

# Conservation & Management Plan

Town of Orange, CT – Turkey Hill Preserve





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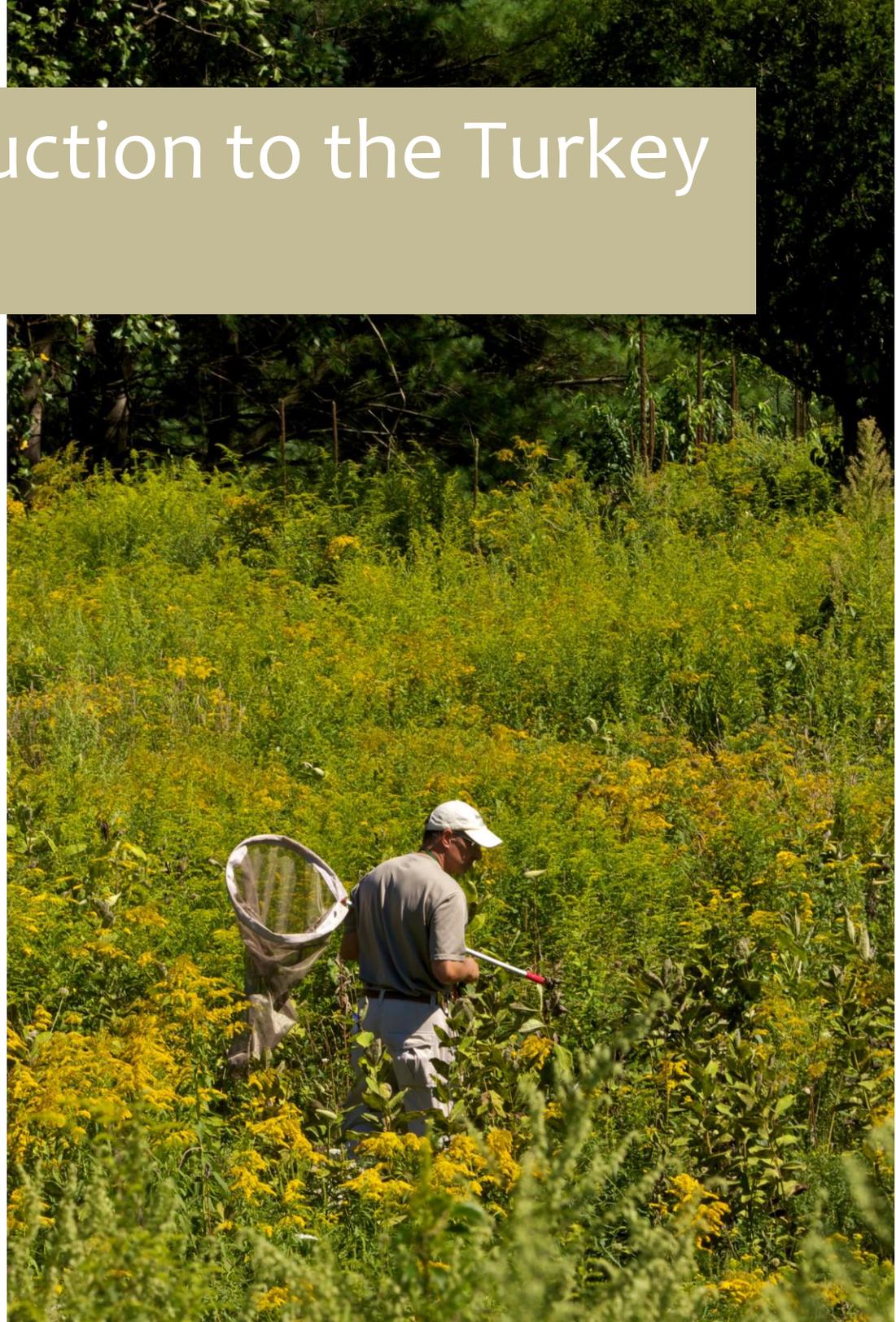
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# Chapter 1: Introduction to the Turkey Hill Preserve

*Seasonal Pools, rocky talus slopes, spring-fed headwater streams, mixed hardwoods, stands of Eastern Hemlock, old field habitat and a small pond are all found in the Turkey Hill Preserve. The 370+ acre preserve is located in the Housatonic River Valley, a migratory corridor of ecological importance. The Town of Orange Conservation Commission strives to balance conservation and active wildlife habitat management with recreational and educational site uses. The preserve is open to the public year-round.*



## Chapter 1

# Introduction to the Turkey Hill Preserve

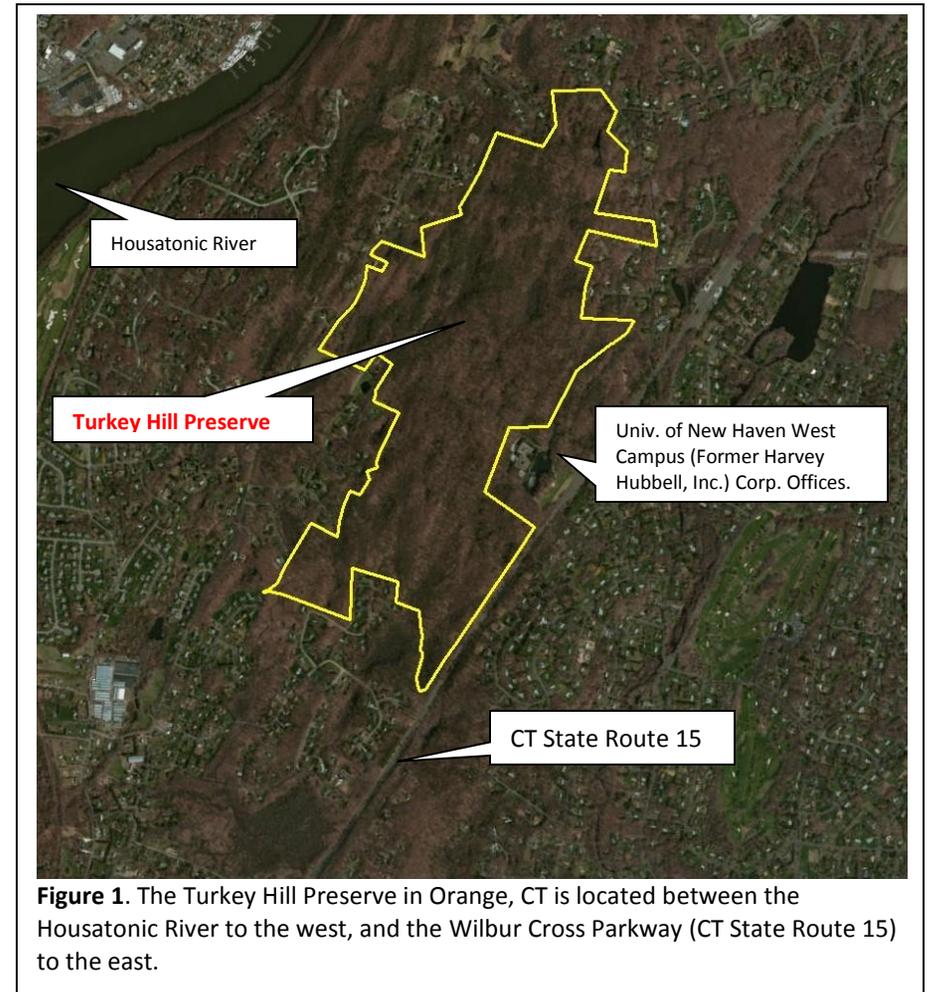
### 1.1 Overview of the Turkey Hill Preserve Area

The Turkey Hill Preserve as described in this report comprises 376 acres of open space located in the Town of Orange, CT. The preserve consists of a number of former parcels acquired via fee purchase from Harvey Hubbell, Inc. The site is depicted in **Figure 1**. The Preserve spans the Turkey Hill Brook and Wepawaug River local watershed basins. Headwater tributaries of these drainages originate in the preserve. A ridge system bisects the site oriented in a north-south direction. The majority of the preserve is forested, except for an old field and small pond area located at the northern end of the site. The combination of large contiguous forest, high quality wetlands and rocky outcrops and slopes contained within the preserve provides great potential for a wide variety of plant and animal species to occur in the area, while also offering many opportunities for the public to enjoy a variety of wildlife, landscapes and habitats in a recreational or educational context. The Site is accessed via an entrance drive off of Derby Milford Road at its intersection with Turkey Hill Road.

### 1.2 Area History

Historically, southwestern Connecticut was probably largely forested prior to the arrival of European settlers in the early 1700s. Until that time, the local vegetated landscape was mainly shaped by natural biotic and abiotic factors such as meteorological events, wild fires, forest tree disease outbreaks, climate, varying soils, topographic elevation changes, etc. with localized anthropogenic influences from Native Americans that inhabited the area. Expansion of the area's human populations gradually resulted in increased conversion of natural forest into agricultural land.

Signs of historic land use and historic aerial photographs document more recent land use changes within the Turkey Hill Preserve and its surrounding landscape. A network of old stone walls and an abandoned cart trail delineate separate parcels that likely were used for various agricultural purposes on the site. The 1934 aerial photograph depicts some lots on the property cleared of woody vegetation and others containing stands of conifers. Cleared lots may have been used for crops, hence the stone walls which were usually created by farmers who tried to rid arable land of stones so that they would not be hit by the plow (as



**Figure 1.** The Turkey Hill Preserve in Orange, CT is located between the Housatonic River to the west, and the Wilbur Cross Parkway (CT State Route 15) to the east.

opposed to pasture where stones were typically left in place). Forested lots may have been retained as a woodlot to supply wood to local farming families or some other limited sort of agricultural use.

### 1.3 Current and Historic Land use at Turkey Hill Preserve

The 376-acre Turkey Hill Preserve lies within a larger forested landscape. From a landscape ecology perspective, the Preserve serves as a significant protected open space in a rather larger minimally fragmented area of an increasingly developed region. Other major holdings within the local region include the protected watersheds of the South Central Regional Watershed Authority's Maltby Lakes Reservoirs, the state-owned Naugatuck Forest and additional open space lands protected by the Town of Orange.

Much of the Town of Orange open space lands are used for some sort of recreation although the specific activities that are allowed in each area vary by site. Orange allows passive recreational enjoyment of the trails at Turkey Hill Preserve and other town-owned lands, although certain restrictions apply to specific trails at specific sites. The trails of Turkey Hill Preserve are currently open year-round to visitors travelling on foot. Currently, only on-leash dogs are allowed on Town property. The woodland habitat in the Turkey Hill Preserve is primarily a result of forest regeneration after historic agricultural practices in the area were abandoned. The old field area at the Preserve's entrance supports a pond and contains a former homestead site.

Management of Turkey Hill Preserve is currently primarily focused on trail maintenance and mowing to keep invasive shrubs at bay in the old field area. Many Conservation Commission staff and volunteers are involved in trail maintenance and town staff members conduct the mowing and provide some mulching around the base of trees along Derby Milford Road. Mowing is planned carefully to benefit public site use while suppressing unwanted vegetation and supporting functional wildlife habitat use of the early successional habitat area in the preserve.

### 1.4 Purpose of the Conservation & Management Plan

The purpose of this plan is to provide an overview of relevant data describing the physical and biological characteristics of the Turkey Hill Preserve, to identify threatened, endangered or otherwise at-risk species that occur in the Turkey Hill Preserve and to identify sensitive habitat areas contained within the preserve's forested uplands. In addition, this plan describes conservation strategies that can be applied to best protect these species and habitats, and it provides a framework to allow adaptive management actions and monitoring steps to evaluate whether the proposed conservation strategy is successful. A carefully designed management and conservation plan based on relevant survey data will allow Orange to carry out its stewardship goal of maintaining the Turkey Hill Preserve in a natural state in a way that balances the need for protection of the area's resources, plants and animals while simultaneously fulfilling its commitment to provide open space for passive recreational use and enjoyment on the property.

#### The purpose of this Conservation & Management Plan is to:

1. Provide an inventory of the natural resources of the Turkey Hill Preserve
2. Identify priority habitats and species on the preserve that can guide habitat management and conservation actions
3. Identify management issues and opportunities, including human site use
4. Develop a management strategy that provides optimal protection and management of the Turkey Hill Preserve and its species while simultaneously providing recreational and educational opportunities for visitors to the preserve
5. Develop a series of success benchmarks that can be used to evaluate the effectiveness of the proposed management strategy

# Chapter 2: Natural Resources



## Chapter 2

# Natural Resources

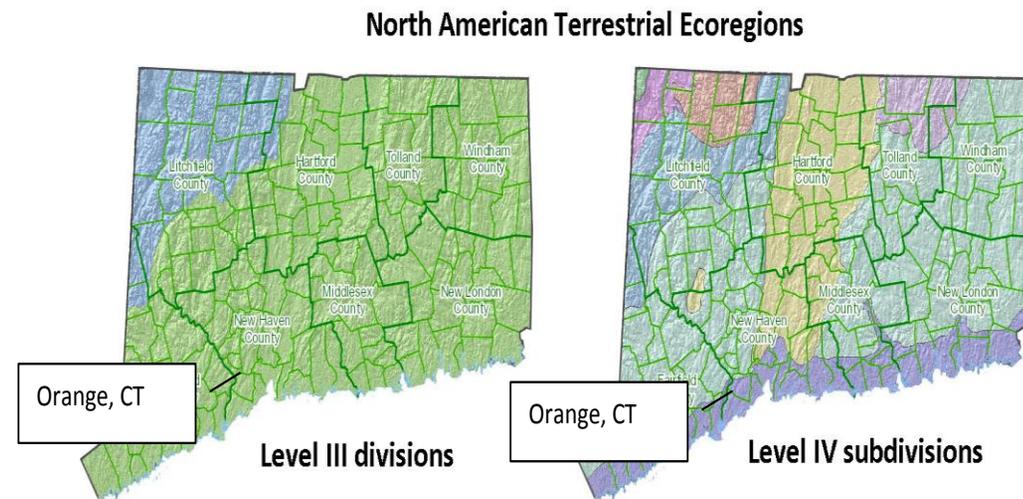
### 2.1 Ecological Region

Turkey Hill Preserve is located in the Northeastern Coastal Zone Ecoregion (EPA Level III; Ecoregion 59), subdivision Southern New England Coastal Plains and Hills (EPA Level IV; Ecoregion 59c) (**Figure 2**). The Northeastern Coastal Zone covers most of southern New England and the coastal areas of New Hampshire and southern Maine, and is defined as follows (Griffith 2010):

**Climate:** This ecoregion has a severe mid-latitude humid continental climate, marked by warm summers and severe winters. The mean annual temperature ranges from approximately 8°C to 10°C (46 to 50 °F). The frost-free period ranges from 150 to 230 days. The mean annual precipitation is 1,181 mm, ranging from 890 to 1,250 mm, and is generally evenly distributed throughout the year.

**Vegetation:** Appalachian oak forest and northeastern oak-pine forest are the natural vegetation types. These include white oak, red oak, hickories, white pine, and some maple, beech, birch, and hemlock in cooler or more mesic areas.

**Hydrology:** Abundant perennial streams, lakes, ponds, and wetlands. Stream networks have a variety of patterns due to geologic variety and complex geomorphic history, including dendritic, deranged, and trellis. Streams mostly moderate to low gradient. Some of the surface waters are sensitive to acidification.



**Figure 2:** North American Terrestrial Ecoregions covering Connecticut at Level III (left) and Level IV (right). The preserve is located in the Northeastern Coastal Zone Ecoregion (EPA Level III; Ecoregion 59), subdivision Southern New England Coastal Plains and Hills (EPA Level IV; Ecoregion 59c). *Source:* U. S. Environmental Protection Agency (<http://www.epa.gov/wed/pages/ecoregions.htm>).



**Terrain:** Landforms include irregular plains, plains with low to high hills, and open hills. Elevations range from sea level to over 300 m (984 ft). The Northeastern Coastal Zone contains fine to medium-textured, relatively nutrient poor soils with relatively little surface irregularity. Bedrock geology is complex and varied, with mostly igneous and metamorphic rocks, but some areas of sedimentary rock also occur.

**Land Use/Human Activities:** This region contains dense concentrations of human population. Although attempts were made to farm much of the Northeastern Coastal Zone after the region was settled by Europeans, land use now mainly consists of forests, woodlands, and urban/suburban development, with only some minor areas of pasture and cropland.

## 2.2 Physiographic Characteristics

### 2.2.1 Climate

Locally recorded climate data for Orange via The Weather Channel climatological database indicates that the annual mean temperature for the area surrounding the Turkey Hill Preserve is approximately 52 °F (11°C) with an average of 32 °F (0 °C) in winter and 72 degrees F (22 °C) in summer. On average, the warmest month is July and the coolest month is January, with the highest average precipitation occurring in the month of September. The average last frost in the area generally occurs during the second week of April and the first frost starts around the last week of October. This results in a frost-free season of 180-210 days. The seasonal snowfall averages less than 30 inches, and the mean annual precipitation for the region is approximately 43 inches.

### 2.2.2 Topography, Geology and Soils

The topography of the Turkey Hill is characterized by a moderately hilly landscape with local areas of considerable relief. The terrain within the preserve is largely shaped by the ridgeline that traverses the length of the property in a roughly north-south orientation. Small riverine, intermittent tributary watercourses and wetland systems form the headwaters of larger perennial streams that occur downgradient and off-site. The ridgeline is characterized by steep cliffs and talus slopes. Elevations within Turkey Hill Preserve range from a low of approximately 150 feet above sea level along the headwaters of Turkey Hill Brook to a high of approximately 260 feet above sea level at the center of the property on a high point along the ridge.

The bedrock in the Turkey Hill Preserve is mapped as “Wepawaug Schist” which is defined as follows:

*“Medium- to dark-gray, medium- to fine-grained, well-layered schist or phyllite and metasilstone, composed of quartz, muscovite or sericite, plagioclase, biotite, and in appropriate metamorphic zones chlorite, garnet, staurolite, and kyanite”.*

The bedrock of the site is exposed in a series of linear, discontinuous, north-south trending ridgelines that bisect the site. Some of these ridgelines have been the source of talus piles that are of interest to the site from an ecological perspective as they provide special habitat attributes for a variety of the site’s flora and fauna.

The Quaternary Geologic Map of Connecticut depicts the surficial geology of the Turkey Hill Preserve to be composed of “Thin Till”. This unit is further defined as non-sorted and generally non-stratified, thin till derived directly from glacial ice deposits. The lack of sorting and stratification in these deposits often renders the soil poorly suited for agricultural uses, and unsuitable for septic systems (CTDEP, 2010).

### 2.2.3 Hydrology

A majority of the site lies within the Housatonic Main Stem Regional Basin (No. 5307-04), which is part of the larger South-central Coastal Basin (McElroy, 1981). The majority of the watershed consists of a mixture of undeveloped agricultural lands, forest, suburban and urban land, with the latter two land uses increasing in coverage closer to the shoreline. The headwater swamps within the Preserve feed the Turkey Hill and Little Turkey Hill Brooks to the west (both of which are tributaries to the Housatonic River) and an unnamed tributary stream to the Wepawaug River to the east. In addition to these systems, numerous ephemeral (“vernal”) pools are found throughout the property (see Chapter 2.3.2 for additional details).

## 2.3 Habitat Characteristics

### 2.3.1 Vegetation Cover Types

The Turkey Hill property was acquired by Hubble years ago. Throughout Hubble’s ownership, the land remained in a natural state and was not routinely actively managed. The forest cover ranges in age from about 50 to 100 years old. A harvest of mature trees was conducted on a portion of the property in the 1980s.

Portions of the Preserve have large stands of Eastern Hemlock (*Tsuga canadensis*) component. Much of this hemlock may be declining in vigor due to an infestation of Hemlock Woolly Adelgid (*Adelges tsugae*). The remainder of the forest is upland central hardwood forest consisting of oaks, beech, birch, ash and maples. Mountain Laurel (*Kalmia latifolia*) is found intermittently in the understory throughout the preserve, with heavier concentrations towards the north end.

An additional area of early successional ‘old field’ habitat (approximately 4-5 acres) exists near the Derby Milford Road entrance at the northern end of the preserve.

### 2.3.2 Wetlands

The Turkey Hill Preserve supports a variety of wetlands within its boundaries. Wet seeps and headwater streams feed watercourses that drain into Turkey Hill and Little Turkey Hill Brooks to the west and

#### Which species are important?

The following sections of this plan describe the plant and animal diversity documented in Turkey Hill Preserve during recent surveys. Obviously, all species are an integral part of the preserve’s biodiversity and functionality. However, Connecticut Audubon Society uses its Biological Conservation Unit concept to guide management and conservation strategies and uses specific indicator species to assess quality and functionality of habitats. Indicator species, generally animals or plants with relatively narrow habitat requirements, help our biologists to determine whether certain habitats are functional (provide the necessary resources for the species that rely on it) and whether habitat management practices deliver the desired results.

Connecticut Audubon Society’s conservation and management practices benefit many species and are pro-active, designed to include species that may not have been recorded in the managed area yet. Since it is not practical to focus on every one of those species at the same time, certain conservation priority species are used as benchmarks. The exact species suite selected depends highly on the specific habitat being managed, but the selection is largely driven by the state and federal Endangered Species Acts (ESA) and by Connecticut’s Comprehensive Wildlife Conservation Strategy (CWCS), which identifies species of Greatest Conservation Need (GCN). These lists are augmented by additional species considered by Connecticut Audubon Society to be good indicators of key habitats. These conservation priority species are important elements of Connecticut’s biodiversity, they benefit from achievable conservation actions and their presence in an area can be a good indication of their preferred habitat’s functionality.

More information on these indicator species and our conservation approach can be found in Connecticut Audubon Society’s 2009 **Connecticut State of the Birds Report**, available for download at [www.ctaudubon.org/state-of-the-birds/](http://www.ctaudubon.org/state-of-the-birds/)

Wepawaug River to the east. Much of both watercourses are relatively flat and slow-moving and wide with dense emergent vegetation.

Throughout Turkey Hill Preserve, scattered between stream valleys in isolated depressions in the forest floor, are numerous classic vernal pools formed by the pooling water that remains after the winter's snow cover melts off the surrounding uplands. In addition, other ephemeral wetlands fed and/or drained by intermittent streams or seeps occur in the preserve. Such fishless temporary wetlands effectively function as vernal pools and are often home to obligate vernal pool-breeding fauna.

During a series of site visits in spring 2013, 41 permanent and ephemeral wetlands within the preserve were surveyed, classified and assessed for potential vernal pool functions. These wetlands were surveyed in April-May for signs of amphibian reproduction, with special emphasis on obligate vernal pool breeding species and other early emerging amphibians.

Wetlands were assessed using the criteria and guidelines outlined in the certification of vernal pool habitat manual published by the Massachusetts Division of Fisheries and Wildlife's Natural heritage and Endangered Species Program (2009). Physical criteria for potential vernal pool habitat included the absence of a permanently flowing outlet and a discontinuous hydroperiod. Direct biological criteria indicating a functional ephemeral vernal wetland included the absence of established, reproducing fish populations and evidence of reproduction of one or more of the following obligate vernal pool breeding species:

#### Vertebrates

- Wood Frog (*Rana sylvatica*)
- Spotted Salamander (*Ambystoma maculatum*)
- Blue-spotted Salamander (*Ambystoma laterale*)
- Marbled Salamander (*Ambystoma opacum*)
- Jefferson's Salamander (*Ambystoma jeffersonianum*)

#### Invertebrates:

- Anostraca - Fairy Shrimp (*Eubranchipus* sp.)
- Veneroida - Fingernail Clams (Family: Sphaeriidae)

Evidence of reproduction was defined as follows:

- Presence of a chorus (Wood Frogs) or presence of multiple mated pairs (frogs and salamanders)
- Presence of spermatophores (salamanders), presence of multiple egg masses, adult salamander attending nest (Marbled Salamander in fall)
- Presence of larval amphibians (tadpoles or salamander larvae)
- Presence of adult Fairy Shrimp

In all wetlands visited after May, amphibian larval searches were carried out to evaluate potential vernal pool functionality as well as to inventory late emerging amphibians and other wetland associated species. **Figure 3** shows a map of the Turkey Hill Preserve vernal wetlands that were searched during this study. The relatively mild winter of 2012-2013 did manage to produce some large precipitation events, however following the winter and spring months, significant precipitation events were few resulting in a low water table across the much of the state by early summer. As a result, the region's vernal wetlands quickly lost water and were nearly dry by the latter half of the amphibian breeding season. In addition, lack of summer and autumnal rains to trigger amphibian development and reproduction at the appropriate time of year for some species may have further inhibited activity. Nevertheless, several of the 41 pools surveyed were found to be functional vernal pools, while several more provide suitable habitat that could be functional during wetter years (i.e., years with more normally distributed precipitation events).

All obligate vernal pool breeding amphibians that could potentially occur in the Turkey Hill Preserve region were indeed detected during this survey, in one occasion all in one single pool (Pool No. 5)! Additional surveys over multiple breeding seasons may reveal similar diversity in other high quality wetlands identified during this study. The pools with the highest value to Vernal Pool Obligate Species were Pool Nos. 3-5, 7, 16, 17, and 20.

Subsequent sections of this report will discuss additional data on flora and fauna gathered during this study to further assess and evaluate the critical habitat identification derived from wetland surveys in the Turkey Hill Preserve.



Figure 3. Distribution of seasonal pools across the Turkey Hill Preserve.

## 2.4 Flora

An inventory of the preserve's plant species was conducted during much of the growing season in 2013. A list of wildflowers, shrubs, trees, ferns and vines was formed during crosswalks along transects oriented to bisect various toposequence features on Site. **Appendix I** provides the plant species identified to date. Currently, no state or federally listed plant species have been identified in the Turkey Hill Preserve but several microhabitats that support rather uncommon plant species do exist on the property.

### 2.4.1 Floral Community Characteristics

In a few small sections of the preserve, a dense canopy cover of pure Eastern Hemlock stands combined with the acidic conditions in the soil below these stands (created by the thick layer of its slowly decomposing needles) create conditions that are ill-suited for germination of seedlings or the growth of most understory vegetation. These conditions generally result in relatively low plant diversity in these Hemlock-dominated stands. Throughout much of the preserve, the prevalent plant community is typical of Northeastern woodlands and rich forest. This is particularly true in the mixed hardwood sections of the preserve. Areas where sunlight reaches the forest floor provide the most diverse plant assemblages. Natural forest clearings, as well as the trails provide an interface with the adjacent woodland that supports a wider variety of plants. Unfortunately, much of this transitional ecotone in Turkey Hill Preserve suffers from colonization by several species of non-native invasive plants such as Winged Euonymus and Japanese Wineberry. In addition, the native vegetation is greatly suppressed due to the effects of deer browse. The result is an impoverished upland woodland habitat with moderate to low plant diversity and a disproportionately high non-native floral component compared to other natural areas within the state where deer populations are managed. Area wetlands provide habitat conditions that are very different from the surrounding woodland and range from free flowing streams with defined channels to large vegetated swamps and seasonally saturated wetlands which support a variety of hydrophytic plants which contribute to increased structural diversity (i.e., more structurally complex herbaceous and shrub layer components).

### 2.4.2 Non-native Invasive Plant Species

A number of non-native plants occur within the Preserve. Not all non-native plants encountered pose a problem for conservation and management. However the relatively few that do tend to be prolific seeders, compete tenaciously with native vegetation, and are often habitat generalists. They often are established in disturbed areas of the landscape and once established may be particularly hard to eliminate or control. Examples noted at Turkey Hill Preserve include Norway Maple and Tree of Heaven in the tree layer; Multiflora Rose, Japanese Barberry and Wineberry in the shrub layer; Japanese Honeysuckle, Oriental Bittersweet in the vine layer; and Garlic Mustard and Japanese Stiltgrass in the herbaceous layer.

Multiflora Rose is a prime example of a non-native invasive shrub species. It is a thorny perennial shrub of medium height, with compound leaves that are divided into 5-11 oval toothed leaflets. It has arching stems that can root at the tip, allowing it to form dense thickets. A medium bush is capable of producing 500,000 to 1,000,000 seeds. The plant is very adaptable and able to grow in a wide range of soil, moisture, and light conditions. It is found in successional fields, forest edges, stream banks, and roadsides. It is generally not found in standing water or extremely dry habitats. Multiflora rose spreads quickly, forming impenetrable thickets that exclude native plant species. It invades areas that have been subjected to land disturbance, and impedes succession. Studies have shown that it is highly competitive for soil nutrients, and it has lowered crop yields in adjacent field plantings (IPCNYS, 2002). This plant was observed to be widely distributed throughout the preserve, noted growing within forest gaps, woodland edges, and is especially prolific around the old field area.

Japanese barberry is a shade tolerant, dense, thorny shrub with abundant red berries. The plant reproduces from prolific seeds, rhizomes and layering (branches root into new plants as a result of prolonged soil contact). Japanese barberry, once established, can grow to form large thickets that displace native

wildflowers, shrubs and tree seedlings. Infestations of this plant have also been found to cause soil pH changes (IPCNYS, 2002). This plant was observed to be widely distributed throughout the preserve, but is not yet a dominant understory shrub.

Oriental Bittersweet and Japanese Honeysuckle invade disturbed upland habitats. These vines typically colonize edge habitats, where they grow rapidly and cover nearby shrubs and/or trees, eventually shading them out (IPCNYS, 2002). Introduced from Asia in the mid-1800s, these vines have become especially abundant in coastal locations in the Northeast and have infested thickets and woodlands of many formerly natural areas, changing the plant community structure. They are a particular problem in and around the old field area.

Garlic Mustard and Japanese Stiltgrass threaten floristic diversity in the herbaceous layer. The former is a forb that is quite common along the entrance trail and adjacent areas within the preserve, while the latter occurs sporadically throughout along the trails where gaps in the in canopy allow sunlight to reach the forest floor.

## 2.5 Fauna

### 2.5.1 *Insecta*

The species diversity of this group was used to investigate the environmental quality of the site. These animals can serve as useful indicators of habitat quality and functionality, and often have a highly localized distribution in Connecticut. For instance, the potential presence of habitat specialists and/or state-listed species can provide clues to special habitat attributes that contribute to more robust ecosystems.

#### Odonata

Odonate surveys commenced in May and continued through October. A complete list of the 23 species documented on site is provided in Table 2-1. While a multitude of species were recorded, from common and expected dragonflies to uncommon and vagrant damselflies to migrants and scarce breeding species, the success of these surveys was drastically reduced by the weather conditions. The early flight season, April through mid-June, progressed essentially as an average season for southwestern Connecticut would, with typical levels of emergence and most of the anticipated species. However, from mid-June through October nearly all odonate population levels were much lower than usual, with the exceptions being some species dispersing or moving through the state (Common Green Darner, Spot-winged Glider, etc.). This was due to deviations in average rainfall and temperature, in many months of the survey period. These conditions accelerated the drying of vernal pools, streams, creeks, and ponds, and areas that would typically hold water in June were noted to be dry. This likely impacted the habitat of many damselflies and dragonflies as larvae failed to hatch from already dried waterways. Subsequent surveys during seasons with more typical spring and early summer seasons (especially in terms of precipitation) may yield a number of additional species, especially those that appear only in the mid to late summer.

**Table 2-1: Damselflies and Dragonflies of Turkey Hill Preserve**

<i>Common Name</i>	<i>Scientific Name</i>	<i>Family</i>	<i>CT-ESA status</i>	<i>CWCS status</i>
<b>Damselflies (suborder Zygoptera)</b>				
Ebony Jewelwing	<i>Calopteryx maculata</i>	Calopterygidae	-	-
Unidentified	<i>Argia sp.</i>	Coenagrionidae	-	-
Violet Dancer	<i>Argia fumipennis violacea</i>	Coenagrionidae	-	-
Familiar Bluet	<i>Enallaga</i>	Coenagrionidae	-	-
Azure Bluet	<i>Enallagma aspersum</i>	Coenagrionidae	-	-
Fragile Forktail	<i>Ischnura posita</i>	Coenagrionidae	-	-
Eastern Forktail	<i>Ischnura verticalis</i>	Coenagrionidae	-	-
Northern Spreadwing	<i>Lestes disjunctus</i>	Lestidae	-	-
<b>Dragonflies (suborder Anisoptera)</b>				
Common Green Darner	<i>Anax junius</i>	Aeshnidae	-	-
Comet Darner	<i>Anax longipes</i>	Aeshnidae	-	-
Swamp Darner	<i>Epiaeschna heros</i>	Aeshnidae	-	-
Blue Dasher	<i>Pachydiplax longipennis</i>	Libellulidae	-	-
Spangled Skimmer	<i>Libellula cyanea</i>	Libellulidae	-	-
Widow Skimmer	<i>Libellula luctuosa</i>	Libellulidae	-	-
Twelve-spotted Skimmer	<i>Libellula pulchella</i>	Libellulidae	-	-
Great Blue Skimmer	<i>Libellula vibrans</i>	Libellulidae	-	-
Common Whitetail	<i>Plathemis lydia</i>	Libellulidae	-	-
Eastern Pondhawk	<i>Erythemis simplicicollis</i>	Libellulidae	-	-
Slaty Skimmer	<i>Libellula incesta</i>	Libellulidae	-	-
Black Saddlebags	<i>Tramea lacerata</i>	Libellulidae	-	-
Halloween Pennant	<i>Celithemis eponina</i>	Celithemis	-	-
Spot-winged Glider	<i>Pantala hymenaea</i>	Pantala	-	-
Wandering Glider	<i>Pantala flavescens</i>	Pantala	-	-

Lepidoptera

In addition, a preliminary survey of the preserve’s butterfly fauna was initiated during this study. These highly visible invertebrates are generally common and well represented throughout the broader Connecticut environment. However, several stenotypic taxa exist within these groups that thrive only under very narrow habitat conditions. Such sensitive species can be good indicators of habitat quality and can be used to guide and gauge habitat management practices. To date, no rare or state-listed butterfly species have been detected in the Preserve. A complete list of the taxa documented in the area is presented in Table 2-2.

The currently known butterfly fauna of Turkey Hill Preserve represents mostly widespread and common species along with a few unexpected vagrants. Butterfly diversity is largely determined by the availability of host plants and rarer species tend to be restricted to less common host plants. The impact of intense deer browsing and the spread of invasive non-native plants may negatively affect the butterfly diversity.

Additional monitoring of local moth populations may have potential for detecting unusual species in the preserve, but the lack of specific host plants may have a similar effect on the moth diversity as it does on butterflies.



*A Spicebush Swallowtail alights on False Nettle at the Turkey Hill Preserve in Orange, C*

**Table 2-2: Butterflies of Turkey Hill Preserve**

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>	<u>CT-ESA status</u>	<u>CWCS</u>
Least Skipper	<i>Ancyloxypha numitor</i>	Hesperiidae	-	-
Silver-spotted Skipper	<i>Epargyreus clarus</i>	Hesperiidae	-	-
Juvenal's Duskywing	<i>Erynnis juvenalis</i>	Hesperiidae	-	-
Common Sootywing	<i>Pholisora catullus</i>	Hesperiidae	-	-
Zabulon Skipper	<i>Poanes zabulon</i>	Hesperiidae	-	-
Peck's Skipper	<i>Polites peckius</i>	Hesperiidae	-	-
Tawny-edged Skipper	<i>Polites themistocles</i>	Hesperiidae	-	-
Crossline Skipper	<i>Polites origenes</i>	Hesperiidae	-	-
Broad-winged Skipper	<i>Poanes viator</i>	Hesperiidae	-	-
Sachem Skipper	<i>Atalopedes campestris</i>	Hesperiidae	-	-
Swarthy Skipper	<i>Nastra lherminier</i>	Hesperiidae	-	-
Fiery Skipper	<i>Hylephila phyleus</i>	Hesperiidae	-	-
Little Glassywing	<i>Pompeius verna</i>	Hesperiidae	-	-
Red-banded Hairstreak	<i>Hylephila phyleus</i>	Lycaenidae	-	-
Gray Hairstreak	<i>Strymon melinus</i>	Lycaenidae	-	-
Spring Azure	<i>Celastrina ladon</i>	Lycaenidae	-	-
Summer Azure	<i>Celastrina neglecta</i>	Lycaenidae	-	-
Eastern Tailed Blue	<i>Everes comyntas</i>	Lycaenidae	-	-
American Copper	<i>Lycaena phlaeas</i>	Lycaenidae	-	-
Common Wood Nymph	<i>Cercyonis pegala</i>	Nymphalidae	-	-
Monarch	<i>Danaus plexippus</i>	Nymphalidae	-	-
Viceroy	<i>Limenitis archippus</i>	Nymphalidae	-	-
Mourning Cloak	<i>Nymphalis antiopa</i>	Nymphalidae	-	-
Great Spangled Fritillary	<i>Speyeria cybele</i>	Nymphalidae	-	-
Pearl Crescent	<i>Phyciodes tharos</i>	Nymphalidae	-	-
Eastern Comma	<i>Polygonia comma</i>	Nymphalidae	-	-
Question Mark	<i>Polygonia interrogationis</i>	Nymphalidae	-	-
Red Admiral	<i>Vanessa atalanta</i>	Nymphalidae	-	-
Common Buckeye	<i>Junonia coenia</i>	Nymphalidae	-	-
American Lady	<i>Vanessa virginiensis</i>	Nymphalidae	-	-
Eastern Tiger Swallowtail	<i>Papilio glaucus</i>	Papilionidae	-	-
Black Swallowtail	<i>Papilio polyxenes</i>	Papilionidae	-	-
Spicebush Swallowtail	<i>Papilio troilus</i>	Papilionidae	-	-
Orange Sulphur	<i>Colias eurytheme</i>	Pieridae	-	-
Clouded Sulphur	<i>Colias philodice</i>	Pieridae	-	-

## 2.5.2 Fish

No fish were observed in the on-site wetlands. However fish reportedly occur within the small pond at the entrance off of Derby-Milford Road. No fish were observed in the Preserve's watercourses, but streams originating on site form the headwaters of watercourses that contain significant fisheries resources on downstream reaches. For instance, the Wepawaug River receives flow from the unnamed tributary on the east side of the parcel that in turn originates from a hillside seep on the north central portion of the property. The fish community of the Wepawaug River is characterized by sampling data collected in 1992 by the CTDEP (Hagstrom et al., 1991) from a location (Site No. 2069) described as "200 M [656 ft] Upstream of Powerline which cross through town park, Milford." This data is presented in **Table 2-3**. Thirteen species of fish were identified in this watercourse from the CTDEP sampling effort. Both warm-water and cold-water fisheries are well-represented by the sample data. The Large-mouthed Bass and pickerel are examples of warm-water species and are important warm-water gamefish in this system, while the Brown Trout is an important cold water game species. The American Eel is a federal species of conservation concern with conservation management objectives established by a federal interstate management plan.

<b>Table 2-3. Fish Species Collected by CTDEP from Site No. 2069: Wepawaug River Milford, CT</b>				
<i>Scientific Name</i>	<b>Common Name</b>	<b>Number (SE)</b>	<b>Feeding Guild</b>	<b>Preferred Habitat Attributes</b>
<i>Esox niger</i>	Chain Pickerel	93 (5.82)	Invertivore, piscivore	Dense submerged vegetation for ambush lairs
<i>Ambloplites rupestris</i>	Rock Bass	108 (5.17)	Invertivore, piscivore	small, cool, weedy lakes or littoral regions with extensive cover in larger lakes; streams with rocky, silt-free substrate, low turbidity, perennial flow
<i>Salmo trutta</i>	Brown Trout	15 (7.76)	Insectivore	Yearly dissolved oxygen concentrations that do not drop below 5 mg/l
<i>Unknown centrarchid</i>		434 (2.78)		
<i>Lepomis gibbosus</i>	Pumpkinseed	427 (4.08)	Invertebrates and fishes	clear water of ponds, lakes, sloughs, with aquatic vegetation and some organic debris
<i>Rhinichthys atratulus</i>	Black-nosed Dace	100 (5.31)	Insectivore	Pools and slower runs of cool, gravelly or rocky headwaters, creeks, small rivers with high – mod. gradient
<i>Lepomis auritus</i>	Red-breast Sunfish	155 (5.17)	Invertivore	rocky and sandy pools and margins of creeks, small - medium rivers; also rocky and vegetated lake margins
<i>Etheostoma olmstedii</i>	Tessellated Darter	5250 (0.84)	Invertivore	Sand- and mud-bottomed pools, slow runs, and backwaters of headwater streams and small - large rivers
<i>Catostomus commersoni</i>	White sucker	535 (2.82)	Invertivore, Piscivore	Shallow riffles for spawning
<i>Unknown cyprinid</i>		46 (7.76)		
<i>Semotilus corporalis</i>	Fallfish	17,233 (0.56)	Invertivore; Piscivore	Clear, flowing, gravel- to rubble-bottomed small to medium rivers
<i>Micropterus salmoides</i>	Large-mouth Bass	194 (3.63)	Primarily a piscivore	Ponds with water depths greater than 8 feet greater than 0.5 ac
<i>Anguilla rostrata</i>	American Eel	660 (2.00)	Invertivore, Piscivore	rivers, streams, ponds, and the shallow, more productive areas of lakes; spawns in Sargasso Sea

### 2.5.3 Amphibia

Turkey Hill Preserve supports a diverse amphibian fauna and 14 species have been recorded there to date. Several of these are included as species of Greatest Conservation Need in Connecticut's Comprehensive Wildlife Conservation Strategy (CWCS). See Table 2-4 for an overview of the amphibian species encountered in the preserve and their respective conservation status.

**Table 2-4: Amphibians of Turkey Hill Preserve**

Common Name	Scientific Name	Family	CT-ESA status	CWCS status
<b>Salamanders (order Caudata)</b>				
Spotted Salamander	<i>Ambystoma maculatum</i>	Ambystomatidae	-	Important
Marbled Salamander	<i>Ambystoma opacum</i>	Ambystomatidae	-	Important
Four-toed Salamander	<i>Hemidactylium scutatum</i>	Plethodontidae	-	-
Red back Salamander	<i>Plethodon cinereus</i>	Plethodontidae	-	-
Northern Two-lined Salamander	<i>Eurycea bislineata</i>	Plethodontidae	-	-
Northern Dusky Salamanders	<i>Desmognathus fuscus</i>		-	-
Red-spotted Newt	<i>Notophthalmus viridescens</i>	Salamandridae	-	Important
<b>Frogs and Toads (order Anura)</b>				
Eastern American Toad	<i>Bufo americanus</i>	Bufonidae	-	-
Northern Spring Peeper	<i>Pseudacris crucifer</i>	Hylidae	-	-
Gray Tree Frog	<i>Hyla versicolor</i>	Hylidae	-	Important
Bullfrog	<i>Rana catesbeiana</i>	Ranidae	-	-
Green Frog	<i>Rana clamitans</i>	Ranidae	-	-
Pickerel Frog	<i>Rana palustris</i>	Ranidae	-	-
Wood Frog	<i>Rana sylvatica</i>	Ranidae	-	Important

The preserve's variety of wetland habitats and extensive wooded uplands provide ideal conditions for many amphibians. High quality vernal wetlands in the preserve's woodland provide breeding habitat for Spotted Salamander, Marbled Salamander and Wood Frog. Four-toed Salamanders breed in vernal wetlands with dense *Sphagnum*-covered banks. All of these species are considered obligate vernal pool breeding amphibians that rely on ephemeral (non-permanent) wetland types. However, some (especially Spotted Salamander and Wood Frog) can on occasion be found to breed in fish-less wetlands of a more permanent nature such as spring-fed headwaters.

The larger pond on site that holds water year-round harbors breeding populations of Red-spotted Newt, Spring Peeper, Green Frog and Bullfrog. Vegetated shallow marshes and other small ephemeral or permanent wetlands in the wooded uplands are used by American Toad, Gray Tree Frog and Pickerel Frog. Stream-breeding species, such as the Northern Two-lined Salamander (*Eurycea bislineata*) and the Northern Dusky Salamanders (*Desmognathus fuscus*) occupy

seeps, headwaters and streams with clean, cold water. The coarse woody debris on the preserve’s forest floor (logs, pieces of bark, etc.) provides suitable habitat for Redback Salamanders and several other amphibian species use these cover objects throughout the year.

Another species that likely occurs in the area, but one that easily escapes detection is Fowler’s Toad (*Bufo fowleri*). This is a species generally associated with well-drained, sandy soils often in flood plains. It is widespread in Connecticut, but is generally found in relatively low density and is easily mistaken for the ubiquitous American Toad (*Bufo americanus*).

### 2.5.4 Reptiles

A significant number of reptile species occurs in the Turkey Hill Preserve, including several species of Greatest Conservation Need (GCN) and, reportedly, one state-listed species – the Eastern Box Turtle (*Terrapene carolina*; CT-ESA ‘Special Concern’). The area’s known reptile fauna currently comprises three species of turtles and six species of snakes (see Table 2-5).

**Table 2-5: Reptiles of Turkey Hill Preserve**

Common Name	Scientific Name	Family	CT-ESA status	CWCS status
<b>Turtles (order Testudines)</b>				
Common Snapping Turtle	<i>Chelydra serpentina</i>	Chelydridae	- -	
Eastern Painted Turtle	<i>Chrysemys picta</i>	Emydidae	- -	
Eastern Box Turtle	<i>Terrapene carolina Carolina</i>	Emydidae	SC	Very Important
<b>Lizards and snakes (order Squamata)</b>				
Northern Water Snake	<i>Nerodia sipedon</i>	Colubridae	-	-
Eastern Garter Snake	<i>Thamnophis sirtalis</i>	Colubridae	-	-
Northern Ring-necked Snake	<i>Diadophis punctatus</i>	Colubridae	-	-
Black Rat Snake	<i>Elaphe obsoleta</i>	Colubridae	-	-
DeKay’s Brown Snake	<i>Storeria dekayi</i>	Colubridae	-	-

### 2.5.5 Avifauna

To date, 159 species of birds have been identified in the Turkey Hill Preserve, including the state-listed, Great Egret, Northern Parula, and one recently de-listed species the Common Raven. More than half of the preserve’s birds (87 species) are included in Connecticut’s Comprehensive Wildlife Conservation Strategy (CWCS) as species of Greatest Conservation Need. In addition, two species of Connecticut Audubon Society’s Conservation Priority Top 20 (CAS, 2008) have been found in the preserve: Blue-winged Warbler and Wood Thrush.

A breeding bird survey was carried out in the preserve in conjunction with natural resource assessment work conducted from April to September 2013. Breeding activity was recorded at three levels (Possible, Probable & Confirmed) using the criteria and codes indicated in Table 6. During this survey, 17 bird species could be confirmed as breeding in the preserve, 42 additional species classified as probable breeders and another 10 species possibly breed in the preserve. For a complete overview of the birds documented in the Turkey Hill Preserve and their conservation and breeding status, see Appendix II.

The 2010 revision of the CT-ESA removed the Special Concern status of the Common Raven due to its significant southward expansion into Connecticut in recent years. This species is frequently encountered in the preserve and was confirmed as breeding as fledglings were seen with a parent. A number of migrant warblers were observed foraging and singing within the preserve early during the survey period. These were likely migrants as they could no longer be found on site as summer progressed. Nevertheless, Turkey Hill Preserve appears to provide these migrants with suitable stopover habitat for this suite of species.

A number of CWCS Greatest Conservation Need (GCN) species have been recorded in the Turkey Hill Preserve. Many of these species are known to be passage migrants that utilize a portion of the preserve as a stopover and foraging site. Additionally, 34 species are considered ‘Very Important’. These include the state-listed (CT-ESA) species already mentioned, as well as several others that appear to have healthy populations in the preserve. The most noteworthy of those include Great Crested Flycatcher, Wood Thrush, Worm-eating Warbler, Blue-winged Warbler, Black-and-white Warbler, Chestnut-sided Warbler, Eastern Towhee, Field Sparrow, Rose-breasted Grosbeak, and Indigo Bunting.

In general, the avian fauna represented in the Turkey Hill Preserve represents a suite of species characteristically found in large near-coastal forest blocks as well as early successional, or old field habitats. Species such as Pileated Woodpecker, Great Crested Flycatcher, Eastern Wood-Pewee, Wood Thrush, Scarlet Tanager, and several other interior forest species reach their highest densities in large, mature forest stands or small gaps within the mature forest stand matrix. The presence of these avian species, in particular those breeding in the preserve, attests to the functionality of the mature woodland areas in the preserve. A different suite of birds is more commonly encountered in the preserve’s early successional habitat management areas and includes species that rely on a mosaic of different-aged forest stands, young forest or open scrub habitat. Examples of such species include Yellow-throated Vireo, Blue-winged Warbler, Field Sparrow, and Indigo Bunting. All of these species are considered species of Greatest Conservation Need in Connecticut (CWCS, 2005).

The old field area hosted feeding swallows and other aerial insectivores throughout the breeding season and into the end of the survey period. The Purple Martin (CT-ESA Threatened) was detected late during the breeding season as a flyover. This is often a desired species to attract as a nesting resident because of the large number of insect pests that they consume, but the site does not likely offer ideal habitat.

The abundance of odonate and lepidoptera species serve the site’s avifauna well. The variety of wetland habitats and associated wetland vegetation in the Turkey Hill Preserve provide additional habitat for a number of bird species with specific resource requirements. Sections of streamside habitat bisecting mature forest stands offer potential nesting habitat for the Louisiana Waterthrush and Acadian Flycatcher. The small pond and wooded swamps served as a foraging site for a multitude of birds like the Wood Duck, Belted Kingfisher, several swallow species, House Wren,

**Table 6: Breeding Bird Survey Activity Criteria & Codes**

**Possible breeding**

- X Species observed in possible nesting habitat, but no other indication of breeding noted. Singing male(s) present (or breeding calls heard) in breeding season

**Probable Breeding**

- S Singing male(s) present (or breeding calls heard) on more than one date at least a week apart in the same place
- P Pair observed in suitable habitat in breeding season
- T Bird, or pair, apparently holding territory
- C Courtship display, copulation, agitated behavior or anxiety calls from adults observed, suggesting nearby presence of nest or young.
- N Visiting probably nest site
- B Nest building or excavation of nest cavity

**Confirmed Breeding**

- DD Distraction display or injury-feigning behavior observed
- UN Used nest found
- FE Female with egg in oviduct caught in mist net
- FL Recently fledged young present
- ON Adult(s) entering or leaving nest in circumstances indicating occupied nest
- FS Adult carrying fecal sac
- FY Adult(s) with food for young
- NE Identifiable nest and eggs, adult sitting on nest, identifiable egg shells found below nest, identifiable dead nestling found
- NY Nest with young

*Adapted from: McGowan & Corwin (2008)*

Blue-gray Gnatcatcher, Red-eyed Vireo, Black-and-white Warbler, Common Yellowthroat, American Redstart, Yellow Warbler, Baltimore Oriole, and more.

Palustrine forested wetlands on the western edge of the property held birds like Wild Turkey, Golden-crowned Kinglet, Winter Wren, Veery, and Yellow-rumped Warbler as well as Hairy Woodpecker, Eastern Wood-Pewee, Eastern Phoebe, Black-capped Chickadee, Tufted Titmouse, and White-breasted Nuthatch. Additionally, the headwater wetland systems provide potential habitat for birds such as the American Woodcock and Rusty Blackbird, the former a potential breeding species and the latter, a migrant and winter resident in Connecticut and one of the fastest declining songbirds in North America.

It is likely that more birds in terms of individuals as well as species would be recorded if the survey period continued through the 2013 winter season. In general, a variety of winter residents could be added to the list if winter visits were included in the survey period. Additional species could be added from surveys throughout all seasons over a number of years due to the varied nature of the site's habitats, its size, and its location along a landscape level migration corridor, though the vast majority of the expected species for the property have been recorded.

### *2.5.6 Mammals*

Mammal data from the Turkey Hill Preserve is predominantly based on sight records and track surveys. No state Endangered, Threatened or Special Concern mammals have been observed on site, although a few species of Greatest Conservation Need were observed or are expected to occur there. A total of approximately 19 mammal species were either observed or are expected to occur within the preserve and adjacent lands. They include various species in the mammalian order Insectivora (shrews and moles); Chiroptera (bats); Rodentia (e.g., squirrels, mice, rats, voles, beaver, and jumping mice); Carnivora (canids, bear, Raccoon, mustelids, Striped Skunk, and Bobcat), White-tailed Deer and others (see Table 7 for a complete list).

The resulting mammal list (Table 2-6) under-represents one mammalian group in particular: the Order Chiroptera (bats). No bat species have been positively identified in the preserve even though suitable habitat for several species exists, including some state-listed forms. This is because very specialized equipment and protocol operated and conducted by trained personnel is needed to make accurate identifications of bat species on any given site. Likewise, systematic surveys for small insectivores and rodents likely will reveal the presence of additional mammal species in the preserve.

### *2.5.7 Other Organisms*

The diversity observed in groups described previously is primarily driven by the availability of various pockets of high quality habitat within the Turkey Hill Preserve, and by the scale of the wooded habitat in the larger landscape area. Although other organisms present in the preserve have received little or no attention, undoubtedly additional unusual species remain to be found. Targeted surveys for species groups such as moths, spiders or other invertebrates can be very rewarding. A number of mushrooms have been observed during site visits, but no organized inventory of the local species has been attempted. In addition, the aquatic habitat variety and quality in the preserve would warrant a detailed survey for aquatic invertebrates, several of which are excellent habitat quality indicators and include state-listed species. In short, the Turkey Hill Preserve offers tremendous potential for future biological inventories.

**Table 2-6: Mammals observed or expected to occur within the Turkey Hill Preserve**

<i>Common Name</i>	<i>Scientific Name</i>	<i>Family</i>	<i>CT-ESA status</i>	<i>CWCS status</i>
<b>Moles and Shrews (order Soricomorpha)</b>				
Eastern Mole	<i>Scalopus aquaticus</i>	Talpidae	-	-
Short-tailed Shrew	<i>Blarina brevicauda</i>	Soricidae	-	-
<b>Rabbits (order Lagomorpha)</b>				
Eastern Cottontail	<i>Sylvilagus floridanus</i>	Leporidae	-	-
<b>Rodents (order Rodentia)</b>				
White-footed Mouse	<i>Peromyscus leucopus</i>	Cricetidae	-	-
Woodchuck	<i>Marmota monax</i>	Sciuridae	-	-
Gray Squirrel	<i>Sciurus carolinensis</i>	Sciuridae	-	-
Eastern Chipmunk	<i>Tamias striatus</i>	Sciuridae	-	-
American Red Squirrel	<i>Tamiasciurus hudsonicus</i>	Sciuridae	-	-
<b>Opossums (order Didelphimorphia)</b>				
Virginia Opossum	<i>Didelphis virginiana</i>	Didelphidae	-	-
<b>Carnivores (order Carnivora)</b>				
Coyote	<i>Canis latrans</i>	Canidae	-	-
Red Fox	<i>Vulpes vulpes</i>	Canidae	-	-
Gray Fox	<i>Urocyon cinereoargenteus</i>	Canidae	-	-
Striped Skunk	<i>Mephitis mephitis</i>	Mephitidae	-	-
Long-tailed Weasel	<i>Mustela frenata</i>	Mustelidae	-	-
Fisher	<i>Martes Pennanti</i>	Mustelidae	-	-
Mink	<i>Mustela vison</i>	Mustelidae	-	-
Raccoon	<i>Procyon lotor</i>	Procyonidae	-	-
Bobcat	<i>Lynx rufus</i>	Felidae	-	-
<b>Even-toed Ungulates (order Artiodactyla)</b>				
White-tailed Deer	<i>Odocoileus virginianus</i>	Cervidae	-	-

# Chapter 3: Conservation & Management

*One of the biggest conservation and management challenges for most of Connecticut's woodlands is clearly illustrated during early spring emergence, when the first wildflowers of the season sprout and color the landscape. Due to intense overbrowsing by White-tailed Deer, native wildflower populations have been decimated and the first and often most abundant species to provide herbaceous ground cover are non-native invasive species such as Garlic Mustard. Chemical defenses in these plants make them resistant to deer-browse but also cause pervasive changes to the local ecosystem that have a far-reaching and long-term impact. Battling these invasives and restoring healthy forest habitat requires persistence, commitment and substantial resources.*



## Chapter 3

# Conservation & Management

### 3.1 Why Manage Habitats?

Healthy old growth forests consist of a patchwork of different-aged stands of trees. Natural processes such as storms or fire will irregularly remove varying numbers of trees from the forest, creating openings where sunlight can reach the forest floor. Seeds, left dormant in the shaded understory, will germinate and fast-growing species of grasses, wildflowers and shrubs will rapidly colonize the newly formed 'light-gap'. Over time, other plant species that grow more slowly and/or are prefer more shaded conditions will grow in and replace the initial crop of colonists. Tree saplings of light-tolerant species, such as American Beech (*Fagus grandifolia*) will emerge above the ground-covering shrub layer and will start to shade the undergrowth. At this point, the early successional habitat, consisting of herbaceous plants and woody shrub, gradually reverts to young forest. Over time, slow-growing shade-tolerant hardwoods like oaks will infiltrate the closed-canopy young forest and the area once devoid of trees will gradually mature into a diverse old-growth forest, like its surrounding habitat.

At various times during this process of forest regeneration, suitable habitat conditions exist for different species (gap species, shrubland species, young forest specialists, etc.). The transitional nature of these early successional habitats causes species to abandon an area once their specific preferred habitat conditions no longer exist there. Historically, sufficiently large forest blocks would be uneven-aged and contain enough of a habitat mosaic to allow species to move into other suitable habitat patches when vegetative succession caused their previous habitat to become unsuited.

Several factors now hinder this natural process, impacting a suite of species that rely on early successional habitats as those that inhabit forest interiors as well. First, almost all of Connecticut's forest has been cut in the past 100 years. As a result, current forest cover consists of even-aged stands where almost all trees have grown in since the last cutting. Not enough time has passed yet to allow natural processes to create the diverse habitat mosaic, described earlier, in our forests. Secondly, one of the most important driving forces in the creation of forest openings and young growth is fire, and the successful suppression of forest fires over the past century has effectively removed our forest's ability to rejuvenate itself. Blowdowns during storms are now the primary creators of natural forest clearings, but such occurrences are rare. Thirdly, loss of habitat and forest fragmentation have reduced the overall size of continuous forest blocks throughout the state, making it more difficult for species that rely on ephemeral habitat parcels to reach additional areas of suitable habitat.

### 3.2 Recent Management Activities

Recent management activities that have taken place at Turkey Hill Preserve include primarily trail maintenance and routine mowing of the entrance drive and associated parking areas. Mowing and trail maintenance has been primarily focused on allowing passive human recreation and access to the preserve interior to benefit overall public site use. Signage has been erected to notify visitors about the town's rules for managing Open Space property.

## 3.3 General Conservation & Management Goals

### 3.3.1 Conservation Priority Habitats

The Turkey Hill Preserve contains several high-quality habitat types. The following habitats are recognized as vital components of the preserve and prioritized for conservation and management action (in order of decreasing acreage):

- Mixed hardwood stands
- Riverine watercourses
- Seasonal pools
- Early successional habitat
- Palustrine forested wetlands
- Palustrine scrub/shrub wetlands
- Talus slopes

In general, future conservation and management actions should involve strict protection of these habitats within the preserve not unlike those given to the preservation of wetlands and their respective critical upland buffer zones.

Mixed hardwood and evergreen stands should be preserved and monitored for the use of indicator species to assess their biological functionality. Management of various units within the preserve offers opportunity to expand and improve their wildlife habitat value in the future. Detailed conservation and management goals are described below and in Chapter 4.

### 3.3.2 Conservation Priority Species

Several state-listed and other conservation priority species have been recorded in the Turkey Hill Preserve. Future conservation and management strategies will carefully weigh the habitat and resource requirements for the following species:

- Obligate vernal pool-breeding amphibians (e.g. Spotted Salamander & Wood Frog)
- Forest interior avifauna
- Neotropical migrant passerines
- Game species



Eastern Tailed-Blue (*Everes comyntas*)



Red banded Hairstreak (*Calycopis cecrops*)

## 3.4 Conservation & Management Challenges

Several large-scale challenges to the protection of conservation priority species and their specific habitats exist in the region that affects the Turkey Hill Preserve to varying degrees. Three of the biggest challenges and proposed strategies to counteract the potential negative effects of each are briefly discussed below.

### 3.4.1 *Invasive species*

Introduction and proliferation of non-native organisms are of management concern because the introduced species have potential to affect the biotic interactions of the native flora and fauna communities. Biotic interactions such as competition, predation, disease, parasitism, and mutualism may be altered to the detriment of native species. Resultant effects on communities may be manifested in the increased frequency of disease, altered primary and secondary production, altered trophic structure, altered decomposition rates and timing, disruption of seasonal rhythms, shifts in species composition and relative abundance, shifts in invertebrate functional groups (e.g. food for secondary consumers); shifts in trophic guilds (e.g., increased omnivores); and increased frequency of hybridization.

#### Non-native and Invasive Plants

The preserve contains approximately 12 species of non-native invasive plants that pose a threat to biodiversity. Non-native invasive plants are prolific within portions of the preserve. They include herbaceous, liana, shrub, and tree species. Representative non-native invasive plant species noted during our field inspections of the preserve include those listed in Table 3-1. The elimination of all non-native plant species from the preserve's habitats could be labor intensive and perhaps unrealistic, therefore short-term control efforts should be focused on removal (small scale invasions) and containment (large-scale invasions), while the various long-term control methods can be adequately assessed based upon site-specific conditions. For instance, herbicide application can be an effective control tool if applied in a proper manner, but in order to protect groundwater, surface water, drinking water supplies, and other sensitive environmental receptors, the application of herbicides should be avoided whenever alternative control measures are available, effective, and feasible. Even pesticides in use and approved for use today for controlling invasive species may have insufficient toxicological studies supporting their safe use in certain habitats. Safe use is often a matter of proper application and dosage. Recent scientific evidence associates various potential teratogenic, carcinogenic, and mutagenic effects and various toxicities associated with pesticides in use today. If nothing else, use of supposedly "safe" herbicides is still dependent upon proper application, handling, storage, and use.

Apparently feasible control methods are discussed in the literature but selection of the controls is based upon cost, available labor, effectiveness, limitations, response of the target plant species and availability of follow-up monitoring, control, and replacement with native plant species – all factors influenced by site-specific conditions (e.g., soil type, accessibility, proximity to sensitive environmental receptors, etc). In recognition of the impact of non-native plants on our floristic composition in the state, Connecticut enacted legislation barring the sale, use, and cultivation of specific non-native plants species that are known to be particularly widespread and invasive and are causing impact to native habitats (Public Act No. 03-136). Additional legislation allows for enforcement against the ban on the importation, movement, sale, purchase, transplantation, cultivation, or distribution of these plants (Public Act No. 04-203).

<b>TABLE 3-1. NON-NATIVE INVASIVE PLANT SPECIES NOTED ON-SITE</b>			
<b>Common Name/ Scientific Name</b>	<b>Location(s) on site</b>	<b>Potential Control<sup>1</sup></b>	<b>Reference for Further Control Details/Information</b>
<b>TREES</b>			
Norway maple <i>Acer platanoides</i>	Old field – along western side	Girdling with basal bark application of herbicide and tackifier (e.g., Pathfinder II). Application should be conducted anytime between August and October	
Tree of Heaven <i>Ailanthus altissima</i>	Old field	Girdling with basal bark application of herbicide and tackifier (e.g., Pathfinder II). Application should be conducted anytime between August and October	MA DFW, 2006
<b>SHRUBS</b>			
Multiflora rose <i>Rosa multiflora</i>	Woodland edges esp. between the old field and forest, and within some forest gaps.	Mechanical and chemical methods  Frequent repeated cutting or mowing (3-6 x per year) for two to four years; herbicide application to cut stem anytime in August through October <sup>2</sup>  Control via conservation grazing with Exmoor Ponies	<a href="http://www.nps.gov/plants/alien/fact/romu1.htm">http://www.nps.gov/plants/alien/fact/romu1.htm</a>
Japanese barberry <i>Berberis thunbergii</i>	Diffuse and sporadic throughout the preserve	Mechanical control (removal of individual shrubs) in early spring <sup>2</sup>  Cutting with triclopyr (25%) or glyphosate (20%) applied to cut-stem anytime between August to October  Control via conservation grazing with Exmoor Ponies	<a href="http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/b...">http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/b...</a> , <a href="http://plants.usda.gov/">http://plants.usda.gov/</a>  <a href="http://webapps.lib.uconn.edu/ipane/browsing.cfm?descriptionid=26">http://webapps.lib.uconn.edu/ipane/browsing.cfm?descriptionid=26</a>
Autumn Olive <i>Elaeagnus umbellata</i>	Woodland edges esp. between the old field and forest	Sprouts vigorously after cutting, so effective management requires removal of roots or cutting/girdling the stem and then	<a href="http://www.hort.uconn.edu/cipwg/art_pubs/Guide/x12autumn.html">http://www.hort.uconn.edu/cipwg/art_pubs/Guide/x12autumn.html</a>

<sup>1</sup> <http://www.ocfp.on.ca/local/files/Communications/Current%20Issues/Pesticides/Final%20Paper%2023APR2004.pdf>

<sup>2</sup> Be sure to heed all health and safety warnings, permitting requirements, and environmental/ecological recommendations associated with any chemical control method. Information for herbicides can be found at [http://www.pesticideinfo.org/Search\\_Chemicals.jsp](http://www.pesticideinfo.org/Search_Chemicals.jsp)

<b>TABLE 3-1. NON-NATIVE INVASIVE PLANT SPECIES NOTED ON-SITE</b>			
<b>Common Name/ Scientific Name</b>	<b>Location(s) on site</b>	<b>Potential Control<sup>1</sup></b>	<b>Reference for Further Control Details/Information</b>
		application of an herbicide like triclopyr	
Winged Euonymous <i>Euonymous alatus</i>	Throughout the Preserve	Sprouts vigorously after cutting or burning. Therefore, effective management via stem cutting requires subsequent application of an herbicide like glyphosate.  Toxic to some animals – protect conservation grazers against poisoning by installing barriers	<a href="http://www.klines.org/joanne/Archive/Plant_Pages/plant_pages_30.html">http://www.klines.org/joanne/Archive/Plant_Pages/plant_pages_30.html</a>
Wineberry <i>Rubus phoenicolasius</i>	Widely distributed	Treat canes with a systemic herbicide such as glyphosate or trichlopyr	<a href="http://www.nps.gov/plants/alien/pubs/midatlantic/ruph.htm">http://www.nps.gov/plants/alien/pubs/midatlantic/ruph.htm</a>
<b>LIANAS</b>			
Oriental Bittersweet <i>Celastrus orbiculatus</i>	Woodland edges esp. between the old field and the forested areas of the Preserve	Hand removal where practical; cut vines and spot treatment with herbicide (100% Roundup)	<a href="http://www.inhs.uiuc.edu/chf/outreach/VMG/rlbitter.html">http://www.inhs.uiuc.edu/chf/outreach/VMG/rlbitter.html</a>
Japanese Honeysuckle <i>Lonicera japonica</i>	A few locations near the boundaries of the preserve, and within certain gaps	Herbicide application only effective control but necessitates attention to proper timing. Some herbicides ineffective	<a href="http://tncweeds.ucdavis.edu/esadocs/documnts/lonijap.html">http://tncweeds.ucdavis.edu/esadocs/documnts/lonijap.html</a>
<b>HERBS</b>			
Garlic Mustard <i>Allaria officinalis</i>	A number of locations throughout the preserve, heavy infestation along entrance trail	Spraying soil around satellite invasion areas with vinegar to change the soil pH should be tried as a pilot project In areas of large infestations, systemic herbicide application (glyphosate, triclopyr) may be necessary prior to seed set	
Japanese Stiltgrass <i>Microstegium vimenium</i>	Within a tree gap on the blue trail loop section	Hand pulling and proper disposal with municipal trash	
Japanese Knotweed <i>Fallopia japonica</i>	Tributary stream to Wepawaug River at intersection of loop trail	Since this is a new small-scale invasion, Handpulling over successive years to exhaust the seed bank would likely be effective	

More species may exist. Despite known impact to the native floristic composition of the state, some non-native plant species still provide important habitat function to certain bird species. For instance, Multiflora Rose provides suitable nesting cover for shrubland birds at the site. Therefore, care must be taken not to impact species of conservation concern that utilize this special habitat coverage during removal or control projects, and to replace the lost function by re-planting native species.

#### Non-native Animals

Introduced animals have had a detriment to our native fauna, especially domestic house cats, dogs, and rats. Dr. David Pimental and his colleagues of Cornell University calculated the economic valuation of impact from non-indigenous animals including domestic cats. For instance, his research estimated there to be 63 million domestic cats in the United States of which approximately 30 million are considered allowed to roam loose or are feral. These feral cats are estimated to capture approximately 570 million birds each year at an estimated value of 17 billion dollars (Pimental et al., 2000). Loose and/or feral cats can have an even greater impact on local populations of small mammals (Hammerson, 2004). Feral cats were not frequently encountered in the preserve's interior, but since much of the preserve is surrounded by residential property, they are expected to occur. Local residents should be educated of the following truthful facts about cats and wildlife:

- Cats with bells on their collars still capture and kill wild birds and animals
- Even well-fed cats kill wildlife
- Wildlife injured by cats rarely survive, even if they escape; and
- Outdoor cats are at risk of exposure to many hazards including disease, parasites, and vehicles ([www.njaudubon.org](http://www.njaudubon.org)).

Outdoor cats should at least be spayed or neutered.

Rats should be discouraged from congregating within sensitive areas of the preserve by keeping these areas clear of human food wastes. Signs requesting that public remove what they brought in while picnicking should be posted.

Pets should be discouraged from entering the sensitive habitats within the preserve such as wetlands, grasslands, and early successional shrubland. Control measures could include a combination of enclosure fencing (effective at excluding free-roaming dogs), signage, education and via a voluntary program of keeping cats indoors modeled after the one sponsored by the New Jersey Audubon Society. Likewise, Beans and Niles (2003) identified dogs as a threat to the biodiversity (including rare species) in New Jersey. Dogs should be kept on leashes under the control of their owners at all times throughout the preserve, and should be kept on the trails as they risk impact to the biodiversity of the preserve via the following:

- They may spread invasive species propagules deeper into native vegetation associations
- They may seek out and find and kill ground nesting birds, and waterfowl young and their eggs
- They pose a predatory threat to young wildlife that may not have the ability to escape predation including species of conservation concern detected in the preserve such as juvenile Box Turtles (Dodd, Jr., 2001)
- They may impact sensitive seasonal pool communities

- They may trample and destroy rare plants
- They may foul high surface water quality watercourses, and
- They may harass large mammals posing a threat of injury to those species and to themselves.

In addition, dog owners allowing their dogs to roam off-leash risk injury to their dogs from the following:

- Disease-carrying and sickly organisms
- Territorial animals, and
- Conflicts with other off-leash dogs

For a discussion regarding unleashed dogs harassing wildlife in rural environments see Lowry and McArthur (1978) and Hammerson (2004). We recognize that this constraint placed on dog owners may be unpopular with dog-owners, but the disparity in the behavior exhibited among breeds and individual dogs warrants regulation of ALL dogs regardless of their breed and level of training.

### 3.4.2 Diseases & Pests

Disease concerns include those potentially impacting floral and faunal species and those that may affect humans while visiting the preserve.

#### West Nile Virus/Eastern Equine Encephalitis

West Nile Virus (WNV), spread by mosquito vectors is of paramount concern in recent years as it can have acute (lethal), effects on various bird taxa. Since mosquitoes are the vectors of human parasites, they are of management concern. Larval and pupae mosquitoes may occur in seasonal or temporary pools within the preserve and surrounding areas. Since 1999, the Connecticut Agricultural Experiment Station has established permanent mosquito monitoring stations within various communities to monitor for WNV and Eastern Equine Encephalitis (EEE), among other arboviruses, from June to October. Mosquitoes are collected from traps set at these monitoring stations, identified to species level, and then sent to a virology laboratory to test for WNV. This network of monitoring stations includes one in Orange where a trap station (OR59) is operated at Meeting House Lane. Results of monitoring are available through the Connecticut Agricultural Experiment Station. As of October 2013, 1,895 mosquitoes were collected from this trap and none were found to be positive for carrying WNV, EEE, or other arboviruses<sup>3</sup> despite there being positive results for WNV recorded from traps monitored in towns in New Haven County to the east, and Fairfield County to the west.

#### Tick-borne Illness

Ticks are also vectors of parasites that cause disease in humans such as Rocky Mountain spotted fever, rickettsiae, monocytic and granulocytic ehrlichiosis, babesiosis, Lyme disease, and approximately six other diseases for which pathogens or other causative agents have been identified. Tick associations with other pathogens are not yet clearly understood or defined. The most common carriers of tick-borne diseases in the northeast are the Black-legged Ticks (*Ixodes scapularis* and *I. pacificus*) two species responsible for transmission of Lyme disease, granulocytic ehrlichiosis, and babesiosis (Stafford, 2004). However, other species of ticks may also act as vectors. The White-footed Mouse (*Peromyscus leucopus*) and White-tailed Deer are considered major reservoir

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<sup>3</sup> <http://www.ct.gov/caes/cwp/view.asp?a=2819&q=505498>

hosts for Lyme disease. Visitors to the preserve should be warned via signage of the potential for ticks in the woodland, grassland, shrubland, and other heavily vegetated areas of the preserve. Signs posting the warning of tick borne illness may also help to deter people from entering closed areas.

### Rabies

The occurrence of rabies in wildlife, especially raccoons and foxes, is a potential management concern. The public should be informed that any wild animals encountered within the preserve should not be fed, touched, or harassed. Additionally, human food wastes should not be discarded in the preserve to prevent attracting opportunistic scavengers that may also carry rabies.

### Forest Tree Diseases

There are a number of diseases currently plaguing or threatening to plague the health and composition of our forests in the Northeast. The cause of these diseases can be classified into four major groups: abiotic stressors, air pollutants, pathogens, and forest insect pests. Abiotic stressors include temperature and moisture injury, winter injury, frost, high temperatures, drought, and excessive water (prolonged inundation). These stressors, if initiated by natural processes, are an integral part of forest ecology and thus management to control or mitigate their effects is rarely warranted. Air pollutants known to impact tree health include ozone, sulfur dioxide, and hydrogen fluoride. Many of the significant impacts to forest tree health due to air pollution have been mitigated by State implementation plans to meet National Ambient Air Quality Standards, and thus site-specific actions are not warranted unless a discrete point source has been identified within or proximal to a natural area (and none such point sources were identified in or proximal to Turkey Hill Preserve). Thus tree diseases caused by tree pathogens and forest tree insects are the major causes of concern for protecting tree health within the preserve.

Tree pathogens can be further categorized into diseases of hardwoods versus diseases of conifers. Hardwood diseases include dieback and decline syndromes (e.g., Sapstreak Disease of Sugar Maple, Beech Bark Disease, Oak Decline), wilt diseases (e.g., Oak Wilt), leaf diseases (e.g., Anthracnose, leaf blisters, leaf rusts, Powdery Mildew, *Phyllosticta* Leaf Spot, Tobacco Ringspot Virus of Ash, Ash Yellowing, etc.), and root diseases (e.g., Armillaria Root-rot). Conifer diseases include various needle afflictions (rusts, blights, needlecasts, etc.) and twig/stem diseases (e.g., White Pine Blister Rust, Pine – Oak Rust, etc.). (USDA/AIS, No Date) Pathogens may be host-specific, or may be inter-specific.

Forest tree insect pests are also divided broadly into two main categories: those that afflict hardwoods and those that afflict Conifers. Hardwood insect pests include leaf-eating insects (e.g., Gypsy Moth, Oak Leafroller, Forest Tent Caterpillar, etc.), sucking insects (such as Pear Thrip and Periodical Cicada), and meristematic Insects such as the Emerald Ash Borer that only recently has been documented in Connecticut (Naugatuck River Valley area in July 2012 and Hamden, Connecticut in 2013) but has major potential to afflict wide-scale damage to many of our dominant and economically viable eastern forest trees. Conifer insect pests include defoliators such as Hemlock Loopers and the introduced Pine Sawfly, sucking insects such as various aphids, adelgids, spider mites, thrips, etc., and meristematic insects such as various pine and spruce weevils and beetles. The Eastern Hemlock Woolly Adelgid is a significant pest inflicting hemlocks in Southern New England. It has caused wide-scale mortality of hemlock stands in parts of Connecticut, especially stands growing on shallow to bedrock soils. The hemlocks growing within the preserve did not appear to exhibit large scale die-back, but should be monitored closely for signs of Adelgid infestation.

### 3.4.3 Anthropogenic Disturbance

Natural, biotic (predation, disease, parasitism, competition, succession) and abiotic (hydrologic changes, storms, seasonal extremes in temperatures, etc.) factors that may negatively impact plant and animal populations are part of the natural processes in which these organisms have evolved. Robust populations can usually recover from these natural, temporary impacts. Clearly the greatest threats to the ecology within and adjacent to the preserve is the cumulative impact associated with human activity. The continued introduction, proliferation, and spread of non-native invasive plant and animal species, over-collection/harvest of plants and animals, pollution, over-population and the associated demand on natural resources, and the loss or alteration of habitat due to development or fragmentation are often cited as the major factors leading to the loss of biodiversity. More often than not, the cumulative effect of one or more of these factors is responsible for negative impacts to biodiversity in a given area.

Since Turkey Hill is surrounded by residential property, and the former Hubble campus rather than other protected lands in a larger, forested landscape matrix, threats to biodiversity from development and pollution could become significant factors on a local scale in the future. By far the greatest threat to biodiversity within the preserve is the spread and proliferation of non-native invasive plant species that can alter floristic composition, introduce disease, change soil chemistry, and out-compete native food-producing plants for which animal species have evolved.

Human presence within Turkey Hill Preserve also has potential to impact biodiversity and other sensitive environmental receptors of the preserve. Heavy trail use by hikers, horseback riders, and mountain bikers can pose management challenges associated with soil erosion and the resultant sedimentation of downgradient wetlands and watercourses. Hikers, horses/horseback riders, mountain bikers, dogs, and others that deviate from the trail system could potentially do one or more of the following:

- Trample plants of conservation concern
- Introduce non-native plant species propagules
- Trample or kill ground-nesting birds their nests, eggs, or young
- Initiate or exacerbate soil erosion problems, and
- Disturb various roosting birds of conservation concern, especially raptors.

Predators often track the scent of humans and pets within natural areas, therefore humans and pets wandering off-trail can lead predators into different parts of the preserve where sensitive species of conservation concern may be nesting. People and pets deviating from the trail system are also at greater risk of encountering known and potential biological hazards within the preserve such as poisonous plants, biting and stinging insects, stinging plants, and aggressive wildlife that may be defending young, a den site, or other resource.

### 3.4.4. Data Gaps

Insufficient scientific knowledge regarding wildlife species distribution, abundance, and condition is a concern identified for a variety of habitats of greatest conservation need, in Connecticut (CT DEEP, 2005). The lack of representation of certain insect orders from inclusion on Connecticut's Endangered,

Threatened and Special Concern Species list (CT DEEP, 2010) is likely not due to the secure conservation status of those groups but rather a reflection of the lack of understanding of the distribution, abundance, and status of species within the unrepresented orders.

Additional focused and more in-depth invertebrate surveys would likely yield additional listed species among various taxa including the insect orders Diptera (e.g., perhaps *Leptophlebia*, *Paraleptophlebia*, or other Mayfly genera and Tabanid flies especially from the on-site wetland and streams), Lepidoptera (especially rare moths), and perhaps various ground beetle species.

The status of the mammalian order Chiroptera (bats) remains a data gap in the status of the biodiversity within the preserve. The status of bat species within the preserve is best determined by specialized survey methods consisting of bioacoustical monitoring perhaps augmented by trapping methods (mist-netting, harp traps, etc.). Due to the extensive forested habitat, the preserve has potential to support rare arboreal roosting bats included on the CT list of rare species and the CT DEEP Endangered Species Act.

Additional information regarding the potential presence of other small mammalian species within the preserve could be obtained via a trap and release survey deploying a combination of trapping techniques and arrays within various habitats of the preserve.

# Chapter 4: Conservation Plan

*Turkey Hill Preserve's wildlife and habitats are best served with a balanced combination of management and conservation. Certain habitat types within the preserve, such as the headwater swamp shown here, form a unique ecosystem within the forest and benefit most from measures that keep disturbance and other adverse impacts to a minimum. However, other habitat types require intensive management to keep them functional and a higher level of disturbance can be tolerated. In both cases, monitoring habitat quality using carefully selected indicator species can provide the information needed to assess whether specific management practices provide the desired results.*



## Chapter 4

# Conservation Plan

### 4.1 Turkey Hill Preserve Short-term Goals

#### 4.1.1 Stewardship

In order to assess the efficiency and effectiveness of management activities within the preserve, it is recommended that the Town continue monitoring efforts as part of an adaptive management program. Adaptive management occurs when data is collected concurrently with management activities. The collected data is used as feedback to adjust and fine tune the management efforts. This approach to management can be highly beneficial in evaluating the success of pilot-scale programs that can then be scaled up to affect change in larger areas. For instance, the success of treatment methods for controlling invasive species is typically dependent upon the time of year the control is implemented, the growth habit of the target species, the presence/absence of other non-target vegetation, etc. Treatments should be implemented on small satellite invasions first, to determine the factors necessary to successfully treat larger areas.

Trails should be more clearly marked in some areas so that people within the preserve can navigate the trails without a map with relative ease. In order to protect sensitive environmental receptors on site a few recommendations to the trail system are warranted and are noted as follows:

- Where trails bisect hillside seeps, it may make sense to move the trails higher up the slope so that less wetland is crossed, or consider re-routing trail so that it does not cross the seep area at all
- Where trails bisect vernal pool systems, consider elevating the trail on boardwalks (allows for the passage of amphibians underneath without them being stepped on), or re-routing the trail away from the pool system altogether
- Where trail segments descend steep slopes, consider re-routing trail to shallower slopes with less potential for erosion.

It is understood that the preserve is visited by a number of people pursuing various interests and recreational uses. It is our opinion that due to the presence of sensitive environmental receptors within the various habitats of the preserve, recreational use should be limited to passive recreation such as hiking, birding, photography, and nature interpretation.

Higher impact uses such as horse-back riding, ATV use, and Mountain-biking on the site may impact sensitive flora and fauna, erode soils on steep slopes, trample or run over fauna of conservation concern, or come into conflict with hikers.

It is also understood that there are many visitors to the preserve that allow their dogs to run free and off their leash, contrary to the established rules. Due to the potential for property trespass, dog v. dog and dog v. people conflicts, and potential impact to flora and fauna of conservation concern, we recommend that this rule be specifically enforced and addressed via an expanded outreach program, and periodic presence of the dog warden on site.

#### 4.1.2 Outreach

We recommended that Turkey Hill expand its outreach and education program to the town's citizenry, to improve communication of conservation and management goals. An expanded outreach program should use a combination of approaches to reach the widest audiences. For instance, notices or articles regarding the goals of habitat management can be communicated to local residents using social media, blog posts, newsletters, list serves, direct mailings, trail side signage, and links to the town website. Once residents begin to fully understand the value of ecosystem services and the threats to these services, the more they are likely to contribute to its preservation, or at least to respect the natural resources rather than exploit them. Some examples of trailside signage that could be developed include the following:

1. The 13 Functions and Values of Wetlands
2. Vernal Pool Denizens
3. Identifying Non-native, Invasive Plants
4. The Flora and Fauna of Talus Slopes
5. Forest Birds of Conservation Concern
6. Shrubland Birds of Conservation Concern
7. Herpetofauna of Turkey Hill Preserve
8. Recognizing Poison Ivy and Toxic Plants
9. Deer Tick Area Warning
10. Aerial Insectivores
11. Detritivore pathway

## 4.2 Turkey Hill Preserve Long-term Goals

### 4.2.1 Habitat Management and Enhancement

#### General Habitat Matrices Improvement

Through coordinated efforts between stakeholders, stewards and maintenance staff, existing habitats within the preserve could be improved or enhanced, to benefit avifauna. Various management measures can be implemented to increase habitat value without affecting existing uses. Planting native shrubs that bear fruit and mast beneficial to avifauna is one such way. Selecting for timber with high wildlife value via forest management is another. An important aspect of matrix improvement is to assure that not only is food available for the species of conservation concern but also that the following is considered:

- A variety of food types are present supplying all feeding guilds (e.g., insectivores, granivores, frugivores, nectarivores) with sustenance
- Food items such as fruits and mast are available at varying times throughout the seasons
- Food items present a variety of nutritional options for consumers, and

- Food plants are located in areas where they are able to maximize their production without being outcompeted by low value invasive competitors.

The relative nutritional content of food-producing plants beneficial to avifauna that occur within the preserve and some examples of flora within the preserve that provide food high in this nutritional category are presented in **Table 4-1**. Examples of shrub species with high value to avifauna that thrive in the ecoregions of southern New England, and the species to which they are beneficial are provided in **Table 4-2**. Areas where invasive shrubs are removed should be replanted with one or more of these species that are appropriate for the soil, light, and hydrologic conditions in order to prevent the re-colonization of the removed invasive plants.

Wetland Protection

According to the CT DEEP Water Quality Standards for Inland Surface Waters, the streams that drain the preserve are designated as a Class A watercourses (Murphy, 1987). Surface waters with this designation are presumed suitable for their designated uses that include fish and wildlife habitat, among other legitimate designated uses. Such streams are important to maintaining our native populations of cold water finfish species. The water quality goal is to maintain the Class A designation and designated uses. Likewise, groundwater quality within the preserve is designated as Class GA. Groundwater with this classification is within the influence of private drinking water wells. The aquifer beneath the site and vicinity is an important resource upon which residential properties rely to recharge private drinking water wells. Protection of headwater streams and high-quality ephemeral wetlands to maintain water quality and habitat functionality should be a priority conservation goal for the preserve. This best done by implementing best management practices to prevent erosion and sedimentation, keeping pollutants, toxicants and nutrient sources from entering the wetlands and watercourses, retaining forest canopy cover over the first order streams and palustrine wetlands and maintaining adequate buffer zones around these resources.

Nutrition Category	Some Examples of Flora within Turkey Hill Preserve that Provide Food High in this Nutritional Category	Avifauna benefited
High lipid content	Flowering Dogwood, Spicebush, Sassafras, Northern Arrowwood, Virginia Creeper	Thrushes (except American Robin), Gray Catbird Yellow-rumped Warbler, American Tree Swallow (Place and Stiles, 1992)
High protein content	Solomon’s seal, Spicebush	American Robin (Witmer, 1996), Eastern Kingbird, Great Crested Flycatcher
High carbohydrate content	Black Cherry, Highbush Blueberry, Pokeweed, Spicebush, and grapes	Cedar Waxwing (Witmer, 1996)
Emergency sustenance foods (Low nutrient or less palatable foods that are retained on the stem late into winter when other food is scarce)	Maple-leaved Viburnum, Green Briar, Winterberry, sumacs, Eastern Red Cedar	Winter residents, wintering individuals of normally migratory species, early returning spring migrants

Recommended Species	Avifauna benefitted	Comment
Highbush Blueberry ( <i>Vaccinium corymbosum</i> )	34 spp. of birds including Gray Catbird, American Robin, Eastern Bluebird, Orchard Oriole	Requires well-drained sunlit sites

<p>Canadian Serviceberry (<i>Amelanchier canadensis</i>)</p>	<p>Downy Woodpecker, Hairy Woodpecker, Gray Catbird, Eastern Bluebird, Northern Cardinal, American Robin, Brown Thrasher, Swainson's Thrush, Veery, Wood Thrush, Eastern Towhee, Cedar Waxwing, Baltimore Oriole and other songbirds</p>	<p>Grows in a variety of habitats from swamps to rocky dry hillsides. Early spring blooms attract insects and pollinators and thus are important to insectivores</p>
<p>Sumacs (<i>Rhus glabra</i>, <i>R. copallina</i>, <i>R. typhina</i>)</p>	<p>Ruffed Grouse, Ring-necked Pheasant, Wild Turkey, Eastern Bluebird, Northern Cardinal, Gray Catbird, Purple Finch, Northern Flicker, Northern Mockingbird, Eastern Phoebe, American Robin, Brown Thrasher, Hermit Thrush, various other songbirds</p>	<p>Not a preferred food but an important winter sustenance especially later in the winter season when other foods have been depleted</p>

Species	Importance to Avifauna	Notes
Dogwoods ( <i>Cornus stolonifera</i> , <i>C. florida</i> and <i>C. ammomum</i> )	Ruffed Grouse, Wild Turkey, Eastern Bluebird, Northern Cardinal, Gray Catbird, Purple Finch, Northern Flicker, Yellow-breasted Chat, American Robin, Brown Thrasher, Hermit Thrush, Gray-cheeked Thrush, Cedar Waxwing, Red-eyed Vireo, Warbling Vireo, Pine Warbler various other songbirds	Fruits are highly valuable to avifauna including Neotropical migrant passerines. Some of the fruits may persist into winter
Hawthorns ( <i>Crataegus</i> spp.)	18 spp. including American Robin, Northern Cardinal, Blue Jay, and other songbirds especially Fox Sparrows and Cedar Waxwings	The dense thorny branches of this shrub make it an exceptional coverage for nesting birds
Brambles ( <i>Rubus allegheniensis</i> ; <i>R. hispidus</i> , et al. spp.)	49 spp., esp. Wild Turkey, Ruffed Grouse, Gray Catbird, Cedar Waxwing, Veery, Orchard and Baltimore Orioles, Yellow-breasted Chat	Exceptional coverage for nesting ( <i>R. allegheniensis</i> );
Bayberry ( <i>Morella [Myrica] pensylvanica</i> )	Eastern Bluebird, Gray Catbird, Brown Thrasher, White-eyed Vireo, Red-bellied Woodpecker, Tree Swallow, Yellow-rumped Warbler	Especially important component in the diets of Tree Swallows and Yellow-rumped Warbler
Viburnums ( <i>Viburnum acerifolium</i> , <i>V. dentatum</i> )	Ruffed Grouse, Wild Turkey, Pileated Woodpecker, American Robin, Brown Thrasher, Great Crested Flycatcher, Cedar Waxwing, Gray-cheeked and Hermit Thrush	Fruits available during fall migration

### Forestry Management

From a biodiversity perspective, the site could benefit from some limited forestry management. Forestry management techniques directly affect avifaunal composition. For instance, Goodale et al., (2009) addressed the effect of shelterwood and thinning treatments on bird diversity and abundance in the Yale Forest. His conclusions suggested that undisturbed forests tend to have higher avian species diversity when compared to shelterwood stands and stands subject to thinning. He attributed this to the fact that undisturbed stands tended to have a greater density of snags and conifers, and also had a more developed shrub layer (predominantly *Kalmia* in the Yale Forest). Forests managed as undisturbed treatments, favored forest interior species such as Scarlet Tanager (in deciduous forests) and Black-throated Green Warbler (in conifers). Undisturbed forests were often found in hard to log areas, such as saturated wetland soils, boulder fields, or steep hillsides. Undisturbed forests in these areas were often the preferred habitat of Northern and Louisiana Waterthrush. Ground nesters, such as Ovenbirds, and species that favor forests with a dense shrub layer such as the Black-throated Blue Warbler preferred undisturbed forests and stands subjected to thinning over shelterwood stands. Downy Woodpeckers were an example of a species that prefers thinned stands over shelterwood and undisturbed stands. In stands managed via thinning, more early successional species were encountered, while the species composition of shelterwood-managed stands tended to be more dynamic.

However certain aspects of the site present challenges to forestry management.

- Wetlands interspersed throughout including productive vernal pools with obligate species
- Steep slopes

- Surrounding residential properties

Should the town desire to implement a timber harvest program within the preserve, opportunities to conduct forestry management in a way that is beneficial to wildlife should be explored. A harvest technique should be selected that provides both economic and wildlife benefits. For instance, both clear-cutting and shelterwood cuts are techniques used by the CT DEEP in the past to implement timber harvest on state forest lands. Clear cutting has had negative connotations associated with it among “environmentalists” in the past due to the drastic change in landscape cover that were produced by commercial loggers and, when conducted improperly, often resulted in negative impacts to downgradient water quality (flashy flows from stormwater runoff, sedimentation, increased water temperatures, etc.). Yet, if done as smaller management units it may produce the following benefits:

- It may regenerate trees and other vegetation of high wildlife value (e.g., esp. shade intolerant species)
- It frees growing space, nutrient and mineral resources so that they are available for the next generation of timberwood
- It offers a potentially high financial benefit from generation of even-aged trees which contributes to increased marketability, facilitates their harvest, and can result in higher economic benefit, thus perhaps generating a source of revenue for other conservation actions, and
- Clearcuts tend to mimic natural disturbance (e.g., fire, hurricane damage, etc.), thereby resulting in the attraction of those avian species that seek out such disturbed habitat.

Shelterwood treatments leave a number of trees within the management unit uncut. It can be thought of as a very heavy form of thinning, with the trees left uncut serving as sources of seed for the future generation of trees in the stand and as "shelter" for young trees on the forest floor (protecting those seedlings from direct sunlight and wind). The trees to be left in a shelterwood cut are selected not only for their seed producing ability, but also for their potential economic value. Therefore, trees that may be good seed producers but will not increase in size and value are typically harvested while trees that are both good seed producers and also have good growth potential are retained for the next harvest interval.

However, forest management using a shelterwood technique usually necessitates several cuttings. The first removes the undesirable trees thereby creating the gaps for regeneration to take place and freeing up energy and nutrient resources for the remaining trees increasing their health and vigor and providing dominant trees that shelter the regeneration. Eventually, however, these dominant trees begin to impede the growth of the regenerating trees and so the original shelter trees are then harvested to make room for the next generation. Since shelterwood typically requires several cuttings, it often has increased management costs and labor, but it can potentially be used to select for trees with high wildlife value (e.g., White Oak, or aspens) while removing those with less wildlife value by comparison.

Both clear-cutting and shelterwood treatments result in even-aged



Figure 4. Wetland Communities within the Turkey Hill Preserve Provide Much Needed Cover in the Herbaceous and Shrub Layers – Something that is often lacking in the Upland Habitat of the Site

management units (Bolen and Robinson, 2003). Even-aged units lack the vertical structural diversity of many natural forests. Since bird diversity is directly related to foliage height diversity (Morrison, 2002), these treatment areas would be expected to have less avian diversity than the “natural areas” of the forest. From a landscape ecology perspective, however, the treatment areas are small fractions of the total forested land cover of the preserve. In that regard, there is opportunity to improve upon the forested habitat structure so important to Neotropical migrant bird species since the treatments used in the small management units can add special habitat attributes required by some forest specialists, such as increased structural diversity in the floristic composition that can be gained via forest regeneration following a timber harvest.

The forestry methods discussed above may not necessarily maximize economic gains for timber harvest but likely would strike a balance between market value and wildlife habitat creation/enhancement. A tentative schedule of forest management practices for a multi-year planning period could be developed by a Certified Forester. An initial site screening of the Preserve was conducted by Eric Hansen, a certified forester with Ferrucci and Walicki LLC. Based upon his initial assessment, some degree of timber harvest to improve wildlife habitat may be economically feasible. His recommendations based upon a cursory inspection of the property are provided in Appendix III.

Any forest management using clear cut treatments should also consider the following recommendations of Hassenger et al. (1981) in order to further benefit wildlife:

- The cut area should be gated from access roads to keep out off-road vehicles
- A barrier of forest vegetation should separate the clear cut stand from access roads
- The haul road should penetrate this forest barrier from the access road into the management unit at a curve angle to eliminate lines of sight from the access road into the center of the clear cut
- Big “wolf” trees of oak and hickory should be retained in the clearcut to provide mast
- The boundaries of the clearcut should not be straight and abrupt but irregular and diffuse adding structural diversity to the ecotone,
- Dead snags should be left standing
- Log-loading areas should be enlarged and seeded for wildlife
- Fruit bearing shrubs should be retained especially along the boundary, and
- Tall trees should be left along streams to shade the water, and drainages should be crossed using bridges or culverts.

When assessing the various silviculture treatments, consideration should be given to both structure and composition to protect other species of conservation concern that do or may occur within the preserve. For instance, the “natural areas” mentioned above should be designated as such in the Forest Management Plan. Permanent interior forest zones should be established to allow the formation of or retain “climax” forest, a rare habitat type in Connecticut (Dowhan and Craig, 1976). Maintaining the integrity of forest interiors will benefit a number of forest interior bird species identified by Askins et al. (1987) that are priority species of conservation in Connecticut and the region, including keystone species such as Broad-winged Hawk (CT-ESA ‘Special Concern’) and Barred Owl. Timber harvest outside of the natural areas can be conducted in such a way as to benefit what Askins et al. (1987) identifies as “interior-edge species” – species that require or prefer the vegetation structural and foliage height diversity of natural edges and developed ecotones. Examples of these species include Ruffed Grouse, Yellow-billed Cuckoo, Wood Thrush, Eastern Wood Pewee, and Eastern Towhee.

Furthermore, in order to implement a low-impact forestry management program, logging or crossing areas of the forest that may be constrained by soils that are either highly erodible or susceptible to impact from logging equipment should be avoided. These areas primarily include the following:

- Wetland areas, especially those dominated by organic soils

- Upland areas that host predominantly native vegetation layers
- Soils with steep slopes, and
- Areas of high boulder or talus coverage – an important wildlife attribute of the site.

#### Invasive Species Control

The primary over-arching goal in invasive species management for the preserve should be that advocated by the Invasive Plant Atlas of New England (IPANE) assessment group (Mehrhoff et al., 2003). That is: “No New Invasions” either for new invasive species in the region (e.g., Black Swallow-wort [*Cynanchum louiseae*], Mile-A-Minute vine [*Polygonum perfoliatum*], etc.) and for new satellite invasion areas of existing invasive species (e.g., Garlic Mustard, Japanese Barberry, etc.). Stewards should be vigilant to colonization by additional non-native invasive species. If new colonizations are discovered, a rapid response eradication team could be dispatched to dispense with the newly discovered invasives while their populations are still manageable. For instance, Japanese Knotweed has become established along the unnamed tributary stream that drains to the Wepawaug River. This satellite invasion area is rather new and consists of only a handful of stems. Early control is warranted. Hand-pulling of these few stems at this location would likely be a time-efficient and cost-effective strategy.

The secondary focus of control efforts (after rapid response action to prevent new invasions) should be to focus control efforts along the invasion front of existing infestations within the preserve to halt their spread and to contain the invasion. Efforts could then expand inward from there toward the invasion center as resources allow. Care should also be taken not to affect the habitat of species of conservation concern during control or removal projects. For instance, removal of invasive shrubs could impact shrubland birds via removal of suitable nesting habitat and cover, and so, at the very least should not be conducted during nesting season. It would be prudent to inventory all non-native invasive plant species, assess their extent, coverage, and possible impact; to prioritize species based on the urgency and need for control; and to find suitable native or non-invasive analogs that will replace the habitat functions lost upon the removal of the target invasive species. Delineation of invasive plant infestations will establish a baseline that will be useful in calculating potential rates of spread and resultant impact to habitat.

#### 4.2.2 Addressing Data Gaps

It is recommended that future studies assess the conservation status of rare Lepidoptera, stream invertebrates, and the use of the preserve by bats. The dry oak ridgetop communities, rocky outcrops, and certain lush, forb-vegetated Palustrine wetland systems all have potential to contain rare Lepidoptera (Schweitzer et al., 2011). Since these habitat types occur in the preserve, they should be further examined for rare Lepidoptera using an array of light traps.

Few bats species were detected during the biological inventory, and none could accurately be identified to species by visual observation alone. Bat species determinations can be conducted by trapping (e.g., mist-netting, harp traps, etc.) or preferably via ultrasonic sensor detection of their calls. Trapping has the advantage of assessing the health of the individuals caught, but risks injury or stress to them and trapping has the added requirement of a CT DEEP permit acquisition. Ultrasonic detection is non-invasive and more comprehensive method of identifying mixed species congregations of foraging bats. Both approaches require qualified personnel.

Both of the headwater drainages on site have potential to harbor species of invertebrates of conservation concern. The stream fauna could be sampled using an established sample protocol for flowing streams. This would be an excellent activity to incorporate into a school science curriculum. Students could research the various stream sampling techniques, select one appropriate for the site, acquire the proper sampling equipment, conduct the sampling, collect the samples and have the samples analyzed by a qualified laboratory that would identify the collected fauna to the lowest taxonomic level possible. The numbers of species and their abundance could then be used by the students to learn about species diversity, abundance, and evenness, and other ecological metrics.



# Summary and Conclusions

## 5.1 Turkey Hill Preserve Summary and Conclusions

The results of the six month biodiversity survey of the Turkey Hill Preserve revealed that the study area hosts an array of species across multiple taxa, especially among the avifaunal and herpetofaunal groups within the vertebrates and among the Lepidoptera within the invertebrate groups. The total species richness of the area is expected to be even greater than what was detected during the 2013 survey, as some species and faunal groups are cryptic, nocturnal, fossorial, ephemeral, or exhibit a combination of these behaviors and thus pose species-specific detection and identification challenges. Nevertheless, the 2013 survey succeeded in identifying key species of conservation concern among all the habitats represented in the preserve, and a number of sensitive environmental receptors.

Priority habitats identified within THP and adjacent lands include mixed hardwood forest interiors, riverine intermittent watercourses, seasonal pools, talus slopes, palustrine forested wetlands, a small permanent pond, and an early successional “old field” habitat. One or more of these habitats host a wide variety of species, often including species of conservation concern that have been identified in state, federal, or regional conservation plans. The presence of some of these species with specific state or federal designation may qualify the Site for habitat enhancement or improvement funding.

Should the town decide to consider allowing timber harvest on the property, it is recommended that the Town hire a certified forester to prepare a Forestry Management Plan. The plan would provide a long-term, multi-year framework for management, as time and resources allow. This framework, when integrated with the recommendations provided in Chapters 3 and 4 herein, would allow for effective stewardship of the preserve in such a way as to sustain the biodiversity and to maintain associated ecosystem services.

The Old Field area is reported by a member of the Conservation Commission to support Box Turtles, which are listed as Species of Special Concern in Connecticut and which require a combination of habitat types for its life history. Box Turtle home ranges often include ecotones between forest and field with proximal wetland systems. Although we did not see this species on site, the habitat appears to be suitable for their use and the site may contain a remnant population. Disturbance to the Old Field habitat should be minimized by implementing a conservation mowing protocol as discussed previously.

The preserve would likely serve as a suitable outdoor classroom for elementary and high-school level students interested in learning about Connecticut biodiversity. Its ease of access, proximity to town schools, and variety of habitats combine to make an optimal site for outdoor learning.

Further details regarding implementation and logistics of affecting specific management techniques (e.g., timber harvest, invasive species control programs, etc.) should be outlined and identified in project-specific step-down plans as needed or desired.

Based upon our findings, conservation and management recommendations for each of the major habitat groups on site can be summarized as follows:

### **Upland forested land**

- Many areas lacks structural diversity (poorly developed shrub and herbaceous layers) likely due to a combination of shading from mature trees and impact from White-tailed Deer over-browse
- There are stands of mature timber on site that may offer economic opportunity for timber harvest, but in some areas, general forestry practices may be hindered by steep slopes, numerous vernal pools (around which a wooded buffer of at least 200m should be maintained), and the presence/proximity of adjacent residential property.
- The mature forest areas supports forest interior bird species (e.g., Pileated and Hairy Woodpeckers, Hermit Thrush, Veery, Winter Wren, Ovenbird, Worm-eating Warbler, American Redstart, and Scarlet Tanager). Therefore a core area of mature forest should be retained as habitat for these species. However small gaps (less than an acre in size) can benefit forest interior-edge species such as Red-eyed Vireo, Northern Flicker, Eastern Wood Peewee,
- The Preserve is notable as a migratory bird stopover site. A high abundance of neotropical migrant passerines occur on the site during spring and autumn migration periods.
- Non-native invasive plants are distributed throughout the parcel. Gaps created in the forest canopy (either due to timber harvest or as a wildlife management strategy) would likely be colonized by invasive plants. Winged euonymus, Japanese Wineberry, Japanese stiltgrass, and Oriental Bittersweet are widely distributed on site. Autumn Olive, Garlic Mustard, Japanese Honeysuckle and others are locally common.
- Deer overbrowse impacts the quality of wildlife habitat . Deer exclosures adjacent to wetlands could improve upland cover, as could the creation of scattered brush piles, (salvaged limbs from storm trees) that allow light to penetrate to the forest floor but make it difficult for deer to forage in. The brush piles would also provide structural diversity to the vegetation communities that occur on site which are largely lacking dense shrub and subcanopy layers in the upland.
- Another strategy to add increased floristic structure to the shrub layer is to partially cut trees to form tip-overs that remain rooted and continue to grow but at a lower elevation.

### **Wetlands**

- The vegetation in the wetlands tends to be more structurally diverse (i.e., herbaceous, shrub, and subcanopy layers are present)
- High value and productive vernal pools occur on site and are used by obligate vernal pool species (dozens assessed to date). At least half of the total pools assessed are considered important (i.e., appear to support at least two obligate vernal pool spp.)

### **Watercourses**

- Three intermittent streams exist on site; these streams appear to lack a well-developed EPT community (insect orders of Ephemeroptera, Plecoptera, and Trichoptera) members of which are indicator species of high water quality. However their apparent absence in 2013 may likely be due to the low waterflows that occurred throughout much of the survey period. All three streams appear to be supported by groundwater discharge from areas mapped as GA Water Quality Classifications; therefore these streams are expected to have high water quality.

- The site straddles two separate watersheds. One stream system, that has palustrine forested wetlands in series with it, drains eventually to the Housatonic River. The other, which has less amounts of Palustrine Forested wetland coverage in series, drains to the Wepawaug River. Both of these receptor drainages sustain important fisheries. Therefore the water quality of the headwater streams on the Preserve should be protected.
- Wetlands/watercourse form headwaters of downstream and offsite perennial stream reaches that in turn support important fisheries. Wetlands on site should be protected and wooded buffers maintained around them in the uplands.

#### **Old Field**

- The Old Field edge is dominated by non-native invasive plants especially Autumn Olive, Multiflora Rose, and Oriental Bittersweet. Selective clearing and control of these plants can increase habitat value, if their structure is replaced by native analogous species.
- The center of the Old Field is a mixture of non-native and native grasses and forbs. Invasive plants do occur but are typically not dominant and are interspersed with dozens of species of high value native forbs and naturalized grasses.
- Some plants in the Old Field are extremely important food source for birds (such as *Setaria faberi*) which is an important winter food source for sparrows, or thistle which is very important for late summer nesting Goldfinches, etc. This field supports breeding American Goldfinch and breeding Indigo Buntings, and possible Field Sparrow.
- There is an abundance of nectar for pollinators (goldenrods, vervains, clovers, milkweed, asters and other composites) within the Old Field and therefore, a conservation mowing regime should be initiated here. At the very least, mowing here should be deferred until winter, and except for the hiking trails, the field should not be mowed each year. It is recommended that the vegetation community be re-assessed in response to the less frequent mowing, and changes made to the mowing regime as necessary to maintain the floristic diversity in this area.

#### **Old Field Pond**

The pond supports breeding Wood Duck, Mallards, Painted Turtle, and Common Snapping Turtle. No further vegetation removal around the pond edges is recommended, and standing dead wood adjacent or proximal to the pond should be retained as it eventually may be used by Wood Ducks for nesting as the interior wood rots and the trunks or large limbs become hollow.

#### **Trails**

- Minor adjustments to minimize impact to wetlands (e.g., at concave hillside seeps, between the two major vernal pools, etc.) is recommended. As a value added service, CAS personnel can meet Orange Conservation Commission members to walk the trails and identify these specific areas.
- Some trail segments now or formerly are/were poorly marked or confusing in some areas. Routine inspection is recommended to improve use of the trail to first-time visitors to the Preserve.
- Where trails traverse steep slopes, that can/should be avoided to prevent erosion (esp. if used for Mt. Bikers)
- Old refuse clean up needed in vicinity of the red and blue split

- Signage needed at alternate entrance?

### **Parking/Access Area**

To prevent un-wanted vehicle access to the center of the old field, boulders should be placed across the upper driveway/parking area. A secured metal bar gate should be added that can be opened to allow the mower or other trucks/equipment in and out for general maintenance. The lock access should be coordinated with town emergency personnel.

A parking area for a dozen or so cars is recommended to start to gauge the use and demand for access. Additionally, the parking area geometry should be assessed by a landscape architect in order to determine the best configuration for the accommodation of intended users including school buses. A landscape architect would also be useful when considering other issues such as proper drainage, lighting, signage and other parking lot amenities and appurtenances.

## **5.2 Benchmarks for Success**

Managers of the preserve should gauge the effectiveness of management activities, from both a social and science aspect. Feedback from the public could be one measure of success. Feedback can be solicited through response forms attached to or incorporated in newsletters, brochures, e-mailings, or as a link on the town website.

Hard data collected as a result of any monitoring efforts that may be implemented within the preserve could demonstrate and quantify the degree of success obtained from restoration or management efforts. Surveys could be generated and circulated to stakeholders to solicit feedback on restoration or management efforts completed. Measures of success that can be quantified include [but are not limited] to the following:

- Number of people involved as volunteers for stewardship
- Number of stewardship actions completed
- Populations of priority species stable or increasing
- Area impacted by invasive plants decreasing, and
- Native species richness, abundance, or diversity stable or increasing.

Sightings data collected from birders using the site and reporting their sightings to eBird could also be used as a measure of success. The data entered could be monitored over time to determine species richness trends across or within seasons, to document occurrences (frequency and duration) within the preserve and to illustrate trends. The names and contact information of people entering their sightings could help document site use for passive recreation.

Additional surveys of specific habitats should be conducted to generate a time series of trends. For instance, if timber harvests are conducted with the goal of improving wildlife habitat, then flora or fauna surveys at the treatment area before and after the harvest can be used to gauge success.

Regardless of the conservation and management measures adopted, the Turkey Hill Preserve is ecologically significant because of its size as a contiguous habitat block and it is the source of streams with expected high water quality streams that drain to perennial watercourses that in turn sustain important fisheries. Many stand to benefit from the multitude of passive recreation opportunities and ecosystem services that the site provides.

## Chapter 6

# Limitations

### 6.1 Limitations of the Turkey Hill Preserve natural resource survey

Connecticut Audubon Society's (CAS) natural resource survey was performed in accordance with generally accepted practices of other consulting natural resource specialists providing similar services during similar temporal and geographical conditions. CAS personnel observed the degree of care and skill generally exercised by other consulting natural resource specialists under similar circumstances and conditions. CAS findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion based upon the interpreted significance of the data gathered during the course of this assessment which was subject to the financial and temporal limitations specified in our proposal and subsequent contract with the Town of Orange. No other warranty, expressed or implied, is made.

The purpose of this study was to assess the biological site conditions, subject to the terms and limitations of the contractual agreement as well as seasonal conditions that may affect the detection and prevalence of biological diversity during the time of observation.

The observations described in this report were made on the dates referenced and under the conditions stated therein. Conditions observed and reported by CAS are based upon the visual inspections of surface conditions at the site during the specific date and time of observation. Such conditions are subject to change due to various environmental and circumstantial factors beyond the control of CAS. There may be variations between the results of this survey(s) and other past or future surveys due to these inherent environmental factors.

## Chapter 7

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Connecticut Audubon Society's annual Connecticut State of the Birds Reports (2006-present) describe Connecticut's environmental challenges, the Biological Conservation Unit (BCU) concept, the use of Conservation Priority species as biological indicators and recent issues surrounding Connecticut's forests and the species that depend on them. All issues are available for download at:

[www.ctaudubon.org/state-of-the-birds](http://www.ctaudubon.org/state-of-the-birds)



# Appendices

*Much of the terrain in Turkey Hill Preserve is too steep and boulder-strewn to have been of agricultural use in historic times. However, logging for production of charcoal was widespread in the region, the preserve's forested ridges, rock outcrops, and talus slopes were likely devoid of trees about a century ago.*

**Worm-eating Warbler**  
(*Helmitheros vermivorum*)



## Appendix I

# Turkey Hill Preserve Plant List

This list is comprised of plant species documented on site during plant community crosswalks conducted along various transects throughout the Turkey Hill Preserve. Transects were selected to be representative of site toposequences that occur on the property.

### Comprehensive List of Plants Identified at Turkey Hill Preserve Property in Orange, CT

Scientific name	Common Name	Family	Growth form	Notes
<i>Acer rubrum</i>	Red Maple	Sapindaceae	Tree	Seeds eaten by Evening Grosbeaks, Seedlings grazed by deer
<i>Acer saccharum</i>	Sugar Maple	Sapindaceae	Tree	Sap eaten by Yellow-bellied Sapsucker
<b><i>Acer platanoides</i></b>	<b>Norway Maple</b>	<b>Sapindaceae</b>	<b>Tree</b>	
<i>Achillea millefolium</i>	Yarrow	Asteraceae	Forb	
<i>Actaea pachypoda</i>	White Baneberry	Ranunculaceae	Forb	Fruits eaten by Ruffed Grouse
<i>Adiantum pedatum</i>	Maidenhair Fern	Pteridaceae	Forb	
<i>Agropyron repens</i>	Quackgrass	Poaceae	Grass	White-tailed Deer browse plants
<i>Agrostis sp.</i>	Purple Love grass	Poaceae	Grass	
<b><i>Ailanthus altissima</i></b>	<b>Tree of Heaven</b>	<b>Simaroubaceae</b>	<b>Tree</b>	<b>Non-native; Invasive</b>
<b><i>Alliaria petiolata</i></b>	<b>Garlic mustard</b>	<b>Brassicaceae</b>	<b>Forb</b>	<b>Non-native; Invasive</b>
<i>Allium tricoccum</i>	Wild Leek	Liliaceae	Forb	
<i>Alisma c.f. subcodatum</i>	Northern Water Plantain	Alismataceae	Forb	
<i>Alopecurus sp.</i>	Foxtail	Poaceae	Grass	
<i>Ambrosia artemisiifolia</i>	Ragweed	Asteraceae	Forb	An important winter food for Juncos, Sparrows, & goldfinch
<i>Amphicarpa bracteata</i>	Hog Peanut	Fabaceae	Liana	Seeds eaten by White-footed Mouse
<i>Apocynum sp.</i>	Dogbane sp.	Apocynaceae	Forb	
<b><i>Arctium minus</i></b>	<b>Common burdock</b>	<b>Asteraceae</b>	<b>Forb</b>	
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	Araceae	Forb	Fruit sometimes eaten by Wood Thrush
<b><i>Artemisia vulgaris</i></b>	<b>Common mugwort</b>	<b>Asteraceae</b>	<b>Forb</b>	
<i>Asclepias syriaca</i>	Field Milkweed	Apocynaceae	Forb	Nectar attracts almost every butterfly spp. Larval food for Monarch
<b><i>Barberis thunbergii</i></b>	<b>Japanese Barberry</b>	<b>Berberidaceae</b>	<b>Shrub</b>	<b>Invasive</b>
<i>Betula allegheniensis</i>	Yellow Birch	Betulaceae	Tree	Seeds eaten by Common Redpoll and Pine Siskins
<i>Betula lenta</i>	Black Birch	Betulaceae	Tree	Seeds eaten by Common Redpoll and Pine Siskins
<i>Betula populifolia</i>	Gray Birch	Betulaceae	Tree	Seeds eaten by Common Redpoll and Pine Siskins
<i>Bidens frondosa</i>	Beggar's Ticks		Forb	
<i>Bidens connata</i>	Swamp Beggar's Ticks		Forb	
<i>Boehmeria cylindrica</i>	False Nettle	Urticaceae	Forb	

<i>Caltha palustris</i>	Marsh Marigold	Ranunculaceae	Forb	
<i>Calystegia sepium</i>	Hedge False Bindweed	Convolvulaceae	Forb	
<i>Carex c.f. bomoidea</i>	Tussock -forming Sedge No. 1	Cyperaceae	Gramminoid	Seeds eaten by Mallards and Wood Duck
<i>Carex crinita</i>	Fringed Sedge	Cyperaceae	Gramminoid	Seeds eaten by Mallards and Wood Duck
<i>Carex hystericina</i>	Porcupine sedge	Cyperaceae	Gramminoid	Seeds eaten by Mallards and Wood Duck
<i>Carex c.f. stricta</i>	Tussock-forming Sedge No. 2	Cyperaceae	Gramminoid	Potential hostplant for Dun Skipper ( <i>Euphyes vestris</i> )?
<i>Carex sp.</i>	Undentified sp. in Laxiflora group	Cyperaceae	Gramminoid	Seeds eaten by Cardinal and various sparrows
<i>Carex pennsylvanica</i>	Pennsylvania Sedge	Cyperaceae	Gramminoid	
<i>Carpinus caroliniana</i>	American Hornbeam	Betulaceae	Tree	Deer browse twigs and foliage; beaver eat seeds, bark, and wood
<i>Carya cordiformis</i>	Bitternut Hickory	Juglandaceae	Tree	At least 18 bird species eat hickory nuts (typically crumbs left behind by Gray Squirrel feeding activity). Hickories are the
<i>Carya glabra</i>	Pignut Hickory	Juglandaceae	Tree	hostplant for Hickory Hairstreak ( <i>Satyrium caryaevorum</i> )
<i>Carya ovata</i>	Shagbark Hickory	Juglandaceae	Tree	
<b><i>Celastrus orbiculatus</i></b>	<b>Oriental Bittersweet</b>	Celastraceae	<b>Liana</b>	<b>Invasive</b>
<i>Chenopodium album</i>	Goosefoot		Forb	
<i>Chimaphila maculata</i>	Spotted Wintergreen	Ericaceae	Forb	
<i>Cinna sp.</i>	Wood Reed-grass	Poaceae	Gramminoid	
<i>Circaea sp.</i>	Enchanter's nightshade	Onagraceae	Liana	
<i>Cirsium discolor</i>	Field Thistle	Asteraceae	Forb	Food for American Goldfinch
<i>Clethra alnifolia</i>	Sweet Pepperbush	Clethraceae	Shrub	Used as nesting cover by songbirds
<i>Conopholis americana</i>	American Sqawroot	Orobanchaceae	Forb	Parasitic plant on oak roots
<i>Cornus ammomum</i>	Silky Dogwood	Cornaceae	Shrub	Berries eaten by Wood Duck, Cardinal, Evening Grosbeak
<i>Cuscuta sp.</i>	Dodder	Convolvulaceae	Liana	
<i>Cyperus esculentus</i>	Yellow nut sedge	Cyperaceae	Gramminoid	Fruits eaten by Mallard, Green-winged Teal, and Tree Sparrow
<i>Daucus carota</i>	Queen Annes Lace	Apiacea	Forb	
<i>Dianthus armeria</i>	Deptford pink	Caryophyllaceae	Forb	
<i>Dichanthelium clandestinum</i>	Deer tongue Grass	Poaceae	Gramminoid	
<i>Digitaria sanguinalis</i>	Crab Grass	Poaceae	Gramminoid	
<i>Dennstaedtia punctilobula</i>	Hay-scented Fern	Dennstaedtiaceae	Fern	
<i>Descampsia flexuosa</i>	Hairgrass	Poaceae	Gramminoid	
<i>Dryopteris sp.</i>	Wood Fern	Dryopteridaceae	Fern	
<i>Echinocloa crus-gali</i>	Barnyard Grass	Poaceae	Gramminoid	
<b><i>Elaeagnus umbellata</i></b>	<b>Autumn olive</b>	<b>Elaeagnaceae</b>	<b>Shrub</b>	<b>Invasive</b>
<i>Epilobium c.f. coloratum</i>	Willow Herb	Onayraceae	Forb	
<i>Equisetum arvense</i>	Field horsetail	Equisetaceae	Forb	
<i>Erechtites hieracifolius</i>	Pilewort, Burnweed			
<i>Erigeron canadensis</i>	Horseweed	Asteraceae	Forb	
<i>Erythronium americanum</i>	Trout Lily	Liliaceae	Forb	
<i>Euphorbia supina</i>	Milk Spurge		Forb	

<b><i>Euonymous alatus</i></b>	<b>Winged Euonymous</b>	<b>Celastraceae</b>	<b>Bush</b>	<b>Promontory</b>
<i>Eurybia divaricatta</i>	White wood aster	Asteraceae	Forb	
<i>Euthamia tenuifolia</i>	Grass-leaved goldenrod	Asteraceae	Forb	Plants eaten by cottontail rabbits, seeds eaten by goldfinches
<i>Fagus grandifolia</i>	American Beech	Fagaceae	Tree	Fruits eaten by Tufted Titmouse, Black Bear
<b><i>Fallopia japonica</i></b>	<b>Japanese Knotweed</b>		<b>Forb</b>	
<i>Fraxinus americana</i>	White Ash	Oleaceae	Tree	Seeds eaten by Wood Duck, Purple Finch; saplings used by Beaver
<i>Gallium c.f. boreale</i>	Northern Bedstraw	Rubiaceae	Forb	
<i>Gallium c.f. triflorum</i>	Sweet Bedstraw	Rubiaceae	Forb	
<i>Geranium sp.</i>	Wild Geranium	Geraniaceae	Forb	good nectar source for Spring Azure, Hobomok and Pepper and Salt Skippers; seeds eaten by Mourning Dove
<i>Geum sp.</i>	Avens	Rosaceae	Forb	
<i>Hamamelis virginianus</i>	Witch Hazel	Hamamelidaceae	Shrub	Seeds eaten by Ruffed Grouse, saplings eaten by White-tailed Deer
<i>Holcus lanatus</i>	Velvet Grass	Poaceae	Grass	
<i>Hypericum perforatum</i>	St. John's-wort	Clusiaceae	Forb	
<i>Impatiens capensis</i>	Jewelweed; Touch-me-not	Balsaminaceae	Forb	Flowers used for nectar by Ruby-throated Hummingbird
<i>Iris versicolor</i>	Blue Flag			
<i>Juncus tenuis</i>	Path Rush	Juncaceae	Gramminoid	
<i>Juniperus virginiana</i>	Red Cedar	Cupressaceae	Tree	Provides nesting cover and food for a variety of songbirds
<i>Kalmia latifolia</i>	Mountain Laurel	Ericaceae	Shrub	Provides nesting cover for a variety of songbirds
<i>Leersia virginica</i>		Poaceae	Gramminoid	
<i>Lemna sp.</i>	Duckweed	Araceae	Aquatic	Food for Wood Ducks and various dabbling ducks
<i>Liriodendron tulipifera</i>	Tulip Tree	Magnoliaceae	Tree	Seeds eaten by Northern Cardinal and Purple Finch
<i>Linaria vulgaris</i>	Butter and Eggs	Scrophulariaceae	Forb	
<i>Lindera benzoin</i>	Spicebush	Lauraceae	Shrub	Hostplant to Spicebush Swallowtail ( <i>Papilio troilus</i> )
<i>Lobelia cardinalis</i>	Cardinalflower	Campanulaceae	Forb	Nectar source for Ruby-throated Hummingbird
<i>Lobelia sp.</i>	Unidentified Lobelia	Campanulaceae	Forb	
<i>Lobelia c.f. inflata</i>	Indian Tobacco	Campanulaceae	Forb	Shore of pond
<b><i>Lonicera japonica</i></b>	<b>Japanese honeysuckle</b>	<b>Caprifoliaceae</b>	<b>Liana</b>	<b>Non-native; Invasive</b>
<i>Lotus corniculatus</i>	Bird'sfoot Trefoil	Fabaceae	Forb	
<i>Lycopus virginicus</i>	Virginia Bugleweed			
<i>Lysimachia nummularia</i>	Moneywort	Primulaceae	Forb	
<i>Lysimachia ciliata</i>	Fringed Loosestrife	Primulaceae	Forb	
<i>Mianthemum canadense</i>	Canada lilly	Liliaceae	Forb	
<i>Mianthemum racemosum</i>	False Solomon's seal	Liliaceae	Forb	Fruits eaten by Thrushes
<b><i>Microstegium vimineum</i></b>	<b>Japanese Stiltgrass</b>	<b>Poaceae</b>	<b>Gramminoid</b>	<b>Non-native; Invasive</b>
<i>Mimulus ringens</i>	Square-stemmed Monkeyflower	Scrophulariaceae	Forb	

<i>Mitchella repens</i>	Partridgeberry	Rubiaceae	Forb	Fruits eaten by Ruffed Grouse and Wild Turkey
<i>Monotropa uniflora</i>	Indianpipe	Ericaceae	Forb	
<i>Narcissus sp.</i>	Daffodil	Amaryllidaceae	Forb	
<i>Nyssa sylvatica</i>	Tupelo		Tree	Soft mast eaten by a variety of birds
<i>Onoclea sensibilis</i>	Sensitive Fern	Dryopteridaceae	Fern	
<i>Oenothera biennis</i>	Evening Primrose	Onagraceae	Forb	
<i>Osmunda cinamomea</i>	Cinnamon Fern	Osmundaceae	Fern	
<i>Osmunda regalis</i>	Royal Fern	Osmundaceae	Fern	
<i>Oxalis europea</i>	Wood Sorrel	Oxalidaceae	Forb	Seeds eaten by Junco and Savannah Sparrow
<i>Panicum dichotomifolium</i>		Poaceae	Grass	
<i>Parthenocissus quinquefolia</i>	Woodbine; Virginia Creeper	Vitaceae	Liana	fruits provide food for at least 35 bird species, esp. Mockingbird and Yellow-bellied Sapsucker
<i>Persicaria arifolium</i>	Halberd-leaved Tearthumb	Polygonaceae	Forb	
<i>Persicaria c.f. hydropiper</i>	Water Pepper	Polygonaceae	Forb	Seeds eaten by waterfowl (esp. Mallard, Northern Pintail, Blue-winged Teal); Wilson's Snipe, Red-winged Blackbird, Northern Cardinal, Redpoll, Fox Sparrow, Song Sparrow, Swamp Sparrow, and White-throated Sparrow
<i>Persicaria maculosa</i>	Lady's thumb	Polygonaceae	Forb	Seeds eaten by various sparrows, red-winged blackbird, and Mourning Dove
<i>Persicaria sagittata</i>	Arrow-leaved Tearthumb	Polygonaceae	Forb	
<i>Persicaria virginiana</i>	Virginia Jumpseed	Polygonaceae	Forb	
<b><i>Phalaris arundinacea</i></b>	<b>Reed Canary Grass</b>	<b>Poaceae</b>	<b>Grass</b>	<b>Invasive</b>
<i>Phleum pratense</i>	Timothy	Poaceae	Gramminoid	Seeds eaten by sparrows (Tree, Chipping, Song), juncos, and redpolls
<i>Phytolacca americana</i>	Pokeweed			
<i>Pinus strobus</i>	White Pine	Pinaceae	Tree	Pine nuts eaten by Wild Turkey, crossbills, grosbeaks, nuthatches, and wood peckers
<i>Pilea pumila</i>	Clearweed	Urticaceae	Forb	
<i>Plantago lanceolata</i>	English plantain	Plantaginaceae	Forb	Host plant for Baltimore checkerspot ( <i>Euphydryas phaeton</i> )
<i>Plantago major</i>	Common plantain	Plantaginaceae	Forb	Host plant for Baltimore checkerspot ( <i>Euphydryas phaeton</i> ); cottontails browse the foliage
<i>Platanus occidentalis</i>	Sycamore			
<i>Populus grandidentata</i>	Bigtooth Aspen	Salicaceae	Tree	Eaten by Beaver, seedlings eaten by deer
<i>Potentilla canadensis</i>	Dwarf Cinquefoil	Rosaceae	Forb	
<i>Polygonatum biflorum</i>	Solomon's Seal	Liliaceae	Forb	
<i>Polygonum scandens</i>	Climbing buckwheat	Polygonaceae	Liana	
<i>Poylstichium acrosticoides</i>	Christmas Fern	Dryopteridaceae	Fern	
<i>Polypodium virginianum</i>	Rock Polypody	Polypodiaceae	Fern	

<i>Prunus serotina</i>	Black Cherry	Rosaceae	Tree	At least 47 bird species consume the fruit. Hostplant of Eastern Tiger Swallowtail ( <i>Papilio glaucus</i> ); and Red-spotted Purple
<i>Pyrola americana</i>	Round-leaved Pyrola	Ericaceae	Forb	
<i>Quercus alba</i>	White Oak	Fagaceae	Tree	hostplant to Juvenal's Duskywing ( <i>Erynnis juvenalis</i> ), Banded Hairstreak ( <i>Satyrium calanus</i> ); at least 28 spp. of wildlife in the northeast consume the acorns
<i>Quercus palustris</i>	Pin Oak	Fagaceae	Tree	Acorns eaten by Wood Duck, Ruffed Grouse, Blue Jay, White-breasted Nuthatch, woodpeckers
<i>Quercus prinus</i>	Chestnut Oak	Fagaceae	Tree	Top of ridgeline
<i>Quercus rubra</i>	Red Oak	Fagaceae	Tree	Hostplant to Juvenal's Duskywing ( <i>Erynnis juvenalis</i> )
<i>Quercus velutina</i>	Black Oak	Fagaceae	Tree	Acorns eaten by Wood Duck, Ruffed Grouse, Blue Jay, White-breasted Nuthatch, woodpeckers
<i>Rhus copallinum</i>	Winged Sumac	Anacardiaceae	Shrub	Winter food source for birds; nectar source for Red-banded Hairstreak ( <i>Calycropis cecrops</i> ).
<b><i>Rosa multiflora</i></b>	<b>Multiflora Rose</b>	<b>Rosaceae</b>	<b>Shrub</b>	<b>Non-native, Invasive</b>
<b><i>Rubus phoenicolasius</i></b>	<b>Japanese Wineberry</b>	<b>Rosaceae</b>	<b>Shrub</b>	<b>Non-native, Invasive</b>
<i>Rubus alligheniensis</i>	Allegheny Blackberry	Rosaceae	Shrub	Fruits eaten by catbirds, cardinals, Pine Grosbeaks, Orchard Oriole and Brown Thrasher
<i>Rubus occidentalis</i>	Black Raspberry	Rosaceae	Shrub	Fruits eaten by a variety of songbirds and rodents; cover for small mammals and nesting songbirds. Good native alternative to replace Multiflora Rose
<b><i>Rumex acetosella</i></b>	<b>Sheep Sorrel</b>	<b>Polygonaceae</b>	<b>Forb</b>	<b>Invasive</b>
<i>Rumex crispus</i>	Curly Dock	Polygonaceae	Forb	
<i>Sambucus canadensis</i>	Elderberry	Adoxaceae	Shrub	Fruits provide food for at least 33 bird species
<i>Sanguinaria canadensis</i>	Bloodroot	Papaveraceae	Forb	
<i>Sassafras albidum</i>	Sassafras	Lauraceae	Tree	Fruits eaten by 22 bird species; preferred by Northern Catbird, Great-crested Flycatcher, Eastern Kingbird, Pileated Woodpecker
<i>Scirpus c.f. cyperinus</i>	Bullrush sp.	Cyperaceae	Gramminoid	
<i>Setaria faberii</i>	Foxtail Grass	Poaceae	Grass	Important winter food for sparrows
<i>Setaria c.f. glauca</i>	Yellow Foxtail	Poaceae	Grass	
<i>Silene latifolia</i>	White Campion	Caryophyllaceae	Forb	
<i>Sium suave</i>	Water Parsnip	Apiacea	Forb	
<i>Smilax c.f. rotundifolia</i>	Green Brier	Smilacaceae	Liana	Fruits eaten by Ruffed Grouse and Wild Turkey, Gray Catbird, Fish Crow, Northern Mockingbird, Swainson's Thrush
<i>Solanum dulcamara</i>	Nightshade	Solanaceae	Forb	
<i>Solidago rugosa</i>	Rough-stemmed Goldenrod	Asteraceae	Forb	Nectar source for a variety of Lepidoptera
<i>Solidago caesia</i>	Weath Goldenrod	Asteraceae	Forb	Nectar source for a variety of Lepidoptera

<i>Solidago canadensis</i>	Canada Goldenrod	Asteraceae	Forb	Nectar source for a variety of Lepidoptera
<i>Sparganium americanum</i>	Burrweed	Typhaceae	Forb	Fruits eaten by Mallard, Wood Duck, Muskrat
<i>Sphagnum sp.</i>	Sphagnum moss		moss	
<i>Streptopus amplexifolius</i>	Twisted Stalk	Liliaceae	Forb	
<i>Symphotrichum pilosum</i>	Hairy White Oldfield Aster	Asteraceae	Forb	Nectar source for a variety of Lepidoptera
<i>Symphotrichum racemosum</i>	Smooth White Oldfield Aster	Asteraceae	Forb	Nectar source for a variety of Lepidoptera
<i>Symplocarpus feotidus</i>	Skunk Cabbage	Araceae	Forb	
<i>Taxus</i>	Yew	Taxaceae	Shrub	
<i>Thalictrum pubescens</i>	Tall Meadow Rue	Ranunculaceae	Forb	
<i>Thelypteris noveboracensis</i>	New York Fern	Thelypteridaceae	Fern	
<i>Thelypteris palustris</i>	Marsh Fern	Thelypteridaceae	Fern	
<i>Toxicodendron radicans</i>	Poison Ivy	Anacardiaceae	Liana	Skin irritant but has wildlife value (berries eaten by catbird, chickadees, flicker, and Downy Woodpecker)
<i>Toxicodendron vernix</i>	Poison Sumac	Anacardiaceae	Tree	Poisonous to humans (highly toxic skin irritant) but has wildlife value as a food source (berries)
<i>Trientalis borealis</i>	Star flower	Primulaceae	Forb	
<i>Trifolium pratense</i>	Red Clover	Fabaceae	Forb	Hostplant to Eastern Tailed Blue ( <i>Everes comyntas</i> ); cottontails, Striped Skunk, and Wild Turkey eaten foliage
<i>Trifolium repens</i>	White Clover	Fabaceae	Forb	
<i>Trillium erectum</i>	Trillium		Forb	
<i>Tsuga canadensis</i>	Eastern Hemlock	Pinaceae	Tree	Seeds eaten by Pine Siskin, White-winged Crossbill
<i>Ulmus americana</i>	American Elm	Ulmaceae	Tree	Hostplant to the Morning Cloak ( <i>Nymphalis antiopa</i> ), and Question Mark ( <i>Polygonia interrogationis</i> ); seeds eaten by Wood Duck, Wild Turkey, Purple Finch, Rose-breasted Grosbeak
<i>Vaccinium corymbosum</i>	Highbush Blueberry	Ericaceae	Shrub	Fruits eaten by Ruffed Grouse, Eastern Bluebird, Gray Catbird, Scarlet Tanager
<i>Verbascum thapsus</i>	Common Mullein	Scrophulariaceae	Forb	
<i>Verbascum blattaria</i>	Moth Mullein	Scrophulariaceae	Forb	
<i>Verbena urticularia</i>	White Vervain	Verbenaceae	Forb	
<i>Verbena hastata</i>	Blue Vervain	Verbenaceae	Forb	Seeds eaten by Cardinal and Swamp Sparrow
<i>Viburnum acerfolium</i>	Maple-leaved Viburnum	Adoxaceae	Shrub	Fruits eaten by Ruffed Grouse, Cedar Waxwing
<i>Viburnum dentatum</i>	Northern Arrowwood	Adoxaceae	Shrub	Fruits eaten by a variety of songbirds
<i>Viburnum rafinesquianum</i>	Downy Arrowwood	Adoxaceae	Shrub	Fruits eaten by a variety of songbirds
<i>Viola pallens</i>	Northern White Violet	Violaceae	Forb	
<i>Unident. Viola sp. No. 1</i>	Violet	Violaceae	Forb	
<b><i>Vincetoxicum (rossicum?)</i></b>	<b>(Pale?) swallow-wort</b>	<b>Apocynaceae</b>	<b>Liana</b>	<b>Non-native, Invasive</b>

<i>Vitis labrusca</i>	Foxgrape	Vitaceae	Liana	fruits provide food for at least 52 bird species, esp. Ruffed Grouse, Turkey, Cardinal, Gray Catbird, Northern Mockingbird, American Robin, Fox Sparrow, Cedar Waxwing, Pileated Woodpecker
<i>Vitis riparia</i>	Riverbank Grape	Vitaceae	Liana	fruits provide food for at least 52 bird species, esp. Ruffed Grouse, Turkey, Cardinal, Gray Catbird, Northern Mockingbird, American Robin, Fox Sparrow, Cedar Waxwing, Pileated Woodpecker
<i>Woodwardia areolata</i>	Netted Chain Fern		Fern	

## Appendix II

# Turkey Hill Preserve Bird List

The following list represents an overview of the bird species observed in Turkey Hill Preserve during different times of the year. The protected status of species included in the Connecticut Endangered and Threatened Species Acts is included in the CT-ESA column ('E' = Endangered, 'T'=Threatened and 'SC'=Special Concern). Species of Greatest Conservation Need (GCN) as identified in the Connecticut Comprehensive Wildlife Conservation Strategy (CWCS) are included in that column ('MI'=Most Important, 'VI'=Very Important and 'I'=Important). The breeding status of possible, probable and confirmed breeders occurring in Turkey Hill Preserve is indicated in the BBS column ('C' = Confirmed, 'Pr' = Probable and 'Po' = Possible).

	CT-E	CWC	BBS	January	February	March	April	May	June	July	August	September	October	November	December
Canada Goose				X	-	X	-	X	X	-	X	-	X	X	X
Mute Swan				-	-	-	-	-	-	-	-	-	X	-	-
Snow Goose				-	-	-	-	-	-	-	-	-	-	-	-
Wood Duck			C	-	-	-	X	X	-	X	-	-	-	-	-
Mallard				-	X	-	X	X	-	-	-	-	-	-	-
Common Merganser		I		-	-	-	-	-	-	-	-	-	X	-	-
Wild Turkey			C	-	-	-	X	X	X	X	-	X	-	X	-
Common Loon	SC	VI		-	-	-	-	-	-	-	-	-	-	X	-
Double-crested Cormorant				-	-	-	-	X	-	-	X	X	X	X	-
Great Blue Heron		I		-	-	-	X	-	-	-	-	-	-	-	-
Great Egret	T	MI		-	-	-	-	X	-	-	-	-	-	-	-
Black Vulture				-	X	-	-	X	-	-	X	-	X	X	-
Turkey Vulture			Po	X	-	X	X	X	X	X	X	X	X	X	-
Osprey		I		-	-	-	-	X	-	-	-	X	X	X	-
Mississippi Kite				-	-	-	-	-	-	-	-	-	-	-	-
Bald Eagle	T	VI		-	-	-	-	-	-	-	-	X	X	X	X
Golden Eagle				-	-	-	-	-	-	-	-	X	X	X	-
Northern Harrier	E	MI		-	-	-	-	-	-	-	X	X	X	X	X
Sharp-shinned Hawk	E	VI		-	-	X	-	-	-	-	-	X	X	X	X
Cooper's Hawk		I	Pr	-	-	-	-	X	-	X	-	X	X	X	-
Northern Goshawk		I		-	-	-	-	-	-	-	-	-	X	X	X
Red-shouldered Hawk		I	Pr	-	-	X	X	X	X	-	X	X	X	X	X
Broad-winged Hawk	SC	I	Pr	-	-	-	X	X	-	X	-	X	X	X	-
Red-tailed Hawk			Pr	-	X	X	X	X	X	X	X	X	X	X	X
Rough-legged Hawk				-	-	-	-	-	-	-	-	-	-	X	-
American Kestrel	T	VI		-	-	-	X	-	-	-	-	X	X	X	X
Merlin				-	-	-	-	-	-	-	-	X	X	X	X
Peregrine Falcon	T	VI		-	-	-	-	-	-	-	-	X	X	X	X
Killdeer				-	-	X	X	-	-	-	-	-	-	X	-
Upland Sandpiper	E	MI		-	-	-	-	-	-	-	-	-	-	-	-









September 27, 2013

Anthony Zemba, Director of Conservation Services  
2325 Burr St.  
Fairfield, CT 06824

Dear Anthony,

Thank you for the invitation to walk the Turkey Hill Preserve in Orange, Connecticut. The following is a synopsis of our discussion regarding potential forest management on the property.

There are many areas at the Preserve where a commercial timber sale is feasible. The benefits to having a commercial timber sale in this area include:

- focusing increased sunlight and growing space on trees that remain following the sale;
- maintenance and/or improvement of vigor of individual trees, which may help to reduce future potential harm from storms or insects;
- increasing potential to establish desirable tree regeneration which is significantly lacking on the property;
- creating better access to the southern portion of the property, which can be used for recreational purposes following the sale;
- improving structural complexity and age diversity as regeneration becomes established;
- a potential educational opportunity to showcase sound stewardship; and
- potential revenue to the town to be able to put back into the property or expand other land management projects elsewhere.

Since this area is open to the public and it is a natural system, there are some potential challenges. Some of these include:

- access for roads and landings;
- potential safety concerns for hikers using the property if any of the established blue or red trail system is used for skidding;
- potential concern for increasing spread of invasive plant species;
- the need to create an appropriate buffer around water sources, vernal pools and wetland features;
- potential poor public opinion.

There are other many other aspects to having a timber sale that are not included in this letter. The ones listed are the most relevant for this area, I believe. If you or anyone from the Town of Orange is interested in discussing forest management on this property further, please feel free to contact me.

Thank you again for the opportunity to comment on this.

Sincerely,

Eric Hansen

