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A FOREST OWNERS' COOPERATIVE ENGAGED SINCE 1945 IN THE STEWARDSHIP OF FORESTS FOR WOOD, WATER, WILDLIFE, RECREATION, AND AESTHETICS.

# FOREST STEWARDSHIP PLAN

## WAVENY PARK CONSERVANCY
## TOWN OF NEW CANAAN

82 ACRES IN NEW CANAAN CT

2016 – 2026

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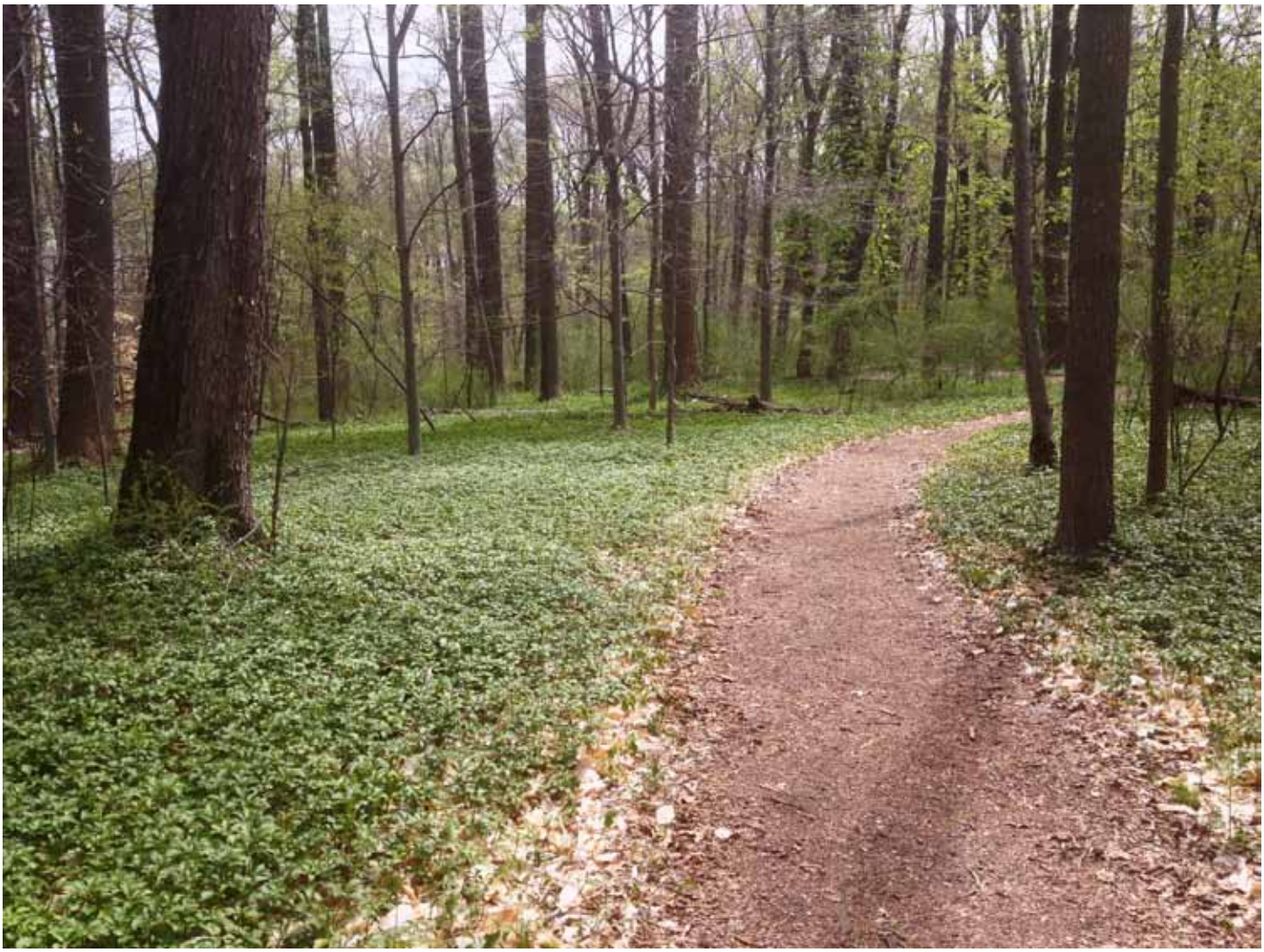
## EXECUTIVE SUMMARY/FOREST MAP

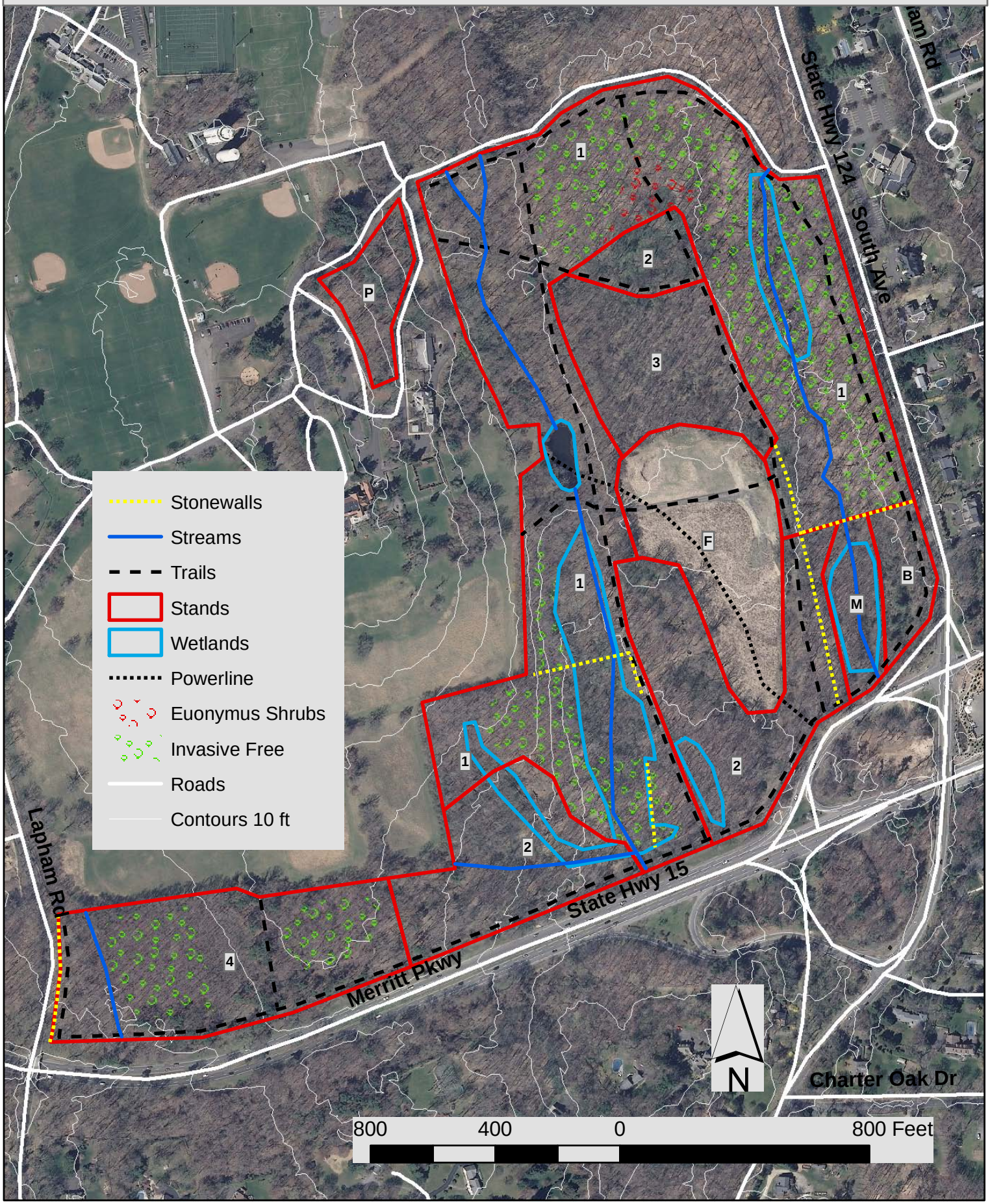
When doing the forest inventory, I was amazed by the constant stream of walkers and joggers on the forest trails that were not only exercising, but perhaps more importantly, socializing. Many were walking in pairs or groups talking with each other. I see this as the most important natural resource that this forest provides. This is the reason why a healthy and safe forest is so important for this very active public park.

The forest is extremely diverse, no doubt about that. There are over 20 different tree species. Most of the forests I work with have about 10 species. There is also a diversity of tree sizes/ages, shrubs, ground cover and wildlife habitat types. This diversity is extremely beneficial and healthy for a forest. It makes a forest more resilient and interesting.

The threats to the health and safety of the forest are invasive exotic vegetation (shrubs, trees, vines, forbs, grasses), vine growth and ash decline/death. The invasives crowd out native vegetation to the detriment of the wildlife (particularly birds and insects). The vines are hurting native tree/shrub growth. The ash decline/death is creating hazard trees that could fall on the trails. The following plan addresses these forest health issues to make this forest an even better place for recreation and renewal.



# New Canaan - Waveny Park - Stewardship Map - 2016



## GENERAL INFORMATION

Date Prepared: April 2016 (Fieldwork)

Prepared By: CONNWOOD FORESTERS, INC.
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Forester: David Beers 860-384-1214 (cell)
CT Forester #207 NRCS TSP 10-6763

Property Owner: Town of New Canaan
Address: 677 South Avenue, New Canaan CT 06480
Contact Person: Chris Schipper, Waveny Park Conservancy
Email: newcanaanlandtrust@gmail.com
Property Address: South Ave (Rte 124)
Latitude 41.12147 Longitude -73.49007
Acreage: 82 acres

***Signatures:***

Preparer: _____ Date: _____
David Beers of Connwood Foresters, Inc.

As the property owner, I have reviewed this management plan with my forester and I understand the contents and agree that it reflects my goals and intention for the management of this property.

Property Owner: _____ Date: _____

## INTRODUCTION

Upon request by the Town of New Canaan and the Waveny Park Conservancy, Connwood Foresters Inc, has prepared a ten-year (2016-2026) forest stewardship plan for the Waveny Park in New Canaan, CT. An inventory of this property was conducted in April of 2016 in order to determine how to best implement the natural resource stewardship objectives of the landowner.

THE STEWARDSHIP OBJECTIVES ARE (NOT IN ORDER OF IMPORTANCE):

1. Protect wetlands and water resources
2. Discourage invasive species
3. Allow public access
4. Improve forest health
5. Improve wildlife habitat (specifically bird habitat)

Forests clean the air and water, protect the soil, provide homes for wildlife, and renew our spirit. Forestry uses scientific knowledge and methods to create a healthy forest and create a greater diversity and abundance of life throughout the landscape, while providing forest products and services to society.

This forest stewardship plan provides an organized and effective approach for the long-term protection and use of the forest resources. The plan also allows the landowner to become aware of the full detail and potential of their forest. An inventory of the forest's condition and your stewardship objectives provide the basis for the recommendations. Implementation of these recommendations will create forest improvements that will last well beyond our lifetime and will provide benefits beyond the property's borders.

The recommendations within this plan are designed to cover a ten-year management period. As management progresses on this property it may become apparent that some recommendations are no longer valid and others become critical. Please note that while these management activities are spaced out over ten years, the order and timing are not carved in stone. Be assured that Connwood Foresters, Inc. is available to assist you with all of the management recommendations outlined in this plan.

Please refer to the maps while reading the plan. Throughout the following narrative, features are described which can be located on the maps. Using the maps will make the narrative much more meaningful. Please also refer to the 'Definitions of Forestry Terms' section to explain any terms that are unfamiliar or confusing.

### Resource concerns observed are:

1) *Growth non-native invasive exotic vegetation crowding out native vegetation*

2) *Vine growth hurting native tree and shrub growth*

3) *Trees that pose a hazard to the recreating public*

## REGIONAL CONTEXT

The property consists of 82 acres in southwestern Connecticut. The property is in the town of New Canaan, which is in Fairfield County.

The conservation of parcels of open space like this one is essential for New Canaan to retain its character and appeal. The landowner does a great service for the community by willingly retaining this land as open space. This property lies in a very residential area.

### Access / Trails

The property is accessible via road frontage on South Avenue (Rte 124) to the east and Lapham Road to the west. From South Avenue and Lapham Road, interior park roads head into the property and to numerous parking areas.

## SITE

The property's elevation rises roughly 82', from a low of 262' where the westerly stream drains under the Merritt Parkway to a high to 344' at the mansion. The property slopes in all directions, with most of the land being flat.

The soils on the property are mostly glacial till derived from bedrock composed of granitic gneiss and schist. These soils originate from the glaciers that ground the bedrock into soil particles 10,000 years ago. These soils are therefore called glacial till. Till has a blend of many mineral particle sizes (clay, silt, sand, and stones) that the glacier mixed up and deposited. These nutrient rich soils encourage vigorous tree growth.

Soils provide nutrients, moisture, and support for trees and other plant life in forest ecosystems. Soils help determine the types of trees and how well they grow on any given site. Soil quality varies greatly with topographic position. Upper slopes are dry and have thin, coarse soils whose nutrients have been leached to lower slopes. As a result, upper slopes typically have trees of shorter stature that grow slower. Mid-slopes are moderately moist and have moderate soil nutrition. Lower slopes are moist and nutrient rich and support the most vigorous tree growth. The bases of slopes hold moisture and even though they are nutrient rich, they often support poor tree growth due to the abundance of water and therefore lack of oxygen in their soils. Species composition and growth reflect this topographic soil pattern.

Soil types for Forest: Please refer to the attached web soil survey report.

| Map | Name | Texture | Hydric | Farmland | Stands |
|---|---|---|---|---|---|
| 2 | Ridgebury | Fine sandy loam | Yes | | 1,2,4,M,B |
| 3 | Ridgebury, Leicester, Whitman | Stony fine sandy loam | Yes | | 1,2 |
| 45 | Woodbridge | Fine sandy loam | | Yes | All |
| 84 | Paxton and Montauk | Fine sandy loam | | Yes | 1,2,3,P |

*Soil not listed if it is an insignificant component of forest (<1 acre)

Disturbed Lands in the 'Cornfields'

## WATER RESOURCES

The entire property drains southerly into Stony Brook. Stony Brook flows southerly through the Town of Darien to the mouth of the Darien River at Long Island Sound.

There are wetlands and watercourses on the property. The soils in the wetlands are poorly drained and are saturated for a significant portion of each year. Any sort of significant ground or vegetation disturbance within 100 feet of wetland soils, watercourses, and waterbodies requires a permit from each town's Inland Wetlands Commission.

The wetlands prevent floods by slowing water runoff during storm periods, absorb and store sediment and nutrients that would otherwise harm downstream water bodies, store and recharge groundwater during dry periods, and provide excellent wildlife habitat. Activities in or near wetlands should be limited to when the water table has receded or has frozen over.

Sustaining water quality requires preventing erosion to keep the soil and its nutrients in the forest and out of the wetlands and watercourses. This means using erosion control methods on trails, roads, and as part of any forest activities to control the volume and velocity of water on unprotected soil. Such methods include installing water bars, spreading mulch, and spreading grass seed. In addition, at least 50% of the tree canopy cover should be retained within 100 feet of wetlands and watercourses and no trees should be removed within 20 feet of wetlands and watercourses. Such measures provide a protective buffer that can filter out damaging pollutants, nutrients, and sediments before reaching water resources.

Please refer to 'Water Quality' section under General Recommendations.

Pond

The property has some stonewalls. Stonewalls served many purposes: a depository for fieldstone removed for tilling the land, a boundary marker, and a barrier to keep livestock out of the crops. Along many of these stonewalls are remnants of wire fencing embedded in the trees. The stonewalls and wire fences are evidence of the decades of agricultural use (livestock pasture) throughout the property.

The steep slopes, rocky outcrops and stoniness of the soil probably made cultivating crops difficult on some of the property. It is likely that most of the property was used for pasture over 100 years ago. Another indication of past pastures is the presence of red cedar in Stands 2, 4 and B. Red cedar would often grow in active pastures because it needs full sunlight and it is one of the few trees livestock won't eat due to its bad taste. Presence of red cedar in today's forests is evidence of past use of that land as pasture.

The gentler and less stony topography may have supported tilled crops or mowed hay. An indication of past tilling and mowing is an area with few, if any, surface rocks and a relatively smooth forest floor. The many small rocks in these areas were picked out of the fields each spring after winter frosts brought the rocks to the surface. Piles of small rocks in an area are indicative of past tilling.

Old-field trees are found throughout the forest (also called legacy trees). These are large, older trees, with large branches low on the stem. They began growing when the surrounding land was being farmed. This open-grown condition allowed the growth of their many large branches and spreading form. Many large old-field trees are along stonewalls and wire fences. These trees served as a seed source for the present forest.

## The Story of Waveny*

The Town of New Canaan has only owned Waveny since 1967, and it was January, 1969 when the town revealed a plan to develop the park. Prior to this, there were many owners of the land, which was settled a few hundred years ago in the 1700s. In the 17th & 18th centuries, the land that makes up Waveny Park was located mostly in Stamford, with a small portion in Norwalk. As the town of New Canaan was settled, the land was divided into several, large farms.

Among the owners of the land, were the Seely family, Elisha Leeds, and John Talmadge. Elisha Leeds owned 90 acres where Waveny Castle was later built, and John Talmadge owned 100 acres in the southern region of the park. In 1863, Talmadge sold his land to Hugh O'Neil, who sold the land to Captain Richard Schufeldt, in 1869, and he eventually sold the land to Lewis H. Lapham. Leed's property went to Samuel Cook Silliman, then William & Margaretta Betts, then Charles R. Christy, and eventually Thomas W. Hall, in 1895.

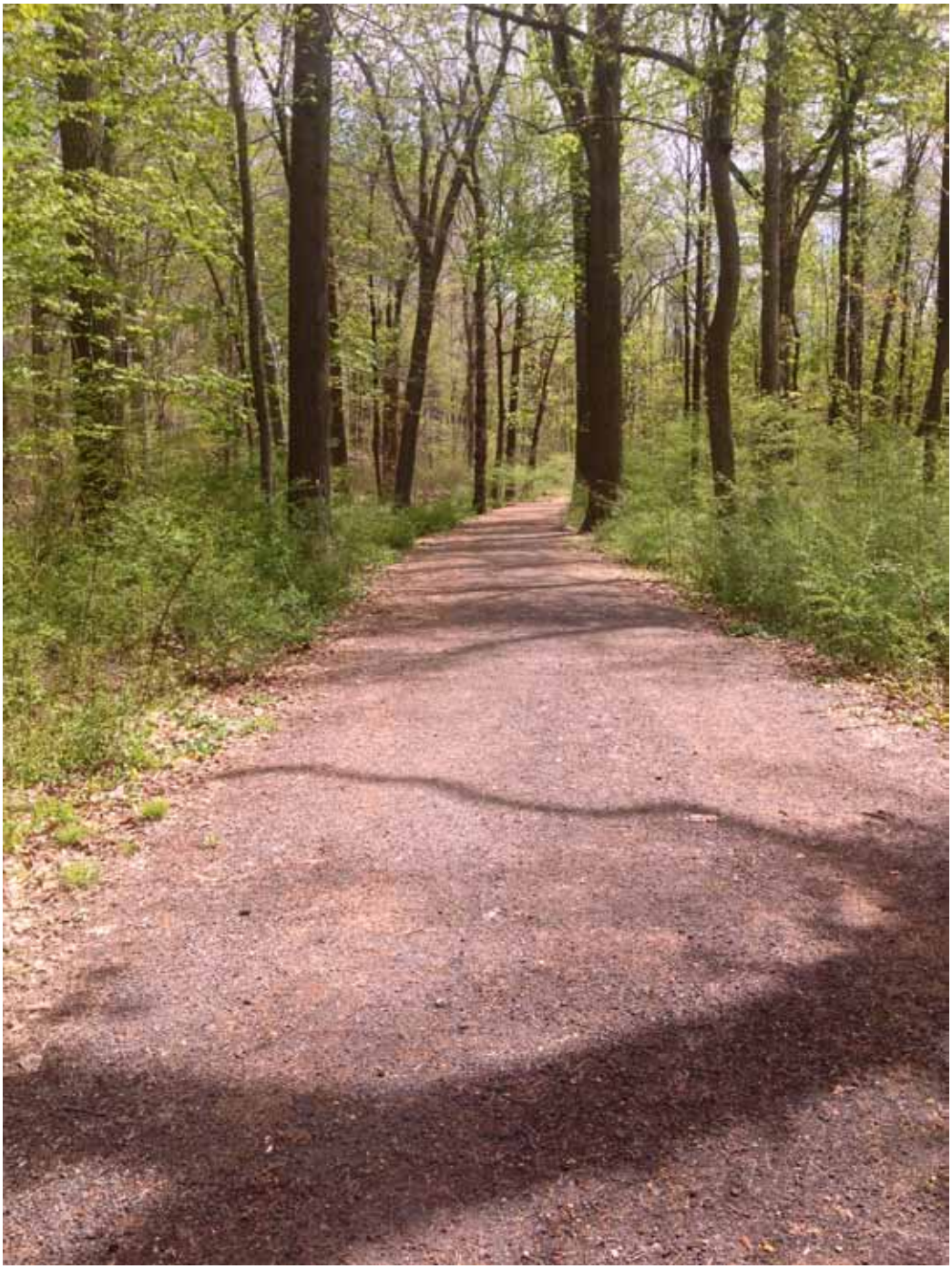
Although Hall ran a business in New York, he also put great time and effort into developing the 195 acres that he acquired in New Canaan. He completed a home on the property in 1896 (later demolished in 1914), built a new cow barn, and a windmill; he named the estate "Prospect Farm" after his summer home on Stamford's Prospect St.. On January 23, 1904, Hall sold "Prospect Farm" to Lewis Lapham.

Lapham participated in the organization and financing of what is now Texaco, Inc. Under Lapham, "Prospect Farm" became Waveny Farm; named after Waveny River in England. At first, Waveny was a summer home, but eventually all 480 acres became an expanded family operation. There was a poultry operation, corn, wheat, fruit trees, and a vegetable garden. On April 11, 1912, ground broke for a new house, the "Big House". The home was designed by W.B. Tubby of Greenwich, and the gardens were laid out by Frederick Law Olmstead Jr. (whose father laid out NYC's Central Park). In 1914, the Lapham family first occupied the home, and subsequently referred to "Waveny Farm" just as "Waveny".

Waveny during the Lapham era was a hub of numerous activities. Mrs. Lewis Lapham, was a founding member of the New Canaan Garden Club, and invited the organization to hold meetings in the "Big House". The "Big House" consisted of a billiard room and an organ, and the grounds were home to a tennis court, swimming pool, and an excellent polo field. In 1919, polo stables were created (later destroyed by fire in 1967). After World War 1, the farming discontinued but emphasis continued on the beautiful gardens and lawns. Additionally, Jack Lapham brought the airplane to New Canaan; the 1st landing at Waveny was on May 21, 1928, and the Lapham's built two airplane hangars for biplanes.

Eventually, Mrs. Lewis Lapham died in 1956, and Mrs. Lloyd (Lapham's daughter) came into possession of Waveny. She soon made the property available for purchase by the Town of New Canaan. The town bought the property, 300+ acres, "almost half the open area of NY's Central Park". Today, the house and surrounding grounds are the site of concerts, the town's 4th of July celebration, youth sports, the high school post prom, weddings, summer camp, a dog park, among other activities.

*Source: New Canaan Preservation Alliance Facebook Page



## FOREST DEVELOPMENT

In order to fully understand how and why we manipulate forest development, we need to understand the natural process of forest development and growth. In other words, how a forest matures and changes over time.

As a forest ages, the trees grow to large sizes and in that process become fewer in number. A young forest of newly established seedlings may have more than 5,000 trees per acre. Twenty years later there are 500 trees per acre. After 50 years there are 200-300 six-inch diameter trees per acre, and in another fifty years there are 50 sawtimber trees per acre. After 100 years, approximately 97% of the original 5000 seedlings per acre have died leaving the remaining 3% of the trees to mature into the trees you see today.

The exact numbers vary from forest to forest, but the process of forest maturation is the same. What is happening here? The other 4,950 trees died and rotted away because they lost the competition for limited growing space. This process continues until the mature trees die from old age or disease, blow over, burn in a forest fire, or are cut. This process has occurred on your property over the past 100+ years.

Each time a tree dies, the surrounding tree crowns expand to fill in the canopy opening. When a large tree dies, or a group of trees die, the opening is too large for the surrounding trees to fill. When this happens, the understory trees will fill the gap. Eventually all the trees we see today will die and be replaced by their progeny in the understory.

You can accelerate and improve upon forest development by selecting the trees that will dominate the stand. You may favor the healthiest and most vigorous trees. You may favor a tree for its value to wildlife, like red cedar. You may favor a tree for its products, like sugar maple for syrup. You may favor a tree for its longevity, like white oak. You can take much of the chance out of the development process by personally guiding how the forest develops, based on your objectives.

You can favor a tree’s survival and vigor by opening up growing space around its crown. This allows the tree to expand its crown and receive more sunlight. In turn, this increases the tree’s photosynthetic capability, which will make the tree more resistant to insect and disease problems and will make it grow faster.

In summary, forestry mimics and manipulates natural forest development to produce a healthier and more valuable forest. This scientific manipulation can produce wood products, improve wildlife habitat, create more recreational opportunities, and form a more attractive forest.

Some of the ash trees have crown dieback from an affliction referred to as white ash decline. This has also killed some of the ash trees. White ash decline is a general term for white ashes that are unhealthy. Ash is very sensitive to environmental stress. Something like drought or an early frost will often make the tree more vulnerable to attack by insects and diseases. There are a variety of fungi and microbes that will readily invade ash when given the chance. Ashes growing on wet soils are particularly vulnerable because their roots are shallow. When a drought does occur, such ashes are stressed because their shallow roots cannot access water. Fortunately, ash is a relatively minor component of this forest. See also the section in the General Recommendations about the Emerald Ash Borer

Some of the birch trees have Nectria cankers, which is a common affliction. Nectria is a fungal infection that causes bark deformities. It can kill the tree, but usually only causes stem deformities. The birch Nectria is a native affliction.

The decline of the black locust can be attributed to early maturity and insect/disease attack. At the age of 30, black locust often begins to decline in health due to old age. Ubiquitous attacks by the locust borer and heart rot fungi often cause an early demise for this tree. The borer constructs feeding tunnels throughout the wood. These feeding tunnels serve as entry points for the heart rot fungus, which causes extensive interior decay. Another common pest is the locust leaf-miner, which feeds on leaf tissue, turning the tree's crown brown. In years of abundance, leaf-miners can defoliate trees, but they are generally not considered lethal.

Relatively few seedlings were observed on the property because the large deer herd eats any that germinate. Because the deer eat just about anything besides invasive species, a large deer herd encourages the proliferation of invasive species at the expense of the native flora. Hunting and fencing are the most effective methods of preventing deer from devouring the native understory and young tree growth.

I could find no evidence of past fires. The current trail system provides good access for all terrain vehicles to suppress any future forest fires throughout the property.

Tepee framing, in Stand 1, just to the east of Stand 3

## WILDLIFE HABITAT

The wildlife habitat on the property provides the necessary food, cover, and water for many types of animals found in this region. Habitat variation includes deciduous trees, coniferous trees, stream banks, wetlands, shrubland, fields, reverting fields, a pond, younger trees and older trees.

Overall the forest is diverse in both tree species and tree sizes. The large diversity of tree species ensures a greater variety of foods and therefore a larger diversity of animals. The diversity of tree sizes affords many different roosting, nesting, and feeding opportunities for birds. The wood thrush, for example, sings from the upper canopy, nests in the mid-story, and feeds on the ground.

### Cover

Cover may be a hemlock tree for a screech owl (sleeping cover), a stonewall for a chipmunk (escape cover), or a dense patch of brush for a deer (resting cover). An animal's cover requirements are variable. Deer and grouse generally feed in relatively open areas of forests, but during a winter snowstorm they may seek refuge in a dense stand of conifers.

Dead Wood/ Snags: A critical part of the forest habitat is dead wood. Standing dead trees (snags) and dead wood on the ground serve important habitat benefits. Over one-quarter of the wildlife species that potentially inhabit this property require dead wood, hollow trees, or rotten wood for some part of their life cycle. Dead wood provides cover, moisture, nest sites, and den sites.

Snags are standing dead trees that provide food and cover for over 85 wildlife species. Snags are important foraging sites for many species of birds and often serve as cavity trees when primary excavators, such as woodpeckers, initiate cavity development. Snags, especially those with good vantage points in clearing or along edges, are also used as perching sites for raptors, phoebes and other birds. A greater number of wildlife species will benefit from large snags (greater than 18 inches diameter) as opposed to numerous small ones. Large snags generally last longer and can be used by both large and small birds and mammals.

On average, each acre of forest should have at least 6 snags per acre, half of which should have diameters over 16". As you can see by this table, all, but Stand 7, are deficient.

| Stand | Snags/Ac | 16"+/Ac |
|---|---|---|
| 1 | 4 | 1 |
| 2 | 7 | 7 |
| 3 | 0 | 0 |
| 4 | 4 | 0 |

Cavity or Den Trees: Den trees are trees having the trunk or large limbs hollowed out by rot, with an opening to the outside. Cavities in trees of all sizes are essential to many species of birds and mammals. Blacked-capped chickadees and eastern bluebirds use cavities in stems less than 6 inches in diameter. Gray squirrels, screech owls, and various woodpeckers such as northern flickers use cavities in stems between 12 and 18 inches in diameter. Larger birds and mammals such as pileated woodpeckers, fishers, and raccoons require larger cavities in stems greater than 18 inches in diameter.

Brush Piles: A small portion of brush should be piled wherever possible and practical to provide additional wildlife cover. This can be combined with efforts to move woody debris away from walking trails and wildlife openings. Small mammals and some birds (wrens) use such piles for cover and bears use them to den. Such piles are particularly desirable if located near water or the edge of forest openings. Large wood and rocks form the base, which are covered by progressively smaller branches to form a mound that is about 6 feet high and 15 feet across.

Conifers: Some conifers (pine, hemlock, and cedar) should always be retained to provide mammals and birds protection from harsh winter weather. They provide food and cover for resting, roosting, and nesting. They also help to moderate the effects

of inclement weather. Forests that contain both conifer and deciduous trees generally contain more wildlife species that either one exclusively. Ruffed grouse, white-tailed deer, red and northern flying squirrels, red-breasted nuthatches, golden and ruby-crowned kinglets, solitary vireos, and bay-breasted warblers are examples of Connecticut wildlife species attracted to conifers. Cedar is particularly beneficial by providing excellent winter cover and food (blue cones) for birds and mammals.

Perches: Perching sites are most often found in old fields, pastures, roadsides, riparian corridors, and in stands with an overstory tree that clearly towers above all other forest vegetation. Supracanopy white pines, hemlocks, yellow poplars, and large roadside sugar maples are examples of high exposed perching sites. The exposed nature of these high perches provides excellent hunting and nesting sites for various raptors such as osprey, red-tailed hawks and kestrels that forage in non-forest cover types and open forests. Fences, utility lines, isolated deciduous shrubs, and woody sprout clumps less than 10 feet high can serve as low perches.

Travel Lanes: Fence rows, stonewalls, drainage ways surrounded by tall herbaceous vegetation and low woody growth make excellent travel lanes. Stonewalls provide structure to wildlife habitats and are especially valuable as travel lanes. For small mammals, such as chipmunks, stonewalls serve as an important cover for nearly all daily functions. For larger species, stonewalls provide protective cover along which to travel. Where stonewalls boarder fields or woodland roads lush herbaceous edges may be present.

## Food

Food, a source of energy for growth, maintenance of good health, and reproduction is essential to all wildlife species. All animals must have an adequate seasonal supply of nutritious foods provided by a variety of habitat types. The seasons and weather can be an important factor in determining food availability. Insects, grasses, forbs, mast (nuts), and fruits as well as other animals are important food sources for wildlife in Connecticut. The following are two major sources of food for wildlife in the forest.

Hard Mast: Hard mast is hard shelled seeds (nuts and acorns) that provide high caloric source of digestible lipids and carbohydrates needed by most resident and migratory wildlife species. Native hard mast-producing trees include the oaks, hickories, and beeches. A variety of hard mast producing tree species will ensure food all year and are insurance against seed failure of any one species. White oak acorns are particularly valuable because of their high protein content.

Fruit: Fleshy (soft) fruits produced from a variety of native shrubs are an important food source for wildlife. Some common shrubs of high value are blueberry, huckleberry, common juniper, serviceberry, spicebush, winterberry, dogwoods, sumacs, and viburnum.

## Rare Threatened and Endangered Specie

According to the CT DEEP Natural Diversity Database (NDDB) map, there are threatened species within the vicinity of this forest. As of the writing of this plan, CT DEEP is working on a NDDB report for this property that will be attached to this plan when it becomes available.

## GENERAL RECOMMENDATIONS

### ACCESS

Maintaining good access roads/trails into the forest increases the value of the timber, aides in wildfire control, prevents trespass, aides in property maintenance, prevents erosion, and improves forest recreation opportunities. Because wildfires can result in soil erosion, roads are critical for the use of fire control equipment. Access roads also can act as barriers to the spread of fires. Roads and trails are useful for surveillance purposes so that the property can be patrolled and unauthorized persons removed.

Proper maintenance of roads and trails is critical to preventing erosion. Basically, maintenance means keeping water off of the trails, with the trail surface remaining intact. Methods include water bars, culverts, drainage ditches, crowning, seeding (grass), and gravelling. Brush and debris must also be cleared from trails for them to be usable.

All of the trails are in good shape.

### BOUNDARIES/ MAPS

All of the property boundaries for this property are road frontage. Some signs along the road frontage might be a good idea. It would also be a good idea to create a trail map to post at trail entrances.

### MERRITT PARKWAY NOISE POLLUTION/NOISE MANAGEMENT

Along the southern boundary is US Route 15 (Merritt Parkway). This is a 4-lane busy highway. The Merritt Parkway is burdened by noise pollution from cars accelerating down the entrance ramp and general roadway traffic. Recent clearing efforts along the roadway may have cut back sound reducing plantings. The noise level makes simple conversation difficult and detracts from the enjoyment of the woodland trail. An effort should be undertaken to explore structural and planting methods to reduce noise levels from the Parkway.

### WATER QUALITY

Protecting water quality requires preventing erosion to keep the soil and its nutrients in the forest and out of the wetlands and watercourses. This means using erosion control methods on trails, roads, and as part of any forest activities to control the volume and velocity of water on unprotected soil. Such methods include installing water bars, spreading mulch, and spreading grass seed as needed. It means hardening trails with rocks and logs at wet or erosive areas to prevent soil disturbance. Please refer to your Connecticut Best Management Practices Manual.

In addition, at least 50% of the tree canopy cover should be retained within 100 feet of wetlands and watercourses and no trees should be removed within 20 feet of wetlands and watercourses. Such measures provide a protective buffer that can filter out damaging pollutants, nutrients, and sediments before reaching water resources. Such buffers also maintain shade to keep the water cool. Cooler water holds more oxygen and is inherently healthier for most aquatic life. Finally, these buffers provide a natural source of forest debris (logs, branches, leaves etc) that is an integral part of maintaining the biological/ecological health of wetlands and watercourses.

### INVASIVES/VINES

Only 20 acres of the forest were, for the most part, without invasive shrubs. Invasive shrubs found throughout the forest include privet, barberry, multi-flora rose, honeysuckle and euonymus. There are also some patches of garlic mustard forbs and Norway maple trees. Invasive species are typically from another part of the world such that when established here have no native enemies to hold their population in check. When left uncontrolled, they spread into natural landscapes and replace what would grow there naturally, including tree regeneration and other native understory vegetation.

Invasive species do not provide cover and food for native insects like native vegetation does. This results in a much lower population of native insects. This, in turn, results in less food for native birds and mammals. This can have a particularly negative effect for the diversity and abundance of bird populations. Deer make this problem worse by eating the native vegetation and typically not eating invasive vegetation.

Control methods include mechanical and chemical methods. In a shady forest, cutting a vine is enough to kill it. Invasive shrubs are not so easy. Pulling the invasives out by the roots can be effective, but extremely difficult and labor intensive. Yearly cutting back of the aboveground stems will keep the invasives under control, and perhaps kill them after a few years. The most effective control method is to cut the invasive and follow with an herbicide treatment during the growing season. An herbicide (Glycophosphate) should be applied to the freshly cut stub and/or green foliage. For more information, visit the Invasive Plant Atlas of New England: invasives.ecb.uconn.edu/ipane. A more detailed treatment method is described in the stand recommendations.

There are also some patches of vine growth that are a strain on the health of the forest. Vines are a forest health issue in Stands 2, 3 and 4. Vine growth is particularly a problem in Stand 3. A single vine cutting treatment should get rid of most of the vine growth. In fully shaded areas, any attempt for vines to resprout will likely fail due to lack of sunlight. In more sunny areas, it is best to apply herbicide to the freshly cut vine (rooted part) to ensure that the vine will not successfully resprout. In order for the herbicide to be effective, this must be done during the growing season.


Stump Herbicide Applicator

## AESTHETICS

There are many opportunities to improve the beauty or aesthetics of the property that fall outside of traditional landscaping. Two activities have already been mentioned and have benefits beyond aesthetics: vine and invasive species control. Most would agree that hanging vines and thorny invasive species have little beauty. Controlling vines and invasives creates a more park-like forest that appeals to most people because it is much easier to see through and walk through.

With the same methods discussed for vine and invasive species control, you can eliminate the understory growth and woody debris of a forest to create a truly park-like setting. This may be desirable around a house, campsite, viewshed or picnic site. The improved visibility and lack of understory clutter is very attractive and enjoyable. Such clearing should remain isolated and small in scale (less than ten acres). The wholesale destruction of understory vegetation is detrimental to bird, mammal, and amphibian habitat. It also prevents the forest from renewing itself with young trees.

## FOREST STAND DESCRIPTIONS AND RECOMMENDATIONS

Stands are separate natural communities that are distinct from each other. Dividing a property into stands makes it possible to logically describe the property. Keep in mind that while stands are distinct, stand boundaries are often indistinct, where one stand will meld into the next stand over the course of 100 to 200 feet. Even within a single stand, there is a tremendous amount of variation. Like most properties in Connecticut, your property could be divided into an almost unlimited number of stands due to the tremendous variety forests inherently possess. To prevent analysis paralysis, a minimum stand size of five acres is usually adhered to.

The following stand descriptions are based on 18 measurement points (10 BAF) evenly distributed throughout the forest. At each measurement point, quantitative and qualitative data was recorded. An average of 10 trees was measured at each point (species, diameter, and height). I zig-zagged all over the place when walking between plots to ensure that I saw every acre.

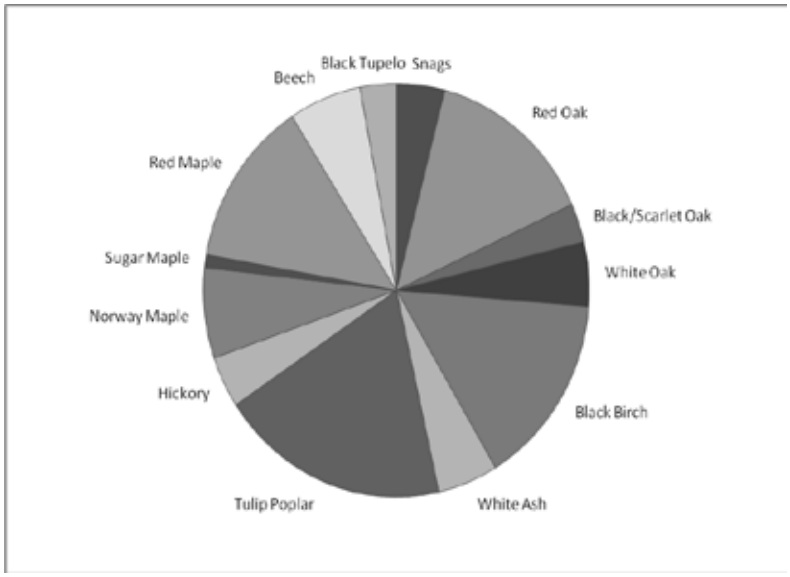
Each description begins with two graphs. The first shows the relative abundance of each species by percent. Not all species found in a stand will be included in this graph because some of the less common species did not fall within a measurement point. The second graph shows the relative abundance of different tree sizes based on the diameter of the tree measured at 4.5 feet off the ground.

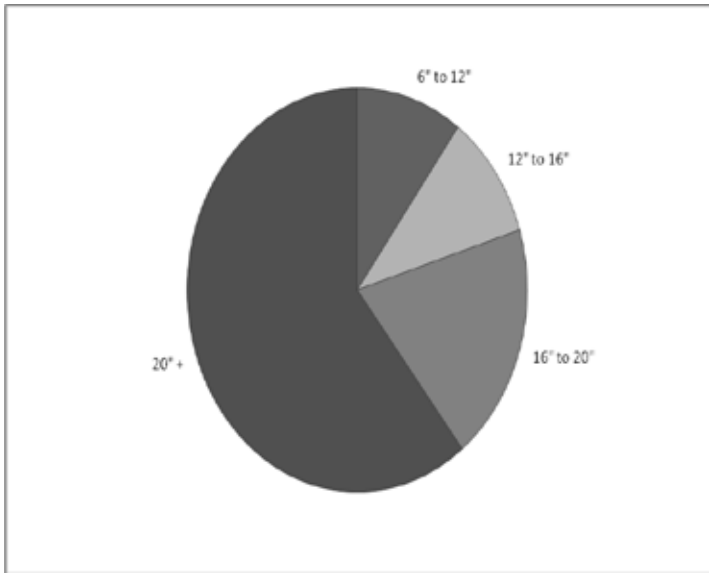
In addition to the following forested stands, listed in the table below

| Stand: | 1 | 2 | 3 | 4 | F | P | M | B |
|---|---|---|---|---|---|---|---|---|
| Acres: | 37 | 16 | 6 | 10 | 7 | 2 | 2 | 2 |

Skunk Cabbage in Stand 1

STAND 1: MATURE (37 ACRES)




| | |
|---|---|
| Other Species (not measured) | Elm, yellow birch, white oak, white pine |
| Regeneration/Understory | A few beech, birch and maple saplings<br>Patches of Norway maple saplings south of the pond<br>Patches of dense shrubs (mostly alder) in wetlands |
| Coarse Woody Debris | Average amount – many large diameter pieces |
| Insect/Disease/Disturbance | Minor birch canker<br>Ash decline and death |
| Invasives/Vines | Patches of privet, honeysuckle, barberry, euonymus and multi-flora rose shrubs<br>-mostly near field edges and along wetlands<br>-western edges of stand have the most invasives<br>A few patches of garlic mustard forbs<br>17 acres of are mostly invasive-free (see map)<br>One-acre patch of euonymus shrubs in north of stand (see map)<br>Patch of pachysandra ground cover in north of stand<br>Norway maple is part of both the overstory and the understory |
| Canopy Closure | 90% |
| Basal Area per Acre | 141 |
| Trees per Acre | 97 |
| Volume per Acre | 10.5 MBF |
| %UGS | 21% |
| History | Likely livestock pasture 100+ years ago<br>-Many old field trees and old wire fencing |

This stand consists of an extremely diverse mix of trees. Most of the trees are of large diameters (over 20”) and growing on excellent site conditions (nutrient rich, not too wet or dry). Many of the tulip poplar trees are well over 40” diameter. Red maple and ash trees are more common in the wetlands.

Included within this stand are a 5- acre and 1-acre forested wetlands that are dominated by red maple trees and skunk cabbage.

## Recommendations

Invasives shrub control/eradication

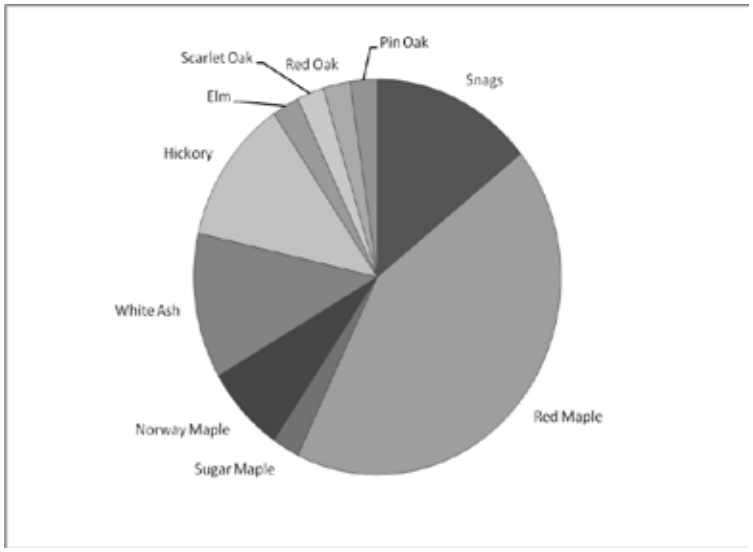
- The green foliage on invasive shrubs should be sprayed with an herbicide during the growing season
    - To minimize herbicide use, shrubs can be cut, then allowed to leaf out again, at which time they are sprayed with an herbicide

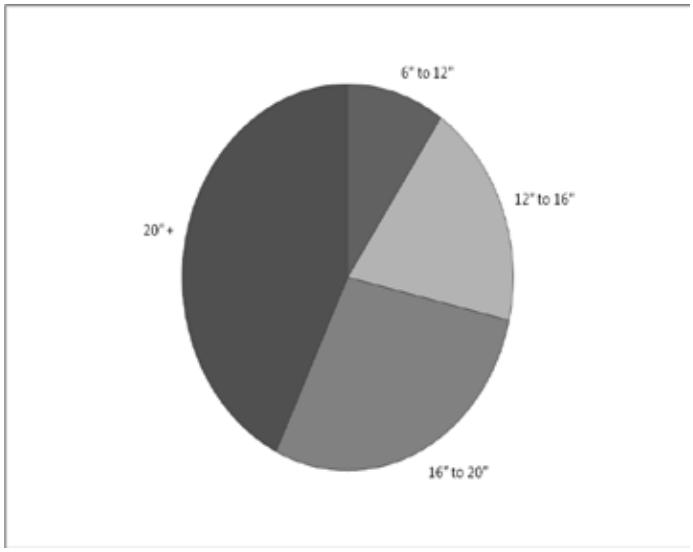
Cut the one-acre patch of euonymus during the growing season and then paint the freshly cut stump with herbicide

Cut down the Norway maple trees during the growing season (summer) and treat the freshly cut stumps with herbicide to prevent the prolific stump and root spouting that will occur otherwise.

Invasive Free Area of Stand 1

STAND 2: INVASIVE UNDERSTORY (16 ACRES)




| | |
|---|---|
| Other Species (not measured) | Sycamore, black cherry, tulip poplar, red cedar, white pine, white oak |
| Regeneration/Understory | Patches of dense Norway maple saplings<br>A few red maple, birch and hickory saplings<br>Patches of alder and spicebush |
| Coarse Woody Debris | Above average amount – many blowdowns |
| Insect/Disease/Disturbance | Dead and dying white ash trees<br>Many blown over trees (blowdowns) |
| Invasives/Vines | Dense patches of privet shrubs<br>Patches of honeysuckle, euonymus and barberry shrubs<br>Some garlic mustard forbs<br>Grape and bittersweet vines – particularly near fields<br>Norway maple is part of both the overstory and the understory |
| Canopy Closure | 70% |
| Basal Area per Acre | 105 |
| Trees per Acre | 91 |
| Volume per Acre | 0.7 MBF |
| %UGS | 36% |
| History | Likely livestock pasture 100+ years ago<br>-Many old field trees and a few red cedar trees |

This stand is half red maple, with the other half a diverse mix of maple, ash, hickory, oak and elm. Most of the trees are of large diameters (over 20”). There are significant canopy gaps from ash dying and trees blowing over. The moist soils in this stand causes shallow rooting due to the lack of oxygen in wet soils. Shallow rooting makes trees prone to falling down. These gaps are filling in thick with invasives and vines. There is also a high number of snags (7 per acre), many of which are dead ash trees, all of which are over 16” diameter. The dead and dying ash trees pose a significant hazard to the nearby hikers (*I would not walk through this stand on a windy day!)*.

Included within this stand is a 1-acre forested wetland that is dominated by red maple trees and skunk cabbage. There are 3 sections of this stand (8, 6 and 2 acres). The northern 2-acre section has mounds of dirt and some pachysandra ground cover. It looks like some digging occurred in this stand many years ago.

## Recommendations

Invasives shrub control/eradication

- The green foliage on invasive shrubs should be sprayed with an herbicide during the growing season
    - To minimize herbicide use, shrubs can be cut, then allowed to leaf out again, at which time they are sprayed with an herbicide

Kill the tree-hanging vines

- Simply severing the vines at waist height will kill them if there is too much tree canopy shade for sprouts from the cut stem to survive – possible project for volunteers
- In more sunny areas (field edges), it is best to apply herbicide to the freshly cut vine (rooted part) to ensure that the vine will not successfully resprout. In order for the herbicide to be effective, this must be done during the growing season.

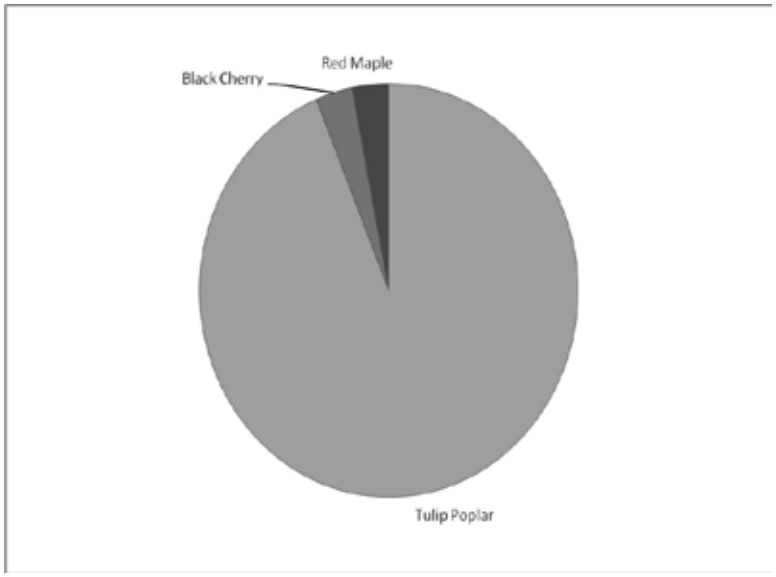
Cut down the Norway maple trees during the growing season (summer) and treat the freshly cut stumps with herbicide to prevent the prolific stump and root spouting that will occur otherwise.

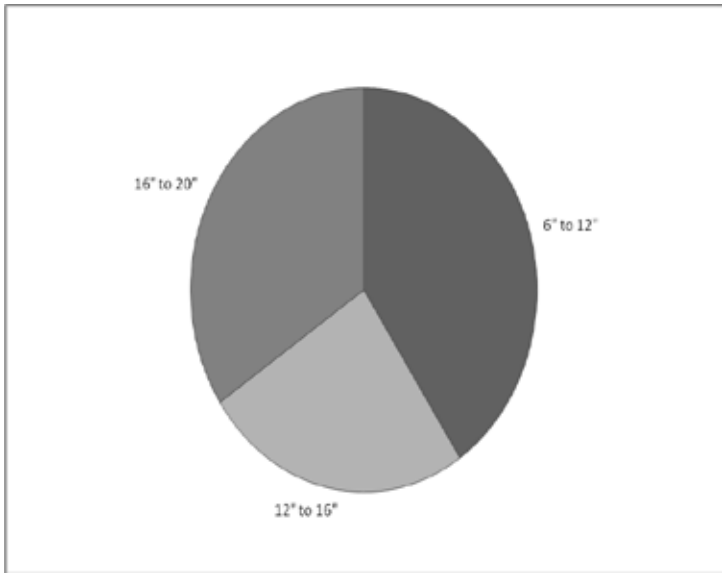
Cut down any dead or dying trees that pose a hazard to trail hikers.

Plant native saplings of oak, maple, birch and hickory to fill in the canopy gaps created by ash death, blowdowns and hazard tree removal. These saplings will need to be protected from deer brows with fending until their foliage reaches a height the deer cannot reach. Currently, canopy gaps are filling in with invasives. Planting will help keep the invasives out and replace them with the natural forest succession of young native tree growth.

Euonymus Shrub in Stand 1

## STAND 3: TULIP POPLAR (6 ACRES)




| | |
|---|---|
| Other Species (not measured) | Black birch, red oak, white ash |
| Regeneration/Understory | A few poplar and cherry saplings |
| Coarse Woody Debris | A lot of small diameter pieces |
| Insect/Disease/Disturbance | Dense vine growth pulling down branches and trees |
| Invasives/Vines | Patches of thick privet shrubs<br>Patches of barberry shrubs<br>Thick with mostly bittersweet vines |
| Canopy Closure | 80% (canopy openings caused by vine growth) |
| Basal Area per Acre | 107 |
| Trees per Acre | 198 |
| Volume per Acre | 6.1 MBF |
| %UGS | 25% |
| History | Likely cropland or hayfield about 50 years ago<br>-smooth even microtopography<br>The southern half appears to be a bit younger – perhaps 30 years old |

This stand consists of almost entirely tulip poplar trees dripping with bittersweet vines. The vines are pulling down branches and entire trees to create canopy openings. There is more poletimber and less sawtimber in the southern half of the stand because it is likely younger. The entire stand is dominated by tulip poplar trees draped with vines.

## Recommendations

Invasives shrub control/eradication

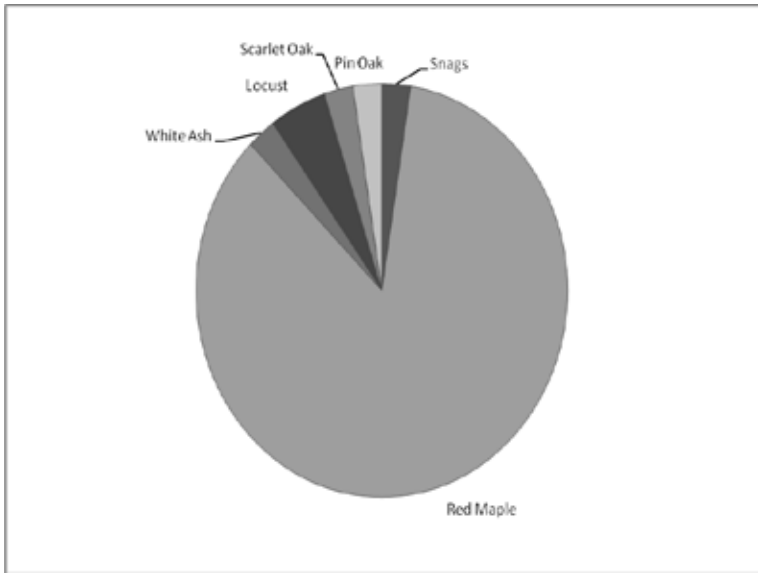
- The green foliage on invasive shrubs should be sprayed with an herbicide during the growing season
    - To minimize herbicide use, shrubs can be cut, then allowed to leaf out again, at which time they are sprayed with an herbicide

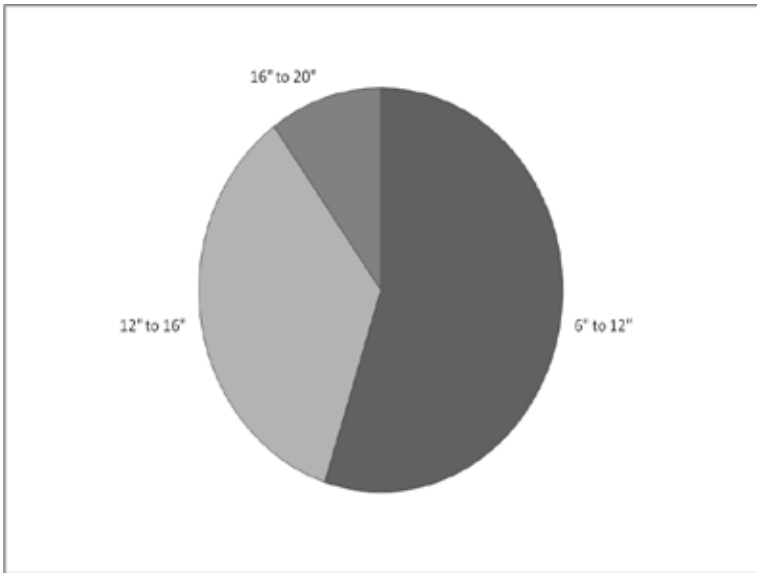
Kill the tree-hanging vines

- Simply severing the vines at waist height will kill them if there is too much tree canopy shade for sprouts from the cut stem to survive – possible project for volunteers
- In more sunny areas (field edges), it is best to apply herbicide to the freshly cut vine (rooted part) to ensure that the vine will not successfully resprout. In order for the herbicide to be effective, this must be done during the growing season.

Bittersweet Vines

STAND 4: RED MAPLE (10 ACRES)




| | |
|---|---|
| Other Species (not measured) | White pine, black cherry, paper birch, red cedar, sugar maple, hickory, tulip poplar |
| Regeneration/Understory | Low density of red maple saplings<br>A few high-bush blueberry shrubs |
| Coarse Woody Debris | Above average amount of dead fallen locust and cedar trees |
| Insect/Disease/Disturbance | Locust decline and death<br>Ash decline and death<br>Cedar decline and death due to overstory shading<br>-Cedar needs full sunlight to survive<br>-the faster growing hardwood trees easily overtop it |
| Invasives/Vines | Patches of privet, barberry, euonymus and honeysuckle shrubs<br>-especially on forest edges<br>Vines along the fields<br>3 acres of this stand are mostly invasive-free (see map) |
| Canopy Closure | 90% |
| Basal Area per Acre | 133 |
| Trees per Acre | 246 |
| Volume per Acre | 2.2 MBF |
| %UGS | 25% |
| History | Likely livestock, cropland or hayfield about 50 years ago<br>-smooth even microtopography<br>-presence of red cedar an indication of livestock pasturing |

This stand consists of mostly relatively young (50 yrs) poletimber red maple trees. Other trees include locust, ash, pine, cherry, birch, cedar, sugar maple, hickory, tulip poplar, scarlet oak and pin oak. There are some large sugar maple old field trees along the western boundary of the stand, along with some big tulip poplar trees.

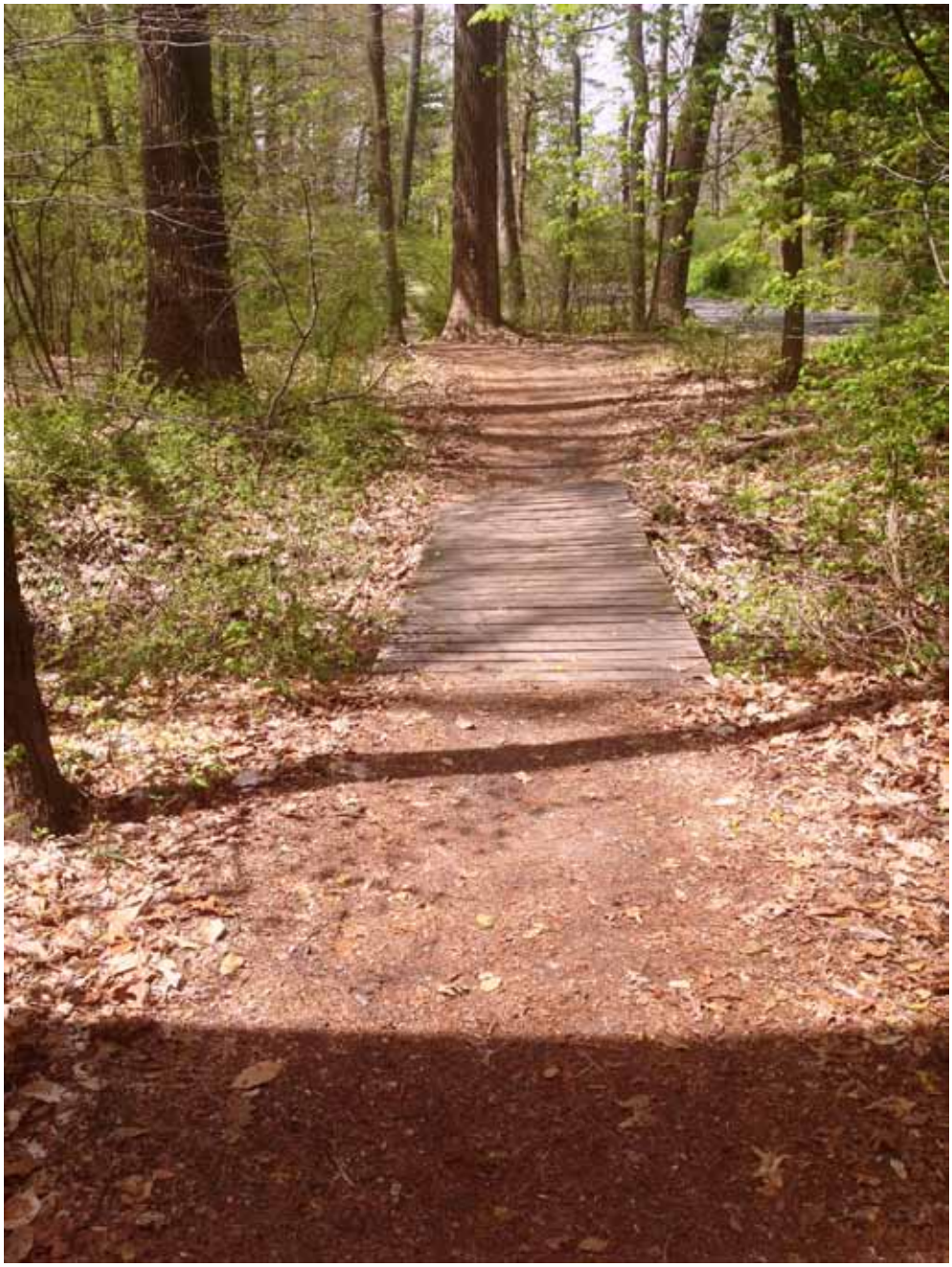
## Recommendations

Invasives shrub control/eradication

- The green foliage on invasive shrubs should be sprayed with an herbicide during the growing season
    - To minimize herbicide use, shrubs can be cut, then allowed to leaf out again, at which time they are sprayed with an herbicide

Kill the tree-hanging vines

- Simply severing the vines at waist height will kill them if there is too much tree canopy shade for sprouts from the cut stem to survive – possible project for volunteers
- In more sunny areas (field edges), it is best to apply herbicide to the freshly cut vine (rooted part) to ensure that the vine will not successfully resprout. In order for the herbicide to be effective, this must be done during the growing season.



## WOODLAND PATCHES

There are patches of woods throughout this property that are too small or not enough trees to treat as a separate stand and inventory. Below is a brief description of these woodland patches.

Field (F): There is a 7-acre cleared area (field) in the middle of the forest. This area is known as the 'Cornfields'. North of the trail, this 2-acre clearing consists of lightly vegetated gravel. This area has some ponding water and appears to be recently excavated. South of the trail is five acres of thick phragmites reed. Phragmites reed, or common reed, is a large perennial grass from Europe. This exotic reed is very invasive and quickly spreads into dense sterile monoculture beds that crowd out any native vegetation in wetland soils. It has done that on about 5 acres here.

I recommend creating a butterfly/pollinator meadow. The first step would be to eradicate the invasives with herbicide and then plow the field. The field would then be seeded with a variety of plants (mostly wildflowers) that are carefully selected to provide nectar for adults and food for larva (caterpillars). The field would then need to be mowed periodically to inhibit woody growth. A butterfly meadow would also be beneficial to bees and other pollinating insects. You should work closely with a soil scientist from the Natural Resource Conservation Service (NRCS) to help you figure out the appropriate soil treatments to make this plan work.

Phragmites

Parking Lot Woodland (P): This 2-acre patch of forest is surrounded by roads and parking lots. It is comprised of mature Norway maple, sugar maple, white ash, red oak, white oak, hickory, white pine, beech, Norway spruce and tulip poplar growing in an average mesic site. The understory has many Norway maple and sugar maple saplings, with some patches of blackberry brambles. There are a few invasive barberry and privet shrubs; along with a patch of pachysandra.

I recommend eradicating the barberry and privet shrubs. I also recommend cutting down the Norway maple trees during the growing season (summer) and treat the freshly cut stumps with herbicide to prevent the prolific stump and root spouting that will occur otherwise.

Pachysandra and Barberry Shrub

Maple Woodland (M): This 2-acre woodland, is a stand of dense red maple saplings growing in a wetland. It is adjacent to the Brush woodland. I have no recommendations for this area.

Brush Woodland (B): This 2-acre woodland, in the southeast corner of the property, is comprised of ash, oak, red maple, tulip poplar, red cedar, white pine and locust sapling and poletimber trees growing in a moist rich site. The woodland is also loaded with invasive barberry shrubs, multi-flora rose shrubs, Russian olive shrubs, honeysuckle shrubs and many vines. This brushy area is relatively young and starting reverting back to forest about 30 years ago. I have no recommendations for this area.

When the forest here becomes more mature in another 20 years, and the tree canopy begins to coalesce, it would then be a good time, in this forest's development, to eradicate the vine and invasive shrub growth. Trying to do this work now would just result in the same mix of vines and invasive shrubs becoming reestablished due to the sunny understory and lack of full tree canopy.

## SUMMARY OF MANAGEMENT RECOMMENDATIONS

The following table summarizes recommended forest management activities for the Town of New Canaan Waveny Park in New Canaan CT for the management period 2016 to 2026. Active management of one's land is an exciting and dynamic process. Adjustments, updates, and revisions may be necessary over time due to unforeseen changes in environmental conditions (disease, insects, fire, and storm damage) or changes in the stated objectives. The extent to which these recommendations are followed is totally up to the landowner.

All

- Create a trail map to post at trail entrances and to post online
- Reduce noise pollution from the Merritt Parkway
- Reinventory the forest and update the forest stewardship plan in 2026

Stand 1

- Eradicate/control the invasive shrubs and trees on 20 acres
  - Includes the one-acre patch of euonymus shrubs
  - Includes both large and small Norway maple trees

Stand 2

- Eradicate/control the invasive shrubs, vines and trees on 16 acres
  - Includes tree-hanging vines
  - Includes both large and small Norway maple trees
- Cut down any dead or dying trees that pose a hazard to the trails
- Plant native saplings, with deer browse protection, to fill in canopy gaps

Stand 3

- Eradicate/control the invasive shrubs and vines on 6 acres
  - Includes tree-hanging vines

Stand 4

- Eradicate/control the invasive shrubs and vines on 7 acres
  - Includes tree-hanging vines

Field

- Eradicate the phragmites (5 acres) and establish a butterfly/pollinator meadow (7 acres)

Parking Lot Woodland

- Eradicate/control of the invasive shrubs and trees (Norway maple) (2 acres)

## DEFINITIONS OF FORESTRY TERMS

AGS: Acceptable Growing Stock: Trees desirable for long-term growth/UGS: Undesirable Growing Stock

Basal Area: The area in square feet of the cross section of a tree at DBH

Boardfoot: Wood used for lumber that measures 1”x 12”x 12” (MBF = 1000 boardfeet)

Canopy: Where the leaves and upper branches in a tree are located

CTT: Crop Tree Thinning: Culturing individual trees with the greatest potential to produce specific benefits

DBH: Diameter at Breast Height: diameter of a tree at 4.5’ above the ground

Girdling: Creates a cut area around the circumference of the tree that blocks the flow of food

Habitat: The foods, water, cover, and living space wildlife needs for survival

Hardwood: Broad-leaved trees that usually shed their leaves in the fall

Intermittent Stream: A small stream that usually does not flow all year

Mast: Tree seeds that supply valuable wildlife nutrition; Hard: acorns, nuts; Soft: berries

Overstory: Upper canopy of treetops

Pole or Poletimber: Trees having a DBH of 6 to 12 inches

Regeneration: New young trees

Release: Remove competition such that the released tree has more sunlight and growing space

Sapling: Trees having a DBH of 1 to 6 inches

Sawtimber or Sawlog: Trees having a DBH greater than 12 inches

Seedling: Trees having a DBH less than 1 inch

Silviculture: The art, science, and practice of producing and tending a forest

Snag: A dead standing tree

Stand: Separate and distinct natural community

Understory: Vegetation layer below the upper canopy of treetops

TSI: Precommercial thinning where trees that have little or no value are killed or removed

Water Bar: Ditches or logs placed at an angle to the slope to divert water from its downhill path

Connecticut Department of

ENERGY &
ENVIRONMENTAL
PROTECTION

May 19, 2016

Mr. David Beers
Connwood Forester, Inc.
P.O. Box 150
Rockfall, CT 06481
dave@connwood.com

Project: Forest Stewardship Plan for Waveny Park on South Ave (Route 124) in New Canaan, Connecticut
NDDB Determination No.: 201606402

Dear David,

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed Forest Stewardship Plan for Waveny Park on South Ave (Rte 124) in New Canaan, Connecticut. According to our information there are known extant populations of State Special Concern *Terrapene c. carolina* (eastern box turtle) in the vicinity of the project site. I have included recommended protection strategies and best management practices for this state special concern turtle. I have described these strategies below.

**Eastern Box Turtle**: Eastern box turtles inhabit old fields and deciduous forests, which can include power lines and logged woodlands. They are often found near small streams and ponds. The adults are completely terrestrial but the young may be semiaquatic, and hibernate on land by digging down in the soil from October to April. They have an extremely small home range and can usually be found in the same area year after year. Eastern box turtles have been negatively impacted by the loss of suitable habitat. Some turtles may be killed directly by construction activities, but many more are lost when important habitat areas for shelter, feeding, hibernation, or nesting are destroyed. As remaining habitat is fragmented into smaller pieces, turtle populations can become small and isolated.

**Recommended Protection Strategies for turtles**:

Work should occur when these turtles are active (April 1st to September 30th) and I recommend the additional strategies in order to protect these turtles:

- Workers should be apprised of the possible presence of turtles, and provided a description of the species (http://www.ct.gov/dep/cwp/view.asp?a=2723&q=473472&depNav_GID=1655 );

- Any turtles that are discovered should be moved, unharmed, to an area immediately outside of the fenced area, and position in the same direction that it was walking;

- No vehicles or heavy machinery should be parked in any turtle habitat;

- Work conducted during early morning and evening hours should occur with special care not to harm basking or foraging individuals; and

- Stockpiles of soil should be cordoned off with silt fencing so turtles do not attempt to try and nest in them.

- Use native plantings if possible. Any plantings should be composed of species native to northeastern United States and appropriate for use in riparian habitat.

If these protection strategies are followed then the proposed activities will lessen the impact on the box turtle. I have attached fact sheets on these turtles. This determination is good for one year. Please re-submit an NDDB Request for Review if the scope of work changes or if work has not begun on this project by April 19, 2017.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Please contact me if you have further questions at (860) 424-3592, or dawn.mckay@ct.gov . Thank you for consulting the Natural Diversity Data Base. Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEEP for the proposed site.

Sincerely,

Dawn M. McKay

Dawn M. McKay
Environmental Analyst 3

# WILDLIFE IN CONNECTICUT

STATE SPECIES OF SPECIAL CONCERN

# Eastern Box Turtle

*Terrapene carolina carolina*

© PAUL J. FUSCO

## Description

The eastern box turtle is probably the most familiar of the 8 species of turtles found in Connecticut's landscape. It is known for its high-domed carapace (top shell). The carapace has irregular yellow or orange blotches on a brown to black background that mimic sunlight dappling on the forest floor. The plastron (under shell) may be brown or black and may have an irregular pattern of cream or yellow. The length of the carapace usually ranges from 4.5 to 6.5 inches, but can measure up to 8 inches long. The shell is made up of a combination of scales and bones, and it includes the ribs and much of the backbone.

Each individual turtle has distinctive head markings. Males usually have red eyes and a concave plastron, while females have brown eyes and a flat plastron. Box turtles also have a horny beak, stout limbs, and feet that are webbed at the base. This turtle gets its name from its ability to completely withdraw into its shell, closing itself in with a hinged plastron. Box turtles are the only Connecticut turtle with this ability.

## Range

Eastern box turtles are found throughout Connecticut, except at the highest elevations. They range from southeastern Maine to southeastern New York, west to central Illinois, and south to northern Florida.

## Habitat and Diet

In Connecticut, this terrestrial turtle inhabits a variety of habitats, including woodlands, field edges, thickets, marshes, bogs, and stream banks. Typically, however, box turtles are found in well-drained forest bottomlands and open deciduous forests. They will use wetland areas at various times during the season. During the hottest part of a summer day, they will wander to find springs and seepages where they can burrow into the moist soil. Activity is restricted to mornings and evenings during summer, with little to no nighttime activity, except for egg-laying females. Box turtles have a limited home range where they spend their entire life, ranging from 0.5 to 10 acres (usually less than 2 acres).

Box turtles are omnivorous and will feed on a variety of food items, including earthworms, slugs, snails, insects, frogs, toads, small snakes, carrion, leaves, grass, berries, fruits, and fungi.

## Life History

From October to April, box turtles hibernate by burrowing into loose soil, decaying vegetation, and mud. They tend to hibernate in woodlands, on the edge of woodlands, and sometimes near closed canopy wetlands in the forest. Box turtles may return to the same place to hibernate year after year. As soon as they come out of hibernation, box turtles begin feeding and searching for mates.

The breeding season begins in April and may continue through fall. Box turtles usually do not breed until they are about 10 years old. This late maturity is a result of their long lifespan, which can range up to 50 to even over 100 years of age. The females do not have to mate every year to lay eggs as they can store sperm for up

to 4 years. In mid-May to late June, the females will travel from a few feet to more than a mile within their home range to find a location to dig a nest and lay their eggs. The 3 to 8 eggs are covered with dirt and left to be warmed by the sun. During this vulnerable time, skunks, foxes, snakes, crows, and raccoons often raid nests. Sometimes, entire nests are destroyed. If the eggs survive, they will hatch in late summer to early fall (about 2 months after being laid). If they hatch in the fall, the young turtles may spend the winter in the nest and come out the following spring.

As soon as the young turtles hatch, they are on their own and receive no care from the adults. This is a dangerous time for young box turtles because they do not develop the hinge for closing into their shell until they are about 4 to 5 years old. Until then, they cannot entirely retreat into their shells. Raccoons, skunks, foxes, dogs, and some birds will prey on young turtles.

## Conservation Concerns

The eastern box turtle was once common throughout the state, mostly in the central Connecticut lowlands. However, its distribution is now spotty, although where found, turtles may be locally abundant. Because of the population decline in Connecticut, the box turtle was added to the state's List of Endangered, Threatened, and Special Concern Species when it was revised in 1998. It is currently listed as a species of special concern. The box turtle also is protected from international trade by the 1994 CITES treaty. It is of conservation concern in all the states where it occurs at its northeastern range limit, which includes southern New England and southeastern New York.

Many states have laws that protect box turtles and prohibit their collection. In Connecticut, eastern box turtles **cannot** be collected from the wild (DEP regulations 26-66-14A). Another regulation (DEP regulations 26-55-3D) "grandfathers" those who have a **box turtle collected before 1998**. This regulation limits possession to a single turtle collected before 1998. These regulations provide some protection for the turtles, but not enough to combat some of the even bigger threats these animals face. The main threats in Connecticut (and other states) are loss and fragmentation of habitat due to deforestation and spreading suburban development; vehicle strikes on the busy roads that bisect the landscape; and indiscriminate (and now illegal) collection of individuals for pets.

Loss of habitat is probably the greatest threat to turtles. Some turtles may be killed directly by construction activities, but many more are lost when important habitat areas for shelter, feeding, hibernation, or nesting are destroyed. As remaining habitat is fragmented into smaller pieces, turtle populations can become small and isolated.

Adult box turtles are relatively free from predators due to their unique shells. The shell of a box turtle is extremely hard. However, the shell is not hard enough to survive being run over by a vehicle. Roads bisecting turtle habitat can seriously deplete the local population. Most vehicle fatalities are pregnant females searching for a nest site.

## How You Can Help

- *Leave turtles in the wild. They should never be kept as pets. Whether collected singly or for the pet trade, turtles that are removed from the wild are no longer able to be a reproducing member of a population. Every turtle removed reduces the ability of the population to maintain itself.*
- *Never release a captive turtle into the wild. It probably would not survive, may not be native to the area, and could introduce diseases to wild populations.*
- *Do not disturb turtles nesting in yards or gardens.*
- *As you drive, watch out for turtles crossing the road. Turtles found crossing roads in June and July are often pregnant females and they should be helped on their way and not collected. Without creating a traffic hazard or compromising safety, drivers are encouraged to avoid running over turtles that are crossing roads. Also, still keeping safety precautions in mind, you may elect to pick up turtles from the road and move them onto the side they are headed. Never relocate a turtle to another area that is far from where you found it.*
- *Learn more about turtles and their conservation concerns. Spread the word to others on how they can help Connecticut's box turtle population.*

State of Connecticut
Department of Environmental Protection
Bureau of Natural Resources
Wildlife Division
*www.ct.gov/dep*

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United States Department of Agriculture

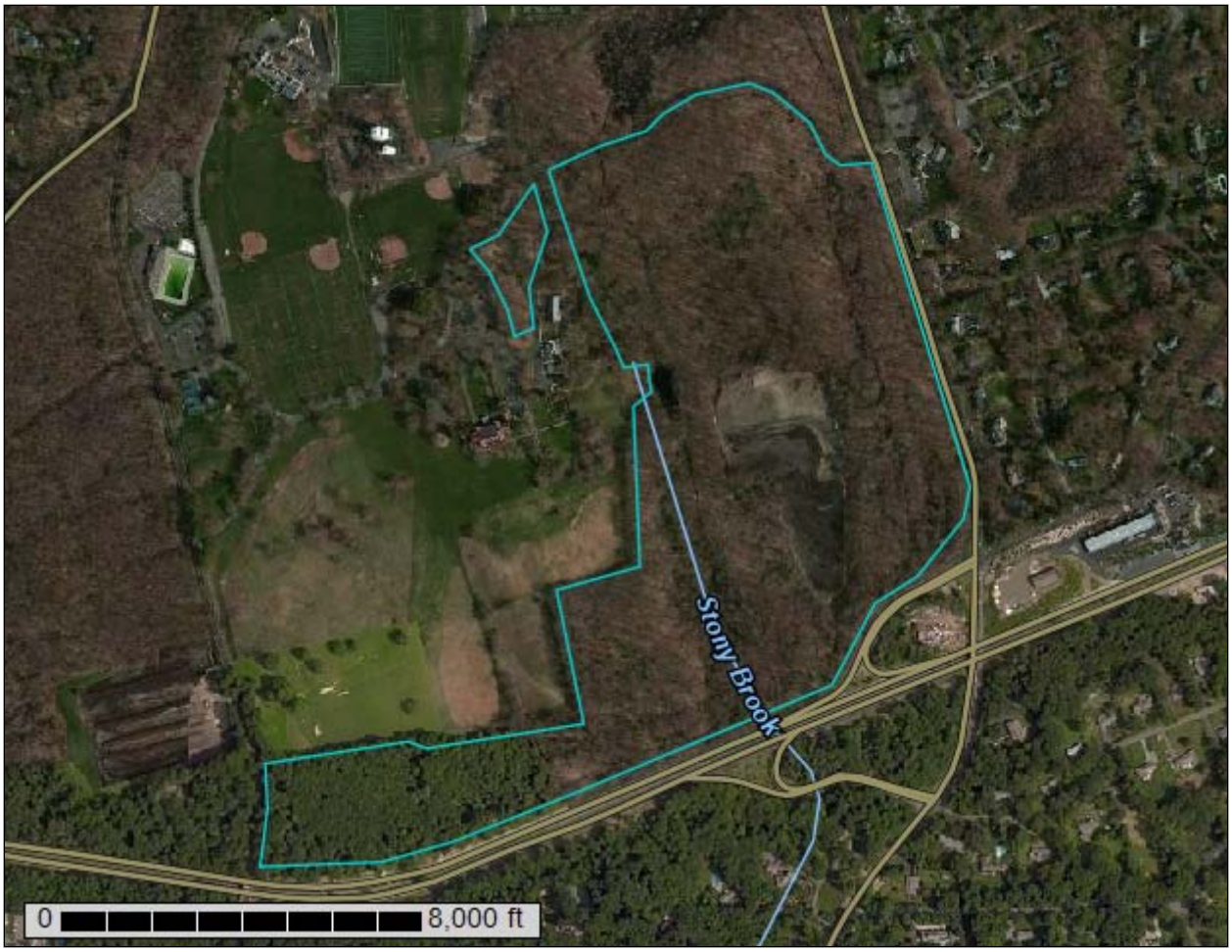
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for

# State of Connecticut

## Waveny Park




May 12, 2016

# Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

# Contents

# How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

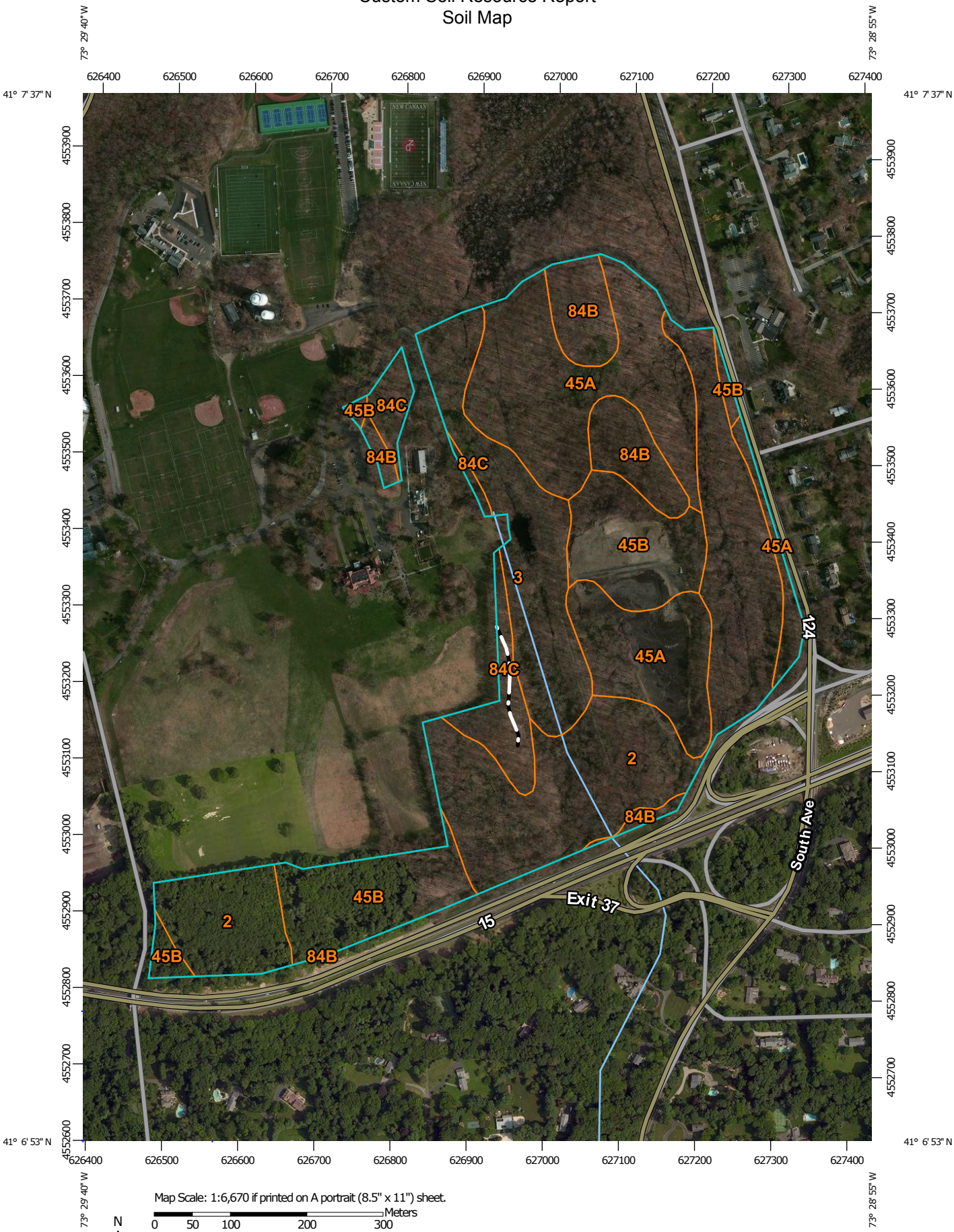
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report
## Soil Map




Map Scale: 1:6,670 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**

- Streams and Canals

**Transportation**

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**

- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 28, 2011—Aug 27, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| State of Connecticut (CT600) | | | |
|---|---|---|---|
| **Map Unit Symbol** | **Map Unit Name** | **Acres in AOI** | **Percent of AOI** |
| 2 | Ridgebury fine sandy loam | 27.1 | 33.2% |
| 3 | Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony | 10.1 | 12.3% |
| 45A | Woodbridge fine sandy loam, 0 to 3 percent slopes | 20.9 | 25.5% |
| 45B | Woodbridge fine sandy loam, 3 to 8 percent slopes | 13.2 | 16.2% |
| 84B | Paxton and Montauk fine sandy loams, 3 to 8 percent slopes | 6.2 | 7.6% |
| 84C | Paxton and Montauk fine sandy loams, 8 to 15 percent slopes | 4.3 | 5.3% |
| **Totals for Area of Interest** | | **81.8** | **100.0%** |

# Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially

where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

# State of Connecticut

## 2—Ridgebury fine sandy loam

### Map Unit Setting

*National map unit symbol:* 9lk4
*Elevation:* 0 to 1,200 feet
*Mean annual precipitation:* 37 to 56 inches
*Mean annual air temperature:* 45 to 55 degrees F
*Frost-free period:* 140 to 185 days
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Ridgebury and similar soils:* 80 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Ridgebury

#### Setting

*Landform:* Depressions, drainageways
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Parent material:* Coarse-loamy lodgment till derived from granite and/or schist and/or gneiss

#### Typical profile

*A - 0 to 5 inches:* fine sandy loam
*Bg1 - 5 to 14 inches:* fine sandy loam
*Bg2 - 14 to 21 inches:* fine sandy loam
*Cd - 21 to 60 inches:* sandy loam

#### Properties and qualities

*Slope:* 0 to 5 percent
*Depth to restrictive feature:* 20 to 30 inches to densic material
*Natural drainage class:* Poorly drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately high (0.00 to 0.20 in/hr)
*Depth to water table:* About 0 to 6 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water storage in profile:* Very low (about 2.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 4w
*Hydrologic Soil Group:* D

### Minor Components

#### Woodbridge

*Percent of map unit:* 10 percent
*Landform:* Drumlins, hills
*Down-slope shape:* Concave
*Across-slope shape:* Linear

**Sutton**

*Percent of map unit:* 3 percent
*Landform:* Depressions, drainageways
*Down-slope shape:* Concave
*Across-slope shape:* Linear

**Leicester**

*Percent of map unit:* 2 percent
*Landform:* Depressions, drainageways
*Down-slope shape:* Linear
*Across-slope shape:* Concave

**Whitman**

*Percent of map unit:* 2 percent
*Landform:* Depressions, drainageways
*Down-slope shape:* Concave
*Across-slope shape:* Concave

**Unnamed, steep slopes**

*Percent of map unit:* 1 percent
*Landform:* Depressions, drainageways

**Unnamed, silt loam surface**

*Percent of map unit:* 1 percent
*Landform:* Depressions, drainageways

**Unnamed, stony surface**

*Percent of map unit:* 1 percent
*Landform:* Depressions, drainageways

## 3—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony

### Map Unit Setting

*National map unit symbol:* 2t2qt
*Elevation:* 0 to 1,480 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Ridgebury, extremely stony, and similar soils:* 40 percent
*Leicester, extremely stony, and similar soils:* 35 percent
*Whitman, extremely stony, and similar soils:* 20 percent
*Minor components:* 5 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Ridgebury, Extremely Stony

#### Setting

*Landform:* Depressions, drainageways, ground moraines, hills
*Landform position (two-dimensional):* Toeslope, backslope, footslope
*Landform position (three-dimensional):* Base slope, head slope, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

#### Typical profile

*A - 0 to 5 inches:* fine sandy loam
*Bw - 5 to 9 inches:* sandy loam
*Bg - 9 to 18 inches:* gravelly sandy loam
*Cd - 18 to 65 inches:* gravelly sandy loam

#### Properties and qualities

*Slope:* 0 to 8 percent
*Percent of area covered with surface fragments:* 9.0 percent
*Depth to restrictive feature:* 14 to 32 inches to densic material
*Natural drainage class:* Poorly drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)
*Depth to water table:* About 0 to 6 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water storage in profile:* Very low (about 2.1 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7s
*Hydrologic Soil Group:* D

### Description of Leicester, Extremely Stony

#### Setting

*Landform:* Depressions, drainageways
*Landform position (two-dimensional):* Toeslope, footslope, backslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Parent material:* Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

#### Typical profile

*Oe - 0 to 1 inches:* moderately decomposed plant material
*A - 1 to 7 inches:* fine sandy loam
*Bg1 - 7 to 10 inches:* fine sandy loam
*Bg2 - 10 to 18 inches:* fine sandy loam
*BC - 18 to 24 inches:* fine sandy loam
*C1 - 24 to 43 inches:* gravelly fine sandy loam
*C2 - 43 to 65 inches:* gravelly fine sandy loam

**Properties and qualities**

*Slope:* 0 to 8 percent
*Percent of area covered with surface fragments:* 9.0 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Poorly drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 5.95 in/hr)
*Depth to water table:* About 0 to 18 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water storage in profile:* Moderate (about 6.9 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7s
*Hydrologic Soil Group:* B/D

## Description of Whitman, Extremely Stony

**Setting**

*Landform:* Depressions, drainageways
*Landform position (two-dimensional):* Toeslope, footslope, backslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

**Typical profile**

*Oi - 0 to 1 inches:* slightly decomposed plant material
*A - 1 to 9 inches:* fine sandy loam
*Bg - 9 to 16 inches:* fine sandy loam
*Cdg1 - 16 to 22 inches:* fine sandy loam
*Cdg2 - 22 to 60 inches:* fine sandy loam

**Properties and qualities**

*Slope:* 0 to 8 percent
*Percent of area covered with surface fragments:* 9.0 percent
*Depth to restrictive feature:* 12 to 20 inches to densic material
*Natural drainage class:* Very poorly drained
*Runoff class:* Negligible
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately high (0.00 to 0.20 in/hr)
*Depth to water table:* About 0 to 12 inches
*Frequency of flooding:* None
*Frequency of ponding:* Occasional
*Available water storage in profile:* Very low (about 1.9 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7s
*Hydrologic Soil Group:* D

### Minor Components

#### Woodbridge, extremely stony

*Percent of map unit:* 3 percent
*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Backslope, footslope, summit
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Concave
*Across-slope shape:* Linear

#### Swansea

*Percent of map unit:* 2 percent
*Landform:* Bogs, swamps
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave

## 45A—Woodbridge fine sandy loam, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 2w686
*Elevation:* 0 to 1,420 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Woodbridge and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Woodbridge

#### Setting

*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Footslope, summit
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Convex
*Across-slope shape:* Linear
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

#### Typical profile

*Ap - 0 to 7 inches:* fine sandy loam
*Bw1 - 7 to 18 inches:* fine sandy loam
*Bw2 - 18 to 30 inches:* fine sandy loam

*Cd - 30 to 65 inches:* gravelly fine sandy loam

**Properties and qualities**

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* 20 to 39 inches to densic material
*Natural drainage class:* Moderately well drained
*Runoff class:* Very high
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)
*Depth to water table:* About 18 to 30 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water storage in profile:* Low (about 4.7 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2w
*Hydrologic Soil Group:* C/D

## Minor Components

**Paxton**

*Percent of map unit:* 7 percent
*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Summit, shoulder
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Linear, convex
*Across-slope shape:* Convex

**Ridgebury**

*Percent of map unit:* 6 percent
*Landform:* Depressions, drainageways, drumlins, ground moraines, hills
*Landform position (two-dimensional):* Toeslope, footslope
*Landform position (three-dimensional):* Base slope, head slope
*Down-slope shape:* Concave
*Across-slope shape:* Concave

**Whitman, extremely stony**

*Percent of map unit:* 1 percent
*Landform:* Depressions, drainageways
*Down-slope shape:* Concave
*Across-slope shape:* Concave

**Sutton**

*Percent of map unit:* 1 percent
*Landform:* Ground moraines, hills
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Concave
*Across-slope shape:* Linear

## 45B—Woodbridge fine sandy loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 2t2ql
*Elevation:* 0 to 1,470 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Woodbridge, fine sandy loam, and similar soils:* 82 percent
*Minor components:* 18 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Woodbridge, Fine Sandy Loam

#### Setting

*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Backslope, footslope, summit
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Concave
*Across-slope shape:* Linear
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

#### Typical profile

*Ap - 0 to 7 inches:* fine sandy loam
*Bw1 - 7 to 18 inches:* fine sandy loam
*Bw2 - 18 to 30 inches:* fine sandy loam
*Cd - 30 to 65 inches:* gravelly fine sandy loam

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* 20 to 39 inches to densic material
*Natural drainage class:* Moderately well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)
*Depth to water table:* About 18 to 30 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water storage in profile:* Low (about 3.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2w
*Hydrologic Soil Group:* C/D

### Minor Components

#### Paxton

*Percent of map unit:* 10 percent
*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Backslope, summit, shoulder
*Landform position (three-dimensional):* Side slope, crest, nose slope
*Down-slope shape:* Linear, convex
*Across-slope shape:* Convex

#### Ridgebury

*Percent of map unit:* 8 percent
*Landform:* Depressions, drainageways, ground moraines, hills
*Landform position (two-dimensional):* Toeslope, backslope, footslope
*Landform position (three-dimensional):* Base slope, head slope, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave

## 84B—Paxton and Montauk fine sandy loams, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 2t2qn
*Elevation:* 0 to 1,570 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Paxton and similar soils:* 55 percent
*Montauk and similar soils:* 30 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Paxton

#### Setting

*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Backslope, summit, shoulder
*Landform position (three-dimensional):* Nose slope, side slope, crest
*Down-slope shape:* Linear, convex
*Across-slope shape:* Convex
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

#### Typical profile

*Ap - 0 to 8 inches:* fine sandy loam
*Bw1 - 8 to 15 inches:* fine sandy loam
*Bw2 - 15 to 26 inches:* fine sandy loam
*Cd - 26 to 65 inches:* gravelly fine sandy loam

**Properties and qualities**

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* 18 to 39 inches to densic material
*Natural drainage class:* Well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)
*Depth to water table:* About 18 to 37 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water storage in profile:* Low (about 3.1 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2s
*Hydrologic Soil Group:* C

## Description of Montauk

**Setting**

*Landform:* Drumlins, hills
*Down-slope shape:* Convex
*Across-slope shape:* Linear
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

**Typical profile**

*A - 0 to 4 inches:* fine sandy loam
*Bw1 - 4 to 14 inches:* fine sandy loam
*Bw2 - 14 to 25 inches:* sandy loam
*2Cd1 - 25 to 39 inches:* gravelly loamy coarse sand
*2Cd2 - 39 to 60 inches:* gravelly sandy loam

**Properties and qualities**

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* 20 to 38 inches to densic material
*Natural drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately high (0.00 to 0.20 in/hr)
*Depth to water table:* About 24 to 30 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water storage in profile:* Low (about 3.3 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* C

## Minor Components

**Woodbridge**

*Percent of map unit:* 5 percent
*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Footslope, backslope, summit

*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Concave
*Across-slope shape:* Linear

**Charlton**
*Percent of map unit:* 5 percent
*Landform:* Hills
*Down-slope shape:* Linear
*Across-slope shape:* Linear

**Ridgebury**
*Percent of map unit:* 5 percent
*Landform:* Depressions, drainageways, ground moraines, hills
*Landform position (two-dimensional):* Toeslope, backslope, footslope
*Landform position (three-dimensional):* Base slope, head slope, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave

## 84C—Paxton and Montauk fine sandy loams, 8 to 15 percent slopes

### Map Unit Setting
*National map unit symbol:* 2w67b
*Elevation:* 0 to 1,550 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition
*Paxton and similar soils:* 55 percent
*Montauk and similar soils:* 30 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Paxton

**Setting**
*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear, convex
*Across-slope shape:* Convex
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

**Typical profile**
*Ap - 0 to 8 inches:* fine sandy loam
*Bw1 - 8 to 15 inches:* fine sandy loam
*Bw2 - 15 to 26 inches:* fine sandy loam
*Cd - 26 to 65 inches:* gravelly fine sandy loam

**Properties and qualities**

*Slope:* 8 to 15 percent
*Depth to restrictive feature:* 20 to 39 inches to densic material
*Natural drainage class:* Well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)
*Depth to water table:* About 18 to 37 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water storage in profile:* Low (about 4.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* C

## Description of Montauk

**Setting**

*Landform:* Drumlins, ground moraines, hills, recessionial moraines
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear, convex
*Across-slope shape:* Convex
*Parent material:* Coarse-loamy over sandy lodgment till derived from gneiss, granite, and/or schist

**Typical profile**

*Ap - 0 to 4 inches:* fine sandy loam
*Bw1 - 4 to 26 inches:* fine sandy loam
*Bw2 - 26 to 34 inches:* sandy loam
*2Cd - 34 to 72 inches:* gravelly loamy sand

**Properties and qualities**

*Slope:* 8 to 15 percent
*Depth to restrictive feature:* 20 to 39 inches to densic material
*Natural drainage class:* Well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately high (0.00 to 1.42 in/hr)
*Depth to water table:* About 18 to 37 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water storage in profile:* Low (about 5.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* C

## Minor Components

**Woodbridge**

*Percent of map unit:* 6 percent

*Landform:* Drumlins, ground moraines, hills
*Landform position (two-dimensional):* Backslope, footslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Concave
*Across-slope shape:* Linear

**Charlton**

*Percent of map unit:* 5 percent
*Landform:* Hills
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear, convex
*Across-slope shape:* Convex

**Ridgebury**

*Percent of map unit:* 3 percent
*Landform:* Depressions, drainageways, drumlins, ground moraines, hills
*Landform position (two-dimensional):* Footslope, toeslope
*Landform position (three-dimensional):* Base slope, head slope
*Down-slope shape:* Concave
*Across-slope shape:* Concave

**Stockbridge**

*Percent of map unit:* 1 percent
*Landform:* Hills
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Concave
*Across-slope shape:* Linear

# References


American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf