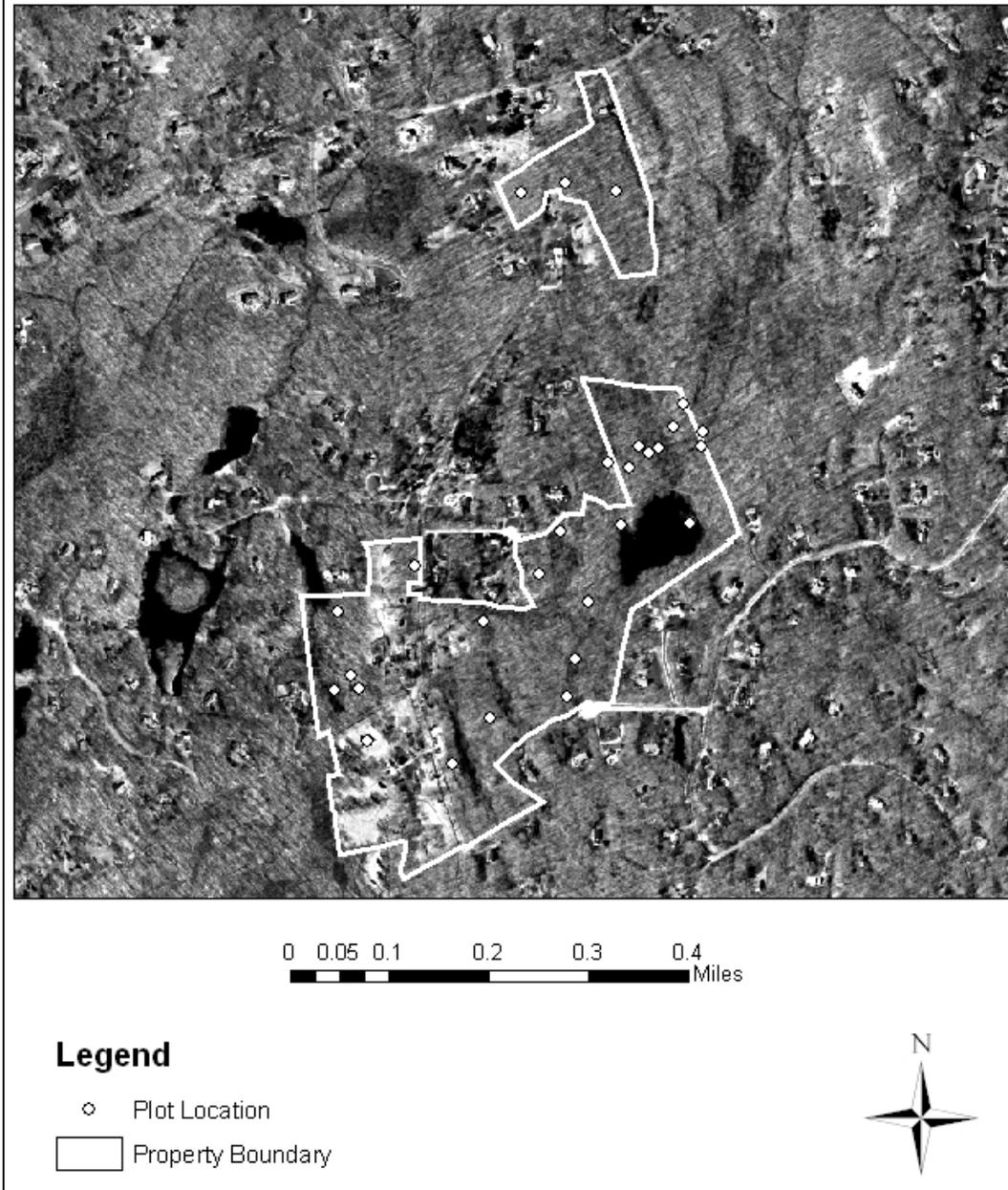


Figure 2. Location of vegetation plots sampled in Weir Farm National Historic Site for vegetation classification and mapping.

Species that were recorded in multiple layers, such as tree, shrub, and/or herbaceous, were treated as separate entries, or pseudospecies. Since many of the woody plants that were used to distinguish vegetation associations in the 1991 classification had been reduced to the herbaceous layer, we placed no limits on the pseudospecies in the analysis to emphasize the qualitative nature of the data. These data were then classified by floristic analysis using TWo-way INdicator SPecies ANalysis, TWINSPAN, a polythetic, divisive, hierarchical, dual classification method based on reciprocal averaging techniques (Hill 1979).

Given the apparent loss of structural and floristic diversity at Weir Farm by deer over-browse, the TWINSPAN analysis proved to be of minimal use in the determination of vegetation types because many of the physiognomic and floristic characteristics necessary for meaningful ordination were not present. Therefore, we utilized our familiarity with both the Connecticut vegetation classification and the 1991 vegetation mapping of Weir Farm and classified the present vegetation using a pre-determined correlation of habitat conditions and the presence of woody indicator species such as mapleleaf viburnum (*Viburnum acerifolium*), regardless of their structural position. Variants of the associations were determined also by field observations using readily visible changes in either shrub or herbaceous dominance in otherwise seemingly uniform habitat. Variants were named by these floristic differences (e.g. *Kalmia latifolia*, *Osmunda claytoniana* variants) to allow recognition of this distinction by the casual observer.

The final units were compared to both the Connecticut classification (Metzler and Barrett 2006) and existing USNVC associations that were similar in vegetation composition, structure, and environmental setting. With the exception of the shallow-to-bedrock managed grasslands characterized by little bluestem (*Schizachyrium scoparium*), new provisional association descriptions were prepared only if there was not a good match to those already described in the USNVC. Provisional associations were described based on the qualitative data collected at Weir Farm, as well as from plot data collected at the Saratoga National Historical Park in NY.

We also created a park-specific dichotomous key for the vegetation associations for use by the park natural resource managers and others (Appendix C). A dichotomous key is a tool for identifying unknown entities, in this case, vegetation associations. It is structured as 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.

### Vegetation Map Preparation

Mapping was conducted using a combination of aerial photointerpretation and field delineation using a Trimble ProXR GPS with a TSCe datalogger/display unit. This device, running TerraSync software, was extremely useful during the multiple visits because it allowed us to view and verify existing data while collecting new information. Since Weir Farm is a relatively small site, walking the perimeter of each vegetation type with a GPS unit delineated most mapping polygons. Other polygons, such as the Northeastern Buttonbush Shrub Swamp and the mountain laurel variants of several of the upland forests, were determined by the photointerpretation of the 2001 DEP black and white aerial photos (1:12,000). Lines were drawn

on acetate overlays on the photos and then screen-digitized in ArcView 3x. This combination of field-collected lines and interpreted polygons was converted into the final map.

### Accuracy Assessment

Two sources of potential error in the vegetation map include: 1) horizontal positional accuracy, in which a location on the photomosaic does not accurately align with the same location on the ground due to errors in orthorectification or triangulation; and 2) thematic accuracy, in which the vegetation type assigned to a particular location on the map does not correctly represent the vegetation at the same location in the park due to mapping error. The USGS/NPS Vegetation Mapping Program protocols (TNC and ESRI 1994c) were followed to assess the positional accuracy of the Weir Farm National Historic Site photomosaic and not followed to assess the thematic accuracy because all minimum mapping units and polygons were visited on this small site.

#### Positional Accuracy Assessment

The horizontal positional accuracy of the mosaic was assessed using guidelines of the USGS/NPS Vegetation Mapping Program (ESRI et al. 1994). Well-defined positional accuracy ground control points, spaced throughout all quadrants of the mosaic, were placed on the final 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 locations in the field and then recorded the coordinates with a Trimble Pro XR/XRS or GeoXT. Mapped ground control points that were physically inaccessible were also noted. The field crew correctly located and collected accuracy assessment data at 11 ground control points.<sup>1</sup> The coordinate data were collected with real time GPS and post-processed with differential correction using Pathfinder Office software. Prior to calculating accuracy, one ground control point, identified as an outlier with SAS's JMP program, was removed. For each of the 11 points, the field-collected "true" or "reference" GPS coordinates 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 and Minnesota Land Management Information Center 1999). Figure 3 shows the distribution of these 11 ground control points within the park and surrounding area.

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<sup>1</sup> USGS/NPS Vegetation Mapping Program guidelines recommend a minimum of 20 ground control points for accuracy assessment regardless of park size. NPS personnel were responsible for collecting accuracy assessment data for this park and provided ground control data for only 11 points.

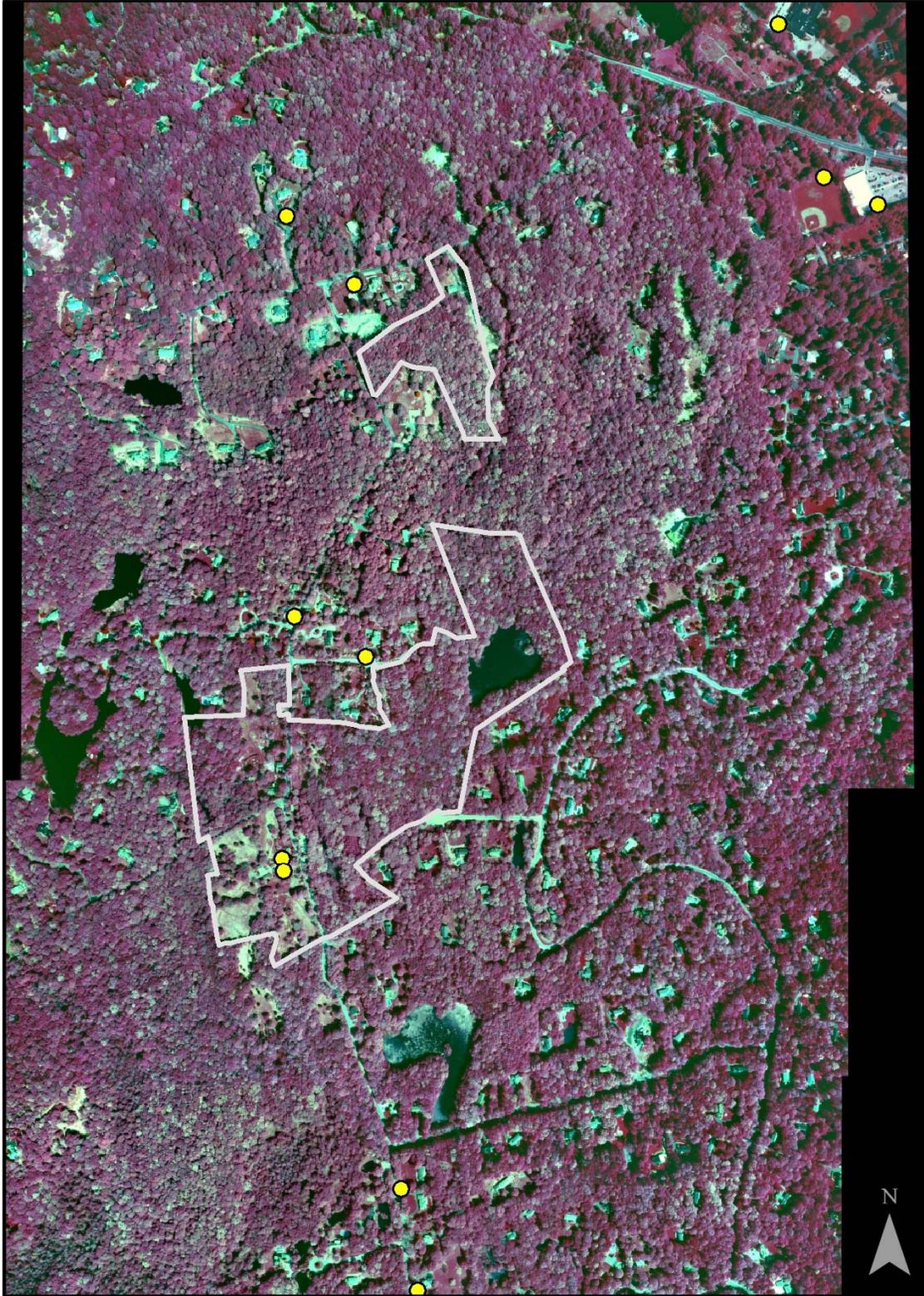


Figure 3. Ground control points (n=11) used to calculate horizontal positional accuracy of the Weir Farm National Historic Site mosaic.

## Thematic Accuracy Assessment

State Geological and Natural History Survey staff assessed the thematic accuracy of the vegetation map by field visiting each of the 86 polygons attributed with vegetation association names. Since the boundaries of nearly all of the polygons were field delineated using a Trimble ProXR GPS device, only the classification of each polygon was checked.



## Results

### Vegetation Classification and Characterization

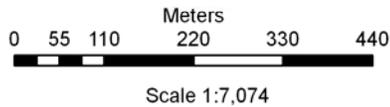
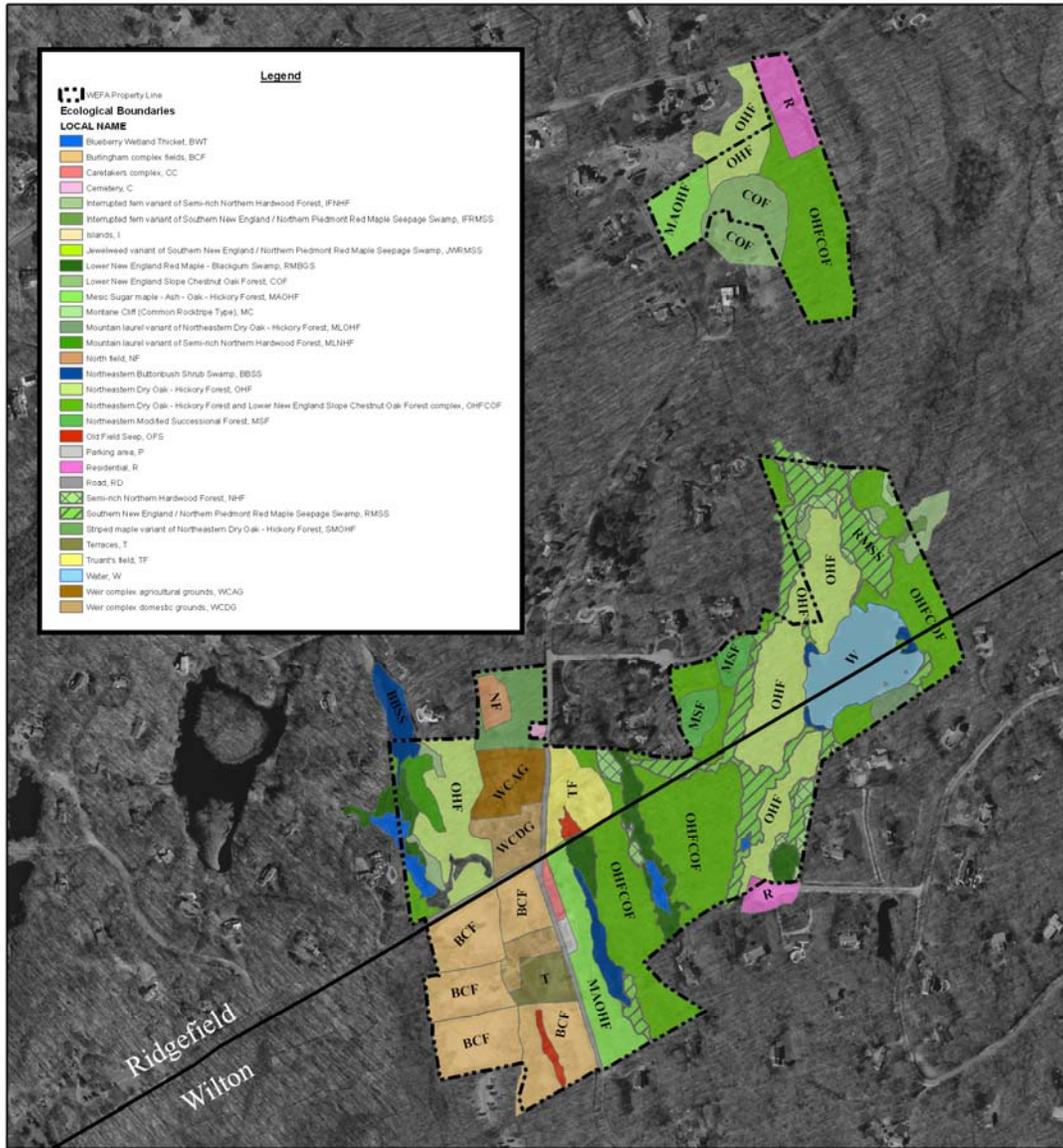
Thirteen vegetation associations describe the vegetation at Weir Farm National Historic Site (Figure 4). Nine of these are dominated by woody plants and were distributed over a soil moisture gradient. From the driest to wettest they are: Lower New England Slope Chestnut Oak Forest, Mesic Sugar Maple - Ash - Oak - Hickory Forest, Northeastern Dry Oak - Hickory Forest, Semi-rich Northern Hardwood Forest, Southern New England / Northern Piedmont Red Maple Seepage Swamp, Lower New England Red Maple - Blackgum Swamp, Blueberry Wetland Thicket, and Northeastern Buttonbush Shrub Swamp. One successional forest with sapling trees occurs in two adjacent polygons and is classified as a provisional Northeastern Modified Successional Forest. The four additional vegetation associations include one dominated by non-vascular plants that occurred exclusively on bedrock outcrops and cliff faces (Montane Cliff (Common Rocktripe Type)) and three anthropogenic types that occurred on managed sites: Northeastern Old Field and *Schizachyrium scoparium* in mowed fields and the provisional *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* shrubland (Old Field Seep) in the mowed herbaceous seeps. A summary of these types and their relationship to the USNVC is presented in Table 2.

As previously stated, the TWINSpan analysis for Weir Farm proved to be of minimal use in the determination of vegetation types since many of the physiognomic and floristic characteristics necessary for meaningful ordination were not present (Appendix D). There was a fairly clear separation of the upland and wetland types but within the upland forests, there was no clear cluster for the Semi-rich Northern Hardwood Forest. This is likely because, at Weir Farm, this community occurred as a narrow transition to wetland forests with an ecotone of upland and wetland species occurring within the plot. However, the presence of New York fern (*Thelypteris novaboracensis*) within this wetland transition was differential. Other plots that were misclassified and did not group well in this analysis included the successional forests, likely due to the diversity of tree species that have colonized the sites and the abundance of invasive plants in the understory. The Lower New England Slope Chestnut Oak Forest, which was based upon one description, also grouped poorly. This community is distinct from other vegetation types within Weir Farm, differentiated by a dwarf shrub layer of black huckleberry (*Gaylussacia baccata*) and presented no classification issues.

No plots were measured in the Blueberry Wetland Thicket during this study.

# Association-level Vegetation Map of the Weir Farm National Historic Site

Ridgefield and Wilton Townships, CT



**Map Notes:**

- Ecological Delineations, with the exceptions listed below were field delineated using a Trimble ProXR GPS and maintain an accuracy of +/- 3m
- Wetland Thickets and Mountain Laurel variants were photo interpreted using 2001 DEP black and white, 1:12000, aerial photos and then screen digitized.
- WEFA Property Boundaries and Roads were provided by NPS.
- Background political features were digitized from DEP base layers and maintain an accuracy of +/- 40ft.
- This map is to be used for reference purposes only.

Map prepared by Ken Metzler, March 2008

Figure 4. Association-level vegetation map of Weir Farm National Historic Site.

Table 2. Vegetation groups, park-specific common names, and corresponding USNVC associations.

Group	Park-specific Common Name	USNVC Association	USNVC Code
Upland Forests	Semi-rich Northern Hardwood Forest	<i>Acer saccharum</i> - ( <i>Fraxinus americana</i> ) / <i>Arisaema triphyllum</i> Forest	CEGL006211
	Northeastern Dry Oak - Hickory Forest	<i>Quercus (alba, rubra, velutina)</i> / <i>Cornus florida</i> / <i>Viburnum acerifolium</i> Forest	CEGL006336
	Lower New England Slope Chestnut Oak Forest	<i>Quercus prinus</i> - <i>Quercus (rubra, velutina)</i> / <i>Vaccinium angustifolium</i> Forest	CEGL006282
	Mesic Sugar Maple - Ash - Oak - Hickory Forest	<i>Acer saccharum</i> - <i>Quercus rubra</i> / <i>Hepatica nobilis</i> var. <i>obtusata</i> Forest	CEGL006046
	Northeastern Modified Successional Forest	<i>Prunus serotina</i> - <i>Liriodendron tulipifera</i> - <i>Acer rubrum</i> - <i>Fraxinus americana</i> Forest	CEGL006599
Wetland Forests	Lower New England Red Maple - Blackgum Swamp	<i>Acer rubrum</i> / <i>Rhododendron viscosum</i> - <i>Clethra alnifolia</i> community	CEGL006156
	Southern New England / Northern Piedmont Red Maple Seepage Swamp	<i>Acer rubrum</i> - <i>Fraxinus (pennsylvanica, americana)</i> / <i>Lindera benzoin</i> - <i>Symplocarpus foetidus</i> Forest	CEGL006406
Wetland Thickets	Blueberry Wetland Thicket	<i>Vaccinium corymbosum</i> - <i>Rhododendron viscosum</i> - <i>Clethra alnifolia</i> Shrubland	CEGL006371
	Northeastern Buttonbush Shrub Swamp	<i>Cephalanthus occidentalis</i> - <i>Decodon verticillatus</i> Shrubland	CEGL006069
Herbaceous Wetlands	Old Field Seep	<i>Spiraea tomentosa</i> - <i>Rubus</i> spp. / <i>Phalaris arundinacea</i> Shrubland	CEGL006571
Upland Non-forested Vegetation	Montane Cliff (Common Rocktripe Type)	<i>Unbilicaria mammulata</i> Non-vascular Vegetation	CEGL004387
	Northeastern Old Field	<i>Dactylis glomerata</i> - <i>Rumex acetocella</i> Herbaceous Vegetation	CEGL006107
	Little Bluestem Old Field	<i>Schizachyrium scoparium</i> - <i>Solidago</i> spp. Herbaceous Vegetation	CEGL006333

## Vegetation Association Descriptions

The following detailed local descriptions for the thirteen vegetation associations were written based on a combination of plot data and the ecologists' field experiences at Weir Farm National Historic Site and the surrounding area. The association descriptions contain information on their occurrence at Weir Farm (Local Description) and rangewide (Global Information). A bibliography for the global vegetation descriptions is listed in Appendix E. Although the local descriptions are specific to Weir Farm, the community names reflect the potential vegetation types as described in *Vegetation of Connecticut* (Metzler & Barrett, 2006). Representative photographs of each vegetation type are shown.

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 PLANTS 3.5 in only a very few cases, and when this difference occurs, synonymy is indicated parenthetically in the local description information. English names for associations and alliances use NatureServe Central Ecology-accepted names and may differ slightly from PLANTS 3.5 common names that are used within the local description information and throughout the rest of the report.

**COMMON NAME (PARK-SPECIFIC): SEMI-RICH NORTHERN HARDWOOD FOREST**

**SYNONYMS**

**USNVC English Name:** Sugar Maple - (White Ash) / Jack-in-the-Pulpit Forest  
**USNVC Scientific Name:** *Acer saccharum* - (*Fraxinus americana*) / *Arisaema triphyllum* Forest  
**USNVC Identifier:** CEGLO06211

**LOCAL INFORMATION**

**Environmental Description:** This forested community occurs in moist somewhat poorly drained soil as a narrow, transitional border along streambanks and wetland edges.

**Vegetation Description:** This forest type is distinguished by the co-occurrence of sugar maple (*Acer saccharum*) and white ash (*Fraxinus americana*) with a dominant ground cover of ferns. Tuliptree (*Liriodendron tulipifera*), red maple (*Acer rubrum*), and yellow birch (*Betula alleghaniensis*) also occur. Shrub cover is generally low and includes northern spicebush (*Lindera benzoin*), which is differential. Herbaceous plant cover is dense, with New York fern (*Thelypteris noveboracensis*) often a dominant. Co-occurring herbs at Weir Farm include additional ferns such as interrupted fern (*Osmunda claytoniana*), royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), and broad beech fern (*Phegopteris hexagonoptera*), as well as sedges (*Carex* spp.), nightcaps (*Anemone quinquefolia*), and Maryland sanicle (*Sanicula marilandica*).

**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>Fraxinus americana</i> (white ash), <i>Liriodendron tulipifera</i> (tuliptree)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Lindera benzoin</i> (northern spicebush)
Herb (field)	Fern or fern ally	<i>Osmunda claytoniana</i> (interrupted fern), <i>Thelypteris noveboracensis</i> (New York fern)

**Characteristic Species:** Information not available.

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR	1	Semi-rich Northern Hardwood Forest	Metzler and Barrett 2004

**Local Range:** This community occurs on the upland border of wetlands that receive groundwater seepage throughout Weir Farm.

**Classification Comments:** None.

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevés 10, 13, 14, 20, 25, 26.

**Weir Farm National Historic Site Inventory Notes:** This is the richest upland forest type at the Weir Farm site.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	<i>Acer saccharum</i> - <i>Fraxinus americana</i> - <i>Tilia americana</i> Forest Alliance (A.217)
Alliance (English name)	Sugar Maple - White Ash - American Basswood Forest Alliance
Association	<i>Acer saccharum</i> - ( <i>Fraxinus americana</i> ) / <i>Arisaema triphyllum</i> Forest
Association (English name)	Sugar Maple - (White Ash) / Jack-in-the-Pulpit Forest
<b>Ecological System(s):</b>	Laurentian-Acadian Northern Hardwoods Forest (CES201.564).

### GLOBAL DESCRIPTION

**Concept Summary:** Information not available.

**Environmental Description:** These are northern hardwood forests of slightly enriched soils in the northern Appalachian Mountains and adjacent northeastern United States and Canada. They occur at moderate elevations of 245–610 m (800–2,000 feet) on slightly enriched soils, often silt loams derived from pelite or other subacidic bedrock. Ridgetops and slight concavities on hillslopes are both typical settings.

**Vegetation Description:** The closed-canopy forest has sparse to moderate shrub cover, moderate herb cover, and may have local carpets of *Acer saccharum* (sugar maple) seedlings in the ground vegetation. Bryoids are a minor component of the forest floor. The canopy is dominated by *Acer saccharum* (sugar maple), with associated hardwood species including *Betula alleghaniensis* (yellow birch) and *Fraxinus americana* (white ash). *Fraxinus* may be a canopy codominant in some areas. *Fagus grandifolia* (American beech) is often present but less abundant than in matrix northern hardwood forests. Conifers are usually sparse. Shrubs can include *Cornus alternifolia* (alternateleaf dogwood), *Sambucus racemosa* (= *Sambucus pubens*, red elderberry), *Acer pensylvanicum* (striped maple), and *Ostrya virginiana* (hophornbeam). Typical herbs of this semi-rich type, which are scarce or absent from standard beech-birch-maple forests, include *Arisaema triphyllum* (Jack in the pulpit), *Viola rotundifolia* (roundleaf yellow violet), *Tiarella cordifolia* (heartleaf foamflower), *Actaea pachypoda* (white baneberry), *Botrychium* spp. (grapefern), and *Solidago flexicaulis* (zigzag goldenrod).

### 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>Fraxinus americana</i> (white ash), <i>Acer saccharum</i> (sugar maple)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer pensylvanicum</i> (striped maple), <i>Cornus alternifolia</i> (alternateleaf dogwood), <i>Ostrya virginiana</i> (hophornbeam), <i>Sambucus racemosa</i> (= <i>Sambucus pubens</i> , red elderberry)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	
Herb (field)	Forb	<i>Arisaema triphyllum</i> (Jack in the pulpit)

**Characteristic Species:** *Acer saccharum* (sugar maple), *Arisaema triphyllum* (Jack in the pulpit).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Not applicable.

## **DISTRIBUTION**

**Range:** Information not available.

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

**Federal Lands:** NPS (Marsh-Billings-Rockefeller, Saint-Gaudens, Upper Delaware, Weir Farm).

## **CONSERVATION STATUS**

**Rank:** G4 (7-Dec-2005).

**Reasons:** This association is fairly well-distributed in northern New England and adjacent Canada.

## **CLASSIFICATION INFORMATION**

**Status:** Standard.

**Confidence:** 2 - Moderate.

**Comments:** Information not available.

### **Similar Associations:**

- *Acer saccharum* - *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* Forest (CEGL006252).
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* / *Acer spicatum* / *Caulophyllum thalictroides* Forest (CEGL005008).

### **Related Concepts:**

- Mesic Northern Hardwood Forest (Beech-Birch-Maple Forest)? (Thompson 1996) B
- Semi-rich Northern Hardwood Forest (NAP pers. comm. 1998) ?
- Sugar Maple: 27 (Eyre 1980) B

## **SOURCES**

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

**References:** Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Gawler 2002, Metzler and Barrett 2001, Metzler and Barrett 2004, NAP pers. comm. 1998, Spurduto and Nichols 2004, Thompson 1996, Thompson and Sorenson 2000.



Figure 5. Semi-rich Northern Hardwood Forest at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629762, northing 4568871.

**COMMON NAME (PARK-SPECIFIC): NORTHEASTERN MODIFIED SUCCESSIONAL FOREST**

**SYNONYMS**

**USNVC English Name:** Black Cherry - Tuliptree - Red Maple - White Ash Forest

**USNVC Scientific Name:** *Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* Forest

**USNVC Identifier:** CEGLO06599

**LOCAL INFORMATION**

**Environmental Description:** Information not available.

**Vegetation Description:** There are several reverting fields on the Weir Farm site. Sweet birch (*Betula lenta*) saplings are dominant, with several other small trees intermixed, such as shagbark hickory (*Carya ovata*), sugar maple (*Acer saccharum*), northern red oak (*Quercus rubra*), and red maple (*Acer rubrum*). The understory is composed primarily of eastern poison ivy (*Toxicodendron radicans*) and dewberry (*Rubus* sp.) interspersed with nonnative invasive plants. Without active management, these areas will soon become a tangle of oriental bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), and garlic mustard (*Alliaria petiolata*).

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula lenta</i> (sweet birch), <i>Carya ovata</i> (shagbark hickory)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Berberis thunbergii</i> (Japanese barberry), <i>Celastrus orbiculatus</i> (oriental bittersweet)
Herb (field)	Forb	<i>Alliaria petiolata</i> (garlic mustard)

**Characteristic Species:** *Betula lenta* (sweet birch).

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR		[not crosswalked]	

**Local Range:** Restricted to two areas adjacent to residential lands just west of the Weir Farm pond.

**Classification Comments:** None.

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevé 27, 28.

**Weir Farm National Historic Site Inventory Notes:** Without active management, these areas will soon become a tangle of oriental bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), and garlic mustard (*Alliaria petiolata*).

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	<i>Prunus serotina</i> - <i>Acer rubrum</i> - <i>Amelanchier canadensis</i> - <i>Quercus</i> spp. Forest Alliance (A.237)
Alliance (English name)	Black Cherry - Red Maple - Canada Serviceberry - Oak species Forest Alliance
Association	<i>Prunus serotina</i> - <i>Liriodendron tulipifera</i> - <i>Acer rubrum</i> - <i>Fraxinus americana</i> Forest
Association (English name)	Black Cherry - Tuliptree - Red Maple - White Ash Forest
<b>Ecological System(s):</b>	Central Appalachian Dry Oak-Pine Forest (CES202.591). Northeastern Interior Dry-Mesic Oak Forest (CES202.592).

### GLOBAL DESCRIPTION

**Concept Summary:** This early successional woody vegetation of the northeastern United States occurs on sites that are becoming reforested after having been cleared for agriculture.

Environmental setting varies, but generally sites are dry-mesic to mesic, with small seepage inclusions in some examples. Physiognomy of this vegetation is highly variable, ranging from closed forest, open forest, tall dense shrubland, to more open tall shrubland. Early successional woody species dominate the canopy in a widely variable mix, depending on geographic location. Tree species often include some combination of *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), and *Acer rubrum* (red maple). Other associates can include *Juglans nigra* (black walnut), *Sassafras albidum* (sassafras), *Betula populifolia* (gray birch), *Juniperus virginiana* (eastern redcedar), *Acer negundo* (boxelder), *Acer saccharinum* (silver maple), *Ailanthus altissima* (tree of heaven), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Amelanchier* (serviceberry) spp., *Pinus strobus* (eastern white pine), and *Populus grandidentata* (bigtooth aspen). Other woody species may contribute to the canopy or form a tall-shrub layer, including *Lindera benzoin* (northern spicebush) and *Carpinus caroliniana* (American hornbeam). The low-shrub layer, if present, is usually characterized by the presence of *Rubus* (blackberry) spp. such as *Rubus flagellaris* (northern dewberry), *Rubus allegheniensis* (Allegheny blackberry), *Rubus phoenicolasius* (wine raspberry), or *Rubus hispidus* (bristly dewberry). This layer is often dominated by exotic species such as *Lonicera tatarica* (Tatarian honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Rhamnus cathartica* (common buckthorn), *Crataegus* (hawthorn) spp., *Rosa multiflora* (multiflora rose), and *Berberis thunbergii* (Japanese barberry). The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. Common species include *Ageratina altissima* var. *altissima* (white snakeroot), *Polygonum persicaria* (spotted ladythumb), *Impatiens capensis* (jewelweed), *Glechoma hederacea* (ground ivy), *Polystichum acrostichoides* (Christmas fern), *Calystegia sepium* ssp. *sepium* (hedge false bindweed), *Galium aparine* (stickywilly), *Oxalis stricta* (common yellow oxalis), *Polygonum virginianum* (jumpseed), *Dennstaedtia punctilobula* (eastern hayscented fern), *Arisaema triphyllum* (Jack in the pulpit), *Allium vineale* (wild garlic), and *Veronica officinalis* (common gypsyweed), among many others. The invasive species *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum caespitosum* (oriental ladythumb) can be abundant in this disturbed forest type. Vines can be absent or

abundant. In stands with high vine cover, the vegetation structure can be altered by the weight of the vines pulling down trees and shrubs. Common vines include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), *Vitis labrusca* (fox grape), and the invasive vines *Celastrus orbiculata* (oriental bittersweet) and *Lonicera japonica* (Japanese honeysuckle). These forests are often young and resulted from the colonization of old agricultural fields by woody species. Recent disturbance or abundant invasive species give these forest stands a weedy character. It is unlikely that these stands will succeed to a natural plant community dominated by native species.

**Environmental Description:** This vegetation occurs on sites that have been cleared for agriculture or otherwise heavily modified in the past. Generally, sites are dry-mesic and may have small seepage inclusions in some examples. Occasionally, this type may occur in formerly agricultural bottomlands, in which case the soils may be temporarily flooded or saturated.

**Vegetation Description:** Early successional woody species dominate the canopy in a widely variable mix, depending on geographic location. Tree species often include some combination of *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), and *Acer rubrum* (red maple). Other associates can include *Juglans nigra* (black walnut), *Sassafras albidum* (sassafras), *Betula populifolia* (gray birch), *Juniperus virginiana* (eastern redcedar), *Acer negundo* (boxelder), *Acer saccharinum* (silver maple), *Ailanthus altissima* (tree of heaven), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Amelanchier* (serviceberry) spp., *Pinus strobus* (eastern white pine), and *Populus grandidentata* (bigtooth aspen). Other woody species may contribute to the canopy or form a tall-shrub layer, including *Lindera benzoin* (northern spicebush) and *Carpinus caroliniana* (American hornbeam). The low-shrub layer, if present, is usually characterized by the presence of *Rubus* (blackberry) spp. such as *Rubus flagellaris* (northern dewberry), *Rubus allegheniensis* (Allegheny blackberry), *Rubus phoenicolasius* (wine raspberry), or *Rubus hispida* (bristly dewberry). This layer is often dominated by exotic species such as *Lonicera tatarica*, *Lonicera morrowii* (Morrow's honeysuckle), *Rhamnus cathartica* (common buckthorn), *Crataegus* (hawthorn) spp., *Rosa multiflora* (multiflora rose), and *Berberis thunbergii* (Japanese barberry). The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. Common species include *Ageratina altissima* var. *altissima* (white snakeroot), *Polygonum persicaria* (spotted ladythumb), *Impatiens capensis* (jewelweed), *Glechoma hederacea* (ground ivy), *Polystichum acrostichoides* (Christmas fern), *Calystegia sepium* ssp. *sepium* (hedge false bindweed), *Galium aparine* (stickywilly), *Oxalis stricta* (common yellow oxalis), *Polygonum virginianum* (jumpseed), *Dennstaedtia punctilobula* (eastern hayscented fern), *Arisaema triphyllum* (Jack in the pulpit), *Allium vineale* (wild garlic), and *Veronica officinalis* (common gypsyweed), among many others. The invasive species *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum caespitosum* (oriental ladythumb) can be abundant in this disturbed forest type. Vines can be absent or abundant. In stands with high vine cover, the vegetation structure can be altered by the weight of the vines pulling down trees and shrubs. Common vines include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), *Vitis labrusca* (fox grape), and the invasive vines *Celastrus orbiculata* (oriental bittersweet) and *Lonicera japonica* (Japanese honeysuckle).

### 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>Fraxinus americana</i> (white ash), <i>Liriodendron tulipifera</i> (tuliptree), <i>Prunus serotina</i> (black cherry), <i>Robinia pseudoacacia</i> (black locust)
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Carpinus caroliniana</i> (American hornbeam)
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Lindera benzoin</i> (northern spicebush), <i>Rosa multiflora</i> (multiflora rose)
Herb (field)	Forb	<i>Alliaria petiolata</i> (garlic mustard), <i>Polygonum persicaria</i> (spotted ladysthumb)
Herb (field)	Graminoid	<i>Microstegium vimineum</i> (Nepalese browntop)

**Characteristic Species:** *Acer rubrum* (red maple), *Alliaria petiolata* (garlic mustard), *Berberis thunbergii* (Japanese barberry), *Elaeagnus umbellata* (autumn olive), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tuliptree), *Microstegium vimineum* (Nepalese browntop), *Polygonum persicaria* (spotted ladysthumb), *Prunus serotina* (black cherry), *Robinia pseudoacacia* (black locust), *Rosa multiflora* (multiflora rose), *Rubus allegheniensis* (Allegheny blackberry).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Not applicable.

### DISTRIBUTION

**Range:** This vegetation is currently described from Pennsylvania, New York, and New Jersey but is of broader distribution in the northeastern U.S.

**States/Provinces:** CT, NJ, NY, PA.

**Federal Lands:** NPS (Allegheny Portage Railroad, Delaware Water Gap, Fort Necessity, Friendship Hill, Gateway, Gettysburg, Johnstown Flood, Morristown, Upper Delaware, Valley Forge, Weir Farm); USFWS (Great Meadows?).

### CONSERVATION STATUS

**Rank:** GNA (ruderal) (29-Nov-2004).

**Reasons:** This vegetation is modified by human activity and not of conservation concern.

### CLASSIFICATION INFORMATION

**Status:** Standard.

**Confidence:** 2 - Moderate.

**Comments:** This vegetation is broadly defined and varies widely in composition across its range, presenting a classification challenge at the alliance level.

### Similar Associations:

- *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221)--is more strongly dominated by *Liriodendron* and is generally in a later successional state as evidenced by taller trees and more closed canopy.
- *Prunus serotina* - *Sassafras albidum* - (*Fraxinus americana*) / *Juniperus virginiana* Forest (CEGL004133).
- *Robinia pseudoacacia* Forest (CEGL007279).

**Related Concepts:** Information not available.

## SOURCES

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

**References:** Eastern Ecology Working Group n.d., Ehrenfeld 1977, Fike 1999, Perles et al. 2005c, Podniesinski et al. 2006.



Figure 6. Northeastern Modified Successional Forest at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629500, northing 4568642.



**COMMON NAME (PARK-SPECIFIC): NORTHEASTERN DRY OAK - HICKORY FOREST**

**SYNONYMS**

**USNVC English Name:** (White Oak, Northern Red Oak, Black Oak) / Flowering Dogwood / Mapleleaf Viburnum Forest

**USNVC Scientific Name:** *Quercus (alba, rubra, velutina)* / *Cornus florida* / *Viburnum acerifolium* Forest

**USNVC Identifier:** CEGLO06336

**LOCAL INFORMATION**

**Environmental Description:** This forest type occurs on moderately deep, acidic loamy soils, often in a midslope position.

**Vegetation Description:** Tree cover forms a nearly continuous canopy and is dominated by a mixture of trees, including northern red oak (*Quercus rubra*), sweet birch (*Betula lenta*), maples (*Acer* spp.), and hickories (*Carya* spp.). Due to the heavy deer browse, the shrub layer is very poorly developed. Typically, this community is characterized by the dominance of mapleleaf viburnum (*Viburnum acerifolium*) in the shrub layer, but due to heavy browse it is only found here in the herb layer. Several shrubs that can be found here in low numbers include American hornbeam (*Carpinus caroliniana*), American witchhazel (*Hamamelis virginiana*), and highbush blueberry (*Vaccinium corymbosum*). In some areas adjacent to wetlands, uncharacteristic shrubs such as northern spicebush (*Lindera benzoin*) and coastal sweetpepperbush (*Clethra alnifolia*) occur. Eastern hayscented fern (*Dennstaedtia punctilobula*) often occurs as large patches, reflecting the disturbed nature of the site.

A variant of this community (White oak - Red hickory / Striped maple (*Quercus alba* - *Carya ovalis* / *Acer pensylvanicum* variant, relevés 16, 17) occurs in a small area north of the Weir complex. This area has a dense canopy of numerous species, including white, northern red, scarlet, and black oaks (*Quercus alba*, *Q. rubra*, *Q. coccinea*, *Q. velutina*), red and shagbark hickory (*Carya ovalis*, *C. ovata*), black cherry (*Prunus serotina*), and tuliptree (*Liriodendron tulipifera*). Striped maple (*Acer pensylvanicum*) shrubs and saplings are conspicuous. Additional shrubs include American witchhazel (*Hamamelis virginiana*) and highbush blueberry (*Vaccinium corymbosum*). The herbaceous layer is variable both in terms of cover and composition. Sedges, including Pennsylvania sedge (*Carex pensylvanica*), Swan's sedge (*Carex swanii*), rosy sedge (*Carex rosea*), white edge sedge (*Carex debilis*), and common woodrush (*Luzula multiflora*), are intermixed with white wood aster (*Eurybia divaricata*) and wreath goldenrod (*Solidago caesia*).

**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 lenta</i> (sweet birch), <i>Quercus rubra</i> (northern red oak)
Herb (field)	Fern or fern ally	<i>Dennstaedtia punctilobula</i> (eastern hayscented fern)

**Characteristic Species:** *Viburnum acerifolium* (mapleleaf viburnum).

**Other Noteworthy Species:** Information not available.

### Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	StateName	Reference
CT	SNR		<i>Quercus rubra</i> / <i>Viburnum acerifolium</i> community	Metzler and Barrett 2001

**Local Range:** The Northern red oak / Mapleleaf viburnum community is the most widely distributed forest community in Weir Farm.

**Classification Comments:** This community is recognized by its habitat and occurrence, although rather sparse, of *Viburnum acerifolium* (mapleleaf viburnum).

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevés 1, 3, 8, 9, 12, 16, 17, 23.

**Weir Farm National Historic Site Inventory Notes:** This community is very over-browsed, often with an herbaceous layer dominated by eastern hayscented fern (*Dennstaedtia punctilobula*).

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	<i>Quercus alba</i> - ( <i>Quercus rubra</i> , <i>Carya</i> spp.) Forest Alliance (A.239)
Alliance (English name)	White Oak - (Northern Red Oak, Hickory species) Forest Alliance
Association	<i>Quercus (alba, rubra, velutina)</i> / <i>Cornus florida</i> / <i>Viburnum acerifolium</i> Forest
Association (English name)	(White Oak, Northern Red Oak, Black Oak) / Flowering Dogwood / Mapleleaf Viburnum Forest
<b>Ecological System(s):</b>	Northern Atlantic Coastal Plain Dry Hardwood Forest (CES203.475). Northeastern Interior Dry-Mesic Oak Forest (CES202.592).

### GLOBAL DESCRIPTION

**Concept Summary:** This northeastern oak-hickory forest occurs on well-drained loamy sand of midslopes. 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 alba* (= *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* (= *Smilacina racemosa*, 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* (= *Aster divaricatus*, 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 alba* (= *Carya tomentosa*, mockernut hickory), and *Carya ovalis* (red hickory). Other canopy associates may 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* (= *Smilacina racemosa*, 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* (panicledleaf ticktrefoil), *Melampyrum lineare* (narrowleaf cowwheat), *Chimaphila maculata* (striped prince's pine), *Eurybia divaricata* (= *Aster divaricatus*, white wood aster), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), *Dennstaedtia punctilobula* (eastern hayscented fern), *Aureolaria* (false foxglove) spp., *Pteridium aquilinum* (western brackenfern), 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 alba* (= *Carya tomentosa*, mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Cornus florida* (flowering dogwood), *Gaylussacia baccata* (black huckleberry), *Maianthemum racemosum* (= *Smilacina racemosa*, 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.

### DISTRIBUTION

**Range:** This association occurs from Maine to Virginia.

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

**Federal Lands:** NPS (Booker T. Washington, Cape Cod, Delaware Water Gap, Fort Necessity, Fredericksburg-Spotsylvania, Gettysburg, Minute Man, Morristown, Prince William?, 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, coccinea)* - *Carya (alba, glabra)* / *Vaccinium pallidum* Piedmont Dry-Mesic Forest (CEGL008475)--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 CEGL006375.

- *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.
- *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.

**Related Concepts:**

- *Quercus (alba, rubra, velutina)* / *Cornus florida* - *Viburnum acerifolium* Forest (Bartgis 1986) =
- *Quercus montana* - *Quercus rubra* - *Carya (ovalis, glabra)* / *Viburnum acerifolium* Forest (Fleming pers. comm.) ?
- Mesic Coastal Plain mixed oak forest (Breden 1989) ?
- Northeastern Acidic Oak-Hickory Forest (Fleming et al. 2004) ?
- 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 et al. 2004, Fleming pers. comm., Gawler 2002, Harrison 2004, Hunt 1997a, MENHP 1991, McCoy and Fleming 2000, Metzler and Barrett 2001, Patterson pers. comm., Rawinski 1984, Sperduto 1997b, Sperduto and Nichols 2004, Swain and Kearsley 2001, VDNH 2003.



Figure 7. Northeastern Dry Oak - Hickory Forest at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629615, northing 4568571.

**COMMON NAME (PARK-SPECIFIC): LOWER NEW ENGLAND SLOPE CHESTNUT OAK FOREST**

**SYNONYMS**

**USNVC English Name:** Chestnut Oak - (Northern Red Oak, Black Oak) / Northern Lowbush Blueberry Forest

**USNVC Scientific Name:** *Quercus prinus* - *Quercus (rubra, velutina)* / *Vaccinium angustifolium* Forest

**USNVC Identifier:** C EGL006282

**LOCAL INFORMATION**

**Environmental Description:** This forest type occurs on nearly level to sloping, well-drained loamy acidic soils, often on or near bedrock outcrops.

**Vegetation Description:** The tree canopy can range from nearly continuous to relatively open, depending on the soil conditions on the site with black oak (*Quercus velutina*) and chestnut oak (*Quercus prinus*) often dominant. Co-occurring tree species include white oak (*Quercus alba*), red maple (*Acer rubrum*), and sweet birch (*Betula lenta*). The low-shrub layer is composed of black huckleberry (*Gaylussacia baccata*) and Blue Ridge blueberry (*Vaccinium pallidum*). The high-shrub layer is variable in terms of both cover and composition and may include American witchhazel (*Hamamelis virginiana*), northern bayberry (*Morella pensylvanica*), and highbush blueberry (*Vaccinium corymbosum*). In some areas, mountain laurel (*Kalmia latifolia*) is dominant. Such areas have been delineated as the mountain laurel (*Kalmia latifolia*) variant of this community. The herbaceous layer cover is generally low with a patchy distribution and includes ground-pines (*Lycopodium* spp.), narrowleaf cowwheat (*Melampyrum lineare*), poverty oatgrass (*Danthonia spicata*), and oak (*Quercus* spp.) and maple (*Acer* spp.) seedlings.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus prinus</i> (chestnut oak), <i>Quercus velutina</i> (black oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Gaylussacia baccata</i> (black huckleberry), <i>Vaccinium pallidum</i> (Blue Ridge blueberry)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i> (mountain laurel)
Herb (field)	Graminoid	<i>Danthonia spicata</i> (poverty oatgrass)
Herb (field)		<i>Melampyrum lineare</i> (narrowleaf cowwheat)

**Characteristic Species:** *Danthonia spicata* (poverty oatgrass), *Gaylussacia baccata* (black huckleberry), *Melampyrum lineare* (narrowleaf cowwheat), *Quercus prinus* (chestnut oak), *Quercus velutina* (black oak).

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR*		<i>Quercus velutina</i> - <i>Q. prinus</i> / <i>Gaylussacia baccata</i> community	Metzler and Barrett 2001

**Local Range:** The Black oak - Chestnut oak / Black huckleberry community has limited distribution in Weir Farm being restricted to bedrock outcrops with shallow soils.

**Classification Comments:** None.

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevés 5, 15, 18, 24.

**Weir Farm National Historic Site Inventory Notes:** None.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	<i>Quercus prinus</i> - ( <i>Quercus coccinea</i> , <i>Quercus velutina</i> ) Forest Alliance (A.248)
Alliance (English name)	Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
Association	<i>Quercus prinus</i> - <i>Quercus (rubra, velutina)</i> / <i>Vaccinium angustifolium</i> Forest
Association (English name)	Chestnut Oak - (Northern Red Oak, Black Oak) / Northern Lowbush Blueberry Forest
<b>Ecological System(s):</b>	Central Appalachian Dry Oak-Pine Forest (CES202.591).

### GLOBAL DESCRIPTION

**Concept Summary:** This dry to xeric oak-heath forest of central and southern New England ranges south to the northern Piedmont and central Appalachian Mountains. It occurs on upper slopes and ridgetops with thin, nutrient-poor, acidic soils. Windthrow, fire, and ice damage are common natural disturbances. The canopy is closed to partially open and is dominated by *Quercus prinus* (chestnut oak), which can be codominant with *Quercus rubra* (northern red oak). *Quercus alba* (white oak), *Quercus velutina* (black oak), and *Acer rubrum* (red maple) are common associates, with other less-frequent trees including *Betula lenta* (sweet birch), *Quercus coccinea* (scarlet oak), *Amelanchier arborea* (common serviceberry), *Pinus rigida* (pitch pine), and *Pinus strobus* (eastern white pine). *Sassafras albidum* (sassafras), *Cornus florida* (flowering dogwood), and *Nyssa sylvatica* (blackgum) can be minor associates at the southern and western portions of the range. The low-shrub layer is well-developed and comprised chiefly of ericaceous species, including *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Gaylussacia baccata* (black huckleberry), or *Kalmia angustifolia* (mountain laurel). A tall-shrub layer is often lacking but when present may include *Castanea dentata* (American chestnut), *Kalmia latifolia* (mountain laurel), *Viburnum acerifolium* (mapleleaf viburnum), *Hamamelis virginiana* (American witchhazel), *Quercus ilicifolia* (bear oak), and *Viburnum prunifolium* (blackhaw). *Ilex montana* (mountain holly), *Rhododendron prinophyllum* (early azalea), and *Menziesia pilosa* (minniebush) are minor shrub associates at the southern end of the range. The herbaceous layer is of sparse to moderate cover, depending on shrub cover, and may include *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Ageratina altissima* var. *altissima* (white snakeroot), *Antennaria plantaginifolia* (woman's tobacco), *Aralia nudicaulis* (wild sarsaparilla), *Aureolaria laevigata* (entireleaf yellow false foxglove), *Gaultheria procumbens* (eastern teaberry), *Chimaphila maculata* (striped prince's pine), *Carex rosea* (rosy sedge), *Carex swanii* (Swan's sedge), *Carex pennsylvanica* (Pennsylvania sedge), *Corydalis sempervirens* (rock harlequin), *Comandra umbellata* (bastard toadflax), *Cypripedium acaule* (moccasin flower), *Dryopteris marginalis* (marginal woodfern), *Epigaea repens* (trailing arbutus), *Goodyera pubescens* (downy rattlesnake plantain), *Hieracium venosum* (rattlesnakeweed), *Lycopodium clavatum* (running clubmoss), *Medeola virginiana* (Indian

cucumber), *Melampyrum lineare* (narrowleaf cove-wheat), *Monotropa uniflora* (Indianpipe), *Potentilla canadensis* (dwarf cinquefoil), *Pteridium aquilinum* (western brackenfern), and *Uvularia sessilifolia* (sessileleaf bellwort).

**Environmental Description:** This forest generally occurs on xeric upper slopes and ridgetops and steep sideslopes with shallow, acidic, rocky, infertile soils. Windthrow, fire, and ice storms are common natural disturbances in these habitats.

**Vegetation Description:** The canopy is closed to partially open and dominated by *Quercus prinus* (chestnut oak), which can be codominant with *Quercus rubra* (northern red oak). *Quercus alba* (white oak), *Quercus velutina* (black oak), and *Acer rubrum* (red maple) are common associates, with other less-frequent trees including *Betula lenta* (sweet birch), *Quercus coccinea* (scarlet oak), *Amelanchier arborea* (Common serviceberry), *Pinus rigida* (pitch pine), and *Pinus strobus* (eastern white pine). *Sassafras albidum* (sassafras), *Cornus florida* (flowering dogwood), and *Nyssa sylvatica* (blackgum) can be minor associates at the southern and western portions of the range. The low-shrub layer is well-developed and comprised chiefly of ericaceous species, including *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Gaylussacia baccata* (black huckleberry), or *Kalmia angustifolia* (mountain laurel). A tall-shrub layer is often lacking but when present may include *Castanea dentata* (American chestnut), *Kalmia latifolia* (mountain laurel), *Viburnum acerifolium* (mapleleaf viburnum), *Hamamelis virginiana* (American witchhazel), *Quercus ilicifolia* (bear oak), and *Viburnum prunifolium* (blackhaw). *Ilex montana* (mountain holly), *Rhododendron prinophyllum* (early azalea), and *Menziesia pilosa* (minniebush) are minor shrub associates at the southern end of the range. The herbaceous layer is of sparse to moderate cover, depending on shrub cover, and may include *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Ageratina altissima* var. *altissima* (white snakeroot), *Antennaria plantaginifolia* (woman's tobacco), *Aralia nudicaulis* (wild sarsaparilla), *Aureolaria laevigata* (entireleaf yellow false foxglove), *Gaultheria procumbens* (eastern teaberry), *Chimaphila maculata* (striped prince's pine), *Carex rosea* (rosy sedge), *Carex swanii* (Swan's sedge), *Carex pensylvanica*, *Corydalis sempervirens* (rock harlequin), *Comandra umbellata* (bastard toadflax), *Cypripedium acaule* (moccasin flower), *Dryopteris marginalis* (marginal woodfern), *Epigaea repens* (trailing arbutus), *Goodyera pubescens* (downy rattlesnake plantain), *Hieracium venosum* (rattlesnakeweed), *Lycopodium clavatum* (running clubmoss), *Medeola virginiana* (Indian cucumber), *Melampyrum lineare* (narrowleaf cove-wheat), *Monotropa uniflora* (Indianpipe), *Potentilla canadensis* (dwarf cinquefoil), *Pteridium aquilinum* (western brackenfern), and *Uvularia sessilifolia* (sessileleaf bellwort).

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus prinus</i> (chestnut oak), <i>Quercus rubra</i> (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Vaccinium angustifolium</i> (lowbush blueberry), <i>Vaccinium pallidum</i> (Blue Ridge blueberry)
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia baccata</i> (black huckleberry), <i>Vaccinium stamineum</i> (deerberry)
Herb (field)	Forb	<i>Aralia nudicaulis</i> (wild sarsaparilla)
Herb (field)	Graminoid	<i>Carex pensylvanica</i> (Pennsylvania sedge)
Herb (field)	Fern or fern ally	<i>Pteridium aquilinum</i> (western brackenfern)

**Characteristic Species:** *Acer rubrum* (red maple), *Amelanchier arborea* (common serviceberry), *Aralia nudicaulis* (wild sarsaparilla), *Carex pensylvanica* (Pennsylvania sedge), *Castanea dentata* (American chestnut), *Danthonia spicata* (poverty oatgrass), *Deschampsia flexuosa* (wavy hairgrass), *Gaultheria procumbens* (eastern teaberry), *Gaylussacia baccata* (black huckleberry), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Pteridium aquilinum* (western brackenfern), *Quercus coccinea* (scarlet oak), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Sassafras albidum* (sassafras), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Not applicable.

#### DISTRIBUTION

**Range:** This community ranges from southern Maine through the Central Appalachians to higher elevations in Virginia and West Virginia, and north more locally in the Piedmont.

**States/Provinces:** CT, DE, MA, MD, ME, NH, NJ:S3S4, NY, PA, RI, VA, VT, WV.

**Federal Lands:** NPS (Delaware Water Gap, Harpers Ferry, Rock Creek, Upper Delaware, Valley Forge, Weir Farm); USFS (George Washington, Jefferson).

#### CONSERVATION STATUS

**Rank:** G5 (1-Oct-2001).

**Reasons:** This is a very widely distributed oak / ericad forest that covers large areas.

#### CLASSIFICATION INFORMATION

**Status:** Standard.

**Confidence:** 2 - Moderate.

**Comments:** This community type is closely related to other oak / heath. It is distinguished by the presence of northern species, such as *Pinus strobus* (eastern white pine) and *Vaccinium angustifolium* (lowbush blueberry), and its general lack of southern Appalachian species, such as *Gaylussacia ursina* (bear huckleberry), *Leucothoe recurva* (redtwig doghobble), and *Galax urceolata* (beetleweed). In comparison to *Quercus prinus* - *Quercus* (*alba*, *coccinea*, *velutina*) / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023), it lacks *Oxydendrum arboreum*, *Pinus echinata* (shortleaf pine), and *Pinus virginiana* (Virginia pine). It occupies poorer sites and has a more abundant ericaceous shrub component than *Quercus prinus* - *Quercus rubra* / *Hamamelis virginiana* Forest (CEGL006057) and *Quercus prinus* - *Quercus velutina* / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL008522). The Chestnut Oak / Low-Elevation Subtype of Virginia intergrades with the more southern *Quercus* (*pinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271) throughout west-central Virginia. A well-developed Piedmont example of the Chestnut Oak / Low-Elevation Subtype is described by Allard and Leonard (1943). The Chestnut Oak - Northern Red Oak / High-Elevation Subtype of Virginia is similar to *Quercus rubra* - (*Quercus prinus*, *Quercus velutina*) / *Rhododendron periclymenoides* / *Lysimachia quadrifolia* - *Hieracium paniculatum* Forest (CEGL008523) of high-elevation granitic terrain on the northern Blue Ridge, but lacks *Quercus velutina* (black oak), *Rhododendron periclymenoides* (pink azalea), and the suite of low-cover herbaceous species characteristic of mineral soil microhabitats in that unit. The recognition of global subtypes equivalent to two distinct state community types is well supported by quantitative analysis of compositional and environmental

data. Further study may support the elevation of these subtypes to full association-level status in the USNVC.

**Similar Associations:**

- *Quercus (alba, rubra, velutina) / Cornus florida / Viburnum acerifolium* Forest (CEGL006336)--is similar to the more mesic end of the range of variation found in this type at Valley Forge National Historical Park.
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271)--of Southern Appalachians.
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299).
- *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)--of Western Alleghenies, Interior Low Plateau, etc.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057).
- *Quercus prinus - Quercus rubra / Vaccinium pallidum - (Rhododendron periclymenoides)* Forest (CEGL008523).
- *Quercus prinus - Quercus spp. / Vaccinium arboreum - (Kalmia latifolia, Styrax grandifolius)* Forest (CEGL007700).
- *Quercus prinus - Quercus velutina / Oxydendrum arboreum - Cornus florida* Forest (CEGL008522).

**Related Concepts:**

- *Quercus (prinus, rubra) / Calamagrostis porteri* Ridgetop Forest (Walton et al. 1997) ?
- *Quercus prinus - Quercus rubra / Acer pensylvanicum* Association: *Betula lenta / Ilex montana* Subassociation (Fleming and Moorhead 1996) ?
- *Quercus prinus - Quercus rubra / Kalmia latifolia / Vaccinium angustifolium - Gaultheria procumbens* Forest (Fleming and Coulling 2001) F
- *Quercus velutina - (Quercus prinus)* Forest (Metzler and Barrett 1996) ?
- CNE dry hardwood forest on acidic bedrock or till (Rawinski 1984) ?
- Chestnut Oak Forest (Breden 1989) =
- Chestnut Oak: 44 (Eyre 1980) B
- Dry Oak Woodland (Thompson 1996) B
- SNE dry oak/pine forests on acidic bedrock or till (Rawinski 1984) B
- SNE mesic oak/pine forest on acidic bedrock or till (Rawinski 1984) ?

**SOURCES**

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

**References:** Allard and Leonard 1943, Breden 1989, Breden et al. 2001, Clancy 1996, Collins and Anderson 1994, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming et al. 2001, Gawler 2002, Harrison 2004, Harshberger 1919, Hunt 1997a, Kasmer et al. 1984, Keever 1973, Metzler and Barrett 1996, Metzler and Barrett 2001, Nerurkar 1974, Overlease 1978, Overlease 1987, Pearson 1963, Pearson 1974, Pearson 1979, Rawinski 1984, Rawinski et al. 1994, Rawinski et al. 1996, Russell and Schuyler 1988, Shreve et al. 1910, Sperduto 1997a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Thompson 1996, Thompson and Sorenson 2000, Vanderhorst 2000b, Walton et al. 1997.



Figure 8. Lower New England Slope Chestnut Oak Forest at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629747, northing 4568936.

**COMMON NAME (PARK-SPECIFIC): MESIC SUGAR MAPLE - ASH - OAK - HICKORY FOREST**

**SYNONYMS**

**USNVC English Name:** Sugar Maple - Northern Red Oak / Round-lobe Liverleaf Forest

**USNVC Scientific Name:** *Acer saccharum* - *Quercus rubra* / *Hepatica nobilis* var. *obtusa* Forest

**USNVC Identifier:** CEG006046

**LOCAL INFORMATION**

**Environmental Description:** This forested community occurs on dry, rich slopes.

**Vegetation Description:** In contrast to the Black oak - Chestnut oak / Black huckleberry forest, this community is dominated by sugar maple (*Acer saccharum*) with an admixture of northern red oak (*Quercus rubra*), white ash (*Fraxinus americana*), sweet birch (*Betula lenta*), and red maple (*Acer rubrum*). Shrub cover is relatively sparse, primarily sugar maple saplings and an occasional American hornbeam (*Carpinus caroliniana*). Herbaceous plant cover is poorly represented due to heavy browse by white-tailed deer (*Odocoileus virginianus*). Conspicuous species include Pennsylvania, broad looseflower, rosy and spreading sedges (*Carex pensylvanica*, *C. laxiflora*, *C. rosea*, *C. laxiculmis*), scattered wreath goldenrod (*Solidago caesia*), Canada mayflower (*Maianthemum canadense*), Christmas fern (*Polystichum acrostichoides*), and abundant garlic mustard (*Alliaria petiolata*).

**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>Betula lenta</i> (sweet birch), <i>Fraxinus americana</i> (white ash), <i>Quercus rubra</i> (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Carpinus caroliniana</i> (American hornbeam) <i>Acer saccharum</i> (sugar maple)
Herb (field)	Graminoid	<i>Carex laxiculmis</i> (spreading sedge), <i>Carex laxiflora</i> (broad looseflower sedge), <i>Carex rosea</i> (rosy sedge)
Herb (field)	Fern or fern ally	<i>Polystichum acrostichoides</i> (Christmas fern)
Herb (field)		<i>Solidago caesia</i> (wreath goldenrod)

**Characteristic Species:** *Acer saccharum* (sugar maple), *Carex laxiflora* (broad looseflower sedge), *Carpinus caroliniana* (American hornbeam), *Fraxinus americana* (white ash), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Solidago caesia* (wreath goldenrod).

**Other Noteworthy Species:** *Alliaria petiolata* (garlic mustard).

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR	1	<i>Acer saccharum</i> - <i>Fraxinus americana</i> / <i>Hepatica nobilis</i> var. <i>obtusa</i> community	Metzler and Barrett 2004

**Local Range:** This community is restricted to the slope east of the parking area and to a small area to the east of Nod Hill Road on the northern parcel.

**Classification Comments:** This community is recognized by the tree canopy of sugar maple (*Acer saccharum*) and white ash (*Fraxinus americana*) mixed with northern red oak (*Quercus*

*rubra*) and the presence of nutrient indicators such as wreath goldenrod (*Solidago caesia*) and broad looseflower sedge (*Carex laxiflora*).

**Other Comments:** Information not available.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevés 21, 22.

**Weir Farm National Historic Site Inventory Notes:** Garlic mustard (*Alliaria petiolata*) is a problematic invasive species in much of this community.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	<i>Quercus rubra</i> - ( <i>Acer saccharum</i> ) Forest Alliance (A.251)
Alliance (English name)	Northern Red Oak - (Sugar Maple) Forest Alliance
Association	<i>Acer saccharum</i> - <i>Quercus rubra</i> / <i>Hepatica nobilis</i> var. <i>obtusata</i> Forest
Association (English name)	Sugar Maple - Northern Red Oak / Round-lobe Liverleaf Forest
<b>Ecological System(s):</b>	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593).

### GLOBAL DESCRIPTION

**Concept Summary:** These are forests of well-drained to moist and often on very rocky slopes. *Fraxinus americana* (white ash) and *Acer saccharum* (sugar maple) are common in the tree canopy, with *Quercus rubra* (northern red oak), *Carya ovata* (shagbark hickory), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Quercus velutina* (black oak), *Tilia americana* (American basswood), *Betula lenta* (sweet birch), and *Quercus alba* (white oak) as associates. *Tsuga canadensis* (eastern hemlock) can be occasional. *Ostrya virginiana* (hophornbeam) and *Carpinus caroliniana* (American hornbeam) can form a prominent subcanopy. The shrub layer includes *Hamamelis virginiana* (American witchhazel), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum recognitum* (northern arrow-wood), *Cornus florida* (flowering dogwood), *Corylus cornuta* (beaked hazelnut), and *Lindera benzoin* (northern spicebush). The herb layer is often quite diverse with *Carex platyphylla* (broadleaf sedge), *Carex pedunculata* (longstalk sedge), *Carex blanda* (eastern woodland sedge), *Carex laxiflora* (broad looseflower sedge), *Actaea rubra* (red baneberry), *Polygonatum pubescens* (hairy Solomon's seal), *Phegopteris hexagonoptera* (= *Thelypteris hexagonoptera*, broad beechfern), *Viola rotundifolia* (roundleaf yellow violet), *Thalictrum dioicum* (early meadow-rue), *Hepatica nobilis* var. *obtusata* (= *Hepatica americana*, roundlobe hepatica), *Thalictrum thalictroides* (= *Anemonella thalictroides*, rue anemone), *Festuca subverticillata* (nodding fescue), *Actaea pachypoda* (white baneberry), *Viola sororia* (common blue violet), *Arabis* (rockcress) spp., *Packera obovata* (= *Senecio obovatus*, roundleaf ragwort), and *Arisaema triphyllum* (Jack in the pulpit).

**Environmental Description:** These are forests of well-drained to moist and often on very rocky slopes.

**Vegetation Description:** *Fraxinus americana* (white ash) and *Acer saccharum* (sugar maple) are common in the tree canopy, with *Quercus rubra* (northern red oak), *Carya ovata* (shagbark hickory), *Carya glabra* (pignut hickory), *Carya ovalis* (red hickory), *Quercus velutina* (black hickory), *Tilia americana* (American basswood), *Betula lenta* (sweet birch), and *Quercus alba* (white oak) as associates. *Tsuga canadensis* (eastern hemlock) can be occasional. *Ostrya*

*virginiana* (hophornbeam) and *Carpinus caroliniana* (American hornbeam) can form a prominent subcanopy. The shrub layer includes *Hamamelis virginiana* (American witchhazel), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum recognitum* (northern arrow-wood), *Cornus florida* (flowering dogwood), *Corylus cornuta* (beaked hazelnut), and *Lindera benzoin* (northern spicebush). The herb layer is often quite diverse with *Carex platyphylla* (broadleaf sedge), *Carex pedunculata* (longstalk sedge), *Carex blanda* (eastern woodland sedge), *Carex laxiflora* (broad looseflower sedge), *Actaea rubra* (red baneberry), *Polygonatum pubescens* (hairy Solomon's seal), *Phegopteris hexagonoptera* (= *Thelypteris hexagonoptera*, broad beechfern), *Viola rotundifolia* (roundleaf yellow violet), *Thalictrum dioicum* (early meadow-rue), *Hepatica nobilis* var. *obtusata* (= *Hepatica americana*, roundlobe hepatica), *Thalictrum thalictroides* (= *Anemonella thalictroides*, rue anemone), *Festuca subverticillata* (nodding fescue), *Actaea pachypoda* (white baneberry), *Viola sororia* (common blue violet), *Arabis* (rockcress) spp., *Packera obovata* (= *Senecio obovatus*, roundleaf ragwort), and *Arisaema triphyllum* (Jack in the pulpit).

**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>Fraxinus americana</i> (white ash)
Tree subcanopy	Broad-leaved deciduous tree	<i>Carpinus caroliniana</i> (American hornbeam), <i>Ostrya virginiana</i> (hophornbeam)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Cornus florida</i> (flowering dogwood)
Shrub/sapling	Broad-leaved deciduous shrub	<i>Corylus cornuta</i> (beaked hazelnut), <i>Hamamelis virginiana</i> (American hazelnut), <i>Lindera benzoin</i> (northern spicebush), <i>Viburnum acerifolium</i> (mapleleaf viburnum), <i>Viburnum recognitum</i> (northern arrow-wood)

**Characteristic Species:** *Acer saccharum* (sugar maple), *Arisaema triphyllum* (Jack in the pulpit), *Fraxinus americana* (white ash), *Hepatica nobilis* var. *obtusata* (= *Hepatica americana*, roundlobe hepatica).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Not applicable.

**DISTRIBUTION**

**Range:** Currently described from central and southern New England in Connecticut, Massachusetts, and New Hampshire.

**States/Provinces:** CT, MA, NH, VT.

**Federal Lands:** NPS (Weir Farm).

**CONSERVATION STATUS**

**Rank:** GNR (1-Dec-1997).

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard.

**Confidence:** 3 - Weak.

**Comments:** Information not available.

**Similar Associations:**

- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus* spp. Forest (CEGL006236).

**Related Concepts:**

- *Acer saccharum* / *Hepatica americana* Community (Metzler and Barrett 1996) =
- CNE mesic hardwood forest on acidic bedrock/till (Rawinski 1984) B
- SNE dry rich forest on acidic/circumneutral bedrock or till (Rawinski 1984) ?

**SOURCES**

**Description Authors:** Eastern Ecology Group.

**References:** Damman and Kershner 1977, Eastern Ecology Working Group n.d., Metzler and Barrett 1996, Metzler and Barrett 2001, Metzler and Barrett 2004, Rawinski 1984, Spurduto 1997a, Swain and Kearsley 2001, Thompson and Sorenson 2000.



Figure 9. Mesic Sugar Maple - Ash - Oak - Hickory Forest at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629396, northing 4568303.

**COMMON NAME (PARK-SPECIFIC): SOUTHERN NEW ENGLAND / NORTHERN  
PIEDMONT RED MAPLE SEEPAGE SWAMP**

**SYNONYMS**

**USNVC English Name:** Red Maple - (Green Ash, White Ash) / Northern Spicebush / Skunk-cabbage Forest

**USNVC Scientific Name:** *Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest

**USNVC Identifier:** C EGL006406

**LOCAL INFORMATION**

**Environmental Description:** This community occurs in poorly drained mineral soils along small streams that receive seepage water.

**Vegetation Description:** Tree cover is very high (80–95%) with red maple (*Acer rubrum*) dominant. American elm (*Ulmus americana*), birches (*Betula* spp.), and green ash (*Fraxinus pennsylvanica*) are frequent associates. The dominant shrub in this community is northern spicebush (*Lindera benzoin*), although coastal sweetpepperbush (*Clethra alnifolia*) and highbush blueberry (*Vaccinium corymbosum*) can often occur. The herb layer usually has high diversity, and dominance changes depending on the season. In the spring, skunk cabbage (*Symplocarpus foetidus*) is often dominant. Later in the vegetative season, ferns such as cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), bromelike and other sedges (*Carex bromoides*, *Carex* spp.), jewelweed (*Impatiens capensis*), and numerous other herbs commonly occur.

Two variants of this community occur at the Weir Farm site: The interrupted fern variant is distinguished by the abundance of interrupted fern (*Osmunda claytoniana*). These seeps receive groundwater discharge during heavy rains. Sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), tuliptree (*Liriodendron tulipifera*), and sweet birch (*Betula lenta*) form a dense canopy over northern spicebush (*Lindera benzoin*), scattered American witchhazel (*Hamamelis virginiana*), and sapling trees. Additional herbaceous plants include graceful sedge (*Carex gracillima*), greater bladder sedge (*Carex intumescens*), spreading sedge (*Carex laxiculmis*), green false hellebore (*Veratrum viride*), and broad beechfern (*Phegopteris hexagonoptera*).

The jewelweed variant occurs just west of the Weir Farm domestic grounds. This variant receives storm water runoff from Pelham Lane and has created a wet disturbed habitat, with the herbaceous layer dominated by jewelweed (*Impatiens capensis*), eastern poison ivy (*Toxicodendron radicans*), and garlic mustard (*Alliaria petiolata*).

**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>Fraxinus pennsylvanica</i> (green ash), <i>Ulmus americana</i> (American elm)
Shrub/sapling (tall & short)		<i>Lindera benzoin</i> (northern spicebush)
Herb (field)	Forb	<i>Impatiens capensis</i> (jewelweed), <i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)	Fern or fern ally	<i>Onoclea sensibilis</i> (sensitive fern)
Herb (field)		<i>Carex bromoides</i> (bromelike sedge)

**Characteristic Species:** *Acer rubrum* (red maple), *Carex bromoides* (bromelike sedge), *Fraxinus pennsylvanica* (green ash), *Onoclea sensibilis* (sensitive fern), *Symplocarpus foetidus* (skink cabbage).

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR	1	<i>Acer rubrum</i> / <i>Lindera benzoin</i> community	Metzler and Barrett 2001

**Local Range:** This community occupies all stream drainages in Weir Farm.

**Classification Comments:** None.

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevés 4, 11.

**Weir Farm National Historic Site Inventory Notes:** None.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Seasonally flooded cold-deciduous forest (I.B.2.N.e.)
Alliance	<i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> Seasonally Flooded Forest Alliance (A.316)
Alliance (English name)	Red Maple - Green Ash Seasonally Flooded Forest Alliance
Association	<i>Acer rubrum</i> - <i>Fraxinus</i> ( <i>pennsylvanica</i> , <i>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
<b>Ecological System(s):</b>	Atlantic Coastal Plain Northern Basin Swamp and Wet Hardwood Forest (CES203.520). North-Central Appalachian Acidic Swamp (CES202.604).

### GLOBAL DESCRIPTION

**Concept Summary:** This association is an acidic seepage swamp of southern New England and the northern Piedmont dominated by *Acer rubrum* (red maple). It generally occurs in seasonally 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 acidic and have some seepage indicators but are not particularly species-rich. Soils are shallow to moderately deep mucks over mineral soils. *Acer rubrum* (red maple) dominates the canopy; *Fraxinus pennsylvanica* (green ash) or *Fraxinus americana* (white ash) are usually also found in the canopy. *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 arrow-wood), and *Viburnum nudum* var. *cassinoides* (= *Viburnum 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), *Veratrum viride* (green false hellebore), *Pilea pumila* (Canadian clearweed), and *Glyceria* (mannagrass ) spp. 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 non-vascular species can include *Plagiomnium cuspidatum* (= *Mnium 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 an acidic seepage swamp of southern New England and adjacent areas dominated by *Acer rubrum* (red maple). It generally occurs in seasonally 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 acidic and have some seepage indicators but are not particularly species-rich. Soils are shallow to moderately deep mucks over mineral soils.

**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), *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 arrow-wood), and *Viburnum nudum* var. *cassinoides* (= *Viburnum 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), *Veratrum viride* (green false hellebore), *Pilea pumila* (Canadian clearweed), and *Glyceria* (mannagrass) spp. 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 non-vascular species can include *Plagiomnium cuspidatum* (= *Mnium 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.

**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 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, DE?, MA, MD, NH, NJ:S3S5, NY, PA, RI, VA, VT.

**Federal Lands:** NPS (Delaware Water Gap, Fort Necessity, Minute Man, Morristown, Upper Delaware, Weir Farm); USFWS (Great Meadows?).

**CONSERVATION STATUS**

**Rank:** G4G5 (25-Jun-1998).

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard.

**Confidence:** 1 - Strong.

**Comments:** Information not available.

**Similar Associations:**

- *Acer rubrum* - *Betula alleghaniensis* / *Lindera benzoin* Forest (CEGL006936).
- *Acer rubrum* - *Fraxinus nigra* - (*Tsuga canadensis*) / *Tiarella cordifolia* Forest (CEGL006502).
- *Acer rubrum* - *Fraxinus pennsylvanica* - *Magnolia virginiana* / *Clethra alnifolia* - *Lindera benzoin* Forest (CEGL006964).
- *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220).
- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156).

**Related Concepts:**

- Inland Red Maple Swamp (Breden 1989) B
- 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.

**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, Rawinski 1984, Reschke 1990, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000.



Figure 10. Southern New England / Northern Piedmont Red Maple Seepage Swamp at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629552, northing 4568656.



**COMMON NAME (PARK-SPECIFIC): LOWER NEW ENGLAND RED MAPLE - BLACKGUM SWAMP**

**SYNONYMS**

**USNVC English Name:** Red Maple / Swamp Azalea - Coastal Sweetpepperbush Forest  
**USNVC Scientific Name:** *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest  
**USNVC Identifier:** CEGL006156

**LOCAL INFORMATION**

**Environmental Description:** This forested swamp occurs in very poorly drained soils in undrained wetland depressions. The water table has seasonal fluctuation, with standing water usually present during the summer months, particularly after heavy rain.

**Vegetation Description:** The tree canopy is relatively open with red maple (*Acer rubrum*) dominant, often mixed with green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), and/or blackgum (*Nyssa sylvatica*). Common winterberry (*Ilex verticillata*) and highbush blueberry (*Vaccinium corymbosum*) are characteristic, and coastal sweetpepperbush (*Clethra alnifolia*) can often be dominant. The herbaceous layer is sporadic, with species such as skunk cabbage (*Symplocarpus foetidus*), jewelweed (*Impatiens capensis*), upright sedge (*Carex stricta*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), and several mosses occurring on hummocks.

**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>Fraxinus pennsylvanica</i> (green ash), <i>Nyssa sylvatica</i> (blackgum), <i>Ulmus americana</i> (American elm)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Clethra alnifolia</i> (coastal sweetpepperbush), <i>Ilex verticillata</i> (common winterberry), <i>Vaccinium corymbosum</i> (highbush blueberry)
Herb (field)	Forb	<i>Impatiens capensis</i> (jewelweed), <i>Symplocarpus foetidus</i> (skunk cabbage)
Herb (field)		<i>Carex stricta</i> (upright sedge)

**Characteristic Species:** *Acer rubrum* (red maple), *Carex stricta* (upright sedge), *Fraxinus pennsylvanica* (green ash), *Ilex verticillata* (common winterberry), *Nyssa sylvatica* (blackgum), *Vaccinium corymbosum* (highbush blueberry).

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR*		Lower New England Red Maple - Blackgum Swamp	Metzler and Barrett 2001

**Local Range:** Information not available.

**Classification Comments:** This community grades into the common winterberry - highbush blueberry shrub thicket.

**Other Comments:** Information not available.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevé 2, 6, 7.

**Weir Farm National Historic Site Inventory Notes:** None.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Saturated cold-deciduous forest (I.B.2.N.g.)
Alliance	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> Saturated Forest Alliance (A.348)
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
<b>Ecological System(s):</b>	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), *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 arrow-wood), *Viburnum*

*nudum* var. *cassinoides* (= *Viburnum cassinoides*, with-rod), *Spiraea alba* var. *latifolia* (= *Spiraea latifolia*, white meadowsweet), *Rosa palustris* (swamp rose), *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, RI.

**Federal Lands:** NPS (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.

**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) B
- Southern New England acidic seepage swamp, Black gum 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, Metzler and Barrett 1996, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Sperduto 2000a, Swain and Kearsley 2000, Thompson and Jenkins 1992.



Figure 11. Lower New England Red Maple - Blackgum Swamp at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629421, northing 4568567.

**COMMON NAME (PARK-SPECIFIC): OLD FIELD SEEP**

**SYNONYMS**

**USNVC English Name:** Steeplebush - Blackberry species / Reed Canarygrass Shrubland  
**USNVC Scientific Name:** *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Shrubland  
**USNVC Identifier:** C EGL006571

**LOCAL INFORMATION**

**Environmental Description:** This community occurs in low-lying areas in managed fields that receive groundwater discharge.

**Vegetation Description:** The seeps in the Burlingham and Truant's fields are variable in species composition. The Burlingham field is composed primarily of graminoids, including graceful sedge (*Carex gracillima*), fowl mannagrass (*Glyceria striata*), deertongue (*Dichanthelium clandestinum*), whitegrass (*Leersia virginica*), and Nepalese browntop (*Microstegium vimineum*). Additional plants such as eastern poison ivy (*Toxicodendron radicans*), wild basil (*Clinopodium vulgare*), and northern dewberry (*Rubus flagellaris*) are also conspicuous.

The Truant's field seep is markedly different, composed primarily of grasses and sedges, intermixed with fall composites, including reed canarygrass (*Phalaris arundinacea*), deertongue (*Dichanthelium clandestinum*), woolgrass (*Scirpus cyperinus*), owlfruit sedge (*Carex stipata*), shallow sedge (*Carex lurida*), flat-top goldentop (*Euthamia graminifolia*), wrinkleleaf goldenrod (*Solidago rugosa*), parasol whitetop (*Doellingeria umbellata*), smooth blue aster (*Symphyotrichum laeve*), and others. Several shrubs and vines also occur, including multiflora rose (*Rosa multiflora*) and Virginia creeper (*Parthenocissus quinquefolia*).

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex gracillima</i> (graceful sedge), <i>Dichanthelium clandestinum</i> (deertongue), <i>Phalaris arundinacea</i> (reed canarygrass)

**Characteristic Species:** *Carex gracillima* (graceful sedge).

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR		[not crosswalked]	

**Local Range:** Information not available.

**Classification Comments:** None.

**Other Comments:** The Burlingham field should be mowed in the late summer to prevent seed set by Nepalese browntop (*Microstegium vimineum*) in order to control its spread.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevé 33, 34.

**Weir Farm National Historic Site Inventory Notes:** None.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Spiraea tomentosa</i> - <i>Rubus</i> spp. Seasonally Flooded Shrubland Alliance (A.3022)
Alliance (English name)	Steeplebush - Blackberry species Seasonally Flooded Shrubland Alliance
Association	<i>Spiraea tomentosa</i> - <i>Rubus</i> spp. / <i>Phalaris arundinacea</i> Shrubland
Association (English name)	Steeplebush - Blackberry species / Reed Canarygrass Shrubland
<b>Ecological System(s):</b>	Information not available.

### GLOBAL DESCRIPTION

**Concept Summary:** This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, or beaver-impacted wetlands. The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Shrub species usually include *Spiraea tomentosa* (steeplebush), *Spiraea alba* var. *alba* (white meadowsweet), *Cornus amomum* (silky dogwood), *Rubus allegheniensis* (Allegheny blackberry), *Rubus hispidus* (bristly dewberry), *Salix* (willow) spp., and others. *Hypericum densiflorum* (bushy St. Johnswort) often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* (Morrow's noneysuckle) and *Rosa multiflora* (multiflora rose) may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea* (reed canarygrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Solidago canadensis* (Canada goldenrod), *Juncus effusus* (common rush), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Leersia oryzoides* (whitegrass), *Carex scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex lurida* (shallow sedge), *Carex lupulina* (hop sedge), *Carex vulpinoidea* (fox sedge), *Carex trichocarpa* (hairyfruit sedge), *Vernonia noveboracensis* (New York ironweed), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lycopus uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Eupatorium maculatum* (spotted joepeyeweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Eleocharis* (spikerush) spp., and others. The invasive species *Microstegium vimineum* (Nepalese browntop), *Lythrum salicaria* (purple loosestrife), and *Phragmites australis* (common reed) can be abundant or form monocultures in these wetlands.

**Environmental Description:** This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, or beaver-impacted wetlands. These wetlands typically flood early in the growing season and may be saturated to near the surface for some of the growing season, but they are generally dry for much of the year. The substrate is typically mineral soil with a layer of muck at the surface.

**Vegetation Description:** The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Within each wetland, species may be locally abundant and often have patchy distribution. Shrub species usually include *Spiraea tomentosa* (steeplebush), *Spiraea alba* var. *alba* (white meadowsweet), *Cornus amomum* (silky dogwood), *Rubus allegheniensis* (Allegheny blackberry), *Rubus hispidus* (bristly dewberry), *Salix* (willow) spp., and others. *Hypericum densiflorum* (bushy St. Johnswort) often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* (Morrow's honeysuckle) and *Rosa*

*multiflora* (multiflora rose) may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea* (reed canarygrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Solidago canadensis* (Canada goldenrod), *Juncus effusus* (common rush), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Leersia oryzoides* (whitegrass), *Carex scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex lurida* (shallow sedge), *Carex lupulina* (hop sedge), *Carex vulpinoidea* (fox sedge), *Carex trichocarpa* (hairyfruit sedge), *Vernonia noveboracensis* (New York ironweed), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lycopus uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Eupatorium maculatum* (spotted joepeyeweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Eleocharis* (spikerush) spp., and others. The invasive species *Microstegium vimineum* (Nepalese browntop), *Lythrum salicaria* (purple loosestrife), and *Phragmites australis* (common reed) can be abundant or form monocultures in these wetlands.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus allegheniensis</i> (Allegheny blackberry), <i>Spiraea alba</i> var. <i>alba</i> (white meadowsweet), <i>Spiraea tomentosa</i> (steeplebush)
Herb (field)	Forb	<i>Solidago canadensis</i> (Canada goldenrod), <i>Solidago rugosa</i> (wrinkleleaf goldenrod)
Herb (field)	Graminoid	<i>Leersia oryzoides</i> (whitegrass), <i>Phalaris arundinacea</i> (reed canarygrass)

**Characteristic Species:** *Polygonum sagittatum* (arrowleaf tearthumb), *Rubus allegheniensis* (Allegheny blackberry).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Not applicable.

**DISTRIBUTION**

**Range:** Although this vegetation is widespread, its range has not been evaluated. It is known from the Central Appalachian ecoregion, the High Alleghany Plateau, and the Lower New England / Northern Piedmont ecoregions, and is likely in others.

**States/Provinces:** CT, NJ, NY, PA.

**Federal Lands:** NPS (Allegheny Portage Railroad, Delaware Water Gap, Johnstown Flood, Upper Delaware, Weir Farm); USFWS (Assabet River?, Great Meadows?, Great Swamp, Parker River?).

**CONSERVATION STATUS**

**Rank:** GNR (8-Jul-1999).

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard.

**Confidence:** 2 - Moderate.

**Comments:** Information not available.

**Similar Associations:** Information not available.

**Related Concepts:** Information not available.

**SOURCES**

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

**References:** Decker 1955, Eastern Ecology Working Group n.d., Fike 1999, NatureServe and Russell 2003.



Figure 12. Old Field Seep at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629343, northing 4568527.

**COMMON NAME (PARK-SPECIFIC): BLUEBERRY WETLAND THICKET**

**SYNONYMS**

**USNVC English Name:** Highbush Blueberry - Swamp Azalea - Coastal Sweet-pepperbush Shrubland

**USNVC Scientific Name:** *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland

**USNVC Identifier:** C EGL006371

**LOCAL INFORMATION**

**Environmental Description:** This community occurs in undrained depressions with organic soils influenced by strongly fluctuating water levels. The depressions are flooded during spring and early summer followed by a drop in water level to below the soil surface in late summer and early fall.

**Vegetation Description:** These shrub thickets are dominated by highbush blueberry (*Vaccinium corymbosum*) and common winterberry (*Ilex verticillata*). Coastal sweetpepperbush (*Clethra alnifolia*), scattered red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), and common buttonbush (*Cephalanthus occidentalis*) may also occur. Herbaceous cover is generally low and may include royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), fowl mannagrass (*Glyceria striata*), water arum (*Calla palustris*), and others. Moss cover is variable but can often cover the ground surface.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Clethra alnifolia</i> (coastal sweetpepperbush), <i>Ilex verticillata</i> (common winterberry), <i>Vaccinium corymbosum</i> (highbush blueberry)
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Cephalanthus occidentalis</i> (common buttonbush)
Herb (field)	Forb	<i>Calla palustris</i> (water arum)
Herb (field)	Graminoid	<i>Glyceria striata</i> (fowl mannagrass)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern), <i>Osmunda regalis</i> (royal fern)

**Characteristic Species:** *Acer rubrum* (red maple), *Clethra alnifolia* (coastal sweetpepperbush), *Glyceria striata* (fowl mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Vaccinium corymbosum* (highbush blueberry).

**Other Noteworthy Species:** *Calla palustris* (water arum).

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR*		<i>Vaccinium corymbosum</i> - <i>Rhododendron viscosum</i> community	Metzler and Barrett 2001

**Local Range:** Information not available.

**Local Description Authors:** K. J. Metzler.

**Plots:** None.

**Weir Farm National Historic Site Inventory Notes:** None.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Vaccinium formosum</i> - <i>Vaccinium fuscatum</i> - <i>Vaccinium corymbosum</i> Seasonally Flooded Shrubland Alliance (A.992)
Alliance (English name)	Southern Highbush Blueberry - Black Highbush Blueberry - Highbush Blueberry Seasonally Flooded Shrubland Alliance
Association	<i>Vaccinium corymbosum</i> - <i>Rhododendron viscosum</i> - <i>Clethra alnifolia</i> Shrubland
Association (English name)	Highbush Blueberry - Swamp Azalea - Coastal Sweet-pepperbush Shrubland
<b>Ecological System(s):</b>	Atlantic Coastal Plain Northern Basin Peat Swamp (CES203.522). Atlantic Coastal Plain Northern Pondshore (CES203.518). Atlantic Coastal Plain Northern Dune and Maritime Grassland (CES203.264).

### GLOBAL DESCRIPTION

**Concept Summary:** This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, or beaver-impacted wetlands. The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Shrub species usually include *Spiraea tomentosa* (steeplebush), *Spiraea alba* var. *alba* (white meadowsweet), *Cornus amomum* (silky dogwood), *Rubus allegheniensis* (Allegheny blackberry), *Rubus hispidus* (bristly dewberry), *Salix* (willow) spp., and others. *Hypericum densiflorum* (bushy St. Johnswort) often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* (Morrow's honeysuckle) and *Rosa multiflora* (multiflora rose) may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea* (reed canarygrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Solidago canadensis* (Canada goldenrod), *Juncus effusus* (common rush), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Leersia oryzoides* (whitegrass), *Carex scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex lurida* (shallow sedge), *Carex lupulina* (hop sedge), *Carex vulpinoidea* (fox sedge), *Carex trichocarpa* (hairyfruit sedge), *Vernonia noveboracensis* (New York ironweed), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lycopus uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Eupatorium maculatum* (spotted joepeyeweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Eleocharis* (spikerush) spp., and others. The invasive species *Microstegium vimineum* (Nepalese browntop), *Lythrum salicaria* (purple loosestrife), and *Phragmites australis* (common reed) can be abundant or form monocultures in these wetlands.

**Environmental Description:** This community is influenced by a strongly fluctuating water table with flooded conditions in spring and early summer, often followed by a drop in the water table below soil surface usually by late summer. There is usually a shallow organic layer often over mineral soil.

**Vegetation Description:** This association is a tall-shrub swamp where the dominant shrubs include *Vaccinium corymbosum* (highbush blueberry), *Ilex verticillata* (common winterberry), and *Rhododendron viscosum* (swamp azalea). Scattered *Acer rubrum* (red maple) are not uncommon. *Lyonia ligustrina* (maleberry) and *Cephalanthus occidentalis* (common buttonbush)

are characteristic although not necessarily dominant. Associated shrub species may include *Clethra alnifolia* (coastal sweetpepperbush), *Spiraea tomentosa* (steeplebush), *Chamaedaphne calyculata* (leatherleaf), *Ilex glabra* (mountain holly), *Leucothoe racemosa* (swamp doghobble), *Decodon verticillatus* (swamp loosestrife), *Kalmia angustifolia* (mountain laurel), *Alnus serrulata* (hazel alder), *Myrica gale* (sweetgale), and *Photinia* spp. (= *Aronia*, chokeberry spp.). Herbaceous composition is variable; some of the more typical species include *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Calla palustris* (water arum), *Lycopus uniflorus* (northern bugleweed), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Glyceria striata* (fowl mannagrass), *Leersia oryzoides* (whitegrass), *Dulichium arundinaceum* (threeway sedge), *Juncus effusus* (common rush), and *Woodwardia virginica* (Virginia chainfern). A layer of peatmoss is common and varies in cover; species include *Sphagnum fimbriatum* (sphagnum), *Sphagnum rubellum* (sphagnum), *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum fallax* (sphagnum), and *Sphagnum viridum* (sphagnum).

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry), <i>Rhododendron viscosum</i> (swamp azalea), <i>Vaccinium corymbosum</i> (highbush blueberry)
Herb (field)	Forb	<i>Lycopus uniflorus</i> (northern bugleweed)
Herb (field)	Graminoid	<i>Glyceria striata</i> (fowl mannagrass)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern), <i>Osmunda regalis</i> (royal fern), <i>Woodwardia virginica</i> (Virginia chainfern)

**Characteristic Species:** *Calla palustris* (water arum), *Lyonia ligustrina* (maleberry), *Rhododendron viscosum* (swamp azalea), *Sphagnum fallax* (sphagnum), *Sphagnum fimbriatum* (sphagnum), *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum rubellum* (sphagnum), *Sphagnum viridum* (sphagnum), *Thelypteris palustris* (eastern marsh fern), *Vaccinium corymbosum* (highbush blueberry).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Palustrine.

**DISTRIBUTION**

**Range:** Although this vegetation is widespread, its range has not been evaluated. It is known from the Central Appalachian ecoregion, the High Alleghany Plateau, and the Lower New England / Northern Piedmont ecoregions, and is likely in others.

**States/Provinces:** CT, DE, MA, ME, NH:S4, NJ:S1S3, NY, PA, RI.

**Federal Lands:** NPS (Cape Cod, Delaware Water Gap, Fire Island, Weir Farm); USFWS (Assabet River, Great Meadows, Great Swamp, Oxbow, Parker River).

**CONSERVATION STATUS**

**Rank:** GNR (14-Apr-1998).

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard.

**Confidence:** 2 - Moderate.

**Comments:** Information not available.

**Similar Associations:**

- *Vaccinium corymbosum* / *Sphagnum* spp. *Shrubland* (CEGL006190).

**Related Concepts:** Information not available.

**SOURCES**

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

**References:** Breden et al. 2001, Conard 1935, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fike 1999, Gawler 2002, Golet 1973, Johnson 1981b, Lynn and Karlin 1985, Metzler and Barrett 2001, Niering and Egler 1966, Reschke 1990, Schall and Murley 1984, Sperduto 2000a, Sperduto and Nichols 2004.



Figure 13. Blueberry Wetland Thicket at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629462, northing 4568445.

**COMMON NAME (PARK-SPECIFIC): NORTHEASTERN BUTTONBUSH SHRUB SWAMP**

**SYNONYMS**

**USNVC English Name:** Common Buttonbush - Swamp-loosestrife Shrubland  
**USNVC Scientific Name:** *Cephalanthus occidentalis* - *Decodon verticillatus* Shrubland  
**USNVC Identifier:** CEGL006069

**LOCAL INFORMATION**

**Environmental Description:** This community occurs on pond margins and in depressions that contain standing water throughout most of the growing season.

**Vegetation Description:** Common buttonbush (*Cephalanthus occidentalis*) is dominant (covering 70% of this wetland) and intermixed with scattered black willow (*Salix nigra*) and red maple (*Acer rubrum*) shrubs. Herbs are sparse (with only 5% cover) and include smallspike false nettle (*Boehmeria cylindrica*), common marsh bedstraw (*Galium palustre*), and eastern marsh fern (*Thelypteris palustris*). Mosses are extremely abundant on exposed surfaces such as fallen logs and rocks.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Cephalanthus occidentalis</i> (common buttonbush), <i>Salix nigra</i> (black willow)
Herb (field)	Forb	<i>Boehmeria cylindrica</i> (smallspike false nettle), <i>Galium palustre</i> (common marsh bedstraw)
Herb (field)	Fern or fern ally	<i>Thelypteris palustris</i> (eastern marsh fern)

**Characteristic Species:** *Boehmeria cylindrica* (smallspike false nettle), *Cephalanthus occidentalis* (common buttonbush).

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR	1	<i>Cephalanthus occidentalis</i> / <i>Glyceria canadensis</i> community	Metzler and Barrett 2001

**Local Range:** This community occurs on the edge of the pond and in several semipermanently flooded depressions within the wetland complex on the Weir Farm site.

**Classification Comments:** This community is easily recognized by the dominance of *Cephalanthus occidentalis* (common buttonbush) occurring in shallow standing water.

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevé 19.

**Weir Farm National Historic Site Inventory Notes:** None.

**GLOBAL INFORMATION**

**USNVC CLASSIFICATION**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Semipermanently flooded cold-deciduous shrubland (III.B.2.N.f.)
Alliance	<i>Cephalanthus occidentalis</i> Semipermanently Flooded Shrubland Alliance (A.1011)

Alliance (English name)	Common Buttonbush Semipermanently Flooded Shrubland Alliance
Association	<i>Cephalanthus occidentalis</i> - <i>Decodon verticillatus</i> Shrubland
Association (English name)	Common Buttonbush - Swamp-loosestrife Shrubland
<b>Ecological System(s):</b>	Laurentian-Acadian Floodplain Forest (CES201.587). Central Appalachian Floodplain (CES202.608).

## GLOBAL DESCRIPTION

**Concept Summary:** This buttonbush swamp occurs in the northeastern United States. These swamps experience prolonged or semipermanent flooding for much of the growing season, with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings, including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions where water levels recede very slowly, such as those with perched water tables. The substrate is typically loose muck. *Cephalanthus occidentalis* (common buttonbush) is dominant and often monotypic. Occasional associates depend on the environmental setting and most often occur in drier areas. They include *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Acer rubrum* (red maple), *Cornus* (dogwood) spp. closer to upland borders, or *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), and *Viburnum dentatum* (southern arrow-wood) where adjacent to floodplains, or *Decodon verticillatus* (swamp loosestrife), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba* var. *latifolia* (white meadowsweet) in more stagnant basins. Herbaceous species tend to be sparse but can include *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), *Thelypteris palustris* (eastern marsh fern), *Leersia oryzoides* (whitegrass), *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* (= *Nuphar variegata*, variegated yellow pond-lily). Bryophytes, if present, cling to shrub bases and include *Warnstorfia fluitans* (= *Drepanocladus fluitans*, warnstorfia moss), *Drepanocladus aduncus* (drepanocladus moss), or *Sphagnum fallax* (sphagnum). In disturbed areas, these wetlands may be invaded by *Lythrum salicaria* (purple loosestrife).

**Environmental Description:** This association includes buttonbush swamps that experience prolonged or semipermanent flooding for much of the growing season with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions where water levels recede very slowly, such as those with perched water tables. Soils are often organic mucks or silt loams.

**Vegetation Description:** This association includes buttonbush swamps of the eastern and northeastern United States. These swamps experience prolonged or semipermanent flooding for much of the growing season with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small isolated depressions where water levels recede very slowly, such as those with perched water tables. *Cephalanthus occidentalis* (common buttonbush) is dominant and often monotypic. Scattered *Acer rubrum* (red maple) trees may be present in the wetland. Occasional associates depend on the environmental setting, and some only occur in drier areas. They include *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea),

*Acer rubrum* (red maple), *Salix* (willow) spp., *Cornus amomum* (silky dogwood) or *Cornus sericea* (redosier dogwood) closer to upland borders, or *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), or *Viburnum dentatum* (southern arrow-wood) where adjacent to floodplains, or *Decodon verticillatus* (swamp loosestrife), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba* var. *latifolia* (white meadowsweet) in more stagnant basins. Herbaceous species tend to be sparse but can include *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), *Osmunda regalis* (royal fern), *Thelypteris palustris* (eastern marsh fern), *Bidens* (beggarticks) spp., *Sium suave* (hemlock waterparsnip), *Scutellaria lateriflora* (blue skullcap), *Alisma plantago-aquatica* (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* (= *Nuphar variegata*, variegated yellow pond-lily). Bryophytes, if present, cling to shrub bases and include *Warnstorfia fluitans* (= *Drepanocladus 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).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Palustrine.

**DISTRIBUTION**

**Range:** This association is found throughout the northeastern United States.

**States/Provinces:** CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VA, VT, WV?

**Federal Lands:** NPS (Cape Cod, Delaware Water Gap, Minute Man, Weir Farm); USFWS (Assabet River?, Chesapeake Marshlands, Great Meadows, Great Swamp, Oxbow).

**CONSERVATION STATUS**

**Rank:** G4G5 (8-Dec-2005).

**Reasons:** This association is widely distributed in the northeastern U.S. and relatively common in its small-patch setting.

**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 jorii* 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, Enser 1999, Fike 1999, Fleming et al. 2001, Gawler 2002, Harrison 2004, J. Harrison pers. comm., Metzler and Barrett 2001, Nichols et al. 2001, Sperduto 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000.



Figure 14. Northeastern Buttonbush Shrub Swamp at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629642, northing 4568738.

**COMMON NAME (PARK-SPECIFIC): LITTLE BLUESTEM OLD FIELD**

**SYNONYMS**

**USNVC English Name:** Little Bluestem - Goldenrod species Herbaceous Vegetation

**USNVC Scientific Name:** *Schizachyrium scoparium* - *Solidago* spp. Herbaceous Vegetation

**USNVC Identifier:** C EGL006333

**LOCAL INFORMATION**

**Environmental Description:** This vegetation type occurs on regularly mowed areas of dry or shallow soil.

**Vegetation Description:** The vegetation occurs in fields as a mosaic with orchardgrass (*Dactylis glomerata*) and red fescue (*Festuca rubra*) reflecting the depth of soil. Areas with shallow soils have a conspicuous component of little bluestem (*Schizachyrium scoparium*), poverty oatgrass (*Danthonia spicata*), shortbeak sedge (*Carex brevior*), Canada toadflax (*Nuttallanthus canadensis*), wild basil (*Clinopodium vulgare*), and scattered low shrubs, including northern bayberry (*Morella pensylvanica*) and black huckleberry (*Gaylussacia baccata*). Tree seedlings such as oaks (*Quercus* spp.), sassafras (*Sassafras albidum*), and eastern redcedar (*Juniperus virginiana*) occur throughout.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Needle-leaved shrub	<i>Juniperus virginiana</i> (eastern redcedar)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Gaylussacia baccata</i> (eastern teaberry), <i>Sassafras albidum</i> (sassafras)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Morella pensylvanica</i> (northern bayberry)
Herb (field)	Graminoid	<i>Danthonia spicata</i> (poverty oatgrass), <i>Schizachyrium scoparium</i> (little bluestem)
Herb (field)		<i>Nuttallanthus canadensis</i> (Canada toadflax)

**Characteristic Species:** *Danthonia spicata* (poverty oatgrass), *Juniperus virginiana* (eastern redcedar), *Schizachyrium scoparium* (little bluestem).

**Other Noteworthy Species:** *Asclepias tuberosa* (butterfly milkweed).

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR		[not crosswalked]	

**Local Range:** Part of all managed fields on the Weir Farm site.

**Classification Comments:** None.

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevé 30, 31, 32.

**Weir Farm National Historic Site Inventory Notes:** The fields are mowed on an annual basis and would revert to forest if left unmanaged. In some fields, showy plants such as butterfly milkweed (*Asclepias tuberosa*) have been planted to attract butterflies.

## GLOBAL INFORMATION

### USNVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
Alliance	<i>Andropogon virginicus</i> Herbaceous Alliance (A.1208)
Alliance (English name)	Broomsedge Bluestem Herbaceous Alliance
Association	<i>Schizachyrium scoparium</i> - <i>Solidago</i> spp. Herbaceous Vegetation
Association (English name)	Little Bluestem - Goldenrod species Herbaceous Vegetation
<b>Ecological System(s):</b>	Information not available.

### GLOBAL DESCRIPTION

**Concept Summary:** This broadly defined vegetation type includes old fields of well-drained soils, either sandy or shallow to bedrock. They are characterized by dominance of warm-season grasses. *Schizachyrium scoparium* (little bluestem) is characteristic and nearly always present. Species composition is variable, depending on land-use history, but in general this vegetation is quite wide-ranging in northeastern and midwestern states. In addition to the nominal species, other associates may include *Andropogon virginicus* (broomsedge bluestem), *Eragrostis spectabilis* (purple lovegrass), *Festuca rubra* (red fescue), *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Nuttallanthus canadensis* (= *Linaria canadensis*, Canada toadflax), *Rubus flagellaris* (northern dewberry), *Panicum virgatum* (switchgrass), *Dichanthelium depauperatum* (= *Panicum depauperatum*, starved panicgrass), *Potentilla simplex* (common cinquefoil), *Dichanthelium meridionale* (= *Panicum meridionale*, matting rosette grass), *Dichanthelium dichotomum* (= *Panicum dichotomum*, cypress panicgrass), *Solidago rugosa* (wrinkleleaf goldenrod), and *Carex pensylvanica* (Pennsylvania sedge). Scattered shrubs are often present, including *Comptonia peregrina* (sweet fern), *Morella pensylvanica* (northern bayberry), *Gaylussacia baccata* (eastern teaberry), and scattered tree saplings, such as *Prunus serotina* (black cherry), *Sassafras albidum* (sassafras), and *Juniperus virginiana* (eastern redcedar). *Polytrichum juniperinum* (juniper polytrichum moss) and other *Polytrichum* (polytrichum moss) spp. are common bryophytes.

**Environmental Description:** This vegetation occurs on well-drained soils, either on sandy flats or on dry knolls with shallow soils. The vegetation arises spontaneously after soil disturbance.

**Vegetation Description:** *Schizachyrium scoparium* (little bluestem) is characteristic and nearly always present. Species composition is variable, depending on land-use history, but in general, this vegetation is quite wide-ranging in northeastern and midwestern states. In addition to the nominal species, other associates may include *Andropogon virginicus* (broomsedge bluestem), *Eragrostis spectabilis* (purple lovegrass), *Festuca rubra* (red fescue), *Deschampsia flexuosa* (wavy hairgrass), *Centaurea biebersteinii* (= *Centaurea maculosa*, spotted knapweed), *Danthonia spicata* (poverty oatgrass), *Hypericum perforatum* (common St. Johnswort), *Nuttallanthus canadensis* (= *Linaria canadensis*, Canada toadflax), *Rubus flagellaris* (northern dewberry), *Panicum virgatum* (switchgrass), *Dichanthelium depauperatum* (= *Panicum depauperatum*, starved panicgrass), *Potentilla simplex* (common cinquefoil), *Dichanthelium meridionale* (= *Panicum meridionale*, matting rosette grass), *Dichanthelium dichotomum* (= *Panicum dichotomum*, cypress panicgrass), *Solidago juncea* (early goldenrod), *Solidago nemoralis* (gray goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Hieracium* (hawkweed) spp., and *Carex pensylvanica* (Pennsylvania sedge). Scattered shrubs are often present,

including *Comptonia peregrina* (sweet fern), *Morella pensylvanica* (northern bayberry), *Gaylussacia baccata* (black huckleberry), and scattered tree saplings, such as *Prunus serotina* (black cherry), *Sassafras albidum* (sassafras), and *Juniperus virginiana* (eastern redcedar).

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Dwarf-shrub	<i>Rubus flagellaris</i> (northern dewberry)
Herb (field)	Forb	<i>Solidago juncea</i> (early goldenrod), <i>Solidago nemoralis</i> (gray goldenrod), <i>Solidago rugosa</i> (wrinkleleaf goldenrod)
Herb (field)	Graminoid	<i>Schizachyrium scoparium</i> (little bluestem)

**Characteristic Species:** *Andropogon virginicus* (broomsedge bluestem), *Schizachyrium scoparium* (little bluestem), *Solidago juncea* (early goldenrod), *Solidago nemoralis* (gray 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, MA, ME, NH, NJ, NY, PA, RI, VT.

**Federal Lands:** NPS (Cape Cod, Delaware Water Gap, Fire Island, Gateway, Saratoga, Upper Delaware, Weir Farm); USFWS (Great Swamp).

**CONSERVATION STATUS**

**Rank:** GNA (invasive) (19-Jan-2006).

**Reasons:** This vegetation type includes pasture and post-agricultural fields.

**CLASSIFICATION INFORMATION**

**Status:** Standard.

**Confidence:** 3 - Weak.

**Comments:** This type is distinguished, in theory, from the very similar *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Herbaceous Vegetation (CEGL006107) by the dominance of warm-season grasses as opposed to cool-season grasses (*Phleum*, *Festuca*) dominating CEGL006017. Additional data will be required to see how this distinction holds up and what geographic differences might accompany such a distinction.

**Similar Associations:**

- *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Herbaceous Vegetation (CEGL006107).
- *Lolium (arundinaceum, pratense)* Herbaceous Vegetation (CEGL004048).
- *Phleum pratense* - *Bromus pubescens* - *Helenium autumnale* Herbaceous Vegetation (CEGL004018).

**Related Concepts:** Information not available.

**SOURCES**

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

**References:** Eastern Ecology Working Group n.d., Edinger et al. 2002, House 1917, Newbold et al. 1988, Niering et al. 1970.



Figure 15. Little Bluestem Old Field at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629257, northing 4568327.

**COMMON NAME (PARK-SPECIFIC): NORTHEASTERN OLD FIELD**

**SYNONYMS**

**USNVC English Name:** Orchard Grass - Timothy - Fescue species - Goldenrod species  
Herbaceous Vegetation

**USNVC Scientific Name:** *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago*  
spp. Herbaceous Vegetation

**USNVC Identifier:** CEG006107

**LOCAL INFORMATION**

**Environmental Description:** This vegetation type occurs on regularly mowed areas of dry to mesic soil.

**Vegetation Description:** The vegetation occurs in fields as a mosaic with little bluestem (*Schizachyrium scoparium*), reflecting the depth of soil. The mesic areas are distinguished by a dominance of European grasses such as orchardgrass (*Dactylis glomerata*), wild oat (*Avena fatua*), tall oatgrass (*Arrhenatherum elatius*), and red fescue (*Festuca rubra*). Tree seedlings such as oaks (*Quercus* spp.), sassafras (*Sassafras albidum*), and eastern redcedar (*Juniperus virginiana*) occur throughout.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Arrhenatherum elatius</i> (tall oatgrass), <i>Avena fatua</i> (wild oat), <i>Dactylis glomerata</i> (orchardgrass) <i>Festuca rubra</i> (red fescue)
Herb (field)		

**Characteristic Species:** *Dactylis glomerata* (orchardgrass), *Festuca rubra* (red fescue).

**Other Noteworthy Species:** *Arrhenatherum elatius* (tall oatgrass).

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNA		[not crosswalked]	

**Local Range:** Mowed areas associated with the domestic grounds.

**Classification Comments:** This vegetation would revert to forest if mowing were discontinued.

**Other Comments:** None.

**Local Description Authors:** K. J. Metzler.

**Plots:** Relevé 29.

**Weir Farm National Historic Site Inventory Notes:** The fields are mowed on an annual basis and would revert to forest if left unmanaged. In some fields, showy plants such as butterflyweed (*Asclepias tuberosa*) have been planted to attract butterflies.

**GLOBAL INFORMATION**

**USNVC CLASSIFICATION**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
Alliance	<i>Dactylis glomerata</i> - <i>Rumex acetosella</i> Herbaceous Alliance (A.1190)
Alliance (English name)	Orchard Grass - Common Sheep Sorrel Herbaceous Alliance

Association	<i>Dactylis glomerata</i> - <i>Phleum pratense</i> - <i>Festuca</i> spp. - <i>Solidago</i> spp. Herbaceous Vegetation
Association (English name)	Orchard Grass - Timothy - Fescue species - Goldenrod species Herbaceous Vegetation
<b>Ecological System(s):</b>	Information not available.

## GLOBAL DESCRIPTION

**Concept Summary:** This broadly defined vegetation type includes old fields of well-drained soils, either sandy or shallow to bedrock. They are characterized by dominance of warm-season grasses. *Schizachyrium scoparium* (little bluestem) is characteristic and nearly always present. Species composition is variable, depending on land-use history, but in general this vegetation is quite wide-ranging in northeastern and midwestern states. In addition to the nominal species, other associates may include *Andropogon virginicus* (broomsedge bluestem), *Eragrostis spectabilis* (purple lovegrass), *Festuca rubra* (red fescue), *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (orchardgrass), *Nuttallanthus canadensis* (= *Linaria canadensis*, Canada toadflax), *Rubus flagellaris* (northern dewberry), *Panicum virgatum* (switchgrass), *Dichanthelium depauperatum* (= *Panicum depauperatum*, starved panicgrass), *Potentilla simplex* (common cinquefoil), *Dichanthelium meridionale* (= *Panicum meridionale*, matting rosette grass), *Dichanthelium dichotomum* (= *Panicum dichotomum*, cypress panicgrass), *Solidago rugosa* (wrinkleleaf goldenrod), and *Carex pensylvanica* (Pennsylvania sedge). Scattered shrubs are often present, including *Comptonia peregrina* (sweet fern), *Morella pensylvanica* (northern bayberry), *Gaylussacia baccata* (black huckleberry), and scattered tree saplings, such as *Prunus serotina* (black cherry), *Sassafras albidum* (sassafras), and *Juniperus virginiana* (eastern redcedar). *Polytrichum juniperinum* (juniper polytrichum moss) and other *Polytrichum* (polytrichum moss) spp. are common bryophytes.

**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* (tall goldenrod), *Euthamia graminifolia* (flat-top goldentop), *Cerastium arvense* (field chickweed), *Oenothera biennis* (common evening-primrose), *Potentilla simplex* (common cinquefoil), *Symphyotrichum lateriflorum* (= *Aster lateriflorus*, calico aster), *Symphyotrichum novae-angliae* (= *Aster novae-angliae*, New England aster), *Symphyotrichum lanceolatum* (= *Aster simplex*, 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 altissima* (tall goldenrod), *Solidago canadensis* (Canada 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, NH, NJ, NY, PA, RI, TN, VA, VT, WV.

**Federal Lands:** NPS (Allegheny Portage Railroad, Cape Cod, Delaware Water Gap, Fire Island, Fort Necessity, Friendship Hill, Gettysburg, Johnstown Flood, Marsh-Billings-Rockefeller, Minute Man, Morristown, Saint-Gaudens, Upper Delaware, Valley Forge, Weir Farm); USFWS (Aroostook, Assabet River, Carlton Pond, 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 nonnative grasses and herbs (generally of European origin).

**CLASSIFICATION INFORMATION**

**Status:** Standard.

**Confidence:** 3 - Weak.

**Comments:** This type is distinguished, in theory, from the very similar *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Herbaceous Vegetation (CEGL006107) by the dominance of warm-season grasses as opposed to cool-season grasses (*Phleum*, *Festuca*) dominating CEGL006017. Additional data will be required to see how this distinction holds up and what geographic differences might accompany such a distinction.

**Similar Associations:**

- *Lolium (arundinaceum, pratense)* Herbaceous Vegetation (CEGL004048).
- *Phleum pratense* - *Bromus pubescens* - *Helenium autumnale* Herbaceous Vegetation (CEGL004018).
- *Schizachyrium scoparium* - *Solidago* spp. Herbaceous Vegetation (CEGL006333).

**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, Keever 1979, Newbold et al. 1988, Perles et al. 2005a, Perles et al. 2005b, Perles et al. 2005c, Podniesinski et al. 2006, Sneddon et al. 1995, TDNH unpubl. data.



Figure 16. Northeastern Old Field at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629309, northing 4568327.

**COMMON NAME (PARK-SPECIFIC): MONTANE CLIFF (COMMON ROCKTRIPLE TYPE)**

**SYNONYMS**

**USNVC English Name:** Common Rocktripe Non-vascular Vegetation  
**USNVC Scientific Name:** *Umbilicaria mammulata* Non-vascular Vegetation  
**USNVC Identifier:** CEG004387

**LOCAL INFORMATION**

**Environmental Description:** This cliff community comprises exposed and shaded outcrops of acidic, granitic gneiss with scattered vascular plants and cryptogams in patches of various sizes.

**Vegetation Description:** This shaded cliff face and outcrop has an overhanging canopy of sweet birch (*Betula lenta*), American beech (*Fagus grandifolia*), and several oaks (*Quercus* spp.). Common rocktripe (*Umbilicaria mammulata*), a broad-lobed lichen, is conspicuous. Several other bryophytes and lichens co-occur, and sedges [e.g., ribbed sedge, (*Carex virescens*)] are scattered in small pockets where humus accumulates.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Non-vascular	Lichen	<i>Umbilicaria mammulata</i> (common rocktripe)

**Characteristic Species:** *Umbilicaria mammulata* (common rocktripe).

**Other Noteworthy Species:** Information not available.

**Subnational Distribution with Crosswalk data:**

State	State Rank	Confidence	StateName	Reference
CT	SNR		[not crosswalked]	

**Local Range:** This community is restricted to a single cliff face in the Weir Farm site.

**Classification Comments:** None.

**Other Comments:** None.

**Local Description Authors:** K .J. Metzler.

**Plots:** None.

**Weir Farm National Historic Site Inventory Notes:** None.

**GLOBAL INFORMATION**

**USNVC CLASSIFICATION**

Physiognomic Class	Non-vascular Vegetation (VI)
Physiognomic Subclass	Lichen vegetation (VI.B.)
Physiognomic Group	Temperate or subpolar lichen vegetation (VI.B.1.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar lichen vegetation (VI.B.1.N.)
Formation	Alpine to submontane temperate or subpolar lichen vegetation (VI.B.1.N.b.)
Alliance	Umbilicaria mammulata Non-vascular Alliance (A.1827)
Alliance (English name)	Common Rocktripe Non-vascular Alliance
Association	<i>Umbilicaria mammulata</i> Non-vascular Vegetation
Association (English name)	Common Rocktripe Non-vascular Vegetation
<b>Ecological System(s):</b>	North-Central Appalachian Acidic Cliff and Talus (CES202.601). Southern Appalachian Montane Cliff and Talus (CES202.330).

## GLOBAL DESCRIPTION

**Concept Summary:** Vegetation is strongly dominated by *Umbilicaria mammulata* (common rocktripe), on relatively moist, shaded rock outcrops, typically on northeast-facing slopes. This vegetation occurs where periodic seepage occurs on acidic rock outcrops. Individual occurrences can be as large as an acre. Vascular plants are generally sparse or absent, though trees of adjacent forest communities often shade the outcrop community for much of the day. Other umbilicate lichens may also occur. Associates include *Dryopteris intermedia* (intermediate woodfern) and *Polypodium virginianum* (= *Polypodium vulgare*, rock polypody).

**Environmental Description:** This lichen-dominated community occurs on relatively moist, shaded, acidic rock outcrops where periodic seepage occurs. It is typically found on northeast-facing slopes. Individual occurrences can be as large as an acre.

**Vegetation Description:** The vegetation is strongly dominated by *Umbilicaria mammulata* (common rocktripe). Vascular plants are generally sparse or absent, though trees of adjacent forest communities often shade the outcrop community for much of the day. Other umbilicate lichens may also occur. Associates include *Dryopteris intermedia* (intermediate woodfern) and *Polypodium virginianum* (= *Polypodium vulgare*, rock polypody).

### Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Fern or fern ally	<i>Dryopteris intermedia</i> (intermediate woodfern), <i>Polypodium virginianum</i> (rock polypody)
Non-vascular	Lichen	<i>Umbilicaria mammulata</i> (common rocktripe)

**Characteristic Species:** *Umbilicaria mammulata* (common rocktripe).

**Other Noteworthy Species:** Information not available.

**USFWS Wetland System:** Not applicable.

## DISTRIBUTION

**Range:** Information not available.

**States/Provinces:** CT, GA, NC, PA, SC, TN, VA, WV.

**Federal Lands:** NPS (Blue Ridge Parkway?, Weir Farm); USFS (Cherokee?, George Washington, Jefferson, Monongahela?, Nantahala, Pisgah).

## CONSERVATION STATUS

**Rank:** G4? (15-Aug-1994).

**Reasons:** Information not available.

## CLASSIFICATION INFORMATION

**Status:** Standard.

**Confidence:** 2 - Moderate.

**Comments:** Potentially very widespread in Southeast and beyond.

### Similar Associations:

- *Lasallia papulosa* - *Umbilicaria caroliniana* Non-vascular Vegetation (CEGL004386).

### Related Concepts:

- IE2a. Southern Appalachian Acidic Cliff (Allard 1990) ?
- Lichen-dominated shaded outcrops (CAP pers. comm. 1998) ?
- Montane Cliff (Carolina Rocktripe Subtype) (Schafale 1998b) ?
- SNE acidic cliff community (Rawinski 1984) ?

## SOURCES

**Description Authors:** A. S. Weakley.

**References:** Allard 1990, CAP pers. comm. 1998, Fike 1999, Rawinski 1984, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Swain and Kearsley 2001, TDNH unpubl. data.

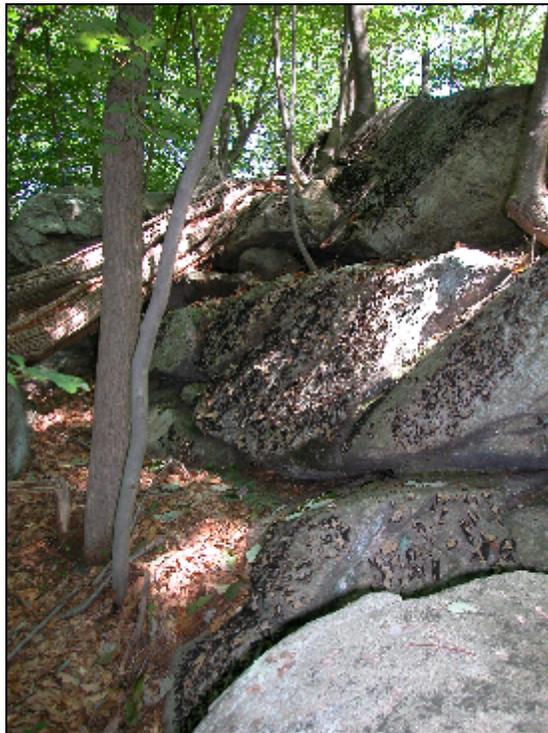


Figure 17. Montane Cliff (Common Rocktripe Type) at Weir Farm National Historic Site. August 2006. NAD 1983 / UTM easting 629738, northing 4568933.



## Vegetation Map Production

Since Weir Farm is a relatively small site, walking the perimeter of each vegetation type delineated nearly all mapping units. Boundaries for the Northeastern Buttonbush Shrub Swamp and the Blueberry Wetland Thicket were determined by air photo interpretation due to difficulty walking the perimeters of these types. These polygons were delineated using stereo-pairs of black and white aerial photos (DEP, 2001, 1:12,000) and then screen-digitized in ArcView (3.3). The combination of GPS field-collected lines and interpreted polygons were converted into the final map.

Based on field classification and vegetation data analysis, each polygon containing vegetation, with the exception of mowed fields, was assigned one of thirteen vegetation association types. Vegetation types were assigned using information from field observations and supplemented with plot data. Given the complexity of vegetation response to subtle differences in soil depth within fields, vegetation communities in mowed fields were not differentiated and the fields were mapped using geographic names provided by WEFA staff.

Once the map was produced, each polygon was re-visited and its classification field-checked. Any discrepancies were marked on the field map for correction. Polygons that were attributed with Anderson Level II categories (modified) retained their attributes. The final map (Figure 3) identified 99 map polygons, each labeled with one of 31 different attributes (Table 3). Of these polygons, 13 represented transportation corridors, domestic and agricultural grounds, managed terraces, and the pond and its contained islands. Remaining polygons were each attributed with one of 13 association-level vegetation types. Several of these were subdivided into variants that were differentiated from the associations by the presence of dominant species such as mountain laurel (*Kalmia latifolia*) or aggregated into mapping unit complexes. The number of total mapped hectares listed in Table 3 is larger than the size of the park because mapped polygons extended beyond the park boundary.

## Accuracy Assessment

### Positional Accuracy Assessment

Final horizontal positional accuracy for the mosaic is 3.85 meters and meets Class 2 National Map Accuracy Standards (FGDC 1998b). A spreadsheet containing x and y coordinates for each ground control point and the accuracy calculation formula is included in the air photo archive.

### Thematic Accuracy Assessment

Of the thirteen vegetation associations identified in this report, all were easily recognized by a combination of differential species and landscape position. Most were under the minimum mapping unit, 0.5 ha (1.24 ac). Varieties, such as associations dominated by mountain laurel (*Kalmia latifolia*), were also confirmed at this time, with any discrepancies noted and corrections to the map units, if needed, made. With the exception of the managed fields, the thematic accuracy of polygons attributed with Anderson Level II categories (modified) was not assessed.

## Project Deliverables

A summary of the products resulting from the Weir Farm project is detailed in Table 4.

Table 3. Number of polygons and corresponding hectares for mapping units that occur both inside and outside the boundaries of Weir Farm National Historic Site.

Ecological Mapping Unit	In-park Hectares (no. of polygons)	Out-of-park Hectares (no. of polygons)	Total Hectares (no. of polygons)
Blueberry Wetland Thicket	0.25 (3)	0.08 (1)	0.33 (4)
Burlingham complex fields	3.3 (5)	0.04 (1)	3.34 (6)
Caretakers complex	0.09 (1)		0.09 (1)
Cemetery		0.04 (1)	0.04 (1)
Interrupted fern variant of Semi-rich Northern Hardwood Forest	0.05 (1)		0.05 (1)
Interrupted fern variant of Southern New England / Northern Piedmont Red Maple Seepage Swamp	0.02 (1)	0.03 (1)	0.05 (2)
Islands	<0.01 (2)		<0.01 (2)
Jewelweed variant of Southern New England / Northern Piedmont Red Maple Seepage Swamp	0.13 (1)		0.13 (1)
Lower New England Red Maple - Blackgum Swamp	0.94 (5)	0.13 (1)	1.07 (6)
Lower New England Slope Chestnut Oak Forest	0.67 (4)	0.39 (1)	1.06 (5)
Mesic Sugar Maple - Ash - Oak - Hickory Forest	1.47 (2)		1.47 (2)
Montane Cliff (Common Rocktripe Type)	0.04 (1)		0.04 (1)
Mountain laurel variant of Northeastern Dry Oak - Hickory Forest	0.14 (1)		0.14 (1)
Mountain laurel variant of Semi-rich Northern Hardwood Forest	0.32 (2)		0.32 (2)
North field	0.21 (1)		0.21 (1)
Northeastern Buttonbush Shrub Swamp	0.44 (5)	0.27 (1)	0.71 (6)
Northeastern Dry Oak - Hickory Forest	3.84 (6)	0.64 (3)	4.48 (9)
Northeastern Dry Oak - Hickory Forest and Lower New England Slope Chestnut Oak Forest complex	7.16 (19)	0 (1)	7.16 (20)
Northeastern Modified Successional Forest	0.46 (2)		0.46 (2)
Old Field Seep	0.14 (2)		0.14 (2)
Parking area	0.06 (1)		0.06 (1)
Residential	0.59 (2)	0.2 (1)	0.79 (3)
Road	0.32 (1)	0.07 (1)	0.39 (2)
Semi-rich Northern Hardwood Forest	0.6 (15)	0.22 (3)	0.81 (18)
Southern New England / Northern Piedmont Red Maple Seepage Swamp	2.09 (8)	0.23 (5)	2.33 (13)
Striped maple variant of Northeastern Dry Oak - Hickory Forest	0.59 (1)	0.02 (1)	0.61 (2)
Terraces	0.38 (1)		0.38 (1)
Truant's field	0.63 (1)		0.63 (1)
Water	1.28 (1)		1.28 (1)
Weir complex agricultural grounds	0.64 (1)		0.64 (1)
Weir complex domestic grounds	0.77 (2)		0.77 (2)
Total	27.64 (98)	2.36 (22)	30 (120)

Table 4. Summary of products resulting from the Weir Farm National Historic Site vegetation classification and mapping project.

Product	FGDC-compliant spatial metadata
Aerial photos, including flight line map and photoindex	Yes
Photomosaic as paper copy and in digital format	Yes
Annotated field forms with vegetation plot sampling data	Not applicable
Vegetation plot sampling data in the PLOTS 2.0 database	Not applicable
Differentially corrected GPS locations of vegetation plots	Yes
Annotated field forms with thematic accuracy assessment data	Not applicable
Thematic accuracy assessment data in the PLOTS 2.0 database	Not applicable
Differentially corrected GPS locations of thematic accuracy assessment sampling points	Yes
Digital photos representative of all vegetation types	Not applicable
Final map of vegetation associations as paper copy and in digital format	Yes
Final report as paper copy and in digital format	Not applicable



## Discussion

### Vegetation Classification and Description

The natural vegetation of Weir Farm National Historic Site is deciduous forest, except in areas too wet to support trees or in the man-made fields maintained by mowing. This vegetation classification and mapping project described four upland forest types, one upland non-vascular type, two forested wetland types, and two wetland shrub thicket types that reflected the soil moisture conditions of the site. In addition, four anthropogenic vegetation types occurred; one successional forest and three non-forested types (two in mowed upland fields, and one herbaceous wetland seep). As throughout much of lower Fairfield County, Connecticut, white-tailed deer (*Odocoileus virginianus*) have significantly altered the structure and diversity of the vegetation (Gregonis 2000; Ward 2000; Metzler 2003), making the classification and recognition of plant communities difficult.

At Weir Farm, the Northeastern Dry Oak - Hickory Forest is the most common upland vegetation, although extremely altered by land-use history and heavy deer browse. The most notable impact was the near elimination of the characteristic shrub layer and the great reduction in the diversity of herbaceous species. Large areas had a near monotypic herbaceous cover of eastern hayscented fern (*Dennstaedtia punctilobula*) reflecting soil disturbance, and one needed to look hard in order to find individuals of mapleleaf viburnum (*Viburnum acerifolium*), the nominal shrub for this type. Within this forest type were patches of the Lower New England Slope Chestnut Oak Forest which corresponded to small areas where bedrock was near the surface, creating the drier soil conditions necessary for this community to develop. Although both vegetation types were mapped as individual polygons within Weir Farm, a large portion of these two communities was mapped as a complex, reflecting the mosaic of site conditions on the Weir Farm landscape.

The majority of wetlands in Weir Farm National Historic Site were linear Southern New England / Northern Piedmont Red Maple Seepage Swamps, still readily recognizable by the dominance of the nominal shrub. These wetlands were associated with drainageways and followed the natural low-lying contours that dissected the site. In general, the wetlands at Weir Farm National Historic Site were more intact than the uplands, with less noticeable impact to their structure and diversity than the forested communities.

### Vegetation Map Production

The association-level map of the vegetation of Weir Farm National Historic Site (Figure 4) was prepared using a combination of shape files that were either field delineated (most of the vegetation), screen digitized (wetland shrub thickets, mountain laurel variants, cemetery, and parking area), or provided by park staff (fields, domestic grounds, residential areas, and road). This map, at the scale of 1:6,753, provides a detailed representation of the vegetation and site that allows the delineation of features such as small herbaceous seeps within the managed fields, small woodland seeps, and variants of forest communities that represent shifts in floristic composition and/or dominance in either the shrub or herbaceous layer within a plant association. Examples include areas dominated by mountain laurel (*Kalmia latifolia*) within the Northeastern

Dry Oak - Hickory Forest. This detail would be lost at the suggested NPS mapping scale of 1:24,000.

At this resolution, we were able to delineate polygons smaller than 0.01 ha (0.025 ac), far smaller than the minimum suggested mapping unit of 0.5 ha (1.24 ac) by NPS standards. For Weir Farm, this level of detail will provide NPS staff the ability to manage the site for the greatest biodiversity and provide a meaningful map to guide future inventory and to assess changes in the vegetation over time.

#### State or Federal-listed Species

The only comprehensive botanical inventory conducted at Weir Farm was by the Brooklyn Botanical Garden as part of the New York Metropolitan Flora Project (Glenn 1998), a project that extended into lower Fairfield County, Connecticut. During that inventory, two previously unrecorded state-listed plants, blackhaw (*Viburnum prunifolium*, State Special Concern) and twoflower dwarfdandelion (*Krigia biflora*, State Special Concern) were recorded from Weir Farm. A third plant of significance, spineless hornwort (*Ceratophyllum echinatum*), an aquatic plant of limited distribution but not tracked by the Natural Diversity Data Base, was also collected during the inventory. According to Connecticut State Statutes Section 26-303 through 313, Species of Special Concern means any native plant species or any native non-harvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population, or to have been extirpated from the state.

Of these three species, only blackhaw and spineless hornwort were observed during this classification and mapping project.

**Blackhaw (*Viburnum prunifolium*):** Blackhaw (*Viburnum prunifolium*) is a deciduous shrub that typically grows to a height of 3.7–4.6 m (12–15 ft). It is a native of eastern and east-central North America. Blackhaw has showy white flowers in the spring with blue-black fruits in the fall that attract birds and other wildlife. In Connecticut, blackhaw is found only in Fairfield County with ten known populations, three of which are historical (see also the New York Metropolitan Flora Project). This species grows in dry to medium-wet, well-drained soils in part shade to full sun. Maintenance of the species is usually low, and it has no serious insect or disease problems.

During this current survey, three individuals were observed after being shown to us by NPS staff. Staff of the Brooklyn Botanical Garden showed the location to them. The extent of the population of blackhaw should be determined during the spring flowering period, when observation of this shrub will be easiest. This is the first documented record of blackhaw from the town of Wilton.

**Twoflower dwarfdandelion (*Krigia biflora*):** Twoflower dwarfdandelion (or two flowered Cynthia [*Krigia biflora*]) is a perennial herb found from the southwestern U.S. through the east-central U.S., eastward including the states of New York, Massachusetts, and Connecticut. This aster is found in a variety of habitats, depending on the region of the country. In Connecticut, it

is found in fields, meadows, and open woods reaching a height of up to 60 cm (2 ft). Flowers are dandelion-like and yellow-orange in color, and appear from May to August. This species was not positively identified during this project.

Spineless hornwort (*Ceratophyllum echinatum*): Spineless hornwort (*Ceratophyllum echinatum*) is a perennial, submerged freshwater aquatic plant found in eastern North America and the Pacific Northwest. The leaves form in stiff whorls, and small spines occur on the stems. This species is related to the commonly found coon's tail (*Ceratophyllum demersum*), but spineless hornwort is generally found in more acidic water and is often found in more ephemeral sites such as the Northeastern Buttonbush Shrub Swamp (relevé 19) and adjacent shallow water.

At the Weir Farm site, spineless hornwort was found at the northwest "cove" of the pond. Due to habitat change and destruction, as well as the competitive threat of nonnative invasive species, spineless hornwort is rapidly disappearing from its known range.

### Nonnative Invasive Plant Species

The following invasive species are currently found at Weir Farm, although populations are generally small and manageable:

Japanese barberry (*Berberis thunbergii*): Japanese barberry (*Berberis thunbergii*) is widely cultivated for its fall leaf color and bright red berries. It has escaped from cultivation and can grow in many soil types. As the plants are both shade and sun tolerant, they are found in a wide variety of settings. Japanese barberry can easily invade open and second-growth forest, and this is where it occurs at Weir Farm. While large numbers of plants are not found here, the species is consistently found in wooded areas and fields at Weir Farm. Without control, colonies of barberry may become established and outcompete native understory plants.

Mechanical removal of plants with a hoe or weed wrench is recommended for Weir Farm, as it will cause the least amount of disturbance. It is important to remove as much of the roots as possible, as they can resprout.

Oriental bittersweet (*Celastrus orbiculatus*): Oriental bittersweet (*Celastrus orbiculatus*) is a nonnative deciduous perennial vine with yellow fruits that split to reveal bright red seeds. Vines can grow in almost any habitat and both strangle and shade out the plants on which they grow. With rapid growth rates, rapid reproductive rates, and the ability to root-sucker, vines can overtake entire plant communities.

Oriental bittersweet vines are not found in great numbers at Weir Farm but are consistently found along the edges of woods, openings, and fields. Due to the small numbers, hand pulling is recommended, but roots must also be removed to prevent resprouting. Care should be taken in the disposal of vines with seeds to prevent further dispersal.

Black swallow-wort (*Cynanchum louisae*): Black swallow-wort (*Cynanchum louisae*) is a perennial vine with dark green opposite leaves. The vine can grow up to 182 cm (6 ft) long and form thickets that both shade and crowd out native plants. Mature fruits are long slender pods that become dark brown when ripe. The vine dies back to the ground each year and reproduction is mainly by seed. There is one additional species of *Cynanchum* that is invasive in Connecticut,

European swallow-wort (*Cynanchum rossicum*), which possesses similar biological characteristics and responds to similar control methods.

At Weir Farm, black swallow-wort vines are found in small numbers in the fields south of the Burlingham House. Hand pulling is effective only if the entire root crown is removed, a method that can lead to disturbance of surrounding vegetation. Hand pulling can prevent further seed production, as can simply picking the pods. Mowing is effective at preventing seed production and is best done with one to two visits just as the pods start to form. Chemical control with herbicide application can also be used, but is not warranted at Weir Farm at this time.

Garlic mustard (*Alliaria petiolata*): Garlic mustard (*Alliaria petiolata*) is a biennial herb that is rapidly becoming extremely common in the northeastern United States. In the first year of growth, a leafy rosette forms. In the second year, stems can grow to a height of 90 cm (3 ft) and produce small white flowers. When mature, thousands of black seeds in linear capsules or siliques are released, exploiting an effective reproductive strategy. Garlic mustard spreads rapidly and outcompetes most native herbaceous species in a wide variety of habitats, although it cannot tolerate soils that are highly acidic.

For small populations, as is the case throughout much of Weir Farm, hand pulling stems before seed formation, followed by tamping the soil, is an effective measure of control. Because seeds are viable for at least five years, control measures need to be performed annually for at least this long. Chemical control is also effective, and may be necessary to control the relatively large populations of garlic mustard that occur behind the Weir House and in the Mesic Sugar Maple - Ash - Oak - Hickory Forest in the northern property.

Japanese stiltgrass (*Microstegium vimineum*): Japanese stiltgrass (*Microstegium vimineum*) is an annual grass that can rapidly overtake a variety of habitats. This grass has lime green leaves that are 10–13 cm (4–5 in) long with a sprawling growth habit. Reproduction is through seeds that are viable for five or more years. This grass can form dense mono-specific stands with rooting of stem nodes that touch the ground. Adapted to low light conditions, Japanese stiltgrass prefers moist soils, often spreading after a disturbance. Due to its ability to rapidly spread, it is best to quickly control new populations. Japanese stiltgrass is easily pulled by hand and flowering plants may be mown or weed-whacked as long as this is accomplished before seed set. For large populations, herbicides may be necessary for control.

At Weir Farm National Historic Site, the infestation of Japanese stiltgrass is still relatively small and can be controlled with mowing and hand pulling. Infested areas include the moist areas in the Burlingham fields and roadsides.

Narrowleaf bittercress (*Cardamine impatiens*): Narrowleaf bittercress (*Cardamine impatiens*) is an herbaceous annual or biennial that can grow up to 0.6 m (2 ft) in height. The stem is erect with numerous leaves (6–20) that are sagittate-auriculate at their base—an important diagnostic characteristic. The plant blooms from May–August with small white flowers. The slender siliques (a type of fruit) ripen from May–September and are located on spreading-ascending to erect pedicels. Each silique can produce up to 24 seeds. Narrowleaf bittercress often overwinters as a basal rosette.

Narrowleaf bittercress is easily dispersed due to its seed-shooting ability. It can form dense areas in woodland habitats and outcompetes native species. New introductions can be controlled by hand pulling prior to seed set; large populations should be controlled by a combination of chemical and mechanical techniques.

At Weir Farm, the infestation of narrowleaf bittercress is still relatively small and can be controlled with hand pulling. Infested areas include the moist areas in the Pond and Woodland area.



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### **Plant Species of Concern information:**

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*Ceratophyllum echinatum* in UW – Stevens Point Freckmann Herbarium at <http://wisplants.uwsp.edu>

*Krigia biflora* in <http://www.ct-botanical-society.org>.

*Krigia biflora* in <http://www.2bnTheWild.com>.

### **Invasive plant fact sheets:**

<http://www.nps.gov/plants/alien/fact/mivi1.htm>.

<http://www.nps.gov/plants/alien/pubs/midatlantic/mivi.htm>.

<http://www.nps.gov/plants/alien/fact/alpe1.htm>.

<http://www.vnps.org/invasive/FSMICROS.html>.

<http://www.nature.org/wherewework/northamerica/states/connecticut/science/art317.html>.

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<http://www.state.me.us/doc/nrimc/mnap/factsheets/mnapfact.html>.



Appendix A. NatureServe USGS/NPS Vegetation Mapping Program plot survey form.

Park Name: **Weir Farm National Historic Site (WEFA)** State: **CT**

<b>Plot Code</b> _____	<b>Polygon Code</b> _____	<b>Airphoto #</b> _____
Park sublocation (Surveysite) _____		
<b>Quad Name</b> _____		<b>Quad Code</b> _____
<b>Survey Date:</b> 2004- _____	<b>Surveyors:</b> _____	<b>Sourcecode:</b> F04BOW
<b>Provisional Community Name</b>		
<b>Classified Community Name</b>		
_____ <b>GELCODE</b>		_____ <b>CEGL00</b>
<b>Ecological System type</b>		
<b>Directions to Plot:</b>		
<b>Plot length</b>	<b>width</b>	<b>shape</b>
<b>Permanent (y/n)</b>	<b>Plot Photos (y/n)</b>	<b>Roll#</b>
<b>Frame#</b>	<b>Plot representativeness</b>	
<b>GPS file name</b> _____	<b>Field UTM X</b> _____ <b>m E</b>	<b>Field UTM Y</b> _____ <b>m N</b>
<b>GPS unit used</b> _____	<b>datum</b> _____	<b>Error +/-</b> _____ <b>m</b>
<b>Corrected UTM X</b> _____ <b>m E</b>	<b>Corrected UTM Y</b> _____ <b>m N</b>	<b>UTM Zone</b> _____

**ENVIRONMENTAL DESCRIPTION**

<b>Elevation:</b>			<b>m / ft include units!</b>		<b>Aspect (use true, not magnetic, value):</b>	
<b>Slope</b>	<b>Degr</b>	<b>%</b>	<b>Topographic</b>	<b>Landform</b>		<b>Geology:</b>
Flat	0	0%	<b>Position</b>	<b>Bar</b>	<b>Kame</b>	<b>Geology:</b>
Gentle	1-5	1-9%	Crest/Summit/Ridge	<b>Basin</b>	<b>Kettle</b>	<b>Bedrock</b>
Modt.	6-14	10-25%	Upper/Shoulder Slope	<b>Beach</b>	<b>Lake/pond</b>	<b>Granitic</b>
Som. Steep	15-26	26-49%	High Plateau	<b>Buff/bank</b>	<b>Ledge</b>	<b>Dioritic</b>
Steep	27-45	50-100%	Middle Slope	<b>Channel</b>	<b>Moraine</b>	<b>Gabbroic</b>
V. Steep	46-69	101-275%	Slope step (terraced)	<b>Cliff</b>	<b>Mountain</b>	<b>Metamorphic</b>
Abrupt	70-95	276-300%	Lower Slope	<b>Cove</b>	<b>Outwash plain</b>	<b>Slate/phyllite</b>
Overhang	>100	>300%	Toe Slope	<b>Delta</b>	<b>Oxbow</b>	<b>Schist</b>
Record more			Low level/terrace	<b>Dome</b>	<b>Plain</b>	<b>Gneiss</b>
exact			Channel wall	<b>Drumlin</b>	<b>Plateau</b>	<b>Marble</b>
measures, if			Channel bed	<b>Dune</b>	<b>Ravine</b>	<b>Serpentine</b>
taken:			Depression	<b>Escarpment</b>	<b>Ridge</b>	<b>Sedimentary</b>
				<b>Esker</b>	<b>Saddle</b>	<b>Shale</b>
				<b>Estuary</b>	<b>Swale</b>	<b>Limestone</b>
				<b>Flat</b>	<b>talus</b>	<b>/Dolomite</b>
				<b>Floodplain</b>	<b>Terrace</b>	<b>Other</b>
				<b>Gorge</b>	<b>Valley</b>	
				<b>Hill</b>	<b>Other</b>	

<b>Soil Taxon/Description</b>		<b>Soil Profile notes</b> Depth examined: _____ Horizons, colors, depth to obstruction, depth to water table, depth to mottling, etc.	
<b>Soil Texture</b> <input type="checkbox"/> sand <input type="checkbox"/> sandy loam <input type="checkbox"/> loam <input type="checkbox"/> silt loam <input type="checkbox"/> silt <input type="checkbox"/> clay loam <input type="checkbox"/> clay <input type="checkbox"/> peat <input type="checkbox"/> muck	<b>Soil Drainage</b> <input type="checkbox"/> Rapidly drained <input type="checkbox"/> Well drained <input type="checkbox"/> Moderately well drained <input type="checkbox"/> Somewhat poorly drained <input type="checkbox"/> Poorly drained <input type="checkbox"/> Very poorly drained	<b>Unvegetated Surface: (please use the cover scale below)</b> <input type="checkbox"/> Bedrock <input type="checkbox"/> Large rocks (cobbles, boulders > 10 cm) <input type="checkbox"/> Sand (0.1–2 mm) <input type="checkbox"/> Litter, duff <input type="checkbox"/> Wood (>1cm) <input type="checkbox"/> Bare soil <input type="checkbox"/> Water <input type="checkbox"/> Other: _____	
<b>Soil pH:</b>	<b>Soil stoniness</b> <input type="checkbox"/> v. little (<1%) <input type="checkbox"/> moderate (2–20%) <input type="checkbox"/> very stony (20–50%) <input type="checkbox"/> exceedingly stony (>50%)		
<b>Additional environmental notes:</b>			
<b>Cowardin System</b> <input type="checkbox"/> Upland <input type="checkbox"/> Riverine <input type="checkbox"/> Palustrine <input type="checkbox"/> Lacustrine <input type="checkbox"/> Estuarine	<b>Hydrologic regime</b> <input type="checkbox"/> Permanently Flooded <input type="checkbox"/> Semipermanently Flooded <input type="checkbox"/> Seasonally Flooded <input type="checkbox"/> Saturated (& may be seas. flooded) <input type="checkbox"/> Temporarily Flooded <input type="checkbox"/> Intermittently Flooded <input type="checkbox"/> Tidally Flooded		<b>Salinity</b> <input type="checkbox"/> Coastal salt (>30 ppt) <input type="checkbox"/> Coastal brackish (5–30 ppt) <input type="checkbox"/> Fresh tidal (<5 ppt) <input type="checkbox"/> Inland salt <input type="checkbox"/> Inland brackish

#### VEGETATION DESCRIPTION

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

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



**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 B. Plants observed in Weir Farm National Historic Site.

Nomenclature follows the PLANTS 3.5 Database developed by the Natural Resource Conservation Service in cooperation with the Biota of North American Program (United States Department of Agriculture, Natural Resources Conservation Service 2007). For this report, some common names listed in the PLANTS database were changed to reflect the common names typically used by ecologists and resource managers in this region. In addition, some scientific and common names were used in this report to maintain consistency with the National Vegetation Classification System. Species with an asterisk (\*) notate species that were observed during vegetation plot sampling, but were not sampled within a plot.

Family	Scientific Name	Common Name
Aceraceae	<i>Acer pensylvanicum</i>	striped maple
	<i>Acer rubrum</i>	red maple
	<i>Acer saccharum</i>	sugar maple
Anacardiaceae	<i>Rhus hirta</i>	staghorn sumac
	<i>Toxicodendron radicans</i>	eastern poison ivy
Apiaceae	<i>Sanicula marilandica</i>	Maryland sanicle
Aquifoliaceae	<i>Ilex verticillata</i>	common winterberry
Araceae	<i>Arisaema triphyllum</i>	Jack in the pulpit
	<i>Calla palustris</i> *	water arum
	<i>Symplocarpus foetidus</i>	skunk cabbage
Araliaceae	<i>Aralia nudicaulis</i>	wild sarsaparilla
Asclepiadaceae	<i>Asclepias tuberosa</i>	butterfly milkweed
	<i>Cynanchum louiseae</i> *	black swallow-wort
Asteraceae	<i>Aster</i> sp.	aster
	<i>Achillea millefolium</i>	common yarrow
	<i>Bidens discoidea</i>	small beggarticks
	<i>Doellingeria umbellata</i> *	parasol whitetop
	<i>Erechtites hieraciifolia</i>	American burnweed
	<i>Eurybia divaricata</i>	white wood aster
	<i>Euthamia graminifolia</i> *	flat-top goldentop
	<i>Hieracium</i> sp.	hawkweed
	<i>Prenanthes</i> sp.	rattlesnakeroot
	<i>Solidago bicolor</i>	white goldenrod
	<i>Solidago caesia</i>	wreath goldenrod
	<i>Solidago rugosa</i> *	wrinkleleaf goldenrod
	<i>Symphyotrichum laeve</i> *	smooth blue aster
	<i>Symphyotrichum lateriflorum</i>	calico aster
	Balsaminaceae	<i>Impatiens capensis</i>
Berberidaceae	<i>Berberis thunbergii</i>	Japanese barberry
Betulaceae	<i>Betula alleghaniensis</i>	yellow birch
	<i>Betula lenta</i>	sweet birch
	<i>Betula populifolia</i>	gray birch
	<i>Carpinus caroliniana</i>	American hornbeam
	<i>Corylus cornuta</i>	beaked hazelnut
Brassicaceae	<i>Alliaria petiolata</i>	garlic mustard
	<i>Cardamine impatiens</i> *	narrowleaf bittercress
Campanulaceae	<i>Lobelia cardinalis</i>	cardinalflower

Family	Scientific Name	Common Name
Caprifoliaceae	<i>Viburnum acerifolium</i>	mapleleaf viburnum
	<i>Viburnum prunifolium</i> *	blackhaw
Celastraceae	<i>Celastrus orbiculatus</i>	oriental bittersweet
Clethraceae	<i>Clethra alnifolia</i>	coastal sweetpepperbush
Ceratophyllaceae	<i>Ceratophyllum echinatum</i> *	spineless hornwort
Climaciaceae	<i>Climacium</i> sp.	climacium moss
Cornaceae	<i>Cornus florida</i>	flowering dogwood
	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood
Cupressaceae	<i>Juniperus virginiana</i>	eastern redcedar
Cyperaceae	<i>Carex blanda</i>	eastern woodland sedge
	<i>Carex brevior</i> *	shortbeak sedge
	<i>Carex bromoides</i>	bromelike sedge
	<i>Carex crinita</i>	fringed sedge
	<i>Carex debilis</i>	white edge sedge
	<i>Carex gracillima</i>	graceful sedge
	<i>Carex intumescens</i>	greater bladder sedge
	<i>Carex laxiculmis</i>	spreading sedge
	<i>Carex laxiflora</i>	broad looseflower sedge
	<i>Carex lurida</i>	shallow sedge
	<i>Carex pensylvanica</i>	Pennsylvania sedge
	<i>Carex radiata</i>	eastern star sedge
	<i>Carex rosea</i>	rosy sedge
	<i>Carex</i> spp.	sedge
	<i>Carex stipata</i> *	owlfruit sedge
	<i>Carex stricta</i>	upright sedge
	<i>Carex swanii</i>	Swan's sedge
<i>Carex virescens</i> *	ribbed sedge	
<i>Scirpus cyperinus</i> *	woolgrass	
Dennstaedtiaceae	<i>Dennstaedtia punctilobula</i>	eastern hayscented fern
Dicranaceae	<i>Dicranum scoparium</i>	dicranum moss
Dryopteridaceae	<i>Athyrium filix-femina</i>	common ladyfern
	<i>Deparia acrostichoides</i>	silver false spleenwort
	<i>Dryopteris carthusiana</i>	spinulose woodfern
	<i>Dryopteris clintoniana</i>	Clinton's woodfern
	<i>Dryopteris intermedia</i>	intermediate woodfern
	<i>Onoclea sensibilis</i>	sensitive fern
	<i>Polystichum acrostichoides</i>	Christmas fern
Elaeagnaceae	<i>Elaeagnus umbellata</i>	autumn olive
Ericaceae	<i>Gaylussacia baccata</i>	black huckleberry
	<i>Gaultheria procumbens</i>	eastern teaberry
	<i>Kalmia latifolia</i>	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 pallidum</i>	Blue Ridge blueberry	
Fabaceae	<i>Amphicarpaea bracteata</i>	American hogpeanut
	<i>Desmodium paniculatum</i>	panickedleaf ticktrefoil
	<i>Trifolium aureum</i>	golden clover

Family	Scientific Name	Common Name
Fagaceae	<i>Fagus grandifolia</i>	American beech
	<i>Quercus alba</i>	white oak
	<i>Quercus coccinea</i>	scarlet oak
	<i>Quercus prinus</i>	chestnut oak
	<i>Quercus rubra</i>	northern red oak
	<i>Quercus sp.</i>	oak
	<i>Quercus velutina</i>	black oak
Geraniaceae	<i>Geranium maculatum</i>	spotted geranium
Hamamelidaceae	<i>Hamamelis virginiana</i>	American witchhazel
Iridaceae	<i>Iris versicolor</i>	harlequin blueflag
Juglandaceae	<i>Carya cordiformis</i>	bitternut hickory
	<i>Carya glabra</i>	pignut hickory
	<i>Carya ovata</i>	shagbark hickory
	<i>Carya ovalis</i>	red hickory
Juncaceae	<i>Luzula multiflora</i>	common woodrush
Lamiaceae	<i>Clinopodium vulgare</i>	wild basil
	<i>Lycopus sp.</i>	waterhorehound
	<i>Prunella vulgaris</i>	common selfheal
	<i>Scutellaria lateriflora</i>	blue skullcap
Lauraceae	<i>Lindera benzoin</i>	northern spicebush
	<i>Sassafras albidum</i>	sassafras
Leucobryaceae	<i>Leucobryum glaucum</i>	leucobryum moss
Liliaceae	<i>Maianthemum canadense</i>	Canada mayflower
	<i>Maianthemum racemosum</i>	feathery false lily of the valley
	<i>Polygonatum pubescens</i>	hairy Solomon's seal
	<i>Uvularia sessilifolia</i>	sessileleaf bellwort
	<i>Veratrum viride</i>	green false hellebore
Lycopodiaceae	<i>Lycopodium obscurum</i>	rare clubmoss
Magnoliaceae	<i>Liriodendron tulipifera</i>	tuliptree
Monotropaceae	<i>Monotropa uniflora</i>	Indianpipe
Myricaceae	<i>Morella pensylvanica</i>	northern bayberry
Nyssaceae	<i>Nyssa sylvatica</i>	blackgum
Oleaceae	<i>Fraxinus americana</i>	white ash
	<i>Fraxinus pennsylvanica</i>	green ash
Onagraceae	<i>Circaea lutetiana</i> ssp. <i>canadensis</i>	broadleaf enchanter's nightshade
Osmundaceae	<i>Osmunda cinnamomea</i>	cinnamon fern
	<i>Osmunda claytoniana</i>	interrupted fern
	<i>Osmunda regalis</i>	royal fern
Oxalidaceae	<i>Oxalis</i> sp.	woodsorrel
Pinaceae	<i>Pinus strobus</i>	eastern white pine
	<i>Tsuga canadensis</i>	eastern hemlock
Poaceae	<i>Agrostis</i> sp.	bentgrass
	<i>Arrhenatherum elatius</i>	tall oatgrass
	<i>Avena fatua</i> *	wild oat
	<i>Cinna arundinacea</i>	sweet woodreed
	<i>Cinna latifolia</i>	drooping woodreed
	<i>Dactylis glomerata</i> *	orchardgrass
	<i>Danthonia spicata</i>	poverty oatgrass
	<i>Dichanthelium clandestinum</i> *	deertongue
<i>Festuca rubra</i>	red fescue	

Family	Scientific Name	Common Name
Poaceae (cont'd)	<i>Glyceria striata</i>	fowl mannagrass
	<i>Leersia virginica</i>	whitegrass
	<i>Microstegium vimineum</i> *	Japanese stiltgrass
	<i>Panicum</i> sp	panicgrass
	<i>Phalaris arundinacea</i> *	reed canarygrass
Polygonaceae	<i>Schizachyrium scoparium</i>	little bluestem
	<i>Polygonum hydropiperoides</i>	swamp smartweed
	<i>Polygonum sagittatum</i>	arrowleaf tearthumb
Polytrichaceae	<i>Rumex acetosella</i>	common sheep sorrel
Polytrichaceae	<i>Polytrichum commune</i>	polytrichum moss
Primulaceae	<i>Lysimachia ciliata</i>	fringed loosestrife
	<i>Lysimachia quadrifolia</i>	whorled yellow loosestrife
Pyrolaceae	<i>Chimaphila maculata</i>	striped prince's pine
	<i>Pyrola elliptica</i>	waxflower shinleaf
Ranunculaceae	<i>Anemone quinquefolia</i>	nightcaps
	<i>Ranunculus recurvatus</i>	blisterwort
	<i>Thalictrum pubescens</i>	king of the meadow
Rosaceae	<i>Amelanchier arborea</i>	common serviceberry
	<i>Amelanchier</i> sp.	serviceberry
	<i>Potentilla simplex</i>	common cinquefoil
	<i>Prunus serotina</i>	black cherry
	<i>Rosa multiflora</i>	multiflora rose
	<i>Rosa</i> sp.	rose
	<i>Rubus flagellaris</i>	northern dewberry
	<i>Rubus hispidus</i>	bristly dewberry
	<i>Rubus pubescens</i>	dwarf red blackberry
	<i>Rubus</i> sp.	blackberry
Rubiaceae	<i>Spiraea alba</i>	white meadowsweet
	<i>Cephalanthus occidentalis</i>	common buttonbush
	<i>Galium aparine</i>	stickywilly
	<i>Galium circaezans</i>	licorice bedstraw
	<i>Galium palustre</i>	common marsh bedstraw
	<i>Galium</i> sp.	bedstraw
Salicaceae	<i>Mitchella repens</i>	partridgeberry
	<i>Salix nigra</i>	black willow
Saxifragaceae	<i>Chryso-splenium americanum</i>	American golden saxifrage
	<i>Mitella diphylla</i>	twoleaf miterwort
Scrophulariaceae	<i>Linaria vulgaris</i>	butter and eggs
	<i>Melampyrum lineare</i>	narrowleaf cowwheat
	<i>Nuttallanthus canadensis</i> *	Canada toadflax
Smilacaceae	<i>Smilax herbacea</i>	smooth carrionflower
	<i>Smilax rotundifolia</i>	roundleaf greenbrier
Sphagnaceae	<i>Sphagnum</i> spp.	sphagnum
Thelypteridaceae	<i>Phegopteris hexagonoptera</i>	broad beechfern
	<i>Thelypteris noveboracensis</i>	New York fern
	<i>Thelypteris palustris</i>	eastern marsh fern
Thuidiaceae	<i>Thuidium delicatulum</i>	delicate thuidium moss
Tiliaceae	<i>Tilia americana</i>	American basswood
Ulmaceae	<i>Ulmus americana</i>	American elm
Umbelicariaceae	<i>Umbilicaria mammulata</i> *	common rocktripe

Family	Scientific Name	Common Name
Urticaceae	<i>Boehmeria cylindrica</i>	smallspike false nettle
	<i>Pilea pumila</i>	Canadian clearweed
Violaceae	<i>Viola cucullata</i>	marsh blue violet
	<i>Viola macloskeyi</i> ssp. <i>pallens</i>	smooth white violet
	<i>Viola</i> sp.	violet
Vitaceae	<i>Parthenocissus quinquefolia</i>	Virginia creeper
	<i>Vitis cinerea</i>	graybark grape
	<i>Vitis labrusca</i>	fox grape



Appendix C. Field Key to USNVC associations at Weir Farm National Historic Site.

1. Forest communities: trees dominant, canopy >75%.
  2. Canopy is dominated primarily by red maple (*Acer rubrum*), wetland forests.
  3. Community has a dominant shrub layer of northern spicebush (*Lindera benzoin*). ..... **Southern New England / Northern Piedmont Red Maple Seepage Swamp (CEGL006406)**
  3. Community has a mixed shrub layer that includes highbush blueberry (*Vaccinium corymbosum*), common winterberry (*Ilex verticillata*), and coastal sweetpepperbush (*Clethra alnifolia*). ..... **Lower New England Red Maple - Blackgum Swamp (CEGL006156)**
2. Canopy includes a mixture of sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), sweet birch (*Betula lenta*), and oaks (*Quercus* spp.).
  4. Canopy dominated by a mixture of sugar maple (*Acer saccharum*) and white ash (*Fraxinus americana*), oaks rarely present. .... **Semi-rich Northern Hardwood Forest (CEGL006211)**
  4. Northern red oak (*Quercus rubra*) is present in the canopy as a dominant or co-dominant species.
    5. Canopy dominated by a mixture of northern red oak (*Quercus rubra*) and sugar maple (*Acer saccharum*), forests on dry slopes ..... **Mesic Sugar Maple - Ash - Hickory Forest (CEGL006046)**
    5. Sugar maple (*Acer saccharum*) is rarely present.
    6. Canopy is open, dominated by a mixture of sweet birch (*Betula lenta*), red maple (*Acer rubrum*) and oaks (*Quercus* spp.) saplings, young successional forests. .... **Northeast Modified Successional Forests (CEGL006599)**
    6. Canopy closed, dominated by a mixture of sweet birch (*Betula lenta*), red maple (*Acer rubrum*) and oaks (*Quercus* spp.).
      7. Canopy closed, dominated by a mixture of sweet birch (*Betula lenta*), red maple (*Acer rubrum*) and oaks (*Quercus* spp.), mapleleaf viburnum (*Viburnum acerifolium*) present. .... **Northeastern Dry Oak - Hickory Forest (CEGL006336)**

- 7. Canopy closed, dominated by northern red oak (*Quercus rubra*), black oak (*Quercus velutina*), and chestnut oak (*Quercus prinus*), black huckleberry (*Gaylussacia baccata*), and Blue Ridge blueberry (*Vaccinium pallidum*). ..... **Lower New England Slope Chestnut Oak Forest (CEGL006282)**
- 1. Non-forested communities: shrubs, herbaceous, or non-vascular species dominate.
- 8. Vegetation is characterized by dense cover of tall shrubs, wetland shrub thickets.
- 9. Common buttonbush (*Cephalanthus occidentalis*) is dominant. .... **Northeastern Buttonbush Shrub Swamp (CEGL006069)**
- 9. Highbush blueberry (*Vaccinium corymbosum*), common winterberry (*Ilex verticillata*), and coastal sweetpepperbush (*Clethra alnifolia*) are dominant shrubs. .... **Blueberry Wetland Thicket (CEGL6371)**
- 8. Vegetation is characterized by herbaceous and/or non-vascular plants.
- 10. Vegetation is characterized by the non-vascular plant common rocktripe (*Umbilicaria mammulata*) and bedrock outcrops. .... **Montane Cliff (Common Rocktripe Type) (CEGL004387)**
- 10. Vegetation is characterized by dense grasses and scattered shrubs.
- 11. Little bluestem (*Schizachyrium scoparium*) is dominant. .... **Little Bluestem Old Field (CEGL006333)**
- 11. Orchard grass and other cool-season grasses are dominant. .... **Northeastern Old Field (CEGL006107)**

Appendix D. Synthesis table of the Two-way Indicator Species Analysis (TWINSPAN) results showing the vegetation associations in Weir Farm National Historic Site. Numbers within matrix refer to species cover values within each plot: 1=<5%; 2=5-25%; 3=25-50%; 4=50-75%; 5=>75%. Vertical lines separate each plant community group; horizontal lines separate each species group that differentiates vegetation association(s) from each other. Species in bold are proposed as diagnostic based on limited data from Weir Farm.

Plant Species <sup>b</sup>		Plant Community <sup>a</sup>																												
		F	OH	OH	OH	OV	OV	SMNY	OH	OV	OV	OV	OV	SMNY	OV	SMRO	SMRO	OV	SMNY	SF	SMNY	RMSB	RMSB	RMSB	RMSB	RMSB	RMHB	RMSB	SF	BB
		Plot Number																												
		29	24	5	15	17	1	10	18	3	8	9	12	26	16	21	22	23	25	28	14	20	11	4	6	7	2	13	27	19
SCSC	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DASP2	H	3	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
POCO38	N	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
ACSA3	T3	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
AMELA	H	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
AMAR3	S1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
ARNU2	H	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
COCO6	H	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
FAGR	S1	-	1	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
GAPR2	H	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
HAVI4	H	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
LYOB	H	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
LYQU2	H	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MELI2	H	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
NYSY	S1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
QUERC	H	1	-	-	1	1	1	-	1	1	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
QURU	H	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
QURU	S1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
QUVE	S1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>QUVE</b>	<b>T2</b>	-	<b>1</b>	<b>2</b>	<b>1</b>	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>QUCO2</b>	<b>T2</b>	-	-	-	<b>1</b>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>QUPR2</b>	<b>T2</b>	-	<b>2</b>	-	<b>2</b>	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
<b>GABA</b>	<b>S1</b>	-	<b>1</b>	<b>1</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>GABA</b>	<b>S3</b>	-	-	-	<b>1</b>	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
QUVE	T3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TSCA	T2	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
VAAN	S1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
VACO	H	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
VAPA4	H	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
VAPA4	S3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BELE	H	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	
CASW	H	-	-	-	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	
DEPU2	H	-	-	-	-	1	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	
SAAL5	H	1	-	-	-	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
NYSY	T2	-	-	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	
SMRO	H	-	-	1	1	-	1	-	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	1	-	-	-	
UVSE	H	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	
ACPE	H	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CALA18	H	-	-	-	-	-	-	-	1	1	1	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	
<b>CAPE6</b>	<b>H</b>	-	<b>2</b>	<b>1</b>	-	<b>1</b>	<b>1</b>	<b>1</b>	-	<b>1</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	-	-	-	-	-	-	-	-	-	-	
<b>CHMA3</b>	<b>H</b>	-	-	<b>1</b>	-	<b>1</b>	-	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>VIAC</b>	<b>H</b>	-	-	-	-	-	<b>1</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
<b>THNO</b>	<b>H</b>	-	-	-	-	-	<b>1</b>	<b>3</b>	-	<b>1</b>	<b>1</b>	-	<b>1</b>	<b>1</b>	-	-	-	-	-	-	<b>1</b>	-	-	-	-	-	1	-	-	
EUDI16	H	-	-	-	-	1	1	1	-	1	-	1	1	1	1	-	1	1	1	-	1	-	-	-	-	-	-	-	-	
FAGR	T2	-	1	1	-	-	-	-	-	1	1	1	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	

Plant Species <sup>b</sup>		Plant Community <sup>a</sup>																											
		Plot Number																											
		F	OH	OH	OH	OV	OV	SMNY	OH	OV	OV	OV	OV	SMNY	OV	SMRO	SMRO	OV	SMNY	SF	SMNY	RMSB	SF						
29	24	5	15	17	1	10	18	3	8	9	12	26	16	21	22	23	25	28	14	20	11	4	6	7	2	13	27	19	
HAVI4	S1	-	1	1	1	-	-	1	-	-	-	-	1	2	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-
KALA	S1	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MIRE	H	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-
POPU4	H	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
PRSE2	T2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
QUAL	T2	-	-	-	-	1	1	-	2	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
QURU	T2	-	-	-	-	2	1	-	1	1	1	1	2	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-
SMHE	H	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
ACPE	S1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
ACSA3	H	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ACSA3	S1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	1	1	-	1	-	-	-	-	-	-	-	-	-
<b>ACSA3</b>	<b>T2</b>	-	1	-	-	-	1	1	-	-	-	-	1	-	1	<b>4</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>2</b>	-	-	-	-	-	-	2	-
ACMI2	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AMBR2	H	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
AREL3	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASTU	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CABL	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CADE5	H	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CAGR2	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CALA19	H	-	-	-	-	-	1	-	-	1	-	-	1	1	1	1	1	-	-	1	-	-	-	-	-	-	-	-	-
CARA8	H	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARO22	H	-	-	-	-	-	-	-	-	-	1	1	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-
CACA18	S1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-
CAGL8	T2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CLVU	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEPA6	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELUM	S1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FERU2	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIVU2	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
POSI2	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RUFL	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RUAC3	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SAAL5	T2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-
SCSC	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOCA4	H	-	-	-	-	-	1	-	-	-	-	1	-	1	1	1	1	-	-	1	-	-	-	-	-	-	-	-	-
SPAL2	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRAU2	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VAAN	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
VICI2	H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ACER	H	-	-	-	-	1	-	-	-	-	1	1	-	-	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-
BELE	T2	-	1	-	1	-	1	1	2	2	1	-	2	1	-	1	1	1	1	-	-	1	-	1	1	-	-	-	-
CAOV3	T2	-	-	-	-	1	-	-	-	-	-	1	1	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
OSCL2	H	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-
ALPE4	H	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	2	-	1	-	-	-	-	-	-	1	-
FRAM2	T2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	-	1	1	-	1	-	-	-	1	-	-
BETH	H	-	-	-	-	1	1	-	-	1	-	1	-	1	-	-	-	-	1	1	-	-	1	-	1	1	1	-	-
BELE	S1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	2	-
CAOV2	T2	-	-	-	-	1	1	-	-	1	1	-	1	-	-	-	-	1	-	1	-	-	1	1	1	-	-	-	-
CLAL3	H	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	1	1	-	-	-	-
LITU	T2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-
MACA4	H	-	-	1	1	-	-	1	1	1	1	-	-	-	1	1	-	-	1	-	1	-	-	1	1	1	1	-	-
PAQU2	H	1	-	-	-	1	-	1	1	1	1	1	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-
CEOR7	H	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	-	-	-	-	1	-	1	-	-
POAC4	H	-	-	-	-	-	1	-	-	1	-	1	-	1	1	-	1	-	-	-	-	1	1	1	1	-	1	1	-
LITU	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-

Plant Species <sup>b</sup>	Plant Community <sup>a</sup>																													
	F	OH	OH	OH	OV	OV	SMNY	OH	OV	OV	OV	OV	OV	SMNY	OV	SMRO	SMRO	OV	SMNY	SF	SMNY	RMSB	SF	BB						
	29	24	5	15	17	1	10	18	3	8	9	12	26	16	21	22	23	25	28	14	20	11	4	6	7	2	13	27	19	
ACRU H	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BETUL H	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
DEAC4 H	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
OSCI H	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1	1	-	-	-
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BETH S1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	2	-
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PRVU H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
RHHI2 T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
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ARTR H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	1	1	1	-	-	-
ATFI H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	-
BEAL2 S1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BEAL2 T2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-
IMCA H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	1	1	-	-	-
LIBE3 S1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3	2	2	2	1	1	-	-
SPHAG2 N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	-	-	-	-
SYFO H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	3	1	1	1	1	-	-
THDE10 N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	1	1	-	-	-
ULAM T2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-
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CAREX H	-	-	-	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1	1	-
CLAL3 S1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-
ILVE S1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-
JUVI S1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
TORA2 H	1	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	1	-	1	1	1	1	1	1	1	1	-
ANQU H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
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BEAL2 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CAIN12 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
CALU5 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
PHHE11 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
PRENA H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
VEVI H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CABR14 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-
CACR6 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CAST8 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CILUC H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
CLIMA2 N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
DRCA11 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-
FRPE H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
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GAAP2 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-
GLST H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-
LEVI2 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-
RARE2 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
SCLA2 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
SYLAL7 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
THPU2 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-
VIOLA H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
VIMAP3 H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-
BOCY H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1

Plant Species <sup>b</sup>		Plant Community <sup>a</sup>																													
		F	OH	OH	OH	OV	OV	SMNY	OH	OV	OV	OV	OV	SMNY	OV	SMRO	SMRO	OV	SMNY	SF	SMNY	RMSB	RMSB	RMSB	RMSB	RMSB	RMHB	RMSB	SF	BB	
		Plot Number																													
		29	24	5	15	17	1	10	18	3	8	9	12	26	16	21	22	23	25	28	14	20	11	4	6	7	2	13	27	19	
GAPA3	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
THPA	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	1
ACRU	T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
<b>BIDI</b>	<b>H</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>1</b>
<b>CEOC2</b>	<b>S1</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>2</b>
COSES	S1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
LYCOP4	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
SANI	T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1

<sup>a</sup>Field classified plant communities are indicated at top of table: F=herbaceous fields; OH=Oak / Huckleberry forests; OV=Oak / Mapleleaf Viburnum forests; SMNY= Sugar maple / New York Fern forests; SMRO= Sugar Maple - Red Oak forests; SF=Successional forests; RMSB=Red Maple / Spicebush forests; RMHB=Red Maple / Highbush Blueberry forests; BB=Buttonbush wetland thickets. Data for Highbush Blueberry - Winterberry wetland thickets not collected in this study.

<sup>b</sup>Plant species listed vertically on left use the USDA PLANTS codes followed by stratum location: T2=tree canopy; T3=tree subcanopy; S1=tall shrub; S2=short shrub; S3=dwarf shrub; H=herbaceous; N=non-vascular.

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