

**TOWN PARK AND GREAT CEDARS CONSERVATION AREA WEST  
OLD SAYBROOK, CONNECTICUT**

**INVASIVE SPECIES AND NATURAL HABITAT MANAGEMENT PLAN**

**December 2010**



*Prepared for:*

Town of Old Saybrook Conservation Commission  
&  
Town of Old Saybrook Parks and Recreation Commission

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**Town Park and Great Cedars Conservation Area West  
Invasive Species and Natural Habitat Management Plan**

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## INTRODUCTION

To assist the Town of Old Saybrook in developing an open space management strategy for Great Cedars Conservation Area West and Town Park, a natural resources assessment was undertaken by the Connecticut River Coastal Conservation District (the District) in the Spring and Summer of 2010. This report summarizes information collected during four field visits, describes observed threats and management opportunities, and offers a number of recommendations for consideration in developing an open space management plan. The report is modeled after the Great Cedars Conservation Area Natural Resources Assessment and Mapping Study completed by the District in 2006, but focuses on where and how to control invasive plant species.

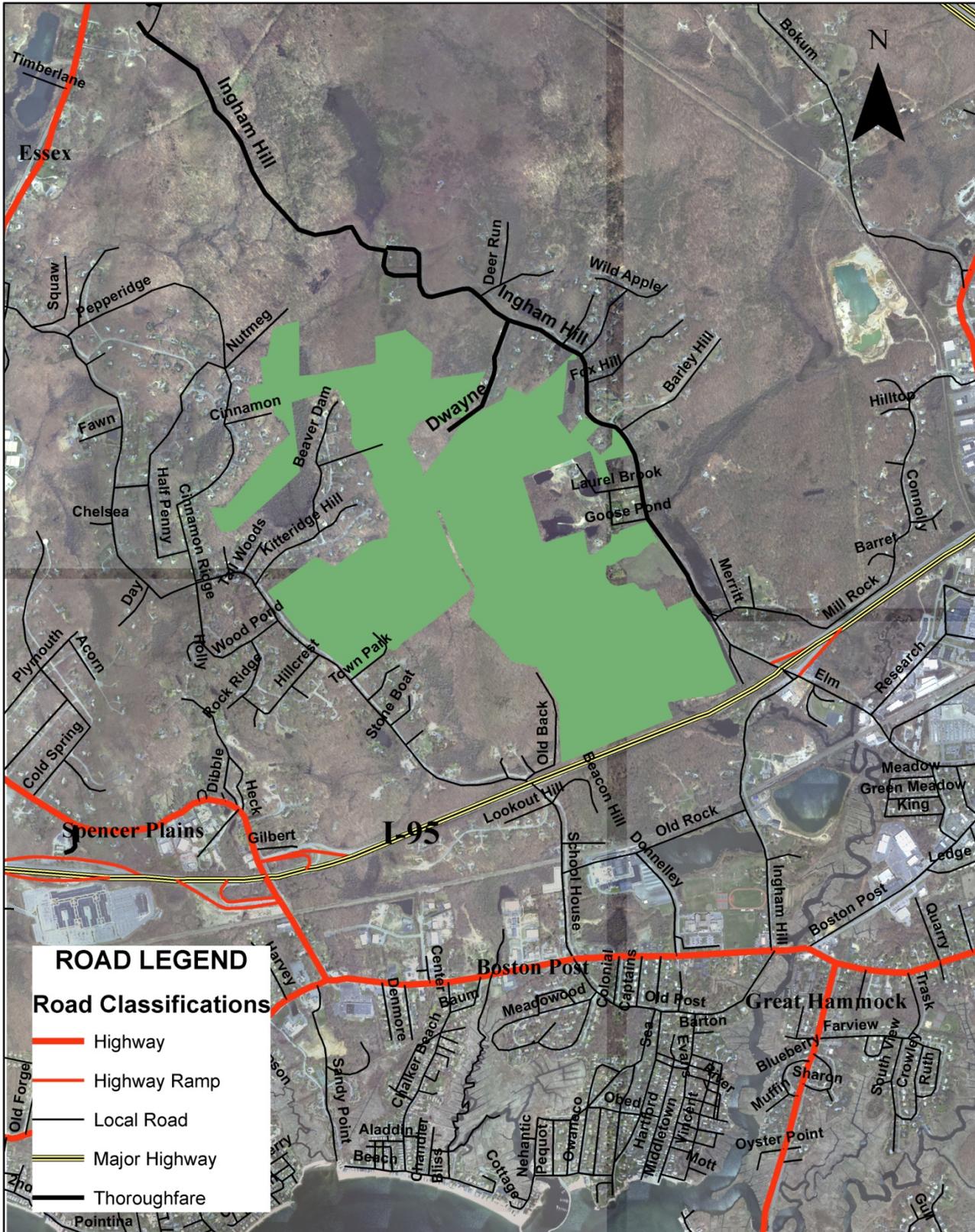
Invasive plants are nonnative plants that grow quickly and aggressively, displacing other species. They are usually introduced by people either accidentally or on purpose, into a region far from their native habitat. Invasive species that colonize a new area may gain an ecological edge since the insects, diseases, and foraging animals that keep their growth in check in their native range are not present. Invasive plant species thrive on disturbed sites like construction areas, road cuts and at the edges of natural habitat. Once these plants have become established, they can create a monoculture with little to no plant biodiversity. Land that is dominated by such species provides fewer resources for fauna, such as food and shelter. Recognition of the problem of invasive plants is growing, at the same time as damage to native ecosystems is mounting. Identifying invasive plants and understanding the potential damage they can cause is essential to stopping their spread and protecting native vegetation.

Clark Community Park, also known as Town Park, and the Great Cedars Conservation Area West (collectively, GCCA West) consist of parts of several different land purchases by the Town of Old Saybrook. Both parcels are located west of Ingham Hill Road, north of the Connecticut Turnpike (I-95) and Schoolhouse Road. Town Park is approximately 185 acres of open space land acquired in pieces from 1967 to 1971, and Great Cedars West is approximately 365 acres purchased in 1999. The property is within the Oyster River subregional drainage basin. Significant water resources on and near the property include the headwaters of the Oyster River, Lake Rockview, Goose Pond, Crystal Lake and an Atlantic white cedar swamp. The site is characterized by wetlands and hilly terrain. Trees and shrubs cover most of the site and canopy cover is greater than 75 percent. (See [Figure 1: Locus Map](#), page 2)

Notable cultural and natural features on the site include Lake Rockview, an old gravel pit whose product was used to construct I-95. The lake is flushed by the tidally influenced Oyster River and is estimated to be 75 feet deep. Fishing Brook flows between Lake Rockview and Crystal Lake. In 2005, the Town installed a fish passage at the dam on Fishing Brook just south of Crystal Lake to restore spawning grounds for alewife, blue back herring, and other herring species. The Atlantic white cedar swamp is an uncommon resource in Connecticut. Of the total of forty swamps identified in the state, the majority of the swamps in Connecticut are in the eastern portion of the state with only six identified west of the Connecticut River.

**FIGURE 1: LOCUS MAP**

**Town Park & Great Cedars Conservation Area West**



## DATA COLLECTION, INFORMATION GATHERING AND ANALYSIS

Data collection and information gathering was conducted by Penelope Sharp, Consulting Professional Wetland Scientist (PWS), and Erica Larner, the District’s Natural Resource Specialist. Field investigations were conducted on in 2010 on April 23, May 10, June 21 and September 15 to assess the following:

- Major plant communities
- Wetlands and watercourses
- Vernal pools
- Wildlife
- Notable natural features
- Unique species
- Sensitive areas
- Non-native invasive plants
- Existing trails
- Property boundaries

During the field visits, notable features and areas of natural resource management concern were photodocumented and georeferenced locations were acquired using a Garmin 12 hand-held GPS unit. Georeferenced locations were also acquired for existing trails.

Features on and near the property were mapped using ESRI’s ArcMap 9.2 program. A Geographic Information System (GIS) project was created in a NAD83 projection. The GIS was populated with field collected GPS data, a digital orthophotograph acquired from the Town of Old Saybrook, and statewide available GIS data. The following table summarizes the data included in this GIS project.

<b>DATA LAYER</b>	<b>DATA SOURCE*</b>
Digital orthophotograph	Town of Old Saybrook
Existing trails	Town of Old Saybrook
Natural community boundaries	Field collected GPS and Penni Sharp
Property lines	Town of Old Saybrook
Roads	DEP Statewide
Soils	DEP Statewide
Topography - 10 ft contours	DEP Statewide
Water resources	DEP Statewide
Wetlands and watercourses	DEP Statewide

*\*see Appendix A for a description of data source and type*

## SOILS AND TOPOGRAPHY

GCCA West is characterized by a wide range of both soils and topography presenting unique assets and management challenges. Portions of the site with steep slopes can make trail development and maintenance, as well as site access, difficult. On the other hand, these same steep slopes create dramatic landscapes and more challenging hikes for the public. Gently sloping to flat areas provide easier to moderate walking opportunities and alternative views, but many of the areas are poorly drained and not suitable for recreation. The twenty soil series identified on the properties are associated with the unique and varied topography. Surprisingly, though, these variations do not correlate with as much diversity of plant communities as would be expected on an over three hundred acre site.

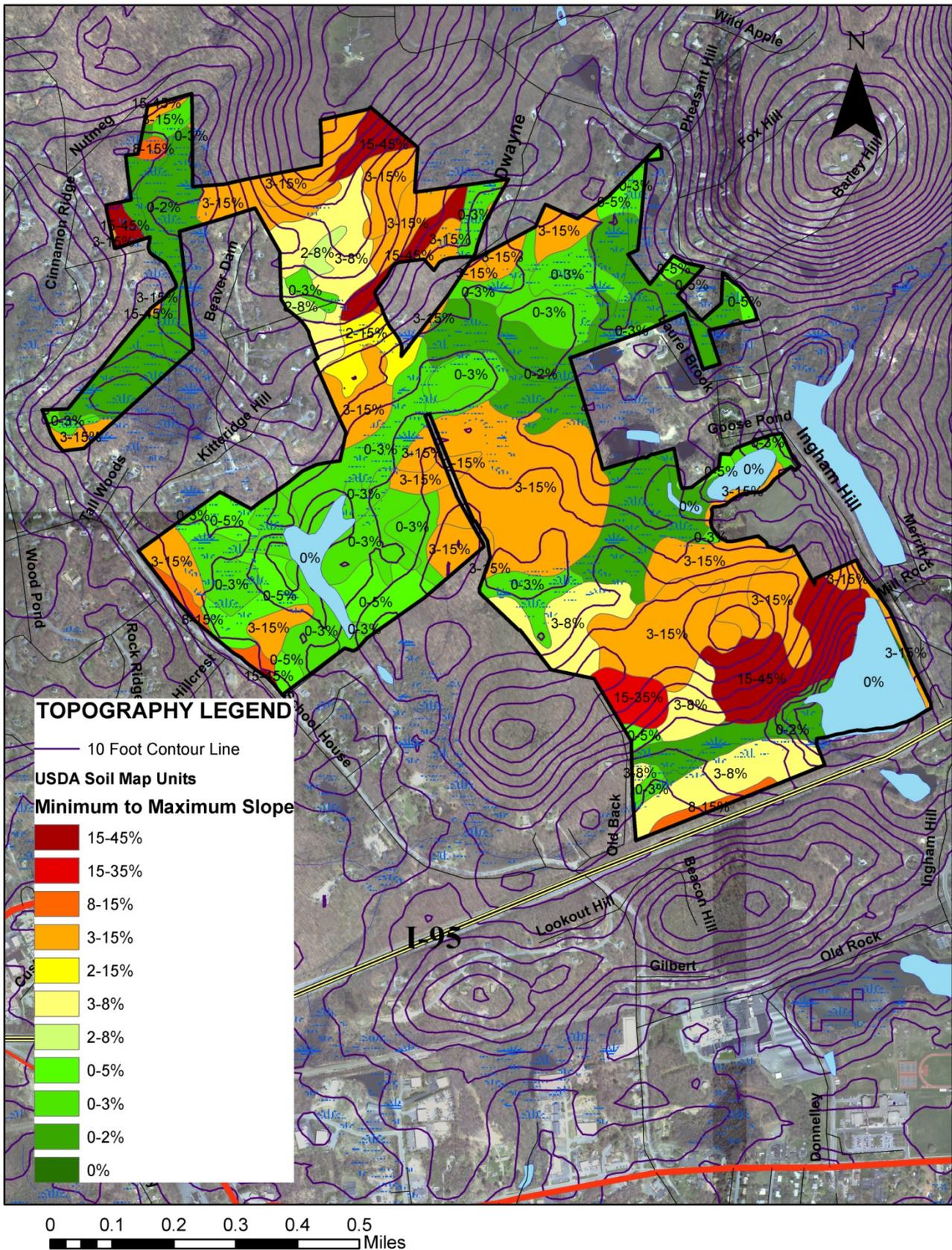
The properties are located on moderate slopes with a number of rock outcroppings on the summit areas. Slopes range from nearly level in the central portion of the property to moderately steep in the northern and southern portions. The majority of the flat areas are classified as wetlands with 0% to 3% slopes, while the upland areas are characterized by slopes ranging from 3% to 45%. Topography is particularly steep north of and adjacent to Lake Rockview and in the northern portion of the property along Bear's Den Loop. (See [Figure 2: Topography](#), page 5)

Soils on the property include eleven poorly or very poorly drained soil series. These eleven wetland soil types are grouped into seven map units (identified by the USDA-NRCS as map units 3, 12, 13, 15, 17, 18 and 103) and are associated with the large wetland in the center of the property, the wetland in the northwest corner, and with the hydrologic connection between Crystal Lake and Lake Rockview. There are nine upland soil series grouped into seventeen map units (identified by the USDA-NRCS as map units 21A, 23A, 29A, 29B, 34A, 38C, 46B, 47C, 61B, 61C, 62C, 62D, 73C, 73E, 85B, 85C and 86C). Upland soils include sandy loams, fine sandy loams, gravelly sandy loams and loamy soils on glacial till plains and ridges. Three of the upland soils have restrictive layers that impede permeability. Woodbridge (identified as map units 46B 47C) is formed in dense glacial till and has a compact hardpan, Charlton-Chatfield (identified as map units 73C and 73E) has a shallow depth to lithic bedrock in the Chatfield portion of the complex, and Paxton-Montauk (identified as map units 85B, 85C and 86C) has a shallow depth to dense material. (See [Figure 3: Soil Map Unit Boundaries](#), page 6)

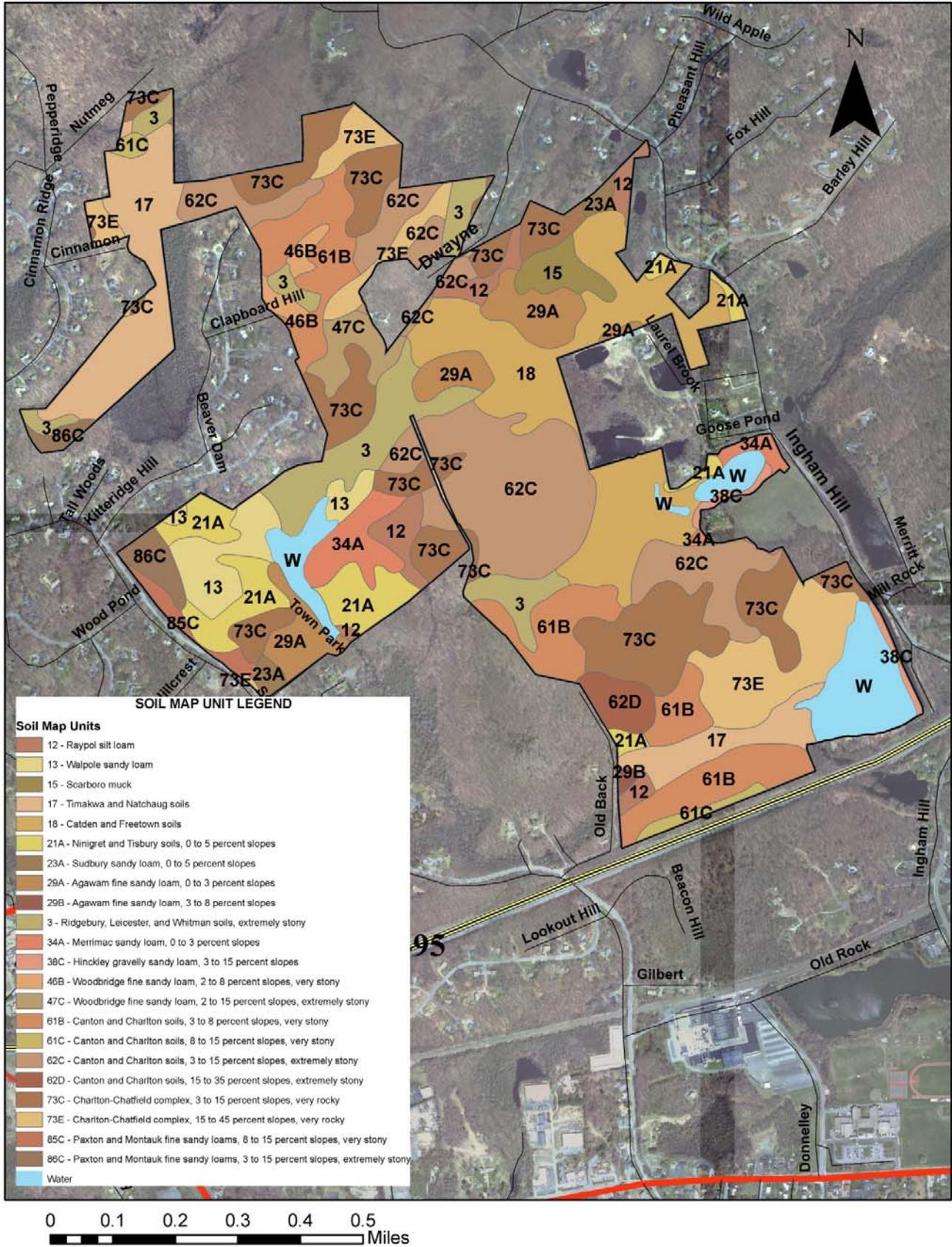
Descriptions of the soil series on the property are provided in Appendix B, and an explanation of the limitations on recreational uses is in Appendix C. Select properties of the soil map units on the property are summarized in Table 1, and limitations on recreational activities are summarized in Table 2. In general, severe limitations on recreational uses are related to wetness, slope, and stoniness of soils found in the southern portion of the property (Woodbridge, Canton, Charlton, and Chatfield) and the wetlands corridor through the central portion of the property.

The soil limitations found in the south and central portions will likely restrict trail development or other recreational activities, such as picnicking or horseback riding. Most of the property without severe soils limitations has already been improved for recreation.

**FIGURE 2: TOPOGRAPHY**  
**Town Park & Great Cedars Conservation Area West**



**FIGURE 3: SOIL MAP UNIT BOUNDARIES**  
**Town Park & Great Cedars Conservation Area West**



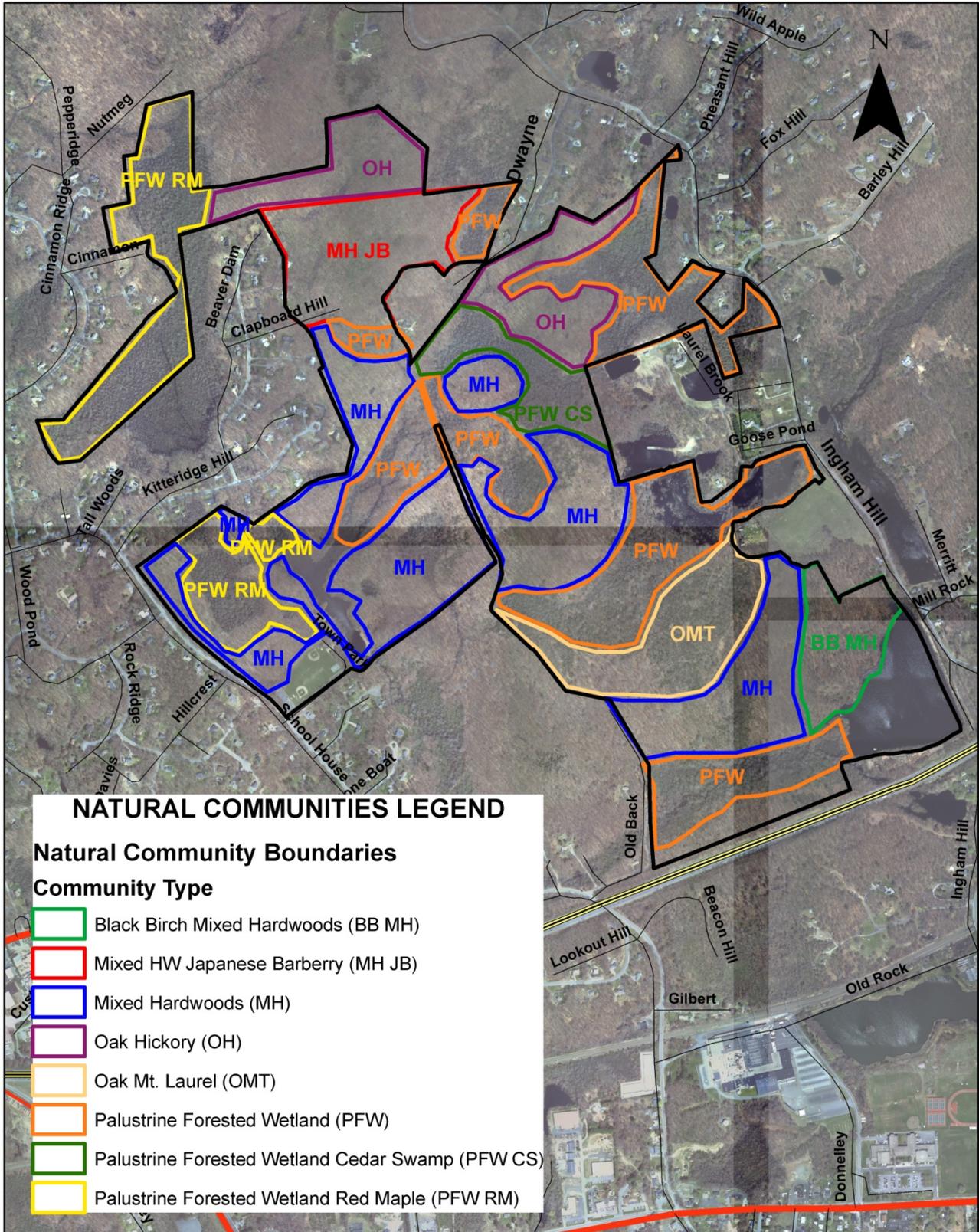
## NATURAL PLANT COMMUNITIES

With the exception of the Atlantic White Cedar Swamp, GCCA West is notable precisely because it is not unique, but provides an excellent example of the plants, habitats and associated wildlife common to the area. Many communities focus on protecting unique and rare resources as part of their open space preservation initiatives, with the result that more common habitats are overlooked. There can be no argument against preserving unusual resources before they no longer exist, but more common habitats are also important to protect. Unique resources provide niche habitat, but the majority of species in the area rely on more generic habitat. Despite some invasive plant infestations, GCCA West provides just that kind of healthy habitat.

Areas that are characterized by similar ecological conditions, physical characteristics, and plants assemblages are referred to by ecologists as “community types” or “cover types.” In any given landscape, the number of communities identified depends upon the degree of resolution desired. For this study, a total of six natural community types have been delineated and descriptions of each are provided below. Several of these communities have populations at multiple locations on site.

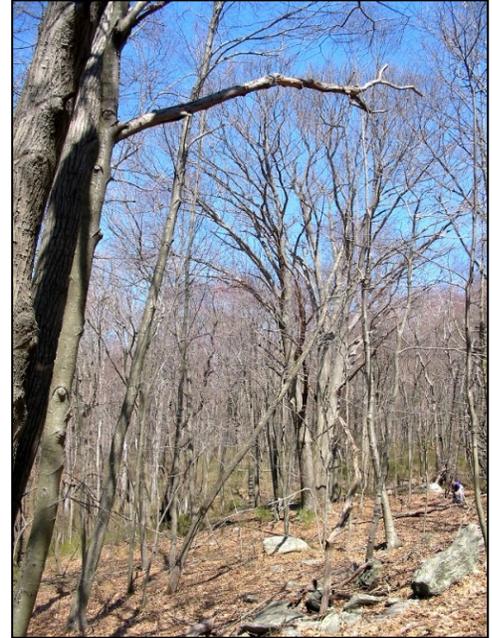
Most of these six communities are upland habitats; however, a large forested swamp occupies a major portion of the central area of the parcel, and several small forested wetland areas associated with intermittent and permanent watercourses are located on the property. Documented vernal pools exist, and there are also potential cryptic vernal pools, meaning they occur within the larger swamp. In the text of the report, common names are used for plant species; a comprehensive species list appears within Appendix D. (See [Figure 4: Natural Community Boundaries](#), page 8)

**FIGURE 4: NATURAL COMMUNITY BOUNDARIES**  
**Town Park & Great Cedars Conservation Area West**



### ***Mixed Hardwoods with No Dominance***

The primary community type within GCCA West is mixed hardwoods with no particular dominance and is located throughout the property. Tree species include American beech, tulip poplar, red oak, white oak, sugar maple, black cherry, ash, hickory, and black birch. Ironwood and flowering dogwood, both small tree species, are also present. In the southern section of the property to the east side of Crystal Lake, mountain laurel and sweet pepperbush dominate the shrub layer, although they grow somewhat sparsely. The herbaceous layer is variable. In some sections of the forest, the layer is thin, with scattered plants including white wood aster and spotted wintergreen. In other areas, fern glades are present consisting primarily of New York fern. Another common species found in the herbaceous layer is Pennsylvania sedge, which is prevalent in the southern sections of the property.



### ***Mixed Hardwoods with Japanese Barberry***

This community is situated in the central portion of the site to the east of Clapboard Lane. Trees within this area include red oak, white oak, American beech, shagbark hickory, black birch, and ironwood.

**Japanese barberry dominates the shrub layer forming dense, impenetrable thickets. The barberry is highly invasive and its presence has been linked to higher abundance of deer ticks.**



### ***Oak-Hickory Dominated Mixed Hardwoods***

The dominant cover type in the northern section of the property is oak-hickory dry woods. This cover type encompasses a relatively small portion of the site and is found along moderately to steeply sloping terrain on rocky upland soils in the area of the Upper and Lower Ledge Trails. Oak species include black oak, red oak, scarlet oak and white oak. Hickory species include shagbark, mockernut, and pignut. Red cedar is also present, particularly on the rocky knolls. Shrub species in this area include lowbush blueberry and huckleberry. Northern dewberry and Pennsylvania sedge are present within the herbaceous stratum. There is exposed bedrock in this section of the parcel and the species present are indicative of thin, dry soils.

### ***Oak Dominated Mixed Hardwoods with Mountain Laurel***

This community is situated to the east of Old Back Highway in the vicinity of the Blue Trails. Oaks, including red oak and white oak are the prevalent trees, although other species including American beech, mockernut hickory, black birch, and ironwood are also common. Mountain laurel is abundant in the shrub layer and forms dense thickets in places. Maple-leaved viburnum, another shrub species, is also common in this area. Canada mayflower, hay-scented fern, New York fern, and Pennsylvania sedge are widespread species in the herbaceous layer in areas that the mountain laurel is not completely shading the forest floor. **Wineberry, an invasive shrub in the raspberry group, was noted in this area, however, it is not yet abundant.**

### ***Black Birch Dominated Mixed Hardwoods***

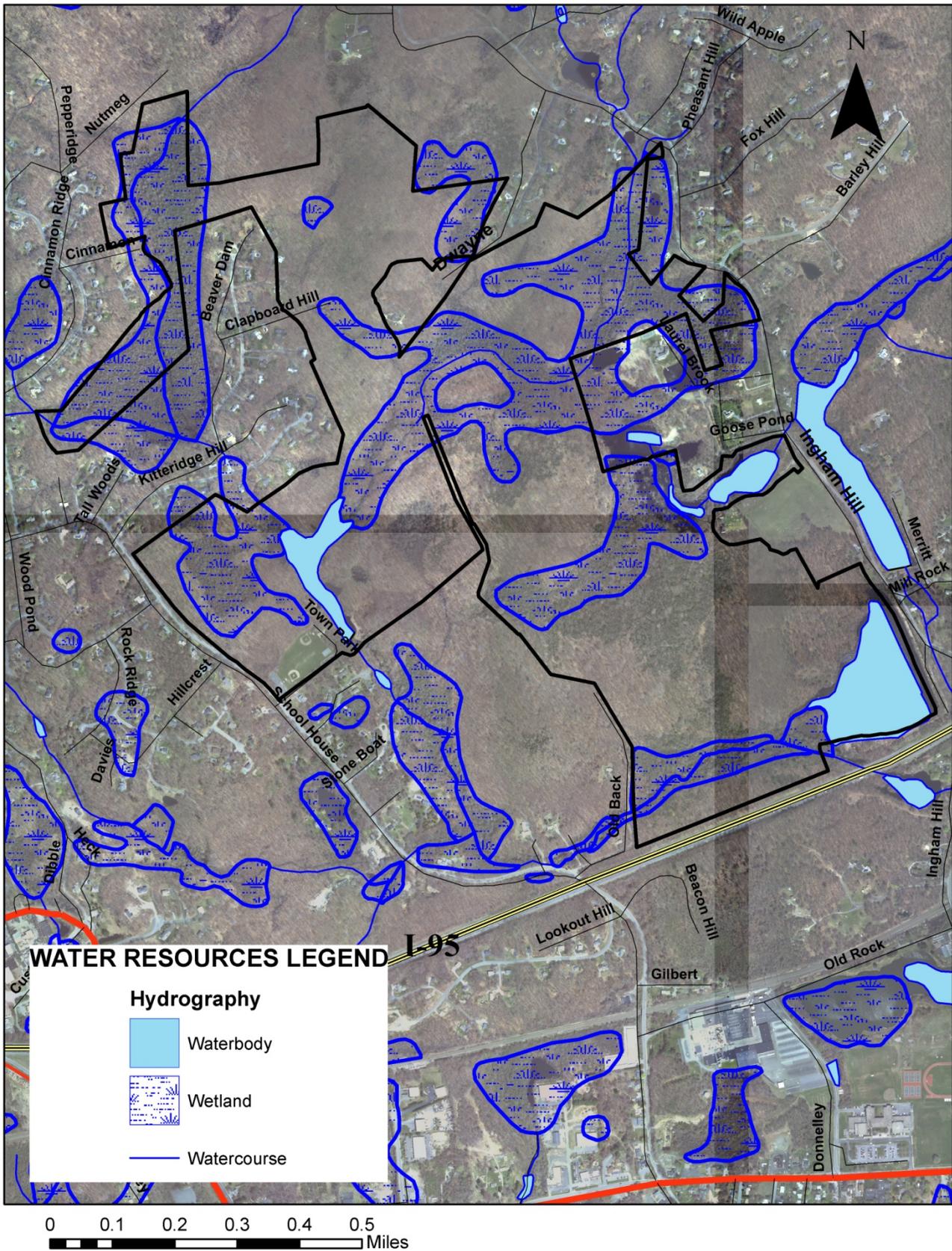
The southeastern portion of the property overlooking Lake Rockview is dominated by black birch. Other tree species include black, red, and white oak, American beech, and mockernut hickory. There is a large, specimen white oak at the lookout over the lake. **Oriental bittersweet, an invasive vine, is abundant in this section of the property. Other invasive plants in this area include Morrow's honeysuckle, wineberry, Japanese barberry, multiflora rose, winged euonymus and Japanese honeysuckle.** Poison ivy, Virginia creeper, and roundleaf greenbrier, although native species, grow vigorously and are less than desirable. The herbaceous layer contains a variety of species, including Christmas fern, Canada bluegrass, white wood aster, sweet vernal grass, shinleaf, and several species of sedge.

### ***Palustrine Forested Wetlands***

Several areas on the property contain wetlands belonging to the palustrine ecological system. This is one of five systems recognized by the U.S. Fish and Wildlife Service's wetland classification system described in *Classification of Wetlands and Deepwater Habitats of the United States*, Cowardin, et al. 1979. Palustrine wetlands include all nontidal wetlands dominated by trees, shrubs, persistent emergent plants, or emergent mosses or lichens, as well as small, shallow open water ponds or potholes. They are often called swamps, marshes, potholes, bogs, or fens. These wetlands occur throughout the property with variations depending on location. (See [Figure 5: Wetland & Water Resources](#), page 11)

Much of the central portion of the property is palustrine forested wetland interspersed with upland. This wetland is dominated by red maple and black gum. Sweet pepperbush is the prevalent shrub species; however, winterberry and northern arrowwood are also fairly widespread. A number of herbaceous species were observed including the showy cardinal flower, turtlehead, royal fern, cinnamon fern, jewelweed and several species of sedges and grasses.

**FIGURE 5: WETLAND & WATER RESOURCES**  
**Town Park & Great Cedars Conservation Area West**



### *Western Wetlands*

In the western section of the property just east of Schoolhouse Road there are three wetland areas with a predominance of red maple. This subcommunity is shown on the maps as PFW Red Maple. The southernmost is a vernal pool forested with pin oak and red maple. Sweet pepperbush and highbush blueberry are the prevalent shrubs, and cinnamon fern the dominant herbaceous species. Roundleaf greenbrier is also present at the perimeter of the vernal pool.

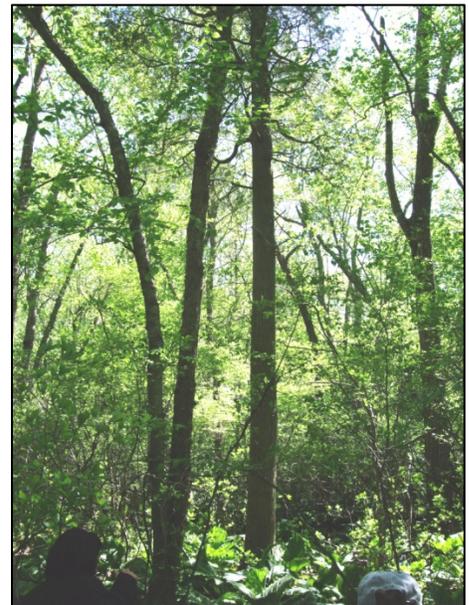


To the north of the pool, there is a fairly large wetland that is encircled by the Red Trail. This wetland is a typical red maple swamp dominated by red maple. Yellow birch is also common. Wetland associated shrubs include sweet pepperbush, northern arrowwood, spicebush, and swamp azalea. Obligate wetland species, defined as plants occurring in a wetland 99% of the time, comprise the herbaceous layer. Examples found at this location include tussock sedge and skunk cabbage. **A significant population of garlic mustard, as well as smaller populations of burning bush and Oriental bittersweet were observed here.**

The most northwestern portion of the property is a “finger” of land accessible from Nutmeg Circle. With the exception of a very small mixed hardwood slope to the extreme west, it is a typical red maple swamp very similar in composition to the wetland just north of the vernal pool near Schoolhouse Road. No invasive plant species were observed at this location.

### *Cedar Swamp*

In the center of the property, there is a large wetland system that is labeled on the USGS topographic map and others as “Cedar Swamp.” Presumably, the name originated from the presence of Atlantic white cedar trees that once may have dominated the wetland. This subcommunity is shown on the maps as PFW Cedar Swamp. During field investigations, the wetland was examined in detail, and only one Atlantic white cedar tree was observed. In a 2001 assessment, multiple trees were observed, though it was noted that there were no young trees or seedlings evident. Despite the lack of cedar trees, the wetland contains a rich diversity of species and an absence of non-native invasive species. Tree species include the dominant red maple, as well as black gum, yellow birch, and American beech. Sweet pepperbush dominates



the shrub layer. Other observed shrubs include swamp azalea, mountain laurel, and winterberry. Roundleaf greenbrier is common in some sections of the swamp. Herbaceous species are plentiful and include cinnamon fern, skunk cabbage, golden ragwort, interrupted fern, netted chain fern, royal fern, tussock sedge, and marsh blue violet. Some portions of this large wetland contained areas of standing water during the June visit. It is quite probable that the areas of deeper water contain more examples of cryptic vernal pools.

### ***Vernal Pools***

The vernal pool that lies to the west of the Yellow Trail and east of Crystal Lake is a classic example of a vernal pool: an isolated wetland that becomes nearly dry during hot summer months yet retains water long enough for successful amphibian breeding. Red maple is the dominant tree species within and around the pool. Winterberry comprises the shrub layer along the pool perimeter. Water willow is abundant within the pool itself. Three other similar vernal pools were observed in close proximity. The pools are shown on [Figure 7: Interesting and Unique Features on the Trail](#) (page 14).



## WILDLIFE

As with the plant communities, GCCA West hosts a healthy population of commonplace, native wildlife. The unremarkable communities provide “bread and butter” habitat for a variety of birds, amphibians, reptiles, and small and large mammals. They also provide suitable habitat for three species of Special Concern on record with the state of Connecticut’s Natural Diversity Database as occurring close to the site. Additionally, potential habitat was observed for New England cottontail, a species being considered for protection under the federal Endangered Species Act. By protecting common upland habitats as well as wetlands and vernal pools, GCCA West provides a complex mosaic of natural communities that together create a more productive habitat than individually they could. Many fauna spend their lives across multiple communities. For example, many salamanders rely on vernal pools to breed but spend their adult lives in upland habitat.

As indicated, the property contains a diversity of upland and wetland community types and supports a number of wildlife species. During the field investigations, a number of bird species were both heard and observed. These include red-winged blackbird, tufted titmouse, white-breasted nuthatch, black-capped chickadee, great-crested flycatcher, rufous-sided towhee, blue jay, black and white



warbler, and red-eyed vireo. A pair of red-shouldered hawk was noted near Crystal Lake and, based upon their behavior, are probable breeders on the site. Many other bird species are likely to utilize these habitats. Wading birds such as great blue heron, green heron, and great egret are likely frequent visitors to Crystal Lake and Goose Pond. Waterfowl are also visitors of the ponds, and some species such as Canada goose and mallard duck may breed at the pond shorelines.

Habitat is also present for some owls such as eastern screech owl, great horned owl, and barred owl. The oak forests are ideal for wild turkey. These woodlands also provide resources for small and large mammals including white-tailed deer, gray squirrel, southern flying squirrel, eastern chipmunk, Virginia opossum, striped skunk, and raccoon.

The vernal pools found on the site provide habitat for spotted salamander and wood frog. It is also highly probable that the red-backed salamander, a common terrestrial species, is present at the site. Amphibians and reptiles likely to be found on the property include garter snake, black snake, green frog, bullfrog, and pickerel frog. A painted turtle was observed laying eggs on the shoreline of Crystal Lake. Snapping turtles are also likely to inhabit the ponds and lakes on site.

The Natural Diversity Data Base of the Connecticut Department of Environmental Protection was requested to review its files for this property. Although there are no records for Endangered, Threatened, or Special Concern species at the site, there are records for three listed faunal species occurring in close proximity to the site. These include Eastern box turtle (*Terrapene carolina*), red bat (*Lasiurus borealis*) and Eastern ribbon snake (*Thamnophis sauritus*), all of which are Special Concern species. Suitable habitat for all three species is present at the property. Habitat for the ribbon snake is found primarily around Crystal Lake. The red bat prefers to forage over open areas adjacent to woodlands and shows a strong preference for red maple trees; the best habitat for this species would appear to be located at the southwestern sections of the property. Good box turtle habitat exists within southerly sections of the property. Additionally, potential habitat for New England cottontail rabbit (*Sylvilagus transitionalis*) was observed in several locations at the edge of wetlands. New England cottontail is being considered for protection under the federal Endangered Species Act. These rabbits prefer early successional forests, or thickets, which often occur at the edge of wetlands. None of these notable species were encountered during field investigations; however, that fact does not exclude the likelihood of their presence within GCCA West.

## RECREATIONAL OPPORTUNITIES

The property offers good opportunities for passive recreation, e.g., hiking, bird watching, picnicking, and possibly limited horseback riding and mountain biking. Due to slope and soil constraints, this site is not appropriate for motorized vehicles, including dirt bikes. The tracks would likely damage steep and/or erodible slopes and riding through any wetlands would result in significant plant death. GCCA West would also not be suitable for active recreation, such as sports fields. Most of the flat land is wet and it would not be feasible to install playing fields in the upland areas as they are frequently steep and rocky.

Access to the site and ample parking can be found at Town Park off of Schoolhouse Road. The trailhead for the eastern portion of GCCA West is located on Ingham Hill Road near the Hay House and also has sufficient parking. The public can also access the property at the end of Nutmeg Circle and Kitteridge Hill Road, although there is no parking and neighbors may be concerned with cars parking on the cul-de-sacs. These access points, and those where the property abuts Ingham Hill Road, lead directly into substantial wetlands and, therefore, are not the most suitable sites for additional trailheads.



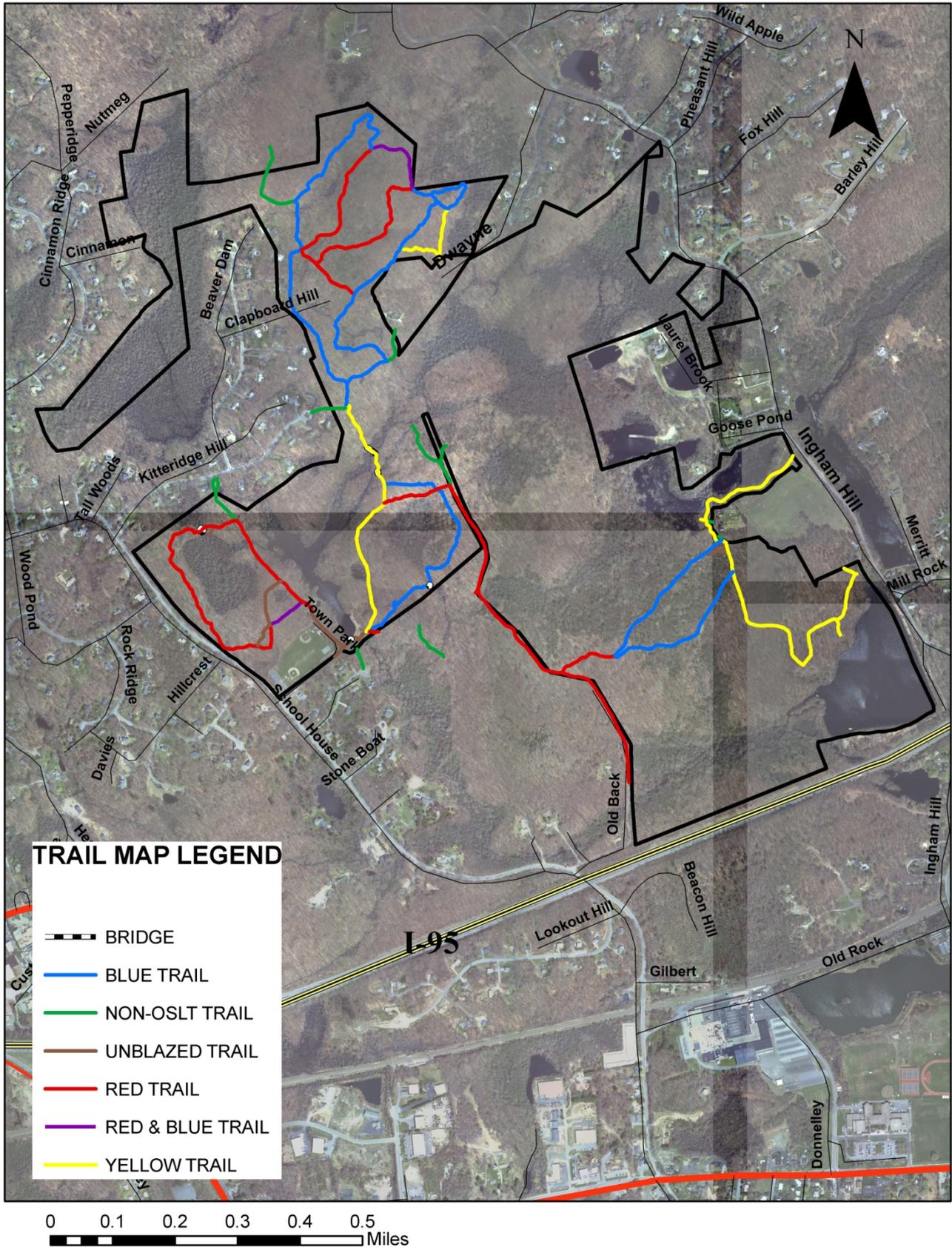
The proximity of the Town Park and Great Cedars Conservation Area West property to adjacent open space and residential neighborhoods is advantageous as it allows for ease of use. The adjacent open space provides for contiguous and healthy habitat, which in turn makes the property more desirable for a variety of plants and animals. The multiple residential neighborhoods have direct access to the property, often times through private trails.

The site currently contains a well-developed and clearly marked trail system that highlights multiple interesting features. (See [Figure 6: Existing Trail System](#), page 17).

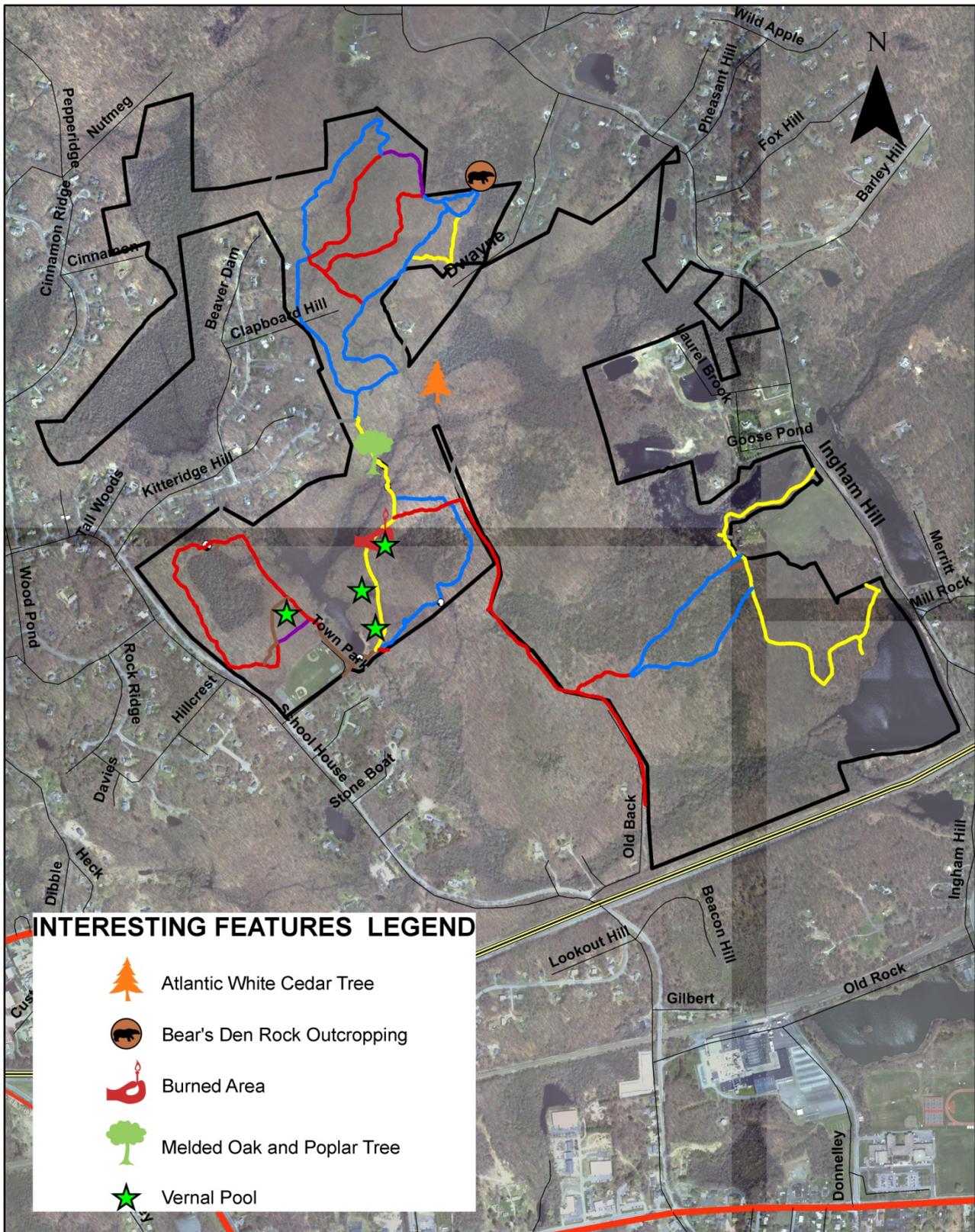
Trails provide access to diverse communities and features such as Lake Rockview, Crystal Lake, vernal pools, an open marsh, forested wetlands, a stream, a rock outcropping that may have been used as a bear's den, and more. At one location, the trees are scorched and the understory is beginning to reestablish after what appears to have been a small forest fire caused by a lightning strike. Another unique feature is an oak tree which has fused with a smaller poplar tree. (See [Figure 7: Interesting and Unique Features on the Trail](#), page 18). Large portions of the wetlands on the property (including the Atlantic white cedar swamp) are not accessible from the trails, however. The Town may wish to consider developing a self-guided nature trail to the more common habitats in the future.



**FIGURE 6: EXISTING TRAIL SYSTEM**  
**Town Park & Great Cedars Conservation Area West**



**FIGURE 7: INTERESTING AND UNIQUE FEATURES ON THE TRAIL**  
**Town Park & Great Cedars Conservation Area West**



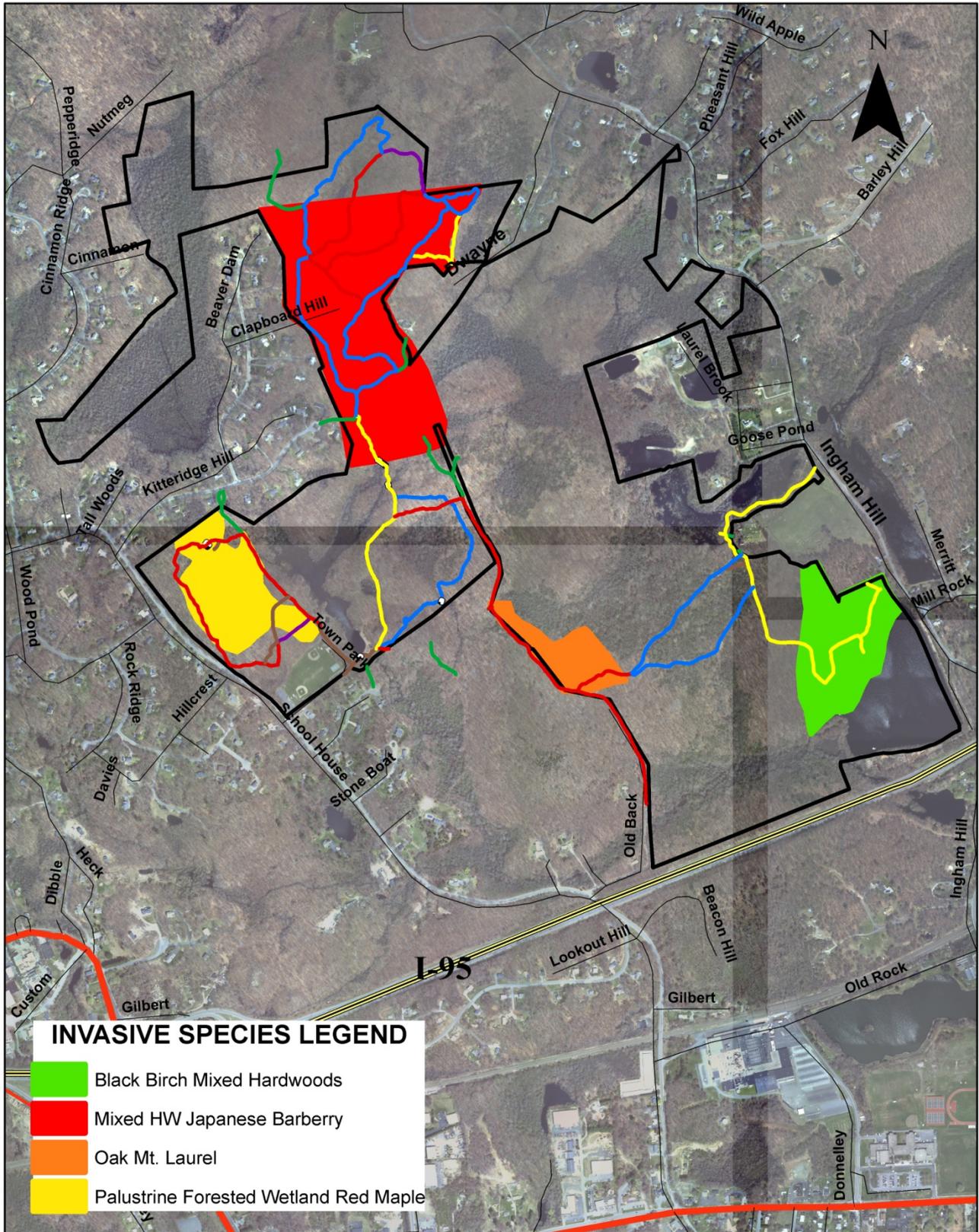
## MANAGEMENT CONCERNS AND RECOMMENDATIONS

Five priority management concerns and opportunities were identified during the study. The most significant observed threat to natural resources on the property is the prevalence of non-native invasive plant species. Additionally, there has been a significant decline in the Atlantic white cedar population, a unique community that should be enhanced if possible. New England cottontail rabbits are rare and unique as well, and therefore efforts to manage the property for their habitat should be considered. One other small concern is the landscaping debris that was dumped along the Blue Trail at the end of Clapboard Hill Road. Lastly, some of the existing trails were wet, indicated that in some areas soils may be seasonally saturated and well-used trails could become muddy or rutted. Specific recommendations to address these concerns follow.

### **Invasive Plant Species**

Although the property contains an excellent diversity of vegetation cover types, there is a prevalence of invasive plant species that somewhat mars the overall ecological integrity of the site. (See [Figure 8: Invasive Species](#), page 20). Japanese barberry is abundant; multiple other species were observed as well, including garlic mustard, burning bush (winged eunonymus), Oriental bittersweet, wineberry, Morrow's honeysuckle, Japanese honeysuckle, and multiflora rose. While it would be a daunting task to attempt the removal of all non-native species from the property, small infestations should be considered for immediate treatment. Larger infestations, such as the Japanese barberry east of Clapboard Hill, will require more intensive treatments and care should be taken when planning control measures. More information on individual invasive species and how to best manage them can be found in Appendix E.

**FIGURE 8: INVASIVE SPECIES**  
**Town Park & Great Cedars Conservation Area West**



***Southwestern Red Maple Swamp – Encircled by the Red Trail, Abutting School House Road:  
Garlic Mustard, Burning Bush & Oriental Bittersweet***

Garlic mustard seeds can remain viable for up to five years, so the goal of removal should be to prevent seed production until the seed bank is exhausted. Hand pulling, cutting stems at ground level to prevent seed production, applying systemic herbicides and burning the plants are all acceptable control methods. Considering the size of the infestation and the location of many desirable plants nearby, hand pulling and cutting stems are recommended. Seedlings and other small specimens of burning bush, also known as winged eunonymus, and Oriental bittersweet were observed. In this immature state, both of these plants are well-controlled by hand pulling and cutting. In slightly more mature plants with a woody stem, it is recommended to apply herbicide directly to the cut stem.

***Recommendations***

1. Remove smaller specimens of burning bush and Oriental bittersweet by hand-pulling or by using a Weed Wrench. Remove the entire root system and bag and remove the dead plants if fruit is present. Wear heavy gloves.
2. Control larger specimens of burning bush and Oriental bittersweet by cutting the plant at its base and applying an herbicide on the exposed stem, preferably more than once a season. Bag and remove the dead plants if fruit is present.
3. Remove the garlic mustard by hand-pulling the entire root system or by cutting the plant at its base while avoiding desirable plants. Bag and remove the dead plants.
4. These activities should be conducted throughout the growing season multiple times, particularly with garlic mustard.
5. Monitor the site for emerging and returning invasive species populations. Continue utilizing control measures for at least five years.
6. Develop and implement a long-term management strategy to control large infestations of Japanese barberry, such as east of Clapboard Hill. When invasive species are the dominant species, it is unlikely that hand-pulling will be effective. Mowing or cutting is difficult with mature plants. These measures should be considered in conjunction with herbicides or controlled burns.

***Mixed Hardwoods/Japanese Barberry – East of Clapboard Hill Road, Along the Blue Trail:  
Japanese Barberry***

The size and density of the infestation in this area rules out use of purely manual and mechanical methods such as removal by hand, using a Weed Wrench or repeated cuttings. Several potential alternatives include cutting the shrubs and applying herbicide to the exposed stem, a foliar herbicide application or a controlled burn with a flame thrower. Each has its risks and benefits. Cutting the mature shrubs would be labor intensive but the localized application of herbicide would boost effectiveness while minimally impacting native species. A foliar application in which herbicides are applied to the leaves would result in a more consistent treatment, and would require less labor making it more likely to be used year-to-year, but it would pose more risk to native species. Conducting the work in late fall or early spring when most native plants are dormant can reduce these risks. Finally, a controlled burn can be quite effective but it can be intensive work to conduct

it safely, and there is always a significant risk of a forest fire. A flame thrower is usually recommended for smaller infestations, but the large infestation could also be treated this way if burned in stages.

#### *Recommendations*

1. Conduct further research into which control method, or combination thereof, is most suitable. Considerations should include effectiveness, native species protection, personal health and safety, labor and funding.
2. Implement desired control measures.
3. Monitor the site for emerging and returning invasive species populations. Continue utilizing control measures until there is no longer any evidence of seedlings or regeneration. It is unlikely that this particular infestation will ever be completely eradicated due to its size and density. However, continued treatment will greatly reduce it and prevent further expansion.

#### ***Oak Dominated Mixed Hardwoods/Mountain Laurel – East of Old Back Highway, Near the Blue Trails: Wineberry***

Wineberry was observed but is not yet common. In fact, it may require a bit of effort to find the observed plants as they were small seedlings interspersed along the trail. It is at this stage that control measures can be the most effective. Simple hand pulling of the small plants is recommended.

#### *Recommendations*

1. Remove smaller specimens by hand-pulling or by using a Weed Wrench. Remove the entire root system and bag and remove the dead plants if fruit is present. Wear heavy gloves.
2. These activities can be conducted throughout the growing season multiple times.

#### ***Black Birch Dominated Mixed Hardwoods – Southeast Portion Overlooking Lake Rockview: Oriental bittersweet, Morrow's Honeysuckle, Japanese Honeysuckle, Wineberry, Japanese Barberry, Multiflora Rose, Burning Bush***

Manual, mechanical and chemical control methods are all effective in removing and killing all types of invasive shrubs and vines in this area. Treatments should depend on the maturity of the plants, and size and density of the infestation.

#### *Recommendations*

1. Remove smaller specimens with low frequency by hand-pulling or by using a Weed Wrench. Remove the entire root system, and bag and remove the dead plants if fruit is present. Wear heavy gloves.
2. Control larger specimens of greater frequency by cutting the plant at its base and applying an herbicide on the exposed stem, preferably more than once a season. Bag and remove the dead plants if fruit is present.
3. These activities can be conducted throughout the growing season multiple times.

## **Atlantic White Cedar Swamp (AWCS)**

The Atlantic White Cedar Swamp is clearly in decline. In the Eastern Connecticut Environmental Review Team's 2001 report on this property, multiple trees were observed, though it was noted that there were no young trees or seedlings evident. Nine years later, only one cedar tree was observed. If this resource area is to be preserved, immediate action is needed.

### *Recommendations*

1. Hire a consultant or contact a local university forestry school to assess the current health of the AWCS. Develop a long-term monitoring plan that includes specific actions to benefit the health of the AWCS.
2. Implement the actions recommended in the long-term monitoring plan.
3. Consider developing trails or boardwalks to showcase this unique resource if efforts to preserve it are successful.

## **New England Cottontail**

New England cottontail rabbits have not been observed on this property to date, although there are several sites that may be suitable habitat for reintroduction. Further investigation should be considered.

### *Recommendations*

1. Coordinate with the U.S. Fish & Wildlife Service to implement trapping and fecal pellet analysis to determine if there is a New England cottontail presence.
2. Coordinate with the U.S. Fish & Wildlife Service to determine if there are opportunities to reintroduce the rabbits to this property.
3. If the rabbits are present or will be reintroduced, develop a long-term plan to manage the site for cottontail habitat.

## **Dumping and Encroachment**

Evidence of improperly disposed of landscape debris was found to the east of Clapboard Hill Road along the Blue Trail. Slightly north, along the same Blue Trail, private landowners have potentially encroached on public property. (See [Figure 9: Points of Management Concern](#), page 25)

### *Recommendations*

1. Locate improperly disposed of landscape debris. Work with adjacent landowners to remove debris and inform them that such disposal is not permitted.
2. Locate property boundaries and determine if private landowners have expanded their private use areas into GCCA. If necessary, demarcate the property line and restore the disturbed areas.



## Wet Trail Areas

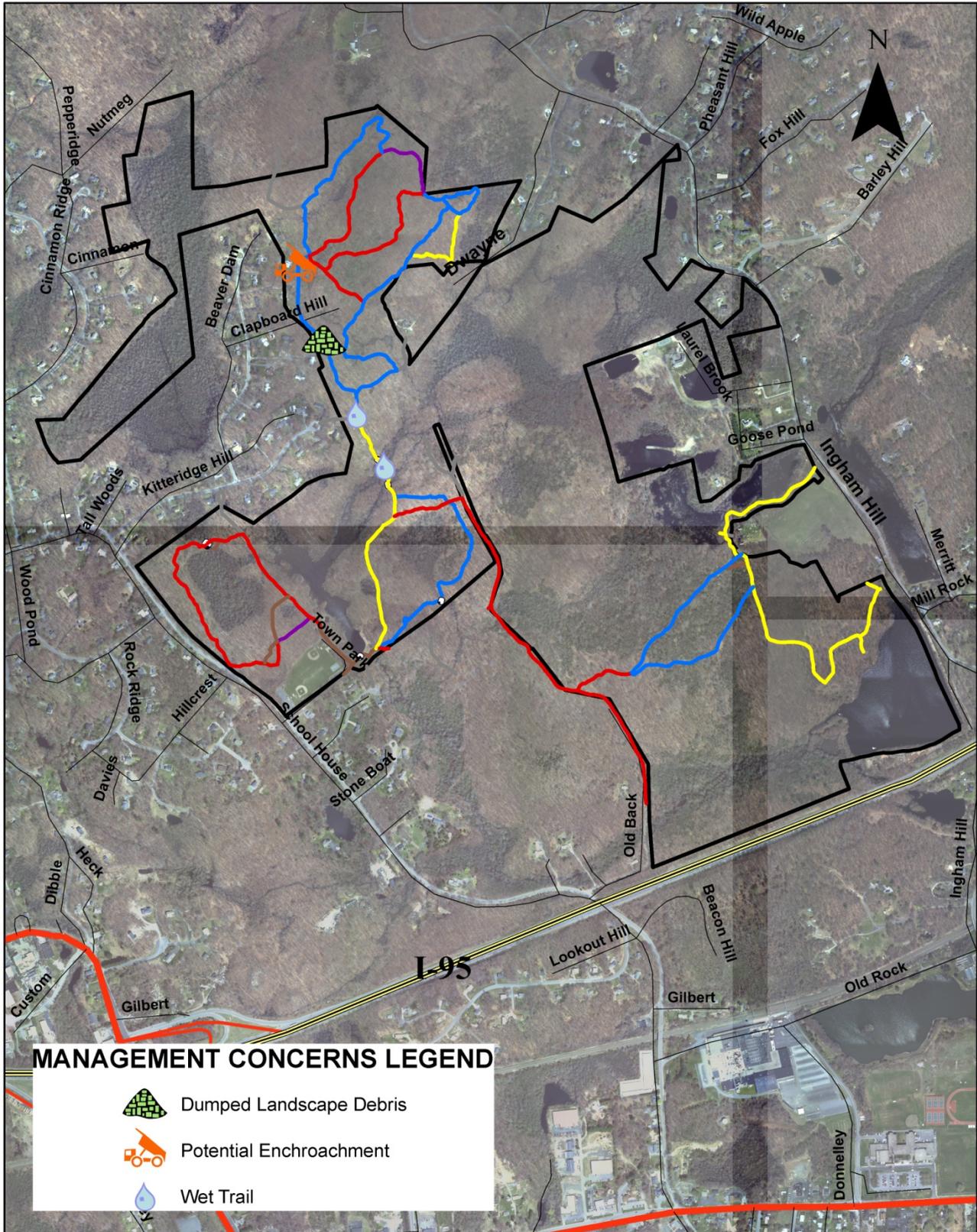
Seasonally wet trails can become deeply rutted and muddy from the wear and tear of users, and can result in trail bypassing or off-trail uses that can cause further negative downgradient impacts. Once seasonally or chronically wet trail areas are identified, a management strategy for each trail section can be developed. (See [Figure 9: Points of Management Concern](#), page 25)



### *Recommendations*

1. Relocate trails from low lying, chronically wet areas to higher, drier areas if suitable alternative routes are feasible.
2. Provide adequate cross drainage using drain dips or curtain drains to ensure water does not pool on the trail (see Appendix F).
3. Construct stabilized crossing points where trails are chronically wet. Consider trail use (e.g., hiking, horseback riding, or mountain biking) when determining appropriate solutions. Alternatives include raised walkways (puncheon), bridges, or turnpikes (see Appendix F).
4. Consider seasonal trail closures or limited trail use in areas that are chronically wet.

**FIGURE 9: POINTS OF MANAGEMENT CONCERN**  
**Town Park & Great Cedars Conservation Area West**



## **TABLES**

Table 1. Select Soil Properties

Table 2. Select Soil Limitations

**Table 1. Select features of the predominant soils at Town Park and Great Cedars West**

Map Unit	Component	Slope	Local Landform	Drainage	Restrictive Layer	Seasonal Ponding duration/frequency	Seasonal Flooding duration/frequency
3	Ridgebury	0-5%	Depressions, drainage ways	Poorly	20-30 inches	None	None
	Leicester						
	Whitman						
12	Raypol silt loam	0-3%	Depressions, drainage ways	Poorly	None	None	None
13	Walpole sandy loam	0-3%	Depressions and drainage ways on terraces	Poorly	None	None	None
15	Scarboro	0-2%	Depressions, drainage ways and terraces	Very poorly	None	Occasional	None
17	Timakwa	0-2%	Depressions	Very poorly	None	Rare	Frequent
	Natchaug						
18	Catden	0-2%	Depression	Very poorly	None	Frequent	Rare
	Freetown						
21A	Ninigret	0-5%	Outwash plains, terraces	Moderately well	None	None	None
	Tisbury						
23A	Sudbury	0-5%	Outwash plains, terraces	Moderately well	None	None	None

**Table 1 cont'd. Select features of the predominant soils at Town Park and Great Cedars West**

Map Unit	Component	Slope	Local Landform	Drainage	Restrictive Layer	Seasonal Ponding duration/frequency	Seasonal Flooding duration/frequency
29A	<b>Agawam</b>	0-3%	Outwash plains, terraces	Well	None	None	None
29B	<b>Agawam</b>	3-8%	Outwash plains, terraces	Well	None	None	None
34A	<b>Merrimac</b>	0-3%	Outwash plains, terraces	Somewhat excessively	None	None	None
38C	<b>Hinckley</b>	3-15%	Eskers, kames, outwash plains, terraces	Excessively	None	None	None
46B	<b>Woodbridge</b>	2-8%	Drumlins, hills	Moderately well	20-40 inches	None	None
47C	<b>Woodbridge</b>	2-15%	Drumlins, hills	Moderately well	20-40 inches	None	None
61B	<b>Canton</b>	3-8%	Hills	Well	None	None	None
	<b>Charlton</b>						
61C	<b>Canton</b>	8-15%	Hills	Well	None	None	None
	<b>Charlton</b>						
62C	<b>Canton</b>	3-15%	Hills	Well	None	None	None
	<b>Charlton</b>						
62D	<b>Canton</b>	15-35%	Hills	Well	None	None	None
	<b>Charlton</b>						

**Table 1 cont'd. Select features of the predominant soils at Town Park and Great Cedars West**

Map Unit	Component	Slope	Local Landform	Drainage	Restrictive Layer	Seasonal Ponding duration/frequency	Seasonal Flooding duration/frequency
73C	<b>Charlton</b>	3-15%	Hills	Well	None	None	None
	<b>Chatfield</b>				20-40 inches		
73E	<b>Charlton</b>	15-45%	Hills, ridges	Well	None	None	None
	<b>Chatfield</b>				20-40 inches		
85B	<b>Paxton</b>	3-8%	Drumlins, hills, till plains	Well	20-40 inches	None	None
	<b>Montauk</b>						
85C	<b>Paxton</b>	8-15%	Drumlins, hills, till plains	Well	20-40 inches	None	None
	<b>Montauk</b>						
86C	<b>Paxton</b>	3-15%	Drumlins, hills, till plains	Well	20-40 inches	None	None
	<b>Montauk</b>						
103	<b>Rippowam</b>	0-3%	Flood plains	Poorly	None	None	Frequent

**Table 2. Select limitations of the predominant soils at Town Park and Great Cedars West**

		LIMITATIONS				
Map Unit	Component	Paths & Trails	Picnic Areas	Road/Trail Erosion Hazard	Off-road/Off trail Erosion Hazard	Soil Rutting Hazard
3	Ridgebury	Very limited <sup>2,3,5</sup>	Very limited <sup>2,3,5,7</sup>	Slight	Slight	Severe <sup>9,10</sup>
	Leicester					
	Whitman					
12	Raypol silt loam	Very limited <sup>5</sup>	Very limited <sup>5</sup>	Slight	Slight	Severe <sup>9,10</sup>
13	Walpole	Very limited <sup>5</sup>	Very limited <sup>5</sup>	Slight	Slight	Severe <sup>9,10</sup>
15	Scarboro	Very limited <sup>3,5</sup>	Very limited <sup>3,5</sup>	Slight	Slight	Severe <sup>9,10</sup>
17	Timakwa	Very limited <sup>3,5</sup>	Very limited <sup>3,5</sup>	Very severe <sup>12</sup>	Very severe <sup>12</sup>	Severe <sup>9,10</sup>
	Natchaug					
18	Catden	Very limited <sup>3,5</sup>	Very limited <sup>3,5</sup>	Very severe <sup>12</sup>	Very severe <sup>12</sup>	Severe <sup>9,10</sup>
	Freetown					
21A	Ninigret	Not limited	Somewhat limited <sup>5</sup>	Moderate <sup>6,11</sup>	Slight	Severe <sup>9,10</sup>
	Tisbury					
23A	Sudbury sandy loam	Not limited	Somewhat limited <sup>5</sup>	Moderate <sup>6,11</sup>	Slight	Moderate <sup>9,10</sup>
29A	Agawam fine sandy loam,	Not limited	Not limited	Slight	Slight	Slight <sup>9</sup>

Limiting Features

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<sup>1</sup> Water erosion    <sup>3</sup> Ponding    <sup>5</sup> Depth to saturated zone    <sup>7</sup> Depth to Bedrock    <sup>9</sup> Strength    <sup>11</sup> Erodibility    <sup>13</sup> Gravel Content  
<sup>2</sup> Large stones    <sup>4</sup> Flooding    <sup>6</sup> Slope    <sup>8</sup> Salinity    <sup>10</sup> Wetness    <sup>12</sup> Organic Content

**Table 2 cont'd. Select limitations of the predominant soils at Town Park and Great Cedars West**

		LIMITATIONS				
Map Unit	Component	Paths & Trails	Picnic Areas	Road/Trail Erosion Hazard	Off-road/Off trail Erosion Hazard	Soil Rutting Hazard
29B	Agawam fine sandy loam	Not limited	Not limited	Moderate <sup>6,11</sup>	Slight	Slight <sup>9</sup>
34A	Merrimac sandy loam	Not limited	Not limited	Slight	Slight	Slight <sup>9</sup>
38C	Hinckley gravelly sandy loam	Not limited	Somewhat limited <sup>6,13</sup>	Slight	Slight	Slight <sup>9</sup>
46B	Woodbridge fine sandy loam	Somewhat limited <sup>2</sup>	Somewhat limited <sup>2,5,7</sup>	Moderate <sup>6,11</sup>	Slight	Moderate <sup>9,10</sup>
47C	Woodbridge fine sandy loam	Very limited <sup>2</sup>	Very limited <sup>2,5,6,7</sup>	Moderate <sup>6,11</sup>	Slight	Moderate <sup>9,10</sup>
61B	Canton	Somewhat limited <sup>2</sup>	Somewhat limited <sup>2</sup>	Moderate <sup>6,11</sup>	Slight	Slight <sup>9</sup>
	Charlton					
61C	Canton	Somewhat limited <sup>2</sup>	Somewhat limited <sup>2</sup>	Moderate <sup>6,11</sup>	Slight	Slight <sup>9</sup>
	Charlton					
62C	Canton	Very limited <sup>2</sup>	Very limited <sup>2,6</sup>	Moderate <sup>6,11</sup>	Slight	Slight <sup>9</sup>
	Charlton					

Limiting Features

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<sup>1</sup> Water erosion    <sup>3</sup> Ponding    <sup>5</sup> Depth to saturated zone    <sup>7</sup> Depth to Bedrock    <sup>9</sup> Strength    <sup>11</sup> Erodibility    <sup>13</sup> Gravel content  
<sup>2</sup> Large stones    <sup>4</sup> Flooding    <sup>6</sup> Slope    <sup>8</sup> Salinity    <sup>10</sup> Wetness    <sup>12</sup> Organic content

**Table 2 cont'd. Select limitations of the predominant soils at Town Park and Great Cedars West**

		LIMITATIONS				
Map Unit	Component	Paths & Trails	Picnic Areas	Road/Trail Erosion Hazard	Off-road/Off trail Erosion Hazard	Soil Rutting Hazard
62D	Canton	Very limited <sup>2,6</sup>	Very limited <sup>2,6</sup>	Severe <sup>6,11</sup>	Moderate <sup>6,11</sup>	Slight <sup>9</sup>
	Charlton					
73C	Charlton	Somewhat limited <sup>2</sup>	Somewhat limited <sup>2,6</sup>	Moderate <sup>6,11</sup>	Slight	Slight <sup>9</sup>
	Chatfield					
73E	Charlton	Very limited <sup>2,6</sup>	Very limited <sup>2,6</sup>	Severe <sup>6,11</sup>	Moderate <sup>6,11</sup>	Slight <sup>9</sup>
	Chatfield					
85C	Paxton	Somewhat limited <sup>2</sup>	Somewhat limited <sup>2,5,6,7</sup>	Moderate <sup>6,11</sup>	Slight	Moderate <sup>9,10</sup>
	Montauk					
86C	Paxton	Very limited <sup>2</sup>	Very limited <sup>2,5,6,7</sup>	Moderate <sup>6,11</sup>	Slight	Moderate <sup>9,10</sup>
	Montauk					
103	Rippowam fine sandy loam	Very limited <sup>4,5</sup>	Very limited <sup>4,5</sup>	Slight	Slight	Severe <sup>9,10</sup>

Limiting Features

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<sup>1</sup> Water erosion    <sup>3</sup> Ponding    <sup>5</sup> Depth to saturated zone    <sup>7</sup> Depth to Bedrock    <sup>9</sup> Strength    <sup>11</sup> Erodibility    <sup>13</sup> Gravel content  
<sup>2</sup> Large stones    <sup>4</sup> Flooding    <sup>6</sup> Slope    <sup>8</sup> Salinity    <sup>10</sup> Wetness    <sup>12</sup> Organic content



## **APPENDICES**

Appendix A. GIS Metadata Description

Appendix B. Soils Series Descriptions

Appendix C. Explanation of Soil Limitations for Recreational Uses

Appendix D. List of Plant Species Observed

Appendix E. Non-Native Invasive Species Fact Sheets

Appendix F. Trail Creation and Maintenance Guidance Documents

## Appendix A. GIS Metadata Description

<b>Data Layer</b>	<b>Creator</b>	<b>Date Created</b>	<b>Date Published</b>	<b>Type</b>	<b>Creation Scale</b>
Digital orthophotograph	GeoVantage, Inc.	2003	2004	Image (GeoTif)	—
Existing trails	Town of Old Saybrook	2005	—	Polyline	—
Natural communities	Field collected and Penni Sharp	2010	—	Polygon	—
Property lines	Town and field collected GPS	2005		Polyline Polygon	
Roads	CT DEP	1969-1984	1995	Polyline	1:24000
Soils	USDA, CT DEP	1962-1995	1995	Polygon	1:12000
Topography - 10 ft	Based on USGS 7.5 minute DEM <sup>1</sup>	1969-1984	1997	Polyline	1:24000
Water resources	CTDEP	1969-1984	1995	Polyline Polygon	1:24000

<sup>1</sup>Topographic lines are at a 30 meter resolution

## Appendix B. Soils Series Descriptions

### WETLAND SOILS

#### CATDEN SERIES

The Catden series consists of very deep, very poorly drained soils formed in woody and herbaceous organic materials in depressions.

**GEOGRAPHIC SETTING:** Catden soils are in depressions on lake plains, outwash plains, moraines, and flood plains. These soils formed in woody and herbaceous organic materials. Slope ranges from 0 to 2 percent.

**DRAINAGE AND PERMEABILITY:** Very poorly drained. Depth to the seasonal high water table ranges from 1 ft above the surface to 1 ft below the surface from Sept. to June. Surface runoff is very low or negligible. Permeability is moderate or moderately rapid. Some areas are subject to rare, very brief flooding during March and April.

**USE AND VEGETATION:** Most areas are used for wildlife, or are in woodland or cutover woodland. Some of these soils are used for pasture. Common vegetation is red maple, skunk cabbage, marsh fern, and sphagnum moss.

#### FREETOWN SERIES

The Freetown series consists of very deep, very poorly drained organic soils formed in more than 51 inches of highly decomposed organic material.

**GEOGRAPHIC SETTING:** Freetown soils are in bogs that range from small enclosed depressions to bogs of several hundred acres in size. These bogs are on lake plains, outwash plains, till plains and moraines. Slope ranges from 0 to 1 percent.

**DRAINAGE AND PERMEABILITY:** Very poorly drained. Saturated hydraulic conductivity is moderately high or high.

**USE AND VEGETATION:** Mostly forested. Native vegetation includes red maple, American elm, green ash, eastern hemlock, Atlantic white cedar, buttonbush, winterberry, swamp azaleas, and leatherleaf. Some acreage has been cleared and is used for truck crops. The main crop is cranberries.

#### LEICESTER SERIES

The Leicester series consists of very deep, poorly drained loamy soils formed in friable till. They are nearly level or gently sloping soils in drainageways and low-lying positions on hills.

**GEOGRAPHIC SETTING:** Leicester soils are nearly level to gently sloping and are in low-lying depressional areas and drainageways of glaciated hills. Slope commonly is less than 3 percent but the range includes 0 to 8 percent.

**DRAINAGE AND PERMEABILITY:** Poorly drained. Surface runoff is slow. Permeability is moderate or moderately rapid in the solum and moderate to rapid in the substratum. Leicester soils have a water table at or near the surface much of the year

**USE AND VEGETATION:** Most areas are wooded. Some areas are in brushy unimproved pasture. Cleared areas are used for hay or pasture. Common trees are red maple, red oak, elm, aspen, gray birch, white pine, balsam fir, red spruce, and ironwood.

#### NATCHAUG SERIES

The Natchaug series consists of very deep, very poorly drained soils formed in woody and herbaceous organic materials overlying loamy deposits.

**GEOGRAPHIC SETTING:** Natchaug soils are in depressions on lake plains, outwash plains, moraines, till plains and flood plains. These soils formed in woody and herbaceous organic materials. Slope ranges from 0 to 2 percent.

**DRAINAGE AND PERMEABILITY:** Very poorly drained. Depth to the seasonal high water table ranges from 1 foot above the surface to 1 foot below the surface from October to June. Surface runoff is negligible or very low. Permeability is moderate to very rapid in the organic layers and moderate or moderately slow in the loamy material. Saturated hydraulic conductivity is moderately low to very high in the organic layers and moderately low to high in the loamy material. Some areas are subject to rare, very brief flooding during March and April.

**USE AND VEGETATION:** Most areas are used for wildlife habitat, or are in woodland or clear-cut woodland. Some areas are used for pasture. Common vegetation is red maple, skunk cabbage and sphagnum moss.

**RAYPOL SERIES**

The Raypol series consists of very deep, poorly drained soils formed in loamy over sandy and gravelly outwash.

**GEOGRAPHIC SETTING:** Raypol soils are nearly level to gently sloping soils in drainageways and low-lying areas on terraces and plains. Slope ranges from 0 to 5 percent. The soils formed in loamy over sandy and gravelly glaciofluvial materials derived mainly from acid crystalline and sedimentary rocks.

**DRAINAGE AND PERMEABILITY:** Poorly drained. Surface runoff is slow. Permeability is moderate in the solum and rapid or very rapid in the coarse-textured substratum. Raypol soils have a watertable at or near the surface much of the year.

**USE AND VEGETATION:** Most areas are wooded. Cleared areas are used for hay and pasture. Drained areas are used for silage corn, hay or vegetables. Common trees are red maple, white oak, white ash, aspen, elm, white pine and hemlock.

**RIDGEBURY SERIES**

The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in till derived mainly from granite, gneiss and schist.

**GEOGRAPHIC SETTING:** The nearly level to gently sloping Ridgebury soils are in slightly concave areas and shallow drainageways of till uplands. Slope ranges from 0 to 15 percent. The soils formed in loamy till derived mainly from granite, gneiss and schist.

**DRAINAGE AND PERMEABILITY:** Commonly poorly drained but the range includes the wetter part of somewhat poorly drained. Runoff is negligible to medium. Saturated hydraulic conductivity ranges from moderately low to high in the solum and very low to moderately low in the substratum. A perched, fluctuating water table above the dense till saturates the solum to or near the surface for 7 to 9 months of the year.

**USE AND VEGETATION:** Largely forested to gray birch, yellow birch, red maple, hemlock, elm, spruce and balsam fir. Cleared areas are used mainly for hay and pasture.

**RIPPOWAM SERIES**

The Rippowam series consists of very deep, poorly drained loamy soils formed in alluvial sediments.

**GEOGRAPHIC SETTING:** Rippowam soils are nearly level soils on flood plains along rivers and streams. They are in low areas. Slope ranges from 0 to 3 percent. The soils formed in recent alluvium derived mostly from granite, gneiss, and schist.

**DRAINAGE AND PERMEABILITY:** Poorly drained. Surface runoff is negligible to low. Saturated hydraulic conductivity ranges from moderately high or high in the loamy upper part and high or very high in the underlying sandy materials. These soils typically flood in the spring of each year. Rippowam soils have a water table at or near the surface much of this year.

**USE AND VEGETATION:** Most areas are in brushy woodland. Common trees are red maple, willow, and alder. A few areas are cleared and used for pasture or hay.

**SCARBORO SERIES**

The Scarboro series consists of very deep, very poorly drained soils in sandy glaciofluvial deposits on outwash plains, deltas, and terraces.

**GEOGRAPHIC SETTING:** Scarboro soils are in level or nearly level depressions on outwash plains, deltas, and terraces. Slope is less than 3 percent. The soils formed in sandy glaciofluvial deposits.

**DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY:** Very poorly drained. Saturated hydraulic conductivity is high or very high. Surface runoff is high or very high. The water table is at or near the surface for 6 to 12 months of the year, and many areas are ponded for short periods.

**USE AND VEGETATION:** Shrub and brush land or woodland. Common shrubs are speckled alder, smooth alder, rhoda azalea, steeplebush spirea, leatherleaf, labrador-tea, winterberry, highbush blueberry, large cranberry, black huckleberry, poison sumac, and sheep laurel. Common trees are red maple, slippery elm, Atlantic white cedar, tamarack, eastern white pine, willow, and gray birch.

**TIMAKWA SERIES**

The Timakwa series consists of very deep, very poorly drained soils formed in woody and herbaceous organic materials over sandy deposits.

**GEOGRAPHIC SETTING:** Timakwa soils are in depressions in lake plains, outwash plains, moraines, till plains and flood plains. These soils formed primarily in woody organic materials with some herbaceous materials. Slope ranges from 0 to 2 percent.

**DRAINAGE AND PERMEABILITY:** Very poorly drained. Depth to the seasonal high water table ranges from 1 foot above the surface to 1 foot below the surface from October to June. Surface runoff is negligible or very low. Permeability is moderate to very rapid in the organic layers and rapid or very rapid in the sandy material. Saturated hydraulic conductivity is moderately low to high in the organic layers and high or very high in the sandy material. Some areas are subject to rare, very brief flooding from November to May.

**USE AND VEGETATION:** Most areas are used for wildlife, or are in woodland or clear-cut woodland. Some of these soils are used for pasture. Common vegetation is red maple, skunk cabbage, and sphagnum moss.

**WALPOLE SERIES**

The Walpole Series consists of very deep, poorly drained sandy soils formed in outwash and stratified drift.

**GEOGRAPHIC SETTING:** Walpole soils are nearly level and gently sloping soils in shallow drainageways and low-lying areas on terraces and plains. Slope ranges from 0 to 8 percent. The soils formed in sandy glaciofluvial and stratified drift materials derived mainly from crystalline rocks.

**DRAINAGE AND PERMEABILITY:** Poorly drained. Surface runoff is slow. Permeability is moderately rapid in the solum and rapid or very rapid in the substratum. Walpole soils have a water table at or near the surface much of the year.

**USE AND VEGETATION:** Most areas are wooded. Cleared areas are used for hay and pasture. Drained areas are used for silage corn and hay. Common trees are red maple, white oak, white ash, aspen, elm, white pine, and hemlock.

**UPLAND SOILS****AGAWAM SERIES**

The Agawam series consists of very deep, well drained soils formed in sandy, water deposited materials.

**GEOGRAPHIC SETTING:** Agawam soils are level to steep soils on outwash plains and high stream terraces. Most areas are on slopes that are less than 15 percent. Steeper slopes are on terrace escarpments and steep sides of gullies in dissected outwash plains. The soils formed in sandy water deposited material derived principally from schist, granite, gneiss, and phyllite.

**DRAINAGE AND PERMEABILITY:** Well drained. Runoff and internal drainage are negligible to low. Saturated hydraulic conductivity is high in the upper solum and high or very high in the lower solum and substratum.

**USE AND VEGETATION:** Most areas are used for growing cultivated hay, silage corn, tobacco, potatoes, and truck crops. Some areas are used for growing pasture. Native vegetation is forest composed mainly of white pine, gray birch, red maple, red, white, black, and scarlet oaks.

**CANTON SERIES**

The Canton series consists of very deep well drained soils formed in a loamy mantle underlain by sandy till.

**GEOGRAPHIC SETTING:** Canton soils are on glaciated upland plains, hills, and ridges. Slope ranges from 0 to 35 percent. The soils developed in a fine sandy loam mantle over acid sandy glacial till of Wisconsin age derived mainly from granite and gneiss and some fine-grained sandstone.

**DRAINAGE AND PERMEABILITY:** Well drained. Runoff is negligible to medium. Internal drainage is medium. Saturated hydraulic conductivity is high in the solum and high or very high in the substratum.

**USE AND VEGETATION:** Mostly forested or idle. Some areas have been cleared of surface stones and are used for crops and pasture. Native vegetation is forest composed of white pine, red, white and black oaks, hickory, red maple, sugar maple, gray birch, yellow birch, beech, hemlock, and white ash.

**CHARLTON SERIES**

The Charlton series consists of very deep, well drained loamy soils formed in till.

**GEOGRAPHIC SETTING:** Charlton soils are nearly level to very steep soils on till plains and hills. Slope ranges from 0 to 50 percent. The soils formed in acid till derived mainly from schist, gneiss, or granite.

**DRAINAGE AND PERMEABILITY:** Well drained. Surface runoff is medium to rapid. Permeability is moderate or moderately rapid throughout.

**USE AND VEGETATION:** Areas cleared of stones are used for cultivated crops, specialty crops, hay, and pasture. Many scattered areas are used for community development. Stony areas are mostly wooded. Common trees are red, white, and black oak, hickory, sugar maple, red maple, black and gray birch, white ash, beech, white pine, and hemlock.

**CHATFIELD SERIES**

The Chatfield series consists of moderately deep, well drained, and somewhat excessively drained soils formed in till.

**GEOGRAPHIC SETTING:** Chatfield soils are nearly level to very steep, and are on convex to plane glaciated upland landscapes. The soils formed in a moderately thick mantle of till overlying granite, gneiss, or schist bedrock. Slope ranges from 0 to 70 percent. Rock outcrops are rare to common and are limited to the more resistant bedrock.

**DRAINAGE AND PERMEABILITY:** Well to somewhat excessively drained. Potential for surface runoff ranges from low to high. Permeability is moderate or moderately rapid.

**USE AND VEGETATION:** Most areas of Chatfield soils are in woodland. Major tree species include white and red oaks, sugar maple, beech, hemlock, white pine, eastern red cedar, and Atlantic white cedar. Some small cleared areas are used for pasture, are idle, or are sites for residential and recreational development.

**HINCKLEY SERIES**

The Hinckley series consists of very deep, excessively drained soils formed in water-sorted material.

**GEOGRAPHIC SETTING:** Hinckley soils are nearly level to very steep soils on terraces, outwash plains, deltas, kames, and eskers. Slope is generally 0 to 8 percent on tops of the terraces, outwash plains and deltas. Slope of 8 to 60 percent or more are on the kames, eskers and margins of the outwash plains, deltas, and terraces. The soils formed in water-sorted sand and gravel derived principally from granite, gneiss, and schist.

**DRAINAGE AND PERMEABILITY:** Excessively drained. Surface runoff is negligible to low. Saturated hydraulic conductivity is high or very high.

**USE AND VEGETATION:** Cleared areas are used for hay, pasture, and silage corn. In the southern Connecticut River Valley, Hinckley soils are used for growing tobacco and truck crops and in eastern Massachusetts, truck crops. Most areas are forested, brush land or used as urban land. Red, black, white, scarlet and scrub oak, white and pitch pine, hemlock and gray birch are the common trees. Unimproved pasture and idle land support hardhack, little bluestem, bracken fern, sweet fern, and low bush blueberry.

**MERRIMAC SERIES**

The Merrimac series consists of very deep, somewhat excessively drained soils formed in glacial outwash.

**GEOGRAPHIC SETTING:** Merrimac soils are level to very steep on glacial outwash plains and valley trains, and associated kames, eskers, stream terraces and water deposited parts of moraines. The steeper slopes are on the margin escarpments of terraces and plains, and on eskers and kames. Slope ranges from 0 to 35 percent. The soils formed in water sorted gravelly and sandy material derived mainly from granitic, gneissic and some schistose rocks.

**DRAINAGE AND PERMEABILITY:** Somewhat excessively drained. Runoff is negligible to medium. Saturated hydraulic conductivity is high or very high.

**USE AND VEGETATION:** Most areas are cultivated and used for growing hay, pasture, silage, corn, or truck crops. Some areas are used to grow tobacco in the Connecticut River Valley in Massachusetts and Connecticut. Some areas are forested with mostly white pine, gray birch, hemlock, red maple, and red, black, white, and scarlet oaks.

**MONTAUKSERIES**

The Montauk series consists of well drained soils formed in lodgement or flow till derived primarily from granitic materials.

**GEOGRAPHIC SETTING:** Montauk soils are on glaciated uplands and moraines. Slopes range from 0 through 35 percent. The landscape in some areas has many closed depressions, some of which are filled by perennial ponds or wet spots. The soils formed in thick moderately coarse or medium textured till mantles underlain by firm sandy till. Some areas have very stony or extremely stony surfaces.

**DRAINAGE AND PERMEABILITY:** Well drained. Runoff is low to high. Saturated hydraulic conductivity is moderately high or high in the solum and low through moderately high in the substratum.

**USE AND VEGETATION:** Many of the nearly level and gently sloping areas are cleared and used for production of potatoes and vegetable crops, hay, silage corn and pasture. Steeper and uneven areas are largely forested. Woodland contains northern red oak, white oak, and occasionally yellow poplar, eastern white pine, red pine, sugar maple, beech, and birch.

**NINIGRET SERIES**

The Ninigret series consists of very deep, moderately well drained soils formed in loamy over sandy and gravelly glacial outwash.

**GEOGRAPHIC SETTING:** Ninigret soils are nearly level to strongly sloping soils on glaciofluvial landforms. Slopes range from 0 through 15 percent, but commonly are 0 through 8 percent. The soils formed in loamy over stratified sandy and gravelly glacial outwash derived from a variety of acid rocks.

**DRAINAGE AND PERMEABILITY:** Moderately well drained. Surface runoff is negligible to medium. Saturated hydraulic conductivity is moderately high or high in the solum and high or very high in the substratum. The soil has a seasonal high water table.

**USE AND VEGETATION:** Much of the acreage is used for cultivated crops, hay, or pasture. Common crops are silage corn, vegetables, tobacco, and nursery stock. Some areas are idle, wooded, or used for community development. Common trees are red, white and black oak, red maple, sugar maple, white pine, gray birch, white ash, and hemlock.

**PAXTON SERIES**

The Paxton series consists of well drained loamy soils formed in lodgement till. The soils are very deep to bedrock and moderately deep to a densic contact.

**GEOGRAPHIC SETTING:** Paxton soils are nearly level to steep and are on till plains, hills, and drumlins. Slope commonly is 0 through 35 percent, but ranges from 0 through 45 percent in some pedons. The soils formed in acid lodgement till derived mostly from schist, gneiss, and granite.

**DRAINAGE AND PERMEABILITY:** Well drained. Surface runoff is negligible to high. Saturated hydraulic conductivity is moderately high or high in the mineral solum and low through moderately high in the substratum.

**USE AND VEGETATION:** Many areas are cleared and used for cultivated crops, hay, or pasture. Scattered areas are used for community development. Some areas are wooded. Common trees are northern red, white, and black oak, hickory, sugar maple, red maple, gray and black birch, eastern white pine, and eastern hemlock.

**SUDBURY SERIES**

The Sudbury series consists of very deep, moderately well and somewhat poorly drained soils on outwash plains.

**GEOGRAPHIC SETTING:** Sudbury soils are nearly level to strongly sloping soils in slight depressions on outwash plains and on gentle foot slopes. Slope ranges from 0 to 15 percent. The soils formed in water sorted sandy and gravelly materials derived mainly from granite, gneiss, and schist.

**DRAINAGE AND PERMEABILITY:** Moderately well and somewhat poorly drained. Surface runoff is slow to moderate. The internal drainage is restricted by a seasonal high water table. Saturated hydraulic conductivity is high in the upper solum and high or very high in the lower solum and substratum.

**USE AND VEGETATION:** Most areas used for growing hay, pasture, field and truck crops. Some are forested with mainly red maple, gray birch, hemlock, larch, white pine, and red, black, and scarlet oaks.

**TISBURY SERIES**

The Tisbury series consists of very deep, moderately well drained loamy soils formed in silty eolian deposits overlying outwash.

**GEOGRAPHIC SETTING:** Tisbury soils are nearly level and gently sloping soils on terraces and outwash plains. Slope commonly is 0 to 3 percent, but the range includes 0 to 8 percent. The soils formed in a silty eolian deposits over stratified sandy and gravelly outwash materials derived from a variety of acid rocks.

**DRAINAGE AND PERMEABILITY:** Moderately well drained. Surface runoff is slow to medium. Permeability is moderate in the solum and rapid or very rapid in the substratum. The soil has a seasonal high water table.

**USE AND VEGETATION:** Much of the acreage is used for cultivated crops, hay or pasture. Common crops are silage corn, vegetables, tobacco and nursery stock. Some areas are idle, wooded or used for community development. Common trees are red, white and black oak, red maple, white ash, gray birch, white pine and hemlock.

**WOODBRIIDGE SERIES**

The Woodbridge series consists of moderately well drained loamy soils formed in subglacial till. They are very deep to bedrock and moderately deep to a densic contact.

**GEOGRAPHIC SETTING:** Woodbridge soils are nearly level to moderately steep and are on till plains, hills and drumlins. Slope commonly is less than 8 percent, but the range includes 0 to 25 percent. The soils formed in acid till derived mostly from schist, gneiss, and granite.

**DRAINAGE AND PERMEABILITY:** Moderately well drained. Surface runoff is negligible to high. Saturated hydraulic conductivity ranges from moderately low or moderately high in the surface layer and subsoil and low or moderately low in the dense substratum.

**USE AND VEGETATION:** Many areas are cleared and used for cultivated crops, hay, or pasture. Scattered areas are used for community development. Some areas are wooded. Common trees are red, white, and black oak, hickory, white ash, sugar maple, red maple, hemlock, and white pine.

Official Soil Series Descriptions available from the NRCS Soil Survey Division online at: <http://soils.usda.gov/technical/classification/osd/index.html> and in the Soil Survey Maps for Middlesex County (USDA/Soil Conservation Service).

## Appendix C. Explanation of Soil Limitations for Recreational Uses

### Select Recreational Limitations

The soils of the survey area are rated according to limitations that affect their suitability for recreation. The ratings indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. **Slightly** limited indicates that the soil has features that are very favorable for the specified use and that any limitations are minor and can be easily overcome. **Moderately** limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or special maintenance. **Severely** limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures, limiting uses, intensive maintenance, or by a combination of these measures.

The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential. Information on recreational limitations can be supplemented by other information, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

**Paths and Trails** for hiking and horseback riding should require little or no slope modification (e.g., cutting and filling); therefore the rating is based on soil properties that affect trafficability and erodibility. The best soils for this use are those that are not wet (e.g., firm after rains), dusty when dry, or subject to flooding during the season of use. Soil properties limiting paths and trails include stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer. Off-road motorcycle trails require little or no site preparation and are not surfaced or vegetated. Considerable soil compaction is likely. Limitations are based on soil properties that influence trafficability, erodibility, dustiness, and the ease of revegetation, e.g., stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

**Camp Areas** require site preparation such as shaping and leveling for tent and parking areas, stabilizing roads and any intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. Soil properties limiting the ease of developing camp areas include slope, stoniness, and depth to bedrock or a hardpan. Soil properties that affect the performance of camp areas after development are those influencing trafficability and vegetation growth. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. Trafficability is affected by the texture of the surface layer, depth to a water table, ponding, flooding, saturated hydraulic conductivity (Ksat), and large stones. Good vegetative growth, especially in heavily used areas, is affected by the depth to bedrock or a hardpan, Ksat, and presence of toxic substances in the soil.

**Picnic Areas** are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils are firm when wet, not subject to flooding during the period of use, not dusty when dry, have mild slopes and limited stoniness. Soil properties affecting the ease of developing picnic areas are those influencing trafficability and the growth of vegetation after development (see Camp Areas above).

*From: Soil Survey Maps for Middlesex County (USDA/Soil Conservation Service)*

**Appendix D. Plant Species List for Great Cedars Conservation Area West**

<b>TREES</b>		
<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>	<b>HABITAT</b>
<i>Acer rubrum</i>	Red maple	PFW; MH
<i>Acer saccharum</i>	Sugar maple	MH
<i>Alnus incana</i>	Speckled alder	PFW
<i>Betula alleghaniensis</i>	Yellow birch	PFW
<i>Betula lenta</i>	Black birch	MH
<i>Carpinus caroliniana</i>	Ironwood	MH; PFW
<i>Carya glabra</i>	Pignut hickory	MH
<i>Carya ovata</i>	Shagbark hickory	MH
<i>Carya tomentosa</i>	Mockernut hickory	MH
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	PFW
<i>Fagus grandifolia</i>	American beech	MH
<i>Fraxinus americana</i>	White ash	MH; PFW
<i>Hamamelis virginiana</i>	Witch hazel	MH
<i>Juniperus virginiana</i>	Red cedar	MH
<i>Liriodendron tulipifera</i>	Tulip poplar	MH
<i>Nyssa sylvatica</i>	Black gum	PFW
<i>Prunus serotina</i>	Black cherry	MH
<i>Quercus alba</i>	White oak	MH
<i>Quercus coccinea</i>	Scarlet oak	MH
<i>Quercus palustris</i>	Pin oak	PFW
<i>Quercus rubra</i>	Red oak	MH
<i>Quercus velutina</i>	Black oak	MH
<b>SHRUBS and VINES</b>		
<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>	<b>HABITAT</b>
<i>Berberis thunbergii</i>	Japanese barberry	MH
<i>Celastrus orbiculatus</i>	Oriental bittersweet	MH
<i>Cephalanthus occidentalis</i>	Buttonbush	OW; PFW
<i>Clethra alnifolia</i>	Sweet pepperbush	PFW
<i>Euonymus alatus</i>	Winged euonymus	MH
<i>Gaylussacia baccata</i>	Huckleberry	MH
<i>Kalmia latifolia</i>	Mountain laurel	MH, PFW
<i>Ligustrum vulgare</i>	Common privet	MH
<i>Lindera benzoin</i>	Spicebush	PFW
<i>Lonicera japonica</i>	Japanese honeysuckle	MH; PL
<i>Lonicera morrowii</i>	Morrow's honeysuckle	MH; PL
<i>Parthenocissus quinquefolia</i>	Virginia creeper	MH
<i>Rhododendron viscosum</i>	Swamp azalea	PFW
<i>Rosa multiflora</i>	Multiflora rose	MH; PFW
<i>Rubus flagellaris</i>	Dewberry	MH; PFW
<i>Rubus phoenicolasius</i>	Wineberry	MH
<i>Smilax glauca</i>	Cat brier	MH
<i>Smilax rotundifolia</i>	Greenbrier	MH; PFW

<i>Spiraea latifolia</i>	Meadowsweet	PFW
<i>Spiraea tomentosa</i>	Steeplebush	
<i>Toxicodendron radicans</i>	Poison ivy	MH; PFW
<i>Vaccinium angustifolium</i>	Lowbush blueberry	MH
<i>Vaccinium corymbosum</i>	Highbush blueberry	PFW
<i>Viburnum acerifolium</i>	Maple-leaved viburnum	MH
<i>Viburnum dentatum</i>	Northern arrowwood	PFW
<i>Viburnum lentago</i>	Nannyberry	PFW
<i>Vitis labrusca</i>	Fox grape	MH
<i>Woodwardia areolata</i>	Netted chain-fern	PFW

### HERBACEOUS SPECIES

SCIENTIFIC NAME	COMMON NAME	HABITAT
<i>Alliaria petiolata</i>	Garlic mustard	MH
<i>Amphicarpaea bracteata</i>	Hog peanut	MH
<i>Anemone quinquefolia</i>	Wood anemone	MH
<i>Anemonella thalictroides</i>	Rue anemone	MH
<i>Anthoxanthum odoratum</i>	Sweet vernal grass	O
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	PFW
<i>Aralia nudicaulis</i>	Wild sarsaparilla	MH
<i>Athyrium filix-femina</i>	Lady fern	MH; PFW
<i>Cardamine</i> sp.	Bitter-cress	PFW
<i>Carex bromoides</i>	Sedge	PFW
<i>Carex intumescens</i>	Bladder sedge	PFW
<i>Carex laxiculmis</i>	Sedge	MH
<i>Carex laxiflora</i>	Loose-flowered sedge	MH
<i>Carex lurida</i>	Lurid sedge	PFW
<i>Carex pensylvanica</i>	Pennsylvania sedge	MH
<i>Carex plantaginea</i>	Plantain-leaved sedge	MH
<i>Carex stipata</i>	Sedge	MH
<i>Carex stricta</i>	Tussock sedge	PFW
<i>Carex swanii</i>	Swan's sedge	MH
<i>Carex vulpimoidea</i>	Sedge	PFW
<i>Carex</i> spp.	Sedges	MH; PFW
<i>Chimaphila maculatum</i>	Spotted wintergreen	MH
<i>Cinna arundinacea</i>	Sweet woodreed	PFW
<i>Danthonia spicata</i>	Oatgrass	MH
<i>Dennstaedtia punctiloba</i>	Hay-scented fern	MH; PFW
<i>Dryopteris intermedia</i>	Spinulose woodfern	MH
<i>Dulichium arundinaceum</i>	Three-way sedge	
<i>Eurybia divaricata</i>	White wood aster	MH
<i>Geranium maculatum</i>	Wild geranium	MH
<i>Geum canadense</i>	White avens	
<i>Glyceria striata</i>	Fowl manna grass	PFW
<i>Goodyera pubescens</i>	Rattlesnake plantain	MH
<i>Juncus effusus</i>	Soft rush	PFW
<i>Juncus tenuis</i>	Path rush	MH

<i>Lycopodium lucidulum</i>	Shining clubmoss	MH
<i>Maianthemum canadense</i>	Canada mayflower	MH
<i>Medeola virginiana</i>	Indian cucumber root	MH
<i>Mitchella repens</i>	Partridge berry	MH
<i>Monotropa uniflora</i>	Indian pipe	MH
<i>Osmunda cinnamomea</i>	Cinnamon fern	PFW
<i>Osmunda claytoniana</i>	Interrupted fern	PFW
<i>Osmunda regalis</i>	Royal fern	PFW
<i>Panicum clandestinum</i>	Deer tongue grass	MH
<i>Poa compressa</i>	Canada blue-grass	MH
<i>Polystichum acrostichoides</i>	Christmas fern	MH; PFW
<i>Pyrola rotundifolia</i>	Shinleaf	MH
<i>Senecio aureus</i>	Golden ragwort	PFW
<i>Symplocarpus foetidus</i>	Skunk cabbage	PFW
<i>Thelypteris noveboracensis</i>	New York fern	MH, PFW
<i>Thelypteris palustris</i>	Marsh fern	PFW
<i>Trientalis borealis</i>	Star-flower	MH
<i>Verbascum thapsis</i>	Common mullein	PL
<i>Viola blanda</i>	Sweet white violet	PFW
<i>Viola cucullata</i>	Marsh blue violet	PFW
<i>Viola pedata</i>	Birdfoot violet	MH
<i>Woodwardia areolata</i>	Netted chain-fern	PFW

Species shaded in gray are nonnative and invasive.

PFW – Palustrine Forested Wetlands: Includes the AWCS, western and central wetlands, and vernal pools

MH – Mixed Hardwoods: Includes all forested uplands

OW – Open Water

## **Appendix E. Non-Native Invasive Species Fact Sheets**