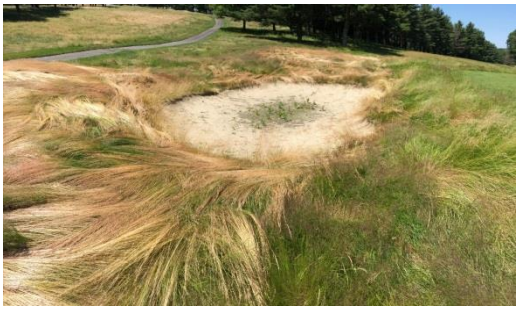
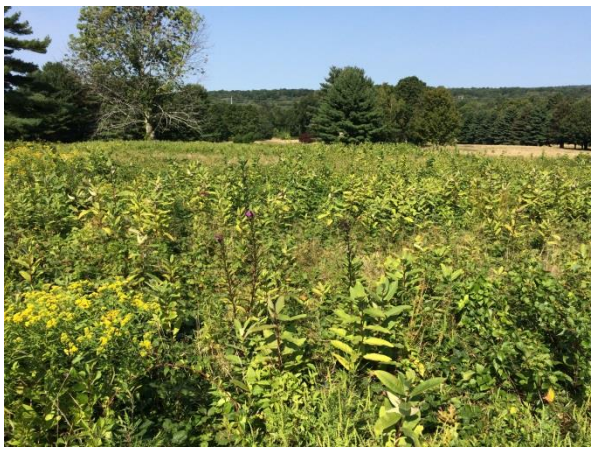
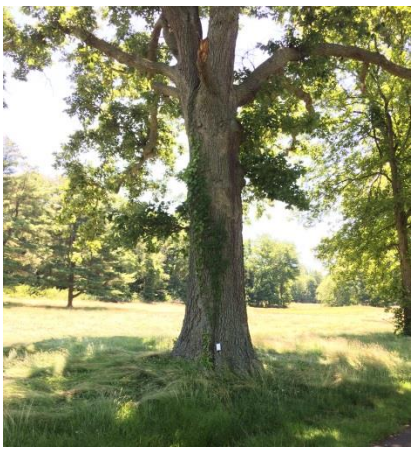
RAPID BIOLOGICAL AND ECOLOGICAL ASSESSMENT OF THE COUNTRY CLUB OF WOODBRIDGE, WOODBRIDGE, CONNECTICUT, WITH PRELIMINARY MANAGEMENT RECOMMENDATIONS

Prepared by

William H. Moorhead III, Consulting Botanist & Plant Community Ecologist

For

Beth Heller, First Selectwoman and Tony Genovese, Director of Finance

11 Meetinghouse Lane

Woodbridge, CT 06525

January 23, 2018

Table of Contents

Appendices

Introduction

The over-arching purposes of this study were 1] biological and ecological inventory, to the extent possible over a limited period in mid- to late summer, of the Country Club of Woodbridge property (149± acres; "The Study Area", hereinafter), based on the on-site observations and the scientific knowledge of the investigators (the author, for plants, habitats, plant communities, and wildlife biologist James Fischer for animals), and 2] develop short term and long term management recommendations that are consistent with the preservation or enhancement of the biological and ecological resources we identify in the Study Area. The specific objectives of this project were as follows:

i. Identify and characterize the habitats of the Study Area at a specific point in time and identify potential habitat (i.e., "Critical Habitat",as designated in the CTDEEP 2009 "Critical Habitats" GIS coverage[1] and in the 2015 Connecticut Wildlife Action Plan[2]) for State-listed[3] species and species of Greatest Conservation Need (i.e., "GCN species") within the Study Area;

ii. Identify Greatest Conservation Need wildlife and plants detectable at the time of the survey within the Study Area;

iii. Identify any species detectable at the time of the survey within the Study Area that are listed in Connecticut as Endangered, Threatened, or Special Concern[4];

iv. Identify any significant plant communities (rare, uncommon, exemplary) that are not one of the habitats addressed in Objective 1 above;

v. Organize and interpret information gathered to maximize as much as possible its utility in the development of long and short-term management strategies for Country Club of Woodbridge; and

vi. Evaluate the potential impacts to native wildlife and plant species, habitats, and natural communities of the following proposed short-term management actions:

   a. Creation and maintenance of grassy paths between the existing cart paths
   b. Mowing of entire golf course in the late fall of 2017

vii. Develop recommendations for long-term management of the golf course

[1] CT-DEP 2009. Critical habitats. Connecticut Dept. of Environmental Protection. Digital ESRI shape file, attribute table, and associated files. Available for download at URL: http://www.ct.gov/deep/cwp/view.asp?A=2698&Q=322898

[2] http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Review

[3] "State-listed" means listed in the Regulations of Connecticut State Agencies Sections 26-306-4 through 26-306-6, pursuant to Connecticut's Endangered Species Act (C.G.S.A. Sec. 26-303 through 26-316), as "Endangered", "Threatened", or "Special Concern

[4] State of CT, 2016

Approach

Field survey of Country Club of Woodbridge was conducted by the author, focusing on plants, habitats and plant communities, on July 2, 7, 9, and 22, August 20 and 27, and September 7 and 11, 2017 (15 hr, cumulatively). Field survey focusing on birds and wildlife (3.75 hr) was conducted by wildlife biologist James Fischer on July 2, 2017.

A meandering walk approach was selected due to the size of the property. All plants and wildlife encountered were catalogued during the walks. Vegetative communities were identified by soil conditions, slope and aspect of topography, plant species composition and structure. Wildlife species were detected by direct (by sight) or by indirect (call, scat, track, or other) observation. It should be emphasized that this is a very small survey effort, especially for wildlife, occurring during a narrow seasonal window (for both wildlife and plants). Therefore, the list of plant and animal taxa must be taken as preliminary, not a comprehensive biological inventory. Habitats and vegetative communities encountered in the Study Area were classified, using the 2015 Connecticut Wildlife Action Plan (CTDEEP 2015) and Metzler and Barrett's Vegetation of Connecticut (Metzler and Barrett 2006) as guides. Boundaries of habitats and vegetative communities were plotted, based on a combination of GPS data and aerial photo interpretation, resulting in the Habitat Map presented in Appendix 1.

Plant taxa observed by the author are presented in the tables in Appendices 3 and 4. James Fischer's and the author's animal observations are presented in that table in Appendix 5. Also included in this table are animals reported to have been observed by local birders Bruce and Jean Webber, and neighbor to the site Jeff Hughes, who fishes in the large pond.

As part of my analysis of the potential management options, I also visited a golf course in Petersham, Massachusetts, which was de-commissioned as a golf course nearly 5 years ago (i.e., 4⅔ growing seasons ago), and has been managed as a semi-natural area since, by its owner, Harvard Forest.

In the course of my analysis, I also consulted with a number of experts in various relevant fields in which I am not expert. A list of these persons is presented in the "Experts Consulted" section on page 25.

Results

Biological and Ecological Overview of the Study Area.

I recorded approximately 278 vascular plant taxa growing outside of cultivation in the Study Area (many of the trees on the golf course, native and non-native, were likely planted, but I am considering them to be plants growing outside of cultivation because they either were observed to be reproducing on the site, or may be expected to do so). Of these, about 181 taxa (65%) are native species, and of the 97 non-native species, 23 species are listed as Invasive or Potentially Invasive in Connecticut by the Connecticut Invasive Plant Working Group (CIPWG). Three non-native plants, Gray willow (*Salix cinerea* var.

oleifolia), Castor-aralia (*Kalopanax septemlobus*), and Wisteria (*Wisteria* sp.) occur in the Study Area that are on the CIPWG "Research List", which means they are suspected to be invasive in CT (data is being collected to help decide). In addition, there are two non-native plants that I would recommend treating as invasives (they are considered so in other nearby states): Northern Catalpa (*Catalpa speciosa*) and Japanese Spiraea (*Spiraea japonica*); the former is adventive in various places in the Study Area, while the latter only occurs as a planting in the garden areas, to my current knowledge. Though my vascular plant inventory includes all the taxa that I observed, it is not a comprehensive list for the Study Area – there probably are, for example, spring ephemeral plants that were not visible in mid-late summer, and plants that are rare in the Study Area and that did not happen to be along one of my routes of survey. I suspect a comprehensive taxa list would be at least several tens of taxa longer, probably exceeding 300 taxa.

State-listed Endangered, Threatened, and Special Concern Species.

James Fischer and I observed no State-listed plants or animals on the property, but a neighbor to the property reported having seen an Eastern Box Turtle (*Terrapene carolina carolina*) a few years ago near the largest pond. This species is listed as Special Concern in Connecticut. This report cannot be treated as incontrovertible documentation of its occurrence on the Study Area, it is reasonable that it could be found here, based on the habitat and the site's proximity to other documented sites.

Arbor Vitae (*Thuja occidentalis*) which occurs on the golf course portion of the Study Area almost certainly as a planting, is State-Endangered, but only native populations are treated as the Endangered entity. No native populations were ever documented from this part of the state.

Non-State-listed Plants of Conservation Concern/Interest.

Carex striatula (Lined Sedge) is not State-listed in Connecticut, but is considered a Regionally Rare species in New England, according to Flora Conservanda (Brumback et al. 2012), a document which addresses rare plants in a New England regional context . In New England, this species is only known from Connecticut. It is listed in Flora Conservanda as a Division 2 species, which means there are fewer than 20 recently observed (i.e., in last 20-25 years) stations in New England. I found a few individuals of this grass-like plant on a rocky, somewhat rich slope in the 13-acre upland forest in the northeastern portion of the Study Area. Though very few documented sites are known in Connecticut for this species, it has never been State-listed, presumably because it is very similar to a common woodland sedge, *Carex laxiflora*, and it has been surmised that it may have been overlooked and is more common than the few observations suggest. However, it may indeed be a rare plant.

Eyebane Sandmat (*Euphorbia nutans*) is not State-listed in Connecticut, but is considered an Indeterminate Taxon in New England, according to Flora Conservanda (Brumback et al. 2012). This means that there is reason to suspect that it is regionally rare (due to there being very few very records for it in the regional herbaria), but more survey is needed to confirm its rarity. I observed it in the

disturbed area around the cellular tower on the east edge of the Study Area. This was the first time I have encountered this species in Connecticut in my ~29 years of botanizing.

Critical Habitats and Associated Species of Greatest Conservation Need (GCN species)

Critical Habitats

I identified no unqualified occurrences of a Critical Habitat in the Study Area. However, there is one 0.2-acre near the northeast corner of the Study Area where a leveled deposit of sand, gravel, and broken tarmac at the former location of a tennis court supports a plant community that is essentially a Sandplain Grassland community, a Subtype of the Sand Barren Critical Habitat (see middle left photo on title page). The dominant species in this area is the GCN grass species, Little Bluestem (*Schizachyrium scoparium*). This man-made Sand Barren occurs in mosaic with a larger dry grassland dominated by cool-season grasses, and both together comprise one of higher existing concentrations of broad-leaved herbaceous pollinator resource plants (see Fig. 1).

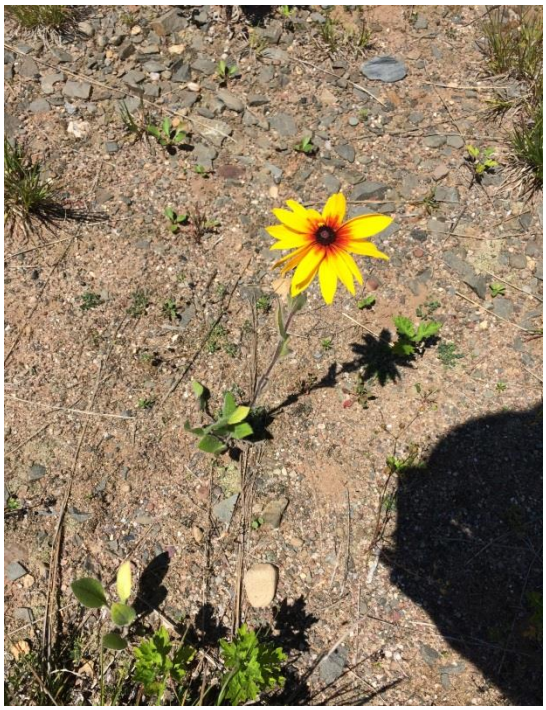


Figure 1. "Autumn Colors" cultivar of Black-eyed Susan (*Rudbeckia hirta*) growing in the Sand Barren on site of former tennis court. This is a high-pollinator-value North American native that is not native to CT.

Cool-season Grasslands, in spite of their being, by definition, dominated by non-native grasses, are considered a Critical Habitat in Connecticut, primarily because of their value, when large enough, as nesting sites for area-sensitive grassland-nesting GCN birds . The fairways and roughs of the golf course are dominated by non-native cool-season grasses. The dry-mesic sites are dominated by Red Fescue (*Festuca rubra*) and Rhode Island Bent (*Agrostis capillaris*), with an admixture of Kentucky Bluegrass (*Poa pratensis*). The mesic and wet-mesic sites are dominated by Creeping Bent (*Agrostis stolonifera*), with Perennial Rye (*Lolium perenne*) and Velvet Bentgrass (*Agrostis canina*) co-dominant or replacing it in some areas[5]. However, whether or not a cool-season grassland is considered an actual Critical Habitat is contingent upon the size of the patch of grassland that is unbroken by concentrations of trees and/or shrubs (i.e, "hedgerows", broadly speaking). The reason for this qualification is that among the most important GCN species for which cool-season grasslands are Critical Habitat are so-called "area-sensitive" grassland-nesting birds, such a Bobolink, Eastern Meadowlark, Savannah Sparrow, Grasshopper Sparrow, Upland Sandpiper, etc. These species require a minimum size patch of unbroken grassland before they will set up nesting territories. Bobolink requires the

[5]These cool-season grasses are all non-native, but are not considered invasive in our region (Creeping Bent is considered invasive in some parts of North America).

smallest minimum size patch, 5-10 acres, while the others require 15-20, 20-40, 30, and 150 acres, respectively, and patch shape matters also – generally, there needs to be as low a perimeter-to-area ratio (e.g., a square or round patch of 5-10 acres will be favored over an oblong 5-10 acres in which no part of the open patch is very far from a hedgerow or forest edge). In the golf course portion of the Study Area, fairways are mostly divided by loose to dense lines of large trees, and thus the open patches tend to be oblong and only up to about 5 acres, maximum. Thus, the golf course can be said to be a potential and/or a partial Critical Habitat: potential, because it easily be can be made into a larger unbroken patches of cool-season grassland, by the removal of existing trees; partial, because it is suitable habitat as is for other CGN species that are not as area-sensitive (e.g., reptiles) as the grassland-nesting birds. Cool-season Grassland occupies a cumulative 84± acres of the study area. It is the largest single habitat\vegetation unit in terms of area (see top left photo on title page).

"Upland Woodland and Shrub: Reverting Field and Early successional Shrubland" is a Critical Habitat that is represented by, in the central portion of the golf course, a 0.8-acre patch of low shrub-vine-forb thicket (see Fig. 2) which appears either to have gone un-mowed for several years running, or perhaps to have been mowed only a few times in the last 10 years or so. In this area, which was once cool-season grassland (judging by historic aerial photos), is now co-dominated generally by the low woody vines, Dewberry (*Rubus flagellaris*), Oriental Bttersweet (*Celastrus orbiculatus*), and Poison Ivy (*Toxicodendron radicans*), and in parts also dominated by the bush-blackberry *Rubus argutus* and tall forbs, such as Common Milkweed (*Ascelpias syriaca*), Grass-leaved Goldenrod (*Euthamia graminifolia*), and Fireweed (*Erechtites hierciifolia*) (the first two species are high-pollinator-value species). Though this area meets the definition of early successional shrubland, its significance as an occurrence of Critical Habitat is relatively low because of its small size and isolation from other similar habitat. It stands out, however, as an island of pollinator resource plants and fruit–bearing plants. Also, this area is instructive. It likely tells us how at least some portions of the golf course fairways would look after about a decade of infrequent mowing. It is therefore important to try to determine as precisely as possible what exactly the management has been in this area, and also determine the nature of the soils (moisture regime and drainage class, texture, pH, consistence and degree of compaction) and how similar they are to the rest of the golf course.

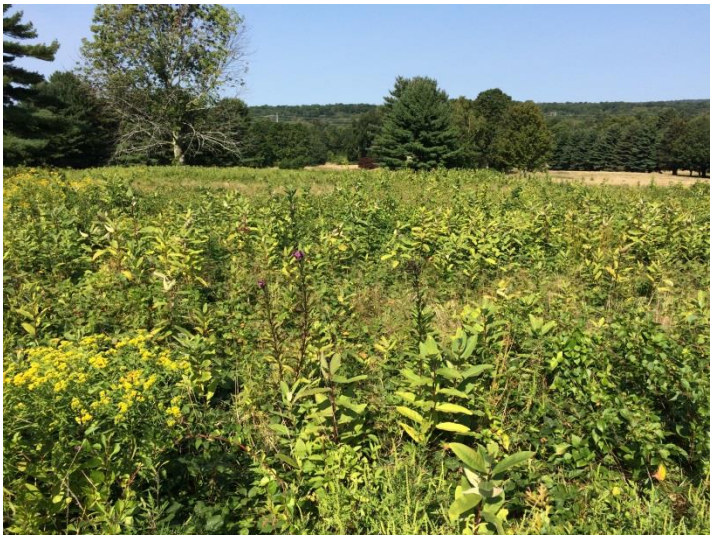


Figure 2. Early successional shrubland patch.

"Evergreen Forests" are a Critical Habitat in Connecticut. While the Study Area contains not extensive Evergreen Forest, there are a number of patches of mature evergreen trees, the dominant species being White Pine (*Pinus strobus*) and Eastern Red Cedar (*Juniperus virginiana*), and many scattered large individuals also. These patches likely fulfill some of the wildlife-supporting functions that are the reasons Evergreen Forests are considered a Critical Habitat. Among these functions are roosting/hiding

sites, especially in the winter and migration, and abundant production of fruit and hard mast, important fall and winter foods for birds and wildlife.

GCN Species

In the Study Area, James Fischer and I documented 10 GCN plants and 3 GCN birds. Two additional GCN birds were observed by the Webbers, and one GCN reptile (Eastern Box Turtle, also State-Special Concern, discussed above) was reported observed within the last few years by site neighbor Mr. Hughes. See "GCN species" column in Appendices 4 and 5 for the full list of GCN species observed and reported to us, to-date .

Existing Plant Communities

As part of this rapid assessment, I walked the entire Study Area and classified the habitats and vegetation, using Vegetation Classification for Connecticut (Metzler & Barrett 2006) and the 2015 WAP (CTDEEP 2015) as my primary guides. There are 37 habitat/vegetation units in the resulting classification, from which I synthesized 35 mappable "Map Units", listed in the Key to Woodbridge Country Club Habitat Map in Appendix 2, and delineated on the Habitat Map in Appendix 1. The table in Appendix 3 presents the plants recorded in each of the habitat/vegetation classification units. The dominant units, in terms of area, are the Cool-season Grassland (84± ac) and Upland Oak Forest Community Approaching Old-Growth Conditions (13± ac), and the Deciduous, Mixed and Evergreen Parklike Woodlands in the golf course roughs (17± ac, collectively), Developed and Landscaped Areas (8 ac), and Pond (3 ac). The 26 other habitat/vegetation units cumulatively occupy the remaining 27 acres. The Cool-season Grassland and Parklike Woodlands together comprise a habitat that is best described as a "savanna": that is, a grassland with scattered mature trees and small groups of mature trees, wherein the tree cover is well subordinate to the open-canopy grassed habitat, but occupy a significant area (in this case, ~17%) and there are no extensive treeless areas.

Other Significant Biological Features

Deciduous Forest approaching old-growth condition. The 13-acre upland oak forest in the northeast corner of the Study Area is probably not quite old enough to classify as the Critical Habitat Old-Growth Forest, but it is approaching the widely accepted old-growth age threshold for eastern deciduous forest, 150 years. Moreover it already possesses or is well along in developing a number of old-growth forest characteristics. These include numerous large specimen trees, large downed wood in various stages of decomposition, good representation of all age classes of trees, and no evidence of logging in many years. This area appears to be closed canopy forest in 1934 aerial photographs (83 years ago), and therefore it is reasonable to surmise that the older canopy trees are well in excess of 100 years old.

Large numbers of open-grown native specimen trees. A prominent feature of the golf course portion of the Study Area is the large number of large native specimen trees (i.e., with trunk diameters in the 2 ft to 4+ ft range, except for the Red Cedar and Arbor Vitae), most of which have an open-grown habit, with large, full crowns. Well represented species include, in order of most abundant first, White Pine (*Pinus strobus*) Black Oak (*Quercus velutina*), White Oak (*Q. alba*), Red Oak (*Q. rubra*), Pin Oak (*Q. palustris*), Swamp White Oak (*Q. bicolor*), and Shagbark Hickory (*Carya ovata*), Eastern Red Cedar (*Juniperus virginiana* – the largest specimens of this species are less than 2 ft in trunk diameter), White Ash (*Fraxinus Americana*), Arbor Vitae (*Thuja occidentalis*), and Red Maple (*Acer rubrum*). The White Ash trees are being decimated by Emerald Ash Borer, and will likely not survive as a mature tree on the golf course unless the trees with less advanced infestations can be treated successfully with pesticide. Besides their significant contribution to the scenic and cultural appeal of the golf course, these large-crowned, open –grown trees produce a tremendous volume of hard mast and fruit of high value to wildlife. They also provide, as portions of the trees senesce and die, cavities of all sizes for cavity-nesting and cavity-roosting wildlife. Large snag trees and dead branches provide perching sites for hunting birds of prey.

Relatively low invasive plant populations. For me, the most surprising finding of this survey was the relatively low numbers of invasive plants in the Study Area, compared with what I would expect in a suburban Connecticut landscape near the coast. While there are at least 23 invasives plant species present in the Study Area, and there are small areas with heavy infestations, the invasive plants are not among the dominant species over the majority of the 149 acres. In the golf course portion of the Study Area I surmise that this is because of assiduous management of weeds by the managers while the golf course was in operation. In the 13-acre oak forest and other habitats, I am guessing that several factors may be at play, including good luck, perhaps most prominently. Whatever the reasons for the currently low invasive populations, it is reasonable to expect that they will increase over time in the absence of intensive management of the golf course as a golf course, and if there is no concerted effort to prevent that increase. The good news is that the prevention of the increase of invasives does not represent a massive undertaking of large scale attempted eradication followed by attempted restoration of degraded habitat, because the invasive populations are currently low. In my opinion, the current low invasives populations can be maintained at low levels or reduced with a reasonable expenditure of non-chemical methods, or a combination of non-chemical methods and very limited application of herbicides. The control work could be conducted by professionals, volunteers, or some combination of professionals and volunteers, depending on the resources that are available. I go into more detail on this subject in part III of the Long-term Management Recommendations section.

Probable nesting Northern Flickers (*Colaptes auratus*). Wildlife biologist Jamie Fischer detected Northern Flickers in the Study Area exhibiting beavior that strongly suggested they were tending young. The savanna habitat, together with the open sandy areas and adjacent mature forest, provide excellent breeding and foraging habitat for this declining breeder in Connecticut. It requires relatively large nesting cavities, which are provided by the numerous large trees.

Management Issues and Recommendations

Short-term Management Actions.

Creation and maintenance of grassy cross trails.

In conducting this assessment, we have assumed that maintenance mowing of trails would occur about once every two weeks during the growing season. We found no areas that should be avoided due to rare or uncommon plants or animals that would be impacted by mowing of paths. It is our conclusion that this management action will create no significant impact to existing vegetation and wildlife, assuming the following conditions are met.

a. The trails are not broader than 10-12 ft.
b. The trails do not represent more than a tiny percentage (i.e., < 3%)of the total grass or meadow area of the golf course.
c. The trails are first created during a seasonal window that avoids impacts to reptiles and nesting birds (i.e., Oct 16 – March 15).
d. The personnel that conduct the mowing of the trails are given training in the avoidance of turtles, snakes, bird nests, and fledgling birds (i.e., how to spot and recognize the turtles, etc., and how to move them when necessary), and are instructed to implement that training when mowing during the nesting and reptile activity seasons (i.e., March 15 – Oct 15).
e. The personnel that conduct the mowing of the trails are instructed to be on the look-out for and avoid reptiles, bird nests and fledgling birds.
f. The trails are situated on the landscape in such a way to avoid creating a soil erosion hazard (i.e., avoid siting paths such that the slope of the long axis of the path is greater than 15%).

Mowing of entire golf course in late fall 2017.

It is the author's understanding that a mowing of the entire grassy area of the golf course is tentatively planned for late fall 2017. It is our conclusion that this mowing would have no significant adverse impacts to the plants, animals, and plant communities we have identified at the golf course, assuming the following conditions are met.

- The mowing occurs not earlier than October 16th, and preferably after November 1st . The purpose of this restriction is to avoid impacts to reptiles, by timing the mowing late enough so that they are hibernating and no longer active. If we have an unusually warm October, it would especially be preferable to wait until November to mow.
- Clippings should be left in place. This will accomplish two purposes: 1) provide winter cover for small mammals, and 2) recycle the nutrients in the clippings to the soil. The latter purpose is especially important if, as I suspect, fertilizers are no longer going to be regularly applied to the golf course (my recommendation is that fertilizers no longer be applied).

Other short-term management actions.

I was not specifically asked to address the following issues, but suggest the following, based on my experience and observations on the property.

1. Prioritize and initiate on-going control of Mugwort (*Artemisia vulgaris*) as soon as possible. Fortunately, this species does not currently occupy large portions of the Study Area, but in my opinion, it is likely to increase rapidly to problem levels in the non-forested portion of the golf course property, unless aggressive measures are taken to control it soon. I personally favor non-herbicide methods, such as pulling and/or frequent cutting, but I know of no sensitive resources that would definitely be threatened by the use of herbicides to control this species. Because this species has very small seeds that are wind-dispersed, it will continue to colonize the property over time into the indefinite future, so on-going removal and control will be always be necessary to prevent its coming to dominate large portions of the non-forested portions of the golf course.

Long-term Management Recommendations.

Based on what I know of the Study Area to-date, I can, as a botanist, ecologist, and one interested in preservation of overall native biodiversity, make the following general long-term management recommendations for the Study Area property. More specific long term recommendations are difficult to make without more information about the animal use of the Study Area.

I. Manage the 13-acre northeastern upland forested portion of the Study Area to favor its development, over the next few decades, into old growth forest. This means no timber harvest or other cutting of trees. A hiking trail, and some cutting of fallen wood to keep the trail clear is acceptable.

II. Manage the currently un-forested portion of the golf course as some form, or forms, of non-forested habitat which has a large element of native fruit- and nut-bearing shrubs, pollinator-resource shrubs, and herbaceous pollinator-resource plants. This may include some or all of the following: cool-season grassland, warm-season grassland, meadow, shrubland, and early successional forest. This recommendation is based on my opinion that a large island of minimally managed non-forested habitat, in this geographic and landscape context, will serve a greater biodiversity function than a completely forested 149 acres. My rationale for this opinion is that virtually all the minimally managed, natural area open space in the Woodbridge area is forested. The only other significant acreage of open-canopy minimally managed habitat is the Eversource power transmission rights-of way (ROW), comprising ~130 acres in Woodbridge. The value and potential value of the Eversource ROW to biodiversity conservation is restricted by its physical dimensions (i.e., only 150 ft wide), landscape setting (i.e., much of it in very close proximity to development), condition of the vegetation (i.e., extensive infestations of invasives, especially Mugwort), and the likelihood Eversource will, over the next few years, convert 25-30+% of the ROW habitat to engineered gravel-paved roads and gravel-paved earthen 100 × 100 ft “work pads” for the large cranes that they are now using in the replacement and servicing of

the stanchions. Thus, if the ~87 acres of currently open-canopy habitat (~104 acres, including the semi-open interspersed woodlands) at the Woodbridge Country Club is converted to minimally managed "natural" open-canopy habitat, it will represent a major and unique addition to the habitats present in the Woodbridge area.

If native plants are planted at the site as part of its management (as opposed to letting them naturally emigrate into and increase on the site), the species that are planted should, in my opinion, be only species whose historic native distribution included this part of Connecticut. The plant species that are planted should not include State-listed Endangered, Threatened, or Special Concern species, unless their introduction to the site is part of a plan approved by CTDEEP for the restoration of such species, using native Connecticut stock of known provenance. The plant species that are planted on the site should not include native species that never occurred in this part of Connecticut in these kinds of habitats, according to the best evidence available. The plant species that are planted on the site should include uncommon native species only if the seeds or plants come from local sources (i.e., within about a 5-mile-radius). The great majority of the native species that are planted should be species that are common in this part of Connecticut.

Native fruit and nut bearing shrubs (including small trees such as Shadbush [*Amelanchier* spp.]) will naturally emigrate onto the site, primarily via birds and small mammals, and the habitat that will likely be colonized the fastest will be that under the existing trees, in which birds roost (especially the evergreen trees). Therefore, I would advise that mowing be discontinued in the habitat under the driplines of at least a large portion of the existing groups of trees, so that the native shrubs will be able to mature. If fruit and nut-bearing shrubs are planted on the site, I would advise targeting these same areas. Also, if it is decided that portions of the existing open grassland should be converted to shrubland [see discussion under Recommendation IV], then these areas could also be targeted for native shrub plantings. The most valuable shrubs are the native-to-Connecticut species of dogwoods (formerly all genus *Cornus*, now *Swida* and *Benthamidia*), Viburnums (genus *Viburnum*), hawthorns (genus *Crataegus*), Shad bush or juneberries (genus *Amelanchier* -- except for *A. spicata*, these will grow into small trees), winterberry (*Ilex verticillata*), hazelnuts (*Corylus americana* and *cornuta*), and native shrub willows (genus *Salix*), which are important early spring nectar- and pollen-source plants. Moisture regime and pH preferences vary among these species, so it will be helpful to have, at minimum, the below-mentioned soils inventory (see recommendation 7 below) of the site, and, if possible, have the plantings sited by an expert in landscaping with native plants.

III. Conduct aggressive on-going invasive plant control. In my opinion, all the existing invasive plants are controllable using non-chemical methods, if enough labor resources are made available. If those resources are not available, herbicide methods should be used that minimize the collateral damage to other vegetation by minimizing the areas over which herbicide is applied and the dosages that are applied. Inventory is needed (see below) to identify which invasive plants should be prioritized. In my opinion at present, Mugwort (*Artimesia vulgaris*) is likely the greatest threat to the open habitats and should be prioritized for control, but there are also at least 22 other invasive plants (including those classified as "Potentially Invasive"), two

species classified as "Research List" species, and two species (*Catalpa speciosa* and *Spiraea japonica*) that may soon be on one of these lists and should be treated as invasive, in my opinion. Consult the plant taxa table in Appendix 4, column headed "CIPWG Invasive Status" to see full list of Invasive, Potentially Invasive, and Research List species detected in the Study Area.

IV. Conserve existing large individuals and concentrations of mature Eastern Red Cedar (*Juniperus virginiana*), Arborvitae (*Thuja occidentalis*), Western Redcedar (*Thuja plicata*) and other associated evergreen trees that provide dense winter cover, for owls, especially. The fruit of Eastern Red Cedar is also an important food source for many songbirds.

V. Conserve open-grown and mostly native specimen trees, which include several oak species, hickories, maples, white pine, and a few other species, including non-native apple, Norway Spruce, and Honey Locust (the last not of specimen size, but having value as wildlife food and pollen and nectar source). These trees, besides being a cultural resource contributing to the beauty of the Study Area, are essential components of the savanna habitat type, which favors a certain set of birds, including the declining Northern Flicker. They are also highly productive of food for wildlife in the form of mast, seeds, and fruit. They provide now, and will increasing provide, snags and large dead branches that are sites for cavity-nesting birds and wildlife requiring all sizes of cavities. The snags and dead branches are also important perching sites for large birds of prey.

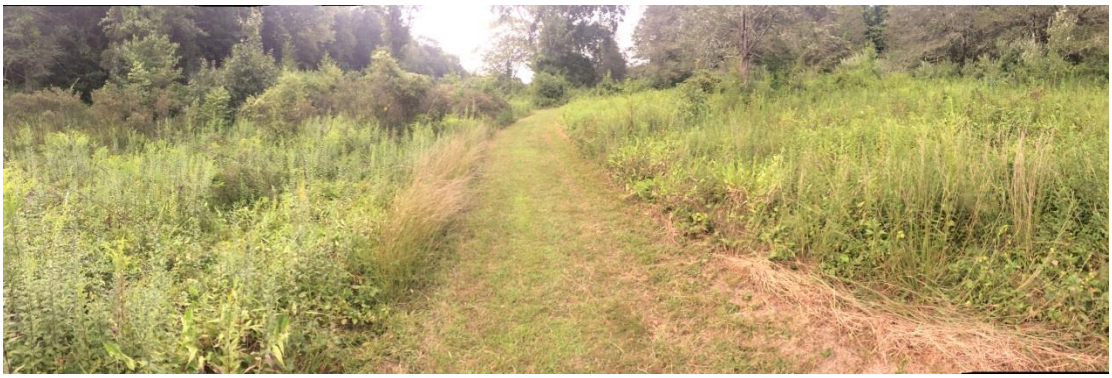


Figure 3. Early successional shrubland habitat on either side of mowed trail at Audubon Bent of the River Preserve in Southbury, CT. Shrubland-nesting bird habitat is maintained by bush-hogging a given area about every 4 years. No more than 25% of the total shrubland habitat is bush-hogged in any given year.

VI. The existing golf course savanna presents an opportunity to create two habitat types that would be suitable breeding habitat for two classes of GCN birds that birds that are declining and of high conservation concern: area-sensitive grassland-nesting birds and shrubland-nesting birds. Suitable breeding habitat for grassland-nesting birds could be created by sacrificing native specimen trees to create larger treeless grassland patches (a minimum of 20 acres is recommended), and then the grassland would need to be managed in such a way as to promote on-going dominance of grasses over forbs and low woody shrubs and vines (which may not be possible without periodic large-scale application of herbicide). Shrubland-nesting GCN birds do not require such large patches of habitat, and so sacrificing of specimen trees would not be

required; their breeding territories are on the order of 1-2 acres/pair, and so conversion of several existing fairways to shrubland (e.g., see Fig. 3 on previous page) would provide breeding habitat for a significant number of pairs of this class of songbird. There are significant ecological resource trade-offs involved in creating larger patches of grassland, and seemingly less of such costs associated with creating shrubland habitat (caveat: control of invasives may be more challenging in shrubland than in meadow or grassland habitat). However, there is one very important question that should be explored before embarking on the creation of either grassland or shrubland habitat that may attract specialist breeding birds, all of which nest on or close to the ground. There are several recent studies that suggest that when these habitats are within 1 km of significant development, the nesting success of these birds drops significantly, due to heightened predation on eggs and nestlings by nest parasites and predators that occur in higher concentrations in the vicinity of human development (e.g., cowbirds, house cats and feral cats, raccoons, skunks, deer, etc.). Areas where birds are attracted to breed but do not produce enough fledged birds to out-pace adult mortality are called "ecological sinks". Because of the landscape context of the golf course, no part of it is more than 0.5 km from developed suburban areas. Thus, judging from the above-mentioned studies, it may become an "ecological sink" for grassland and shrubland specialist birds that nest on or close to the ground, due to increased nest predation and parasitism occurring in such close proximity to development. If this became the case, then these habitat patches would actually be contributing to the decline of the grassland and shrubland specialist birds. I recommend considering very carefully this issue, and consulting about it with experts in bird habitat management (e.g., especially , CTDEEP-Wild life Division, The Connecticut Audubon Society, Audubon-Connecticut), before deciding to convert significant areas of the golf course to large patches of grassland and/or shrubland. Another important fact to keep in mind, in weighing the pros and cons of creating and maintaining large grassland patches for this purpose, is that there are many examples of grasslands in Connecticut which meet all the known requirements of area-sensitive grassland-nesting birds, but which have no breeding populations.

VII. Encourage a significant increase in native fruit- and nut-bearing shrubs and herbaceous pollinator-friendly (i.e., nectar and pollen source) plants. The primary negative legacy of many years of evidently skillful and conscientious traditional golf course maintenance is a remarkable dearth of broad-leaved herbaceous plants and shrubs in the golf course fairways and roughs between the fairways. If the currently unforested areas are mowed once/year or less, these plants should naturally invade these areas over time, as long as invasive species invasions are kept in check. If resources allow, however, planting of such shrubs and pollinator-friendly herbaceous plants will significantly increase the rate at which their populations will increase.

Only species known to be native to Connecticut should be used, but State-listed Endangered, Threatened, and Special Concern plants should not be planted. Additionally, some other uncommon Connecticut natives should not be planted, unless the plants or seeds come from nearby populations (see also part II, para. 2, above). The current list of State-listed Endangered, Threatened, and Special Concern plants is available on-line at http://www.ct.gov/deep/cwp/view.asp?a=2702&q=323482&deepNav_GID=1628 . Determining which uncommon plants should not be planted in the Study Area unless of local

provenance would require some research of the Connecticut botanical literature and collections. Some North American natives that are not Connecticut natives and that are not known or suspected to be invasive are promoted by bird and invertebrate conservationists, because they have such high value to birds and pollinators. The benefits of their use arguably outweigh any potential harm, but if part of the goal of management is to restore a native ecosystem to this part of Woodbridge, they should not be used. To see which plants are considered native to Connecticut, see the Connecticut Botanical Society's Native and Naturalized Vascular Plants of Connecticut Checklist , available from the Society in hard-copy and on-line at https://sites.google.com/a/conncoll.edu/vascular-plants-of-connecticut-checklist/?pli=1 .

Other species to avoid are plants that are native to somewhere else in North America but are currently listed[6] in Connecticut as Invasive, Potentially Invasive, or as Research List plants (see CIPWG website for lists of these species: https://cipwg.uconn.edu/). If seeds or plants for introduction to the golf course are obtained through a professional landscaper or horticulturist, it is important to specify that no State-listed rare plants be used and that otherwise only species common to this area be used, if the provenance of the material is not from Connecticut or is unknown. Currently, most landscapers and horticulturists often include State-listed plants in their planting lists, because it is not illegal to use them if the plants are not of Connecticut origin (it is illegal to sell or use Connecticut-origin State-listed rare plants in horticulture and landscaping). However, the use of non-Connecticut-native State-listed rare plants threatens the genetic integrity of the local native populations, many of which have not been discovered yet, and the creating of the un-natural populations confounds our efforts to identify the natural populations. Landscapers and horticulturists are currently for the most part oblivious to these issues, so it is important to specify no State-listed rare plants be used, and to check the planting lists to make sure that that specification has been followed.

Information needed to advise long-term management actions

There are few specific recommendations for long-term management actions that can be made without first acquiring more biological and ecological information about the Study Area. The following are specific recommendations for the types of information needed.

1. Complete the baseline inventory of native plants currently growing on the property that I have begun, by conducting a survey over at least one entire growing season and inventory the plants, with emphasis on detection of State-listed Endangered, Threatened, and Special Concern species, species of regional conservation concern that are not currently State-listed, uncommon species, GCN species.

2. Complete a baseline inventory of invasive plants, potentially invasive plants, and CIPWG "Research List" plants growing on the property. Based on this inventory, assess threats and prioritize for control those species most likely to increase and threaten the most important

[6] See Conneciticut Invasive Plant Working Group website, at http://cipwg.uconn.edu/

biological and ecological resources. Yearly monitoring and assessment of the status of invasive plants on the property is highly recommended, for at least the first 5 years of management of the Study Area as a non-golf-course, in order to identify those species that need the most attention.

3. Conduct an inventory of birds using the Study Area outside of breeding season, during fall migration, winter, and spring migration. I recommend surveys every 2 weeks from early September through April. Whenever it is possible to determine, the plant species that the birds are using and the way in which they are being used should be recorded (e.g., roosting, feeding on fruits or seeds, etc.). These surveys should continue over time, as the vegetation of Study Area changes, naturally and/or as a result of management and plantings. The fall, winter, and spring usage of the golf course, in its current expression as a treed savanna, will be vitally important information to have when considering whether to remove large trees to make larger un-treed patches.

4. Complete an inventory of birds currently breeding on the Study Area. This is an important parameter that is needed to advise decisions as to whether to convert large amounts of habitat from savanna to grassland, meadow, shrubland, and/or early successional forest habitat over time.

5. Conduct studies to determine the nesting success of birds that are nesting on or close to the ground in the Study Area. This is vitally important information that will advise whether to attempt to create habitat for area-sensitive grassland-nesting birds and nesting habitat for shrubland birds by removing large trees. It is also vitally important to continue these studies if and after such habitat is created.

6. Conduct survey for and inventory of State-listed and uncommon invertebrates associated with Sand Barrens and other sparsely vegetated sandy habitats. This survey should target especially the Sand Barren and its associated dry grassland, and sand traps and sand-trap-like habitats.

7. Have the soil characteristics of the golf course portion of the Study Area (excluding the forests) delineated by a professional soil scientist, based on field inspection (as opposed to being taken off the county soil survey maps). This is a vitally important data that will advise any planting of pollinator- and bird-friendly plants and prevent the investment in inappropriate species and prevent the planting of the wrong species in the wrong places. The most important soil parameters to delineate are drainage class, textural class, pH, consistence and degree of compaction, and whether the soil is fill over wetland.

8. Maintain a current map of habitats, plant communities, and cover types of the Study Area. This map should be updated and revised over time, as these entities change, both naturally and in response to management.

9. Establish and sample an array of permanent vegetation monitoring plots, in order to objectively measure and track the development of the vegetation over time. The number of and

distribution of plots should be such that variation within community types and habitats is captured and robust statistical analysis of the data is possible. In this way, changes in vegetation (or lack of change) can be accurately measured in spite of changes over time in the people doing the monitoring. Data collected should include photographs from permanent reference points, total floristic composition, relative abundances of each species, measurements of vegetation structure, and soil profile descriptions (this last may not be necessary if the Study Area soils have been mapped per recommendation 6 above) . Permanent vegetation plots are the surest way to detect negative changes as early as possible, and management can be adapted to counter such changes while they require smaller allocations of resources.

10. Conduct on-going inventory of pollinator insects and, when possible, the plants they are visiting. Because of the current dearth of pollinator plants at the golf course, it is unlikely that the existing species list of pollinators will provide much information regarding what potentially occurs on the property once pollen and nectar source plants are more abundant. Over time, as pollinator resources increase, so should the number and diversity of pollinator insects, and this may include species of conservation concern. Knowing what pollinators are present will help advise whether to continue or modify management actions.

Discussion of certain long-term management issues.

I have noted above that I believe the golf course portion of the Study Area should be managed as some form or forms of open, non-forested habitat, while simultaneously conserving the existing large trees. Also, it is my opinion that there is in the golf course ecosystem an un-natural and profound dearth of native fruit- and nut-bearing shrubs and broad-leaved herbaceous nectar- and pollen-source plants, which should be corrected. This may be corrected by some combination of management and introduction of these plants, depending on resources available to apply to the task. At minimum, the most essential management action required is control of invasives, in order to allow the desirable native plants to become established and persist, either naturally or with help by introduction, if resources allow.

However, there are other more complex management questions to think about which do not have one “right” answer. I discuss what are the most important of these below.

Maintaining grass dominance versus forb and low woody dominance.

As evidenced by the above-discussed 0.8-acre patch of early successional shrub-vine-forb thicket (see page 8), the natural course of development of vegetation over most of the golf course, in the absence of frequent mowing many times per year, is increase in forbs (i.e., broad-leaved herbaceous plants, or “wildflowers”), low woody vines and shrubs. In the absence of any disturbances such as periodic mowing, bush-hogging, or fire, the grasslands will likely gradually change to early successional shrublands, then young forest, and finally mature forest. The rate at which this occurs is highly dependent on soil type as well as frequency and type of disturbance, but my educated guess, based on superficial observation of the soils over much of the golf course, is that in the absence of any

manangement, the non-forested portions of the golf course would become closed-canopy young forest in 20-30 years.

As I have stated above (Section II under Long-term Management Recommendations), it is my opinion that at this geographic location biodiversity conservation would be better served if the currently non-forested portions of the golf course were prevented from developing into forest, and maintained as some form of open habitat. However, there are number of alternative habitat types that fall under that prescription.

One option is a grassland, dominated either by cool-season or warm-season grasses, or an admixture of both, with forbs and woody plants being well subordinate to the grasses in abundance. This is currently the community that occupies most of the non-forested portions of the golf course, and it has been maintained in that condition by mowing many times per year and the application of fertilizers and weed-killing herbicides (which selectively targets broad-leaved forbs and woody plants).

It is difficult to predict accurately how the floristic composition will change if the application of fertilizers and herbicides is permanently discontinued and the mowing frequency is reduced to once/year, because it depends mostly prominently upon properties of the soil (i.e., especially, moisture regime, pH, texture and consistence), which are not precisely known to me at this time. However, if the soil types present are not unusual in some way, and the golf course portion of the site behaves like most former grasslands (e.g., former lawns, hayfields, and pastures), I would expect that under a mowing regime of one mowing per year or less, and no application of herbicides or fertilizer, broad-leaved forbs and woody plants will increase and the relative dominance of grass will decrease.

Likely prominent among the woody plants will be ground-hugging vines and creeping shrubs, such as dewberries (*Rubus* spp.), Poison Ivy (*Toxicodendron radicans*), and the invasive Oriental Bittersweet (*Celastrus orbiculatus*). The dewberries are valuable to birds, reptiles, and pollinators, and poison ivy, though hostile to humans, is valuable to birds and other wildlife. Oriental Bittersweet has little value to animals. Shrubs and tree species will gradually increase also, but their abundance will be greater If the mowing frequency is less than once/year. There will be many native species among these trees and shrubs, but there will likely also be several invasives, such as Multiflora Rose (*Rosa multiflora*), one of the typically most aggressive old field invaders, but other invasive shrub species (See Appendices 3 and 4 for those already in the Study Area) may be prominent also, or instead of Multiflora Rose.

Among the broad-leaved forbs that will naturally increase in prominence will be species that are valuable to pollinators and birds, and likely also some invasive species. My best guess is that the most aggressive of these will be Mugwort (*Artemisia vulgaris*), but other old field invaders that are problematic on other sites are possible here also, such as the swallow-worts (*Cynanchum* spp.), which I did not see in the Study Area, and Canada Thistle (*Cirsium arvense*), which I did see in small numbers in the Study Area.

Thus, my educated guess, in the absence of detailed soil attribute information, is that, under a management regime of mowing once/year or less, and no general application of fertilizer and herbicides, the currently grass-dominated areas of the golf course will develop over time into meadows dominated by forbs, or co-dominated by forbs and grass, with a strong low woody vine component. There will also be a component of shrubs (especially bush-blackberries and raspberries [both *Rubus* spp.) and young trees that will survive but never become higher than is possible between mowings, and

this component will be more prominent if mowings are less than once/year. This meadow habitat, if invasive species are prevented from becoming the dominant species, will likely be extremely valuable to pollinators, birds, and other animals. However, because of the likely abundance of ground-hugging poison ivy and dewberries, and probably also bush-blackberries and raspberries, it will be a somewhat hostile habitat for most humans, best enjoyed from the safety of a trail. In areas where the mowing is less than once/year, and in the absence of pesticide application, there will potentially be large crops of blackberries and raspberries that can be enjoyed by foraging humans as well as wildlife.

Based on my observations of other sites and conversations with several knowledgeable persons involved in habitat management, such as Pete Piccone (CTDEEP Wildlife Division) and David Foster at Harvard Forest, it appears that in our geographic area , persistent dominance of grasses over the long term can likely only be achieved by frequent mowing (i.e., several times per year), periodic application of herbicide targeting forbs and woody plants, or grazing by livestock. However, from the point of view of maximum value to the largest number of pollinators, birds, and other wildlife, persistent dominance of grass is not as desirable as a meadow with an forbs and low woody plants dominant or co-dominant with grass. In my best judgment, persistent grass dominance is desirable primarily if the site is being made suitable for and attractive to area-sensitive grassland-breeding birds, and grass-dominated habitat is arguably more suitable winter foraging habitat for some birds of prey. Thus, there are significant habitat value trade-offs involved in trying to maintain grass dominated open areas, but these trade-offs might be judged worthwhile if one could be confident that it resulted in significant conservation of certain birds species of special concern. In weighing the pros and cons of creating and maintaining large grassland patches for this purpose, it is important to remember also that there are many examples of grasslands in Connecticut which meet all the known requirements of area-sensitive grassland-nesting birds, but have no breeding populations.

Sources of native shrubs and herbaceous pollinator-friendly plants to plant at the golf course.

My over-arching recommendation for golf course is to transform it, over time, from a golf course into a type or mosaic of types of native open or semi-open, unforested ecosystem, with the understanding that the natural historic vegetation of this site, without disturbance human disturbance, would be forest. It is certainly possible, but unknown whether this site was kept in an open or semi-open unforested condition by Native Americans, using fire and/or tree-girdling, prior to European settlement, but it was likely cleared fairly early in the colonial period and used for some combination of growing row crops and/or hay, and pasture until being turned into a golf course in the 20th century. During the pre-European period and during most of post-settlement period during which it was farmed, the site would have supported a largely native complement of forbs , vines, and shrubs that represented the local native genotypes. Non-native invasives did not begin to become important elements on the landscape until the end of the 19th century and early to mid-20th century. During the agricultural period, cool-season grasses would likely have been planted and become important by the late 1700s, and the native forbs and shrubs would have been largely restricted to fence rows, margins of fields, and pasture (in some measure). Native light-demanding forbs, shrubs, sedges, and possibly warm-season grasses have been abundant prior to European settlement, if the Native Americans kept the site open or semi-open. Thus, by “open or semi-open, unforested ecosystem”, what I mean is open or semi-open habitat that is

maintained in that unforested condition by human disturbance, but supports a native dominated plant assemblage, and that assemblage is preferably composed of local genotypes (with the exception of the cool-season grasses, if the site is not converted to warm-season grasses).

To achieve this, there are several approaches available. One can simply wait for the native plants to naturally expand from their small existing populations on the golf course, and naturally immigrate onto the golf course from off-site populations, all the while weeding out the invasive plants that also colonize the site. This will work, but it would likely be 5-10 years before high-pollinator-value forbs increase to significant abundance, and possibly 10-20 years before shrubs increase to the point of producing abundant fruit and nuts (blackberries and raspberries will likely increase faster). There are a number of valuable forbs and shrubs that may not occur close enough to the site to colonize it appreciably even over that time.

A second approach is to purchase and sow seed of high-pollinator-value forbs and purchase and plant potted shrubs of the desired species . The principal drawback of this approach is that there is currently no forb seed available whose origin is native Connecticut genotype, much less Woodbridge area plants.

Figure 4. Former fairway of a golf course in Petersham, MA, that was decommissioned ~5 years ago. The area in the photo has been mowed less than once/year, and there has been no introduction of plants. The dominant cool-season grasses are the same species as are found at Woodbridge Country Club. Colonizing forbs have increased to ca. 10-15% areal cover. The most prominent high-pollinator-value forbs include goldenrods (*Solidago* and *Euthamia* spp.), Annual Fleabane (*Erigeron annuus*), Yarrow (*Achillea millifolium*), and Common Milkweed (*Asclepias syriaca*). Woody colonizers are to-date very inconspicuous.

Also, the forb seed that is available from other parts of North America is expensive (e.g., ~$520 per acre's-worth, at recommended seeding rate). Both potted plants and shrubs grown from Connecticut genotype seeds or cuttings (though not necessarily from anywhere near Woodbridge) are available, from at least from one Connecticut nursery (Earth Tones, in Woodbury, CT), but this is an expensive approach except on a very small scale (the volume of material available would preclude large scale planting, anyway). Buying Connecticut genotype material from the likes of Earth Tones to plant on a small scale at the golf course, in order to create "founder populations", might be a good idea for desirable species that do not currently occur near the golf course and are unlikely to immigrate from far away.

A third approach is to collect seeds, and in some cases plugs or cuttings, from nearby wild populations of the desired species, propagate plants and transplant onto the golf course. This approach ensures as much as possible that the planted material is adapted to the local climate and soil conditions, and maintains the genetic integrity of the local populations of the native plants. This work could be performed entirely by a contractor with the right background and skills, by volunteers from the community and/or students from local schools, as a community project, or some combination of skilled contractor and adult or student volunteers. Guidance and technical assistance may be available at little or no cost from entities such as the Connecticut Botanical Society. Involving the community would encourage the community to appreciate the golf course as a valuable natural area and develop a sense of propriety and stewardship for the golf course and Woodbridge's natural heritage of native plants and wildlife. Plants for introduction to the golf course can be propagated and grown by volunteers and students in home backyards, or a school greenhouse or garden, or perhaps donated greenhouse space of a commercial nursery. Such a project would be highly educational for students. Depending on the scale of the project, this could accelerate by 5-10 years the rate at which the high-pollinator-value plants and fruit- and nut-bearing shrubs become significant components of the plant assemblage and provide substantial ecosystem services for wildlife and pollinators.

My recommendation is this third approach, together with , if resources allow, some purchasing and planting of Connecticut genotype material from the likes of Earth Tones, in order to create founder populations of some common species on the golf course quickly.

Warm-season versus cool season grassland

Warm-season grasses are grasses that accomplish photosynthesis (conversion of CO_2 to organic molecules, using the energy of light) by a different chemical pathway than cool-season grasses (i.e., "C4" versus "C3", respectively). This difference causes photosynthesis in warm-season grasses to be accomplished most efficiently under hotter and drier (or wetter) conditions than cool-season grasses. For this reason, warm-season grasses do not start growing until late spring, and reach their height of development in late summer and fall. Warm-season grasses all a "bunch grasses", i.e., they grow in a clump or tuft (as opposed to forming a turf), and they have deep roots, which is a drought-resisting adaptation in addition to the C4 photosynthetic pathway. Some of the warm-season grasses are also adapted to tolerate much lower soil fertility than cool-season grasses. Warm-season grasses reach their greatest development as a landscape-level vegetation in the tall-grass and short-grass prairies of the Great Plains. Several of these prairie species are also native to the east and Connecticut, and there are occurrences of what are essentially the same as short grass and tall grass prairie that occur, on a small scale, throughout Connecticut. These include *Schizachyrium scoparium* (Little Bluestem, max. ht. 6'), *Andropogon gerardii* (Big Bluestem, max. ht. 10'), *Sorghastrum nutans* (Indian Grass, max. ht. 8'), *Tridens flavus* (Purpletop, max. ht. 6'), *Panicum virgatum* (Switchgrass, max. ht. 10'), *Spartina pectinata* (Priairie cordgrass, max. ht. 8'), *Tripsacum dactyloides* (Eastern Gamagrass, max. ht. 7-13'), and several others. Except for Little Bluestem, which in Connecticut usually grows ~2-3 ft tall, all of these species can grow tall (in Connecticut, usually up to ~7 ft tall) on favorable soils. On sites that are subject to drought or to having seasonal high water table and/or flooding, especially if the soil is sandy, warm-season grasses

have a competitive advantage over most cool season grasses. On certain soils, warm-season grasses may grow codominant with some of the cool-seasons grasses. Both situations are found on a small portion of the golf course: Little Bluestem grows in some abundance on a steep west-facing slope, over a well-developed cool-season-dominated ground layer, and Little Bluestem dominates the poor soils of a former tennis court area, in the absence of any cool-season grasses. Little Bluestem's colonization of these sites has occurred "naturally", in the sense that it was not planted (or most likely not planted), and the genotype of the Little Bluestem plants here is most likely a local native genotype of this area.

Native-to-Connecticut genotypes of warm season grasses have been able to "naturally" colonize and become dominant on certain kinds of sites in Connecticut. I put "naturally" in quotes, because 99+% of all these grassland sites are sites that would support forest if not for periodic human disturbance to prevent their growing up into shrubland and finally forest, after a few decades. In these cases, "naturally" means that the warm-season grasses found their way to the sites and became established

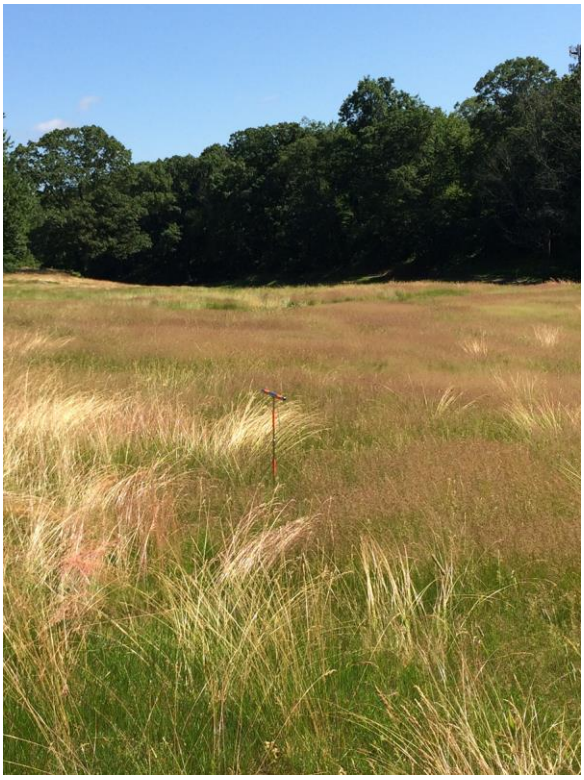


Figure 6. Typical cool-season grass height and density at the golf course in late July. Soil auger for scale is 3 ft high.

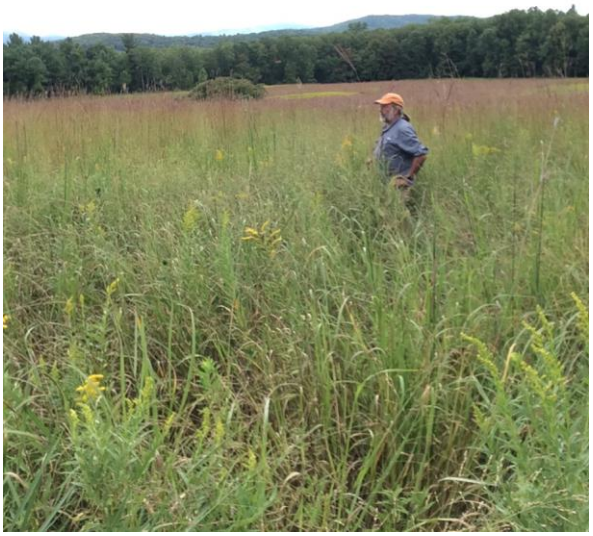


Figure 5. Big Bluestem and Indian Grass warm-season prairie on good dry-mesic sandy agricultural soils, in early September. Planted in a former corn field by CTDEEP about 20 yr ago in Canaan, CT. Person for scale is 6 ft high.

without being planted by humans. Sites where tall warm-season grasslands have developed "naturally" include certain sandy roadsides (especially near the coast towards the east), sandy small river floodplains (where soil is sandy but relatively nutrient -rich) both well-drained and with seasonally high water tables and/or flooding, thin and patchy soils on open rocky summits of traprock ridges and other "rich" rock types, sandy high-pH soil areas in northwest CT, and fields with various soil types very close to the coast, especially fields that transition into tidal wetlands. Tall warm-season grasslands appear to become more frequent on glacial till sites as you go east in CT, and the till becomes sandier. Little

Bluestem-dominated low warm-season grasslands (the eastern equivalent of short grass prairie) are more common than the tall grasslands, and occur on dry, sandy, acidic, low fertility sites throughout the state. Sometimes it is also found as a dominant species on sandy, acid sites that have a seasonally high water table and/or are seasonally flooded, and at the upper extreme of saline tidal flooding.

Cool-season grasses, which include all the non-native grasses that are currently dominant at the golf course, are "C3 grasses" that accomplish photosysnthesis most efficiently under cooler and moister conditions than the warm-season grasses. They begin growing early in the spring and accomplish most of the years productivity by mid- to late June, then stop growing during the hottest , and often driest part of summer and early fall. They have higher shallower root systems and higher water requirements than most warm-season grasses. Some of these species have a fall spurt of growth of vegetative shoots, after the temperatures lower and before the below-freezing weather. Many of the cool-season grasses are rhizomatous or stoloni ferous grasses that form turfs, and this is the reason they are favored for lawns, golf courses and playing fields, but some of the cool-season species are bunch grasses. None of the cool-season grasses that are commonly found on golf courses, lawns, hayfields, road rights-of-way, etc., are native to this part of North America (some species are thought to have varieties that are native to boreal and sub-arctic North America). On soils that are not too dry or too wet, such as some well-drained and moderately well-drained loams formed on deep glacial till, cool season grasses are competitive with warm-season grasses, and it is difficult for warm-season grasses to become established on many such sites without a substantial amount of human manipulation of the site, mainly in the form of killing off the cool-season grasses, by herbiciding or plowing, before sowing the warm-season grass seeds.

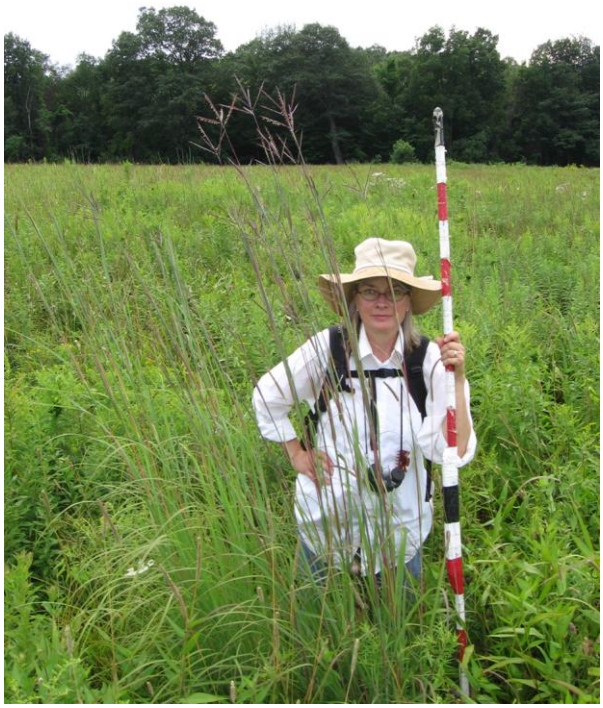


Figure 7. Big Bluestem plant in planted meadow in mid-August, on a mesic higher-pH loam. Striped pole is 6.6 ft high.

In recent decades, the desirability of converting cool-season grasslands that do not have existing grassland-nesting bird populations, former ag fields, and other open habitats to tall warm-season grassland has become accepted dogma among wildlife managers, habitat biologists, and other conservation land managers. Conversion of grasslands to native grasses is recommended without qualification by authorities such The Audubon Society and state fish and wildlife agencies. The main rationale for doing this is that a native-dominated habitat is better than a non-native-dominated habitat, because the rest of the players in the native ecosystem (i.e., the microbes, invertebrates, and wildlife) are adapted to make more and better use of native plants than of non-native. Consistent with this, two of the warm-season grasses, Big Bluestem and Little Bluestem, are obligate host plants for

two rare native moths of conservation concern. However, the scientific data that supports the above rationale was performed in other ecoregions of North America, mainly well west and south of us, and there is a dearth of rigorous biological inventory data from the Northeast to support the notion that man-made, planted tall warm-season grasslands support richer native invertebrate and wildlife assemblages than cool-season grasslands. Further, there is anecdotal and subjective observations to support the notion that the opposite (i.e., cool-season grasslands support a richer fauna than planted warm-season grasslands) is at least sometimes true. In addition, there is recent rigorous floristic inventory data from Long Island documents that planted tall warm-season grasslands there have less overall native floristic diversity than cool-season grasslands that are no longer managed intensively as hayfields, pasture, etc. In the case of both warm- and cool-season grasslands, the richness of the invertebrate assemblage is more a function of the robustness and diversity of the assemblage of high-pollinator-value plants (i.e., forbs and insect-pollinated woody plants), and the tall warm-season grasses are often competitive with, and suppress, the forbs and woody species (Wiegand, pers. comm.). The richness and robustness of the non-invertebrate wildlife community is more strongly correlated with the grassland structure (i.e., how high, how dense at different heights, how much open ground) than with the grass species present, and tall warm-season grasslands, on good agricultural soils such as I believe occupy most of the golf course, can grow taller and denser than is favored for many birds and other wildlife in our region (see Fig. 5).

For example, at the golf course, the ambient height of the grasslands was about 1.5 ft maximum in late summer 2017, and the disappearing point[7] at a few inches above the ground (see Fig. 2). For comparison, ~20 years ago CTDEEP Wildlife Division planted a ~20-acre warm-season grassland, in Canaan in a former agricultural field with loamy, high-pH, well-drained soils. The planting was a success, and with Big Bluestem and Indian Grass the dominant species, is now essentially an eastern version of a tall-grass prairie. In this grassland, the ambient height of the vegetation by late summer is ~6-7 feet high, with a disappearing point at about 3 feet high. In the ~20 years since it was made, this grassland has never been colonized by any area-sensitive grassland-nesting birds, in spite of its adequate size for Bobolink and Savannah Sparrow, and in spite of at least Bobolink having robust breeding populations nearby. There has been some colonization by high-pollinator-value forbs, but they are still quite subordinate to the dominant warm-season grasses. My subjective impression over the years has been of low diversity and abundance of butterflies and moths in the Canaan prairie. It is impossible to say with confidence exactly why Bobolinks have not colonized the site, but it is known that they are drawn to cool-season grasslands, which have an aspect, structure, and level of invertebrate activity in the spring that is dramatically different from that of the Cannaan prairie in the spring, when the birds are establishing their territories and nesting. In May, the Canaan prairie has the aspect of a sea of dead thatch, because the live shoots of the dominant warm-season grasses are barely emergent, while the live shoots of the year of cool-season grasslands are well-developed by May. Also, Bobolinks have a relatively long period of nesting and fledging young; toward the end of this period, in July, the prairie vegetation is becoming taller and denser than that in most cool-season grasslands.

[7] "disappearing point" is the height at which the vegetation is dense enough to hide a measuring stick when it is viewed from a moderate distance. It is a way of characterizing the density of grassland and meadow vegetation, for comparative purposes.

The Canaan prairie example is instructive, because I believe it illustrates the vegetation structure one may expect when the taller warm-season grasses are successfully established planted on well-drained to moderately well-drained loams with relatively high fertility, such as I suspect occupy much of the golf course. If converted to a warm-season grassland that includes the taller species, I believe the structure over most of the golf course will likely resemble that of the above-discussed prairie (see Fig . 1). The managers of the golf course should be prepared for this and consider the implications this structure would have for suitability of the habitat for wildlife, including reptiles and amphibians, small mammals, and the animals that prey on them.

A dense, tall grassland will likely not be suitable habitat for upland reptiles. Also, natural colonization by local native pollinator plants of a tall, dense grassland will likely occur at a much slower rate than the colonization of a lower, cool-season grassland. In addition, in order to encourage a rich invertebrate fauna, including especially pollinators, it would be important to include a substantial proportion of broad-leaved pollinator-resource plants (i.e, forbs) in the warm-season planting mix. However, it is important to remember that the tall warm-season grass species can out-compete the high-pollinator-value forbs (Fiely, pers. comm.). The short warm-season grass Little Bluestem is more "forb friendly" (Fiely, pers. comm.), but it does not do well on mesic loamy soils such as I suspect occupy most of the golf course (Piccone, pers. comm.).

Cost is another consideration in considering conversion of the golf course, or parts of it, to warm-season grassland. Special equipment is required to sow warm-season grasses, and the conventional wisdom is that the cool-season grasses must be eliminated, either by herbiciding or plowing and harrowing. There is at least one experiment currently underway, in Newtown in a former hayfield on a landscape and soils similar to the golf course, to test planting a warm-season grassland with a large proportion of pollinator plants, without first eliminating the cool-season grasses. It will be several years before the results are known. Based on conversations with several individuals with experience in this area and the quoted prices of seed mixes, the cost of conversion of cool-season grassland to warm-season grassland by the standard methods is on the order of $750-$2000/acre. The cost of converting the 83 acres of cool-season grassland at the golf course to warm-season grassland with a significant component of pollinator plants would be on the order $100,000-$200,000, if the conversion were performed entirely by private contractors. The CTDEEP Wildlife Division might well be interested in providing some help (i.e., equipment loan, possibly personnel), but the cost would likely still likely be the better part of $100,000 (e.g., the Ersnt Seeds Company warm-season and pollinator mix would cost $40,000+, at the recommended application rate).

It is important also to remember that <u>there are currently no seed mixes available that are comprised of our local Connecticut genotypes of the warm-season grass species</u>. The only seeds available for planting on the scale required to convert more than an acre or less to warm-season grassland or warm-season grassland plus pollinator plants are from native source populations no closer than Pennsylvania. Thus, in one sense, the planted warm-season grassland would be no more native to Woodbridge, CT, than is the cool-season grassland that exists there now. Also, I suspect the local genotype populations of the warm-season grasses are fairly small, so a very large population of introduced genotypes (e.g., if the entire 83 acres of cool-season grassland were converted to planted warm-season grassland), would likely threaten the genetic integrity of the local populations (grasses are wid-pollinated). The only planting

material currently available from native-to-Connecticut populations are plants grown from seeds collected from Connecticut populations of warm season grasses and pollinator plants (not necessarily from Woodbridge area genotypes). These Connecticut stock plants are available from some local native plant nurseries, such as Earth Tones in Woodbury, CT, and would only provide enough material for small scale introductions, though over time their populations would likely expand, if soil and habitat conditions favor these species. Also, local native populations of warm-season grasses could be located, seeds collected, and plants propagated for introduction to the golf course by volunteers, professionals, or a combination of the two, as discussed for forbs and woody plants in part II of the "Long-term Management Recommendations" section.

Taking all the above into consideration, my recommendation is to introduce the tall warm-season grasses on a small scale, if at all, and use Connecticut genotype material, available as plugs from the likes of Earth tones, in Woodbury, and/or that have been propagated from seeds collected from local native populations. If a larger scale conversion to warm-season grassland is desired, I recommend that it be done experimentally on a scale of no more than a few acres, at first, and this area be monitored for the level of use by wildlife and invertebrates, as compared with the unconverted cool-season grasslands.

Management Issues I am not qualified to address

Residual pesticides and herbicides.

Golf course management has traditionally included abundant use of persticides, herbicides, and fungicides, several of which contain heavy metals, such as mercury, which are toxic and persist in the soil, in some cases at high enough levels that the site should be remediated. These chemicals have typically been used most heavily on and around golf greens. Given that the golf course may come to be heavily used by people and their pets for passive recreation, an assessment of the residual levels of toxic chemicals is warranted. This type of investigation typically occurs in two phases. Phase 1 consists of a review of the records of applications of pesticides and herbicides at the golf course, and Phase 2 consists of actually sampling the soil at the golf course, and potentially entails considerable expense. If the Phase 1 investigation indicates that the records of application are complete and, based on the chemicals used and amounts applied, there are no potentially dangerous concentrations, then Phase 2 is deemed unnecessary. For the most part, residual heavy metals from pest/herb/fungicides are believed to stay in the soil, and not enter the food chain via uptake by plants. However, some plant species are exceptional in this respect, and take up and incorporate certain heavy metals into their tissues (creating what is referred to as "ecological risk"). These species are used in remediation of sites with polluted soil. I recommend that these species be researched and their planting at the golf course be avoided, at least until the levels of heavy metals in the soil is known or confidently surmised. My source of this summary information was Rusty Schmidt, who has been involved in a number of golf course decommissioning and "re-wilding", with Nelson, Pope & Voorhis. I recommend contacting him for further information on this subject.

Pond and discharge stream water quality.

Golf course ponds often are eutrophic, because of typically high levels of fertilizer application to the adjacent fairways, etc., and have higher levels of toxic copper because copper compounds have been used to kill algae in the ponds. Both conditions cause impacts to stream water quality and stream biota downstream of the ponds. I recommend that the level of copper in the ponds and outlet streams be assessed, in order to determine if remediation is necessary. Again I recommend contacting Rusty Schmidt for more information.

Experts Consulted

During this assessment, I consulted a number of experts in different areas. I listed these experts below. They are all available for further consultation.

Patrick Comins, Executive Director
The Connecticut Audubon Society
pcomins@ctaudubon.org

Mike Dudek, Land Manager
Audubon Sharon
Sharon, CT
(860) 464-0048 Ext. 112
mdudek@audubon.org

Earth Tones Native Plants
212 Grassy Hill Road
Woodbury, CT 06798
PHONE: (203) 263-6626
www.earthtonesnatives.com
Kyle and Lisa Turoczi specialize in growing native plant material from seeds collected from local wild populations, which they sell at their nursery and use in their all-native landscaping projects.

Mark Fiely, Horticulturist
Ersnt Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3311
https://www.ernstseed.com/about-ernst/

James Fischer, Wildlife Biologist
Litchfield, CT
(860) 567-0857
Jfischer973@gmail.com

David R. Foster, Ecologist
Harvard Forest
Petersham, MA
David has been heavily involved for the last 5 years in the "re-wilding" of a golf course in Petersham, MA. Her also has been involved in or followed the long term management of several other open-habitat sites elsewhere in MA and CT.

John Markelon, High School Horticulture Class Instructor
Litchfield High School
Litchfield, CT
markelon@optonline.net
Mark has, with his horticulture class students, conducted an on-going meadow restoration project for 7 years, involving the collection of seeds from local native populations of wildflowers, propagating thousands of young plants, and using them to create pollinator-friendly meadow in former cool-season lawn.

Michael Nadeau, Wholistic Land Care Consultant
michaelnadeau.org
men@michaelnadeau.org
203-395-8787
Michael specializes in invasives control and management of meadows and grassland without pesticides and herbicides.

Scott Personatti, Principal
Greenwoods Land Clearing Services
P.O. Box 569
Litchfield, CT 06759
(860) 567-3345
iride1107@yahoo.com
Scott conducts larger scale non-chemical mechanical invasive plant control, using land-clearing machinery.

Peter Piccone, Wildlife Habitat Biologist
CTDEEP-Wildlife Division
(860) 675-8130
peter.picone@ct.gov

Dennis Quinn, Herpetologist and Principal at Connecticut Herpetology
https://www.ctherpetology.com/

Rusty Schmidt, Landscape Ecologist
NELSON, POPE & VOORHIS, LLC
631-427-5665 x217
572 Walt Whitman Road
Melville, NY 11747
rschmidt@nelsonpopevoorhis.com
Rusty has extensive experience in closing and "re-wilding" of golf courses in the Midwest, prior to his recently relocating to The Northeast.

Glen Somogie, Land & Facility Manager
Audubon Center Bent of the River
185 East Flat Hill Rd
Southbury, CT 06488
203-264-5098
http://bentoftheriver.audubon.org/
Glen manages shrubland-bird-nesting habitat at the preserve.

Polly L. Wiegand, CCA
Ecologist
Central Pine Barrens Commission
624 Old Riverhead Rd
Westhampton Beach, NY 11978
(631) 563-0321
Polly.Wiegand@SCWA.com
Polly is also Executive Director of the Long Island Native Plant Initiative, a 7-year-old volunteer-driven non-profit whose mission is create a source of local native genotype plants and seed for use in nursery, landscaping, and habitat restoration activities.

Literature Cited

Connecticut, State of. 2016. Regulations of Connecticut State Agencies Sections 26-306-4 through 26-306-6. Connecticut Law Journal, Aug 2016.

CT-DEP 2009. Critical habitats. Connecticut Dept. of Environmental Protection. Digital ESRI shape file, attribute table, and associated files. Available for download at URL: http://www.ct.gov/deep/cwp/view.asp?A=2698&Q=322898

CTDEEP. 2015. Connecticut's Endangered, Threatened and Special Concern Species. 2015. State of Connecticut Department of Energy and Environmental Protection. Bureau of Natura Resources. Hartford, CT. 20 pp.

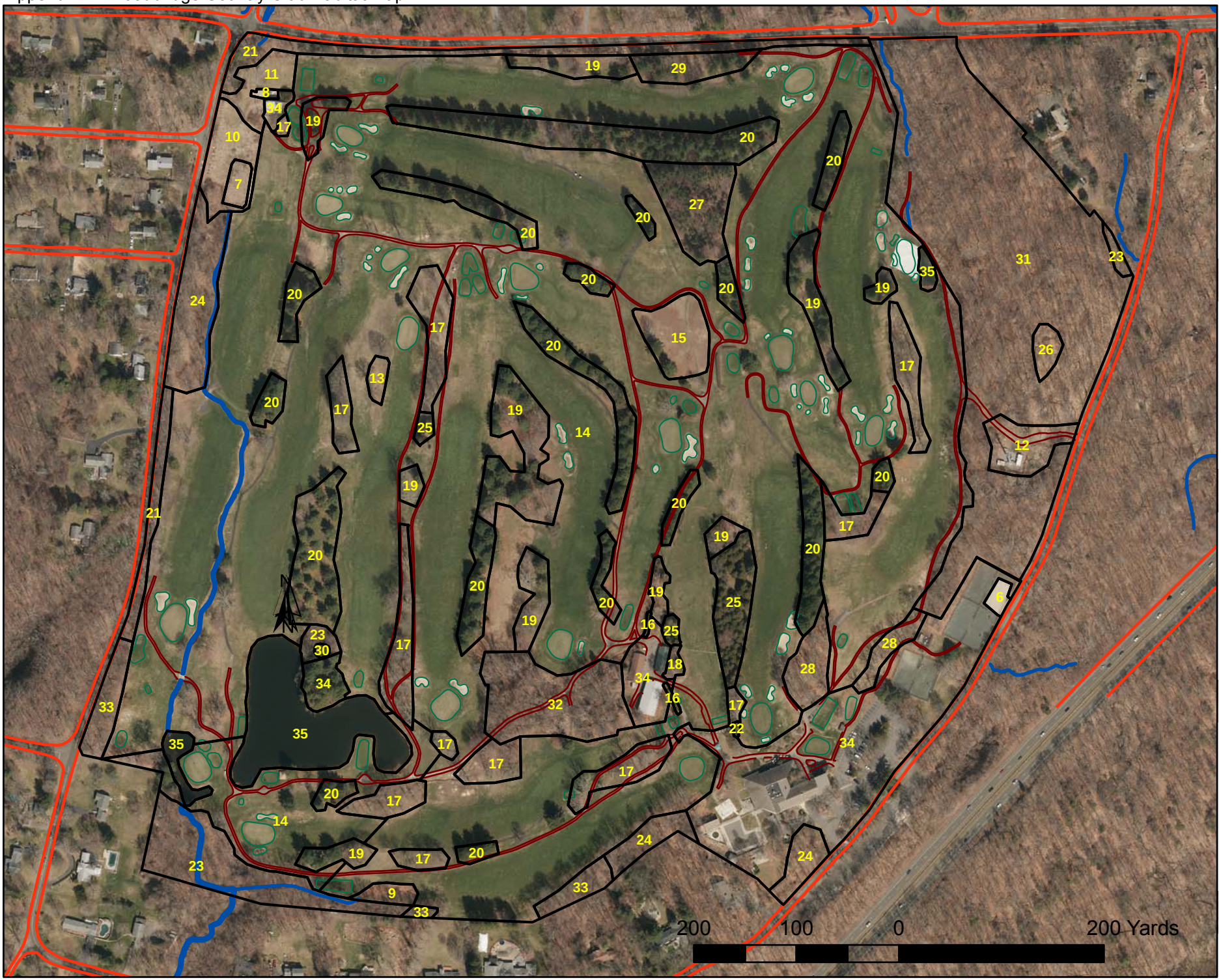
CTDEEP. 2015. Connecticut Wildlife Action Plan. State of Connecticut Department of Energy and Environmental Protection. Hartford, CT. Accessed June 2, 2016. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Review

Metzler, K.J. and J.P. Barrett. 2006. Vegetation classification for Connecticut: a preliminary classification. Connecticut Dept. of Environmental Protection. State Geological and Natural History Survey. Dept. of Environmental Protection. Hartford, CT. 109 pp.

NEPCoP. 2012. *Flora Conservanda*: New England 2012: The New England Plant Conservation Program (NEPCoP) List of Plants in Need of Conservation, 2012 edition. New England Wildflower Society, Framingham, MA. On-line publication. URL: http://www.newfs.org/protect/rare-plants-and-conservation/flora-conservanda

Appendix 1

Appendix 1. Woodbridge Country Club Habitat Map



Appendix 2

Appendix 2. Key to Woodbridge Country Club Habitat Map

Map Unit ID # (or Symbol when # not appearing on map)	Map Unit	Cumulative Acres	Physignomy
1 (dark blue double lines)	Watercourses	not determined	NA
2 (green sub-circles with green centers)	Greens	not determined	herbaceous
3 (green sub-rectangles)	Tees	not determined	herbaceous
4 (burgundy double lines)	Golf cart paths	not determined	asphalt and/or sparse herbaceous
5 (green polygons with light centers)	Sand Traps	not determined	sparse herbaceous
6	Open sand (volleyball court)	0.119	sparse herbaceous
7	Sand barren on former tennis court	0.192	sparse herbaceous
8	Open sand	0.044	sparse herbaceous
9	Wet meadow	0.213	herbaceous
10	Dry-mesic cool-season grassland/meadow	0.767	herbaceous
11	Mesic cool-season grassland/meadow	0.557	herbaceous
12	Disturbed meadow and edge habitat around communication tower	0.710	herbaceous
13	Warm-season grassland	0.148	herbaceous
14	Cool-season grassland	83.792	herbaceous
15	Blackberry-Dewberry-Milkweed meadow	0.879	low scrub
16	Arbor Vitae hedge	0.049	shrub thicket
17	Park-like deciduous woodland	4.470	woodland
18	Park-like mixed evergreen - deciduous woodland	0.088	woodland
19	Park-like mixed White Pine - deciduous woodland	4.274	woodland
20	Park-like White Pine woodland	8.256	woodland
21	Roadside deciduous forest hedge row/edge habitat	1.868	woodland
22	Arbor Vitae copse	0.018	forest
23	Deciduous forested wetland community	2.270	forest
24	Dry-mesic Sugar Maple - White Ash forest community	2.304	forest
25	Eastern Red Cedar tree concentrations	1.078	forest
26	Landscaping dump in deciduous forest	0.230	forest
27	Mixed White Pine - Sugar Maple - White Ash forest community	1.208	forest
28	Park-like deciduous forest	0.925	forest
29	Park-like mixed evergreen - deciduous forest	0.597	forest
30	Potential vernal pool	0.033	forest
31	Upland Oak forest community approaching old-growth conditions	13.029	forest
32	Wet-mesic deciduous forest community	2.085	forest
33	Wet-mesic Sugar Maple - White Ash forest community	0.942	forest
34	Developed and landscaped areas	7.974	developed
34	White Pine forest community	0.377	forest
35	Pond	3.044	open water

Appendix 3

Woodbridge CC Habitat Map Unit																																			
1	2	4	5	6	7	9	10	11	12	13	14	14	14, 16, 17-20, 22, 25, 28, 29	14, 17	14	14	15	21	23	23	23	23(+30)	24	24	27, 32	31	33	33	34	34	35	35	35			
Woodbridge CC Habitat /Community Type																																			
Open ditch/ water-course ca. SW ponds	Greens	Cart paths	Sand traps	Open sand (volleyball court)	Sand Barren	Wet Meadow	Dry-mesic grass-land ca. sand barren	Mesic (& dry-mesic?) meadows	Cell tower disturbed area	Warm season grass-land in rough	Fairways wet-mesic	Fairways - dry-mesic	Roughs - mesic & dry-mesic	Roughs - wet-mesic	Pond-side wet grass-land	Fairway wet draw-down "pannes"	Rubus - Milkweed meadow	Egdes (incl. forest edges not along roads)	Wetland forest	SW red maple swamp	Seepage forest in NE forest	Draw-down swamp adj to pond	Dry-mesic roadside forest on old roadway	Rocky Dry - mesic Sugar Maple-White Ash forest	Upland copses on golfcourse (prob not original forest)	Near old-growth oak forest complex	Wet-mesic A-F forest (ca. wet meadow)	Road-side wet-mesic forest	Gardens (incl. parking lot borders)	Tennis courts	Samller Ponds	Pond shore & bank	SW pond	LIFE FORM	Taxon	Common Name	Taxon Index #
													t												t	t								T	*Abies balsamea* (L.) P. Mill.	Balsam Fir	1
																						t		t	t								T	*Acer nigrum* Michx. f. × *Acer saccharum* Marsh.?	Sugar Maple x Black Maple hybrid	2
												t	t																				T	*Acer platanoides* L.	Norway Maple	3
																				t	**t**	**t**		t	**t**	t	**t**	**t**		h			T	*Acer rubrum* L.	Red Maple	4
													t										**t,s**	**t**	**t**	**t**		**t**						T	*Acer saccharum* Marsh. var. *saccharum*	Sugar Maple	5
													h																						*Achillea millefolium* L.	Yarrow	6
	h										**h**			**h**																				H	*Agrostis canina* L.	Velvet Bentgrass	7
			h				**h**			**h**		**h**					h																	H	*Agrostis capillaris* L.	Rhode Island Bent	8
														h			h																	H	*Agrostis gigantea* Roth	Black Bent	9
h	**h**										**h**	h																			**h**	**h**	h	H	*Agrostis stolonifera* L.	Creeping Bent	10
									s																				s,h					T	*Ailanthus altissima* (P. Mill.) Swingle	Tree-of-heaven	11
																															h	**h**		H	*Alisma* L.	water plantain	12
									h														**h**	**h**	h	h (**h around dump**)	**h**							H	*Alliaria petiolata* (Bieb.) Cavara & Grande	Garlic Mustard	13
s																									s									T,S	*Alnus serrulata* (Ait.) Willd.	Smooth Ader	14
								h									h																	H	*Ambrosia artemisiifolia* L.	Common Ragweed	15
														h																				H	*Ambrosia trifida* L.	Giant Ragweed	16
														t																				T,S	*Amelanchier canadensis* (L.) Medik.	Eastern Shadbush	17
																															h			H	*Andropogon virginicus* L. var. *virginicus*	Broom-sedge	18
																										h								H	*Anthoxanthum odoratum* L.	Sweet Vernal Grass	19
																										h								SS	*Aralia nudicaulis* L.	Wild Sarsaparilla	20
																									h									H	*Arisaema triphyllum* (L.) Schott	Jack-in-the-pulpit	21
		h					**h**	**h**	h																	h								H	*Artemisia vulgaris* L. var. *vulgaris*	Mugwort	22
													h				**h**	h													h			H	*Asclepias syriaca* L.	Common Milkweed	23
																				h														H	*Athyrium angustum* (Willd.) C. Presl.	Narrow Lady Fern	24
																							h		s,h	s,h								S	*Berberis thunbergii* DC.	Japanese Barberry	25
																				t														T	*Betula alleghaniensis* Britt.	Yellow Birch	26
																								t		**t**								T	*Betula lenta* L.	Black Birch	27
																															h			H	*Bidens connata* Muhl. *ex* Willd.	Swamp Beggar-ticks	28
						h							h																			h		H	*Bidens frondosa* L.	Devil's Beggar-ticks	29
					h																													S	*Buddleja davidii* Franch.	Orange-eye Butterfly-bush	30
																			h(ID?)															H	*Calamagrostis canadensis* (Michx.) Beauv.	Bluejoint	31
																										h								H	*Carex appalachica* J. Webber & P.W. Ball	a sedge	32
																										h								H	*Carex cephaloidea* (Dewey) Dewey	a sedge	33
																										h								H	*Carex cephalophora* Muhl. *ex* Willd.	a sedge	34
																										h								H	*Carex digitalis* Willd. var. *digitalis*	a sedge	35
																						h												H	*Carex* L.	a sedge	36
																										h								H	*Carex laxiculmis* Schwein. var. *laxiculmis*	a sedge	37
																										h	**h**							H	*Carex laxiflora* Lam.	a sedge	38
																						h												H	*Carex lupulina* Muhl. *ex* Willd.	Hop Sedge	39
																															h	h		H	*Carex lurida* Wahlenb.	a sedge	40
																										h								H	*Carex muehlenbergii* Schkuhr ex Willd.	a sedge	41
													h													**h**								H	*Carex pensylvanica* Lam.	a sedge	42
																										h								H	*Carex radiata* (Wahlenb.) Small	a sedge	43
															h																h			H	*Carex scoparia* Schkuhr *ex* Willd.	Broom Sedge	44
																																		H	*Carex stipata* Muhl. *ex* Willd. var. *stipata*	a sedge	45
																										h (E-f rich slope)								H	*Carex striatula* Michx.	Lined Sedge	46
h																			h													h		H	*Carex stricta* Lam.	Tussock Sedge	47
																										h								H	*Carex swanii* (Fern.) Mackenzie	a sedge	48
																										h								H	*Carex virescens* Muhl. *ex* Willd.	a sedge	49
																															h			H	*Carex vulpinoidea* Michx.	a sedge	50
																						s												T,S?	*Carpinus caroliniana* Walt. ssp. *virginiana* (Marsh.) Furlow	American Hornbeam	51
																										t,h?								T	*Carya glabra* (P. Mill.) Sweet	Pignut Hickory	52
													t,s							s	t		t,h			t,h?	t							T	*Carya ovata* (P. Mill.) K. Koch	Shagbark Hickory	53

Woodbridge CC Habitat Map Unit																																		
1	2	4	5	6	7	9	10	11	12	13	14	14	14, 16, 17-20, 22, 25, 28, 29	14, 17	14	14	15	21	23	23	23	23(+30)	24	24	27, 32	31	33	33	34	34	35	35	35	
Woodbridge CC Habitat /Community Type																																		
Open ditch/ water-course ca. SW ponds	Greens	Cart paths	Sand traps	Open sand (volleyball court)	Sand Barren	Wet Meadow	Dry-mesic grass-land ca. sand barren	Mesic (& dry-mesic?) meadows	Cell tower disturbed area	Warm season grass-land in rough	Fairways wet-mesic	Fairways - dry-mesic	Roughs - mesic & dry-mesic	Roughs - wet-mesic	Pond-side wet grass-land	Fairway wet draw-down "pannes"	Rubus - Milkweed meadow	Egdes (incl. forest edges not along roads)	Wetland forest	SW red maple swamp	Seepage forest in NE forest	Draw-down swamp adj to pond	Dry-mesic roadside forest on old roadway	Rocky Dry - mesic Sugar Maple-White Ash forest	Upland copses on golfcourse (prob not original forest)	Near old-growth oak forest complex	Wet-mesic A-F forest (ca. wet meadow)	Road-side wet-mesic forest	Gardens (incl. parking lot borders)	Tennis courts	Samller Ponds	Pond shore & bank	SW pond	LIFE FORM	**Taxon**	**Common Name**	**Taxon Index #**
																										t								T	*Carya tomentosa* (Poir. in Lam.) Nutt.	Mockernut Hickory	54
							s,h																			t (@ rdside)								T	*Catalpa speciosa* (Warder) Warder ex Engelm.	Northern Catalpa	55
							h	**h**	**t,s,h**				**h**				**h**	**h**				h	**t,h**		t	**[t-edge],h**			**h**					L	*Celastrus orbiculatus* Thunb.	Asiatic Bittersweet	56
																				s														S	*Cephalanthus occidentalis* L.	Bouttonbush	57
																										h								SS,GV?	*Chimaphila maculata* (L.) Pursh	Spotted Wintergreen	58
																				h	h													H	*Cinna arundinacea* L.		59
																										h								H	*Circaea canadensis* (L.) Hill	Large Enchanter's-nightshade	60
									h				h																					H	*Cirsium arvense* (L.) Scop.	Canada Thistle	61
																			s(E only)															S	*Clethra alnifolia* L.	Coastal Sweetpepperbush	62
h																																		H	*Cuscuta gronovii* Willd. *ex* J.A. Schultes	Hazel Dodder	63
									h						h																			H	*Cyperus esculentus* L. var. *leptostachyus* Boeck.	Nut flatsedge	64
															h													h					H	*Cyperus* L.	umbrella-sedge	65
									h					h																h				H	*Cyperus strigosus* L.	an umbrella-sedge	66
																							h											H	*Dactylis glomerata* L.	Orchard Grass	67
													h													**h**								H	*Danthonia compressa* Austin *ex* Peck	Canada Bluestem	68
				h				**h**																										H	*Daucus carota* L.	Queen Anne's Lace	69
																										h								H	*Dennstaedtia punctilobula* (Michx.) T. Moore	Hay-scented Fern	70
												h																						H	*Dichanthelium acuminatum* (Sw.) Gould & C.A. Clark	a panic grass	71
																										h								H	*Dichanthelium clandestinum* (L.) Gould	Deertongue	72
													h																	h				H	*Digitaria sanguinalis* (L.) Scop.	Hairy Crabgrass	73
																										h								H	*Dryopteris marginalis* (L.) Gray	Marginal Wood Fern	74
									h																										*Echinochloa crus-galli* (L.) Beauv.	Barnyard-grass	75
h																									**h**						h			H	*Echinochloa muricata* (Beauv.) Fern.	Amercian Barnyard Grass	76
															h																h	h		H	*Eleocharis obtusa* (Willd.) J.A. Schultes var. *obtusa*	a spikerush	77
																															h			H	*Eleocharis* R. Br.	spikerush	78
		h																																H	*Eleusine indica* (L.) Gaertn.	Goosegrass	79
																															h			H	*Elodea nuttallii* (Planch.) St. John	a waterweed	80
							h	**h**				h																						H	*Elymus repens* (L.) Gould	Quackgrass	81
																													h						*Epilobium coloratum* Biehler	Purple-leaved Willow-herb	82
																				h														H	*Epilobium* L.	unidentified willow-herb	83
																														h				H	*Eragrostis capillaris* (L.) Nees	Lace Lovegrass	84
		h																																H	*Eragrostis pilosa* (L.) Beauv.	India Love-grass	85
							h																											H	*Eragrostis spectabilis* (Pursh) Steud.	Purple Love-grass	86
																														h				H	*Eragrostis* von Wolf	lovegrass	87
			h						h								**h**									h			h					H	*Erechtites hieraciifolius* (L.) Raf. *ex* DC.	Fireweed	88
				h				**h**	h			h																						H	*Erigeron annuus* (L.) Pers.	Eastern Daisy Fleabane	89
					h																								h	h				H	*Erigeron canadensis* L.	Horseweed	90
													s(hedges)												s	s								S	*Euonymus alatus* (Thunb.) Sieb.	Winged Euonymus	91
																							s											S	*Euonymus europaeus* L.	European Spindle-tree	92
		h									h	h																						H	*Euphorbia maculata* L.	Eyebane	93
									h																									H	*Euphorbia nutans* Lag.	Eyebane Sandmat	94
																							h	**h**		h		h						H	*Eurybia divaricata* (L.) Nesom	Wood Aster	95
						h			h	h							**h**	h																H	*Euthamia graminifolia* (L.) Nutt.	Grass-leaved Goldenrod	96
																	h			h														H	*Eutrochium dubium* (Willd. ex Poir.) E.E. Lamont	Coastal Plain Joe-Pye Weed	97
																										t,h								T	*Fagus grandifolia* Ehrh.	Amercian Beech	98
									h			**h**																							H	*Fallopia ×bohemica* (Chrtek & Chrtková) J.P. Bailey	Japanese × Giant Knotweed	99
																		h							**h**									H	*Fallopia sachalinensis* (F.S. Petrop. ex Maxim.) R. Decr.	Giant Knotweed	100
								h										h					h											H	*Fallopia scandens* (L.) Holub	Climbing False Buckwheat	101
													h																					H	*Festuca filiformis* Pourret	Fine-leaved Sheep Fescue	102
												h																						H	*Festuca rubr* a L.	Red Fescue	103
				h																														H	*Fimbristylis autumnalis* (L.) Roemer & J.A. Schultes	a sedge	104
													t								t	t,s,h	t	t,s	h		**t**						T	*Fraxinus americana* L.	White Ash	105
																															s			T	*Fraxinus pennsylvanica* Marsh.	Green Ash	106

Woodbridge CC Habitat Map Unit																																			
1	2	4	5	6	7	9	10	11	12	13	14	14	14, 16, 17-20, 22, 25, 28, 29	14, 17	14	14	15	21	23	23	23	23(+30)	24	24	27, 32	31	33	33	34	34	35	35	35			
Woodbridge CC Habitat /Community Type																																			
Open ditch/ water-course ca. SW ponds	Greens	Cart paths	Sand traps	Open sand (volleyball court)	Sand Barren	Wet Meadow	Dry-mesic grass-land ca. sand barren	Mesic (& dry-mesic?) meadows	Cell tower disturbed area	Warm season grass-land in rough	Fairways wet-mesic	Fairways - dry-mesic	Roughs - mesic & dry-mesic	Roughs - wet-mesic	Pond-side wet grass-land	Fairway wet draw-down "pannes"	Rubus - Milkweed meadow	Egdes (incl. forest edges not along roads)	Wetland forest	SW red maple swamp	Seepage forest in NE forest	Draw-down swamp adj to pond	Dry-mesic roadside forest on old roadway	Rocky Dry - mesic Sugar Maple-White Ash forest	Upland copses on golfcourse (prob not original forest)	Near old-growth oak forest complex	Wet-mesic A-F forest (ca. wet meadow)	Road-side wet-mesic forest	Gardens (incl. parking lot borders)	Tennis courts	Samller Ponds	Pond shore & bank	SW pond	LIFE FORM	Taxon	Common Name	Taxon Index #
																				h														H	*Galium* L.	unidentified bedstraw	107
																										h								**SS**	*Gaylussacia baccata* (Wangenh.) K. Koch	Black Huckleberry	108
																					h													H	*Geum canadense* Jacq.	White Avens	109
											t																							T	*Gleditsia triacanthos* L.	Honey Locust	110
																										s,h?								S	*Hamamelis virginiana* L.	American Witch-hazel	111
												h																						H	*Hieracium caespitosum* Dumort.	Yellow Hawkweed	112
																																h	H	*Holcus lanatus* L.	Common Velvetgrass	113
												h																						H	*Houstonia caerulea* L.	Little Bluet	114
																																h		H	*Hypericum majus* (Gray) Britt.	Greater Canada St. John's-wort	115
														h																				H	*Hypericum mutilum* L.	Small-flowered St. John's-wort	116
														h																				H	*Hypericum perforatum* L.	Common St. Johnswort	117
																						s												S	*Ilex verticillata* (L.) Gray	Common Winterberry	118
						h			h													h			**h**							h		H	*Impatiens capensis* Meerb.	Spotted Touch-me-knot.	119
																				h	h													H	*Impatiens* L.	touch-me-not	120
																				h														H	*Iris pseudacorus* L.	Yellow Iris	121
																																h	h	H	*Juncus pylaei* Laharpe		122
												h																						H	*Juncus tenuis* Willd.	Path rush	123
																										h								S	*Juniperus communis* L. var. *depressa* Pursh	Common Juniper	124
												t,s											t,s			snag								T,S	*Juniperus virginiana* L. var. *virginiana*	Eastern Red Cedar	125
																							h		h									T	*Kalopanax septemlobus* (Thunb.) Koidz.	Castor-aralia	126
																													h						*Lactuca serriola* L.	Prickly Lettuce	127
																															h	h	h	H	*Leersia oryzoides* (L.) Sw.	Rice Cut-grass	128
													h																					H	*Leersia virginica* Willd.	White Cut-grass	129
																																h	H	*Lemna* L.	unidentified duckweed	130
					h																													H	*Lepidium* L.	pepperweed	131
																						s												S	*Ligustrum obtusifolium* Sieb. & Zucc.	Border Privet	132
													s												s								S	*Ligustrum ovalifolium* Hassk.	California Privet	133
					h		h						h																	h				H	*Linaria vulgaris* P. Mill.	Butter-and-eggs	134
																			s						s								S	*Lindera benzoin* (L.) Blume	Northern Spicebush	135
															h																h		H	*Lindernia dubia* (L.) Pennell	False Pimpernel	136
																										t								T	*Liriodendron tulipifera* L.	Tuliptree	137
		h																																H	*Lobelia inflata* L.	Indian Tobacco	138
											h	h																						H	*Lolium perenne* L.	Perennial Rye Grass	139
													h																					L	*Lonicera japonica* Thunb.	Japanese Honeysuckle	140
															h	h															h	h		H	*Ludwigia palustris* (L.) Ell.	Water Purslane	141
																										h								H	*Luzula multiflora* (Ehrh.) Lej. ssp. *multiflora*	Common Wood Rush	142
																				h														H	*Lysimachia nummularia* L.	Moneywort	143
													h													**h**								H	*Maianthemum canadense* Desf.	Canada May-flower	144
													t																					T,S	*Malus pumila* P. Mill.	crab-apple	145
																																h			*Mentha ×piperita* L.	Peppermint (hybrid)	146
									h				**h**							**h**			h		h	h (**h** at dump)						**h**			*Microstegium vimineum* (Trin.) A. Camus	Japanese Siltgrass	147
h																																			*Mikania scandens* (L.) Willd.	Climbing Hempvine	148
																																h			*Miscanthus sinensis* Andersson	Eulalia	149
			h						h																										*Mollugo verticillata* L.	Carpetweed	150
																										h									*Monotropa uniflora* L.	One-flowered Indian-pipe	151
																																s		T,S	*Morus alba* L.	White Mulberry	152
h																																	**h**		*Myosotis scorpioides* L.	Forget-me-not	153
h																																	h	H	*Nasturtium officinale* Ait. f.	Two-rowed Watercress	154
													t																				T	*Nyssa sylvatica* Marsh.	Blakc Gum	155
																													h						*Oenothera parviflora* L.	Common evening-primrose	156
																			h		h										h		H	*Onoclea sensibilis* L.	Sensitive Fern	157
																											h						H	*Osmorhiza claytonii* (Michx.) C.B. Clarke	Sweet Cicely	158
																			h														H	*Osmunda regalis* L. var. *spectabilis* (Willd.) Gray	Royal Fern	159
									h																	h								H	*Oxalis stricta* L.	Showy Yellow Wood-sorrel	160
		h														h																			*Panicum dichotomiflorum* Michx.	Fall Panicum	161
																										h									*Parathelypteris noveboracensis* (L.) Ching	New York Fern	162
																							h	**h**	**h**	**h**		**h**							*Parthenocissus quinquefolia* (L.) Planch.	Virginia Creeper	163

Woodbridge CC Habitat Map Unit																																					
1	2	4	5	6	7	9	10	11	12	13	14	14	14, 16, 17-20, 22, 25, 28, 29	14, 17	14	14	15	21	23	23	23	23(+30)	24	24	27, 32	31	33	33	34	34	35	35	35				
Woodbridge CC Habitat /Community Type																																					
Open ditch/ water-course ca. SW ponds	Greens	Cart paths	Sand traps	Open sand (volleyball court)	Sand Barren	Wet Meadow	Dry-mesic grass-land ca. sand barren	Mesic (& dry-mesic?) meadows	Cell tower disturbed area	Warm season grass-land in rough	Fairways wet-mesic	Fairways - dry-mesic	Roughs - mesic & dry-mesic	Roughs - wet-mesic	Pond-side wet grass-land	Fairway wet draw-down "pannes"	Rubus - Milkweed meadow	Egdes (incl. forest edges not along roads)	Wetland forest	SW red maple swamp	Seepage forest in NE forest	Draw-down swamp adj to pond	Dry-mesic roadside forest on old roadway	Rocky Dry - mesic Sugar Maple-White Ash forest	Upland copses on golfcourse (prob not original forest)	Near old-growth oak forest complex	Wet-mesic A-F forest (ca. wet meadow)	Road-side wet-mesic forest	Gardens (incl. parking lot borders)	Tennis courts	Samller Ponds	Pond shore & bank	SW pond	LIFE FORM	Taxon	Common Name	Taxon Index #
										h																									*Paspalum setaceum* Michx. var. *muhlenbergii* (Nash) D. Banks	a bead grass	164
																																	h		*Persicaria arifolia* (L.) Haroldson	Halberd-leaved Tear-thumb	165
									h																							**h**			*Persicaria hydropiper* (L.) Opiz	Common Smartweed	166
																																h			*Persicaria hydropiperoides* (Michx.) Small	Mild Water-pepper	167
		h							h																									H	*Persicaria longiseta* (Bruijn) Kitagawa	Bristle Knotweed	168
									h						h		h																		*Persicaria maculosa* S.F. Gray	Lady's-thumb Smartweed	169
									h																										*Persicaria pensylvanica* (L.) G. Maza	Pinkweed	170
									h																									H	*Persicaria punctata* (Ell.) Small	Dotted Smartweed	171
						h																													*Persicaria sagittata* (L.) H. Gross	Arrow-leaved Tear-thumb	172
																							h											H	*Persicaria virginiana* (L.) Gaertn.	Jumpseed	173
																		h																H	*Phalaris arundinacea* L.	Reed Canary-grass	174
												p (rare)																							*Phleum pratense* L.	Timothy	175
									h																				h					H	*Phytolacca americana* L. var. *americana*	Pokeweed	176
													t																					T	*Picea abies* (L.) Karst.	Norway Spruce	177
																													t					T	*Picea glauca* (Moench) Voss	White Spruce	178
													t																					T	*Pinus rigida* P. Mill.	Pitch Pine	179
													t												**t**									T	*Pinus strobus* L.	Eastern White Pine	180
									h																									H	*Plantago lanceolata* L.	English Plantain	181
													h																						*Plantago major* L.	Common Plantain	182
														h																					*Plantago rugelii* Dcne.	Rugel's Plantain	183
																					t													T	*Platanus occidentalis* L.	Sycamore	184
							h	h				**h**																						H	*Poa pratensis* L. ssp. *pratensis*	Kentucky Bluegrass	185
																						h												H	*Poa trivialis* L. ssp. *trivialis*	Rough-sheathed Bluegrass	186
																										h									*Polygonatum pubescens* (Willd.) Pursh	Hairy Solomon's-seal	187
		h										h																							*Polygonum aviculare* L.	Doorweed	188
																										h									*Polypodium virginianum* L.	Rock Polypody	189
																										h								H	*Polystichum acrostichoides* (Michx.) Schott	Christmas Fern	190
				h														t				t				t								T	*Populus deltoides* Bartr. *ex* Marsh. var. *deltoides*	Eastern Cottonwood	191
																															h			H	*Potamogeton crispus* L.	Crispy-leaved Pondweed	192
																															h				*Potamogeton spirillus* Tuckerman	Northern Snail-seed Pondweed	193
																							t		t,**s**		**t**							T	*Prunus serotina* Ehrh. var. *serotina*	Black Cherry	194
																				h														H	*Pteridium aquilinum* (L.) Kuhn	Bracken Fern	195
							h																												*Pyrus calleryana* Dcne.	Callery Pear	196
													t													**t**		**t**						T	*Quercus alba* L.	Eastern White Oak	197
													t								**t (~30")**													T	*Quercus bicolor* Willd.	Swamp White Oak	198
																										t,h								T	*Quercus montana* Willd.	Chestnut Oak	199
											h		**t**						**t**	s		t						**t**						T	*Quercus palustris* Muenchh.	Pin Oak	200
													t							t				**t**		t								T	*Quercus rubra* L.	Northern Red Oak	201
													t						t				t	t	**t,s**	**t**								T	*Quercus velutina* Lam.	Black Oak	202
																				h														H	*Ranunculus recurvatus* Poir. var. *recurvatus*	Hooked Crowfoot	203
							s,h													h		s	s		**s**				s,h					S,L	*Rosa multiflora* Thunb. *ex* Murr.	Multiflora Rose	204
																				h														S	*Rosa palustris* Marsh.	Swamp Rose	205
																		s																S	*Rubus allegheniensis* Porter	Common Blackberry	206
																	s(s in part)						s											S	*Rubus argutus* Link	Southern Blackberry	207
																	h			h														SS(?),GV	*Rubus flagellaris* Willd.	Northern Dewberry	208
																																s		S	*Rubus pensilvanicus Poir.*	Pennsylvania Blackberry	209
									h													s	s											S	*Rubus phoenicolasius* Maxim.	Wineberry	210
					h																													H	*Rudbeckia hirta* L.	Black-eyed Susan	211
h																																h		H	*Rumex crispus* L. ssp. *crispus*	Curly Dock	212
														h																				H	*Rumex obtusifolius* L.	Bitter Dock	213
																																	h		*Sagittaria latifolia* Willd.	Common Arrowhead	214
																		t																T	*Salix ×sepulcralis* Semonkai	weeping willow hybrid	215
																																		S	*Salix cinerea* L.	florist's pussy willow	216
																													s			t		T,S	*Salix cinerea* L. ssp. *oleifolia* (Sm.) Macreight	florist's pussy willow	217
															h																	h		S	*Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli	Black Elderberry	218
																										h (E-f rich slope)								H	*Sanguinaria canadensis* L.	Bloodroot	219

Woodbridge CC Habitat Map Unit																																		LIFE FORM	Taxon	Common Name	Taxon Index #
1	2	4	5	6	7	9	10	11	12	13	14	14	14, 16, 17-20, 22, 25, 28, 29	14, 17	14	14	15	21	23	23	23	23(+30)	24	24	27, 32	31	33	33	34	34	35	35	35				
Woodbridge CC Habitat /Community Type																																					
Open ditch/ water-course ca. SW ponds	Greens	Cart paths	Sand traps	Open sand (volleyball court)	Sand Barren	Wet Meadow	Dry-mesic grass-land ca. sand barren	Mesic (& dry-mesic?) meadows	Cell tower disturbed area	Warm season grass-land in rough	Fairways wet-mesic	Fairways - dry-mesic	Roughs - mesic & dry-mesic	Roughs - wet-mesic	Pond-side wet grass-land	Fairway wet draw-down "pannes"	Rubus - Milkweed meadow	Egdes (incl. forest edges not along roads)	Wetland forest	SW red maple swamp	Seepage forest in NE forest	Draw-down swamp adj to pond	Dry-mesic roadside forest on old roadway	Rocky Dry - mesic Sugar Maple-White Ash forest	Upland copses on golfcourse (prob not original forest)	Near old-growth oak forest complex	Wet-mesic A-F forest (ca. wet meadow)	Road-side wet-mesic forest	Gardens (incl. parking lot borders)	Tennis courts	Samller Ponds	Pond shore & bank	SW pond				
																							t		**s**									T	*Sassafras albidum* (Nutt.) Nees	Sassafras	220
								h																										H	*Schedonorus arundinaceus* (Schreb.) Dumort	Tall Fescue	221
					h					**h**																								H	*Schizachyrium scoparium* (Michx.) Nash var. *scoparium*	Little Bluestem	222
																															h	h		H	*Schoenoplectus tabernaemontani* (K.C. Gmel.) Palla	Soft-stemmed Bulrush	223
													h																			h		H	*Scorzoneroides autumnalis* (L.) Moench	Fall Dandelion	224
		h																																	*Senecio viscosus* L.	Sticky Ragwort	225
									h				h																					H	*Setaria faberi* (Herrm.)	Chinese Foxtail	226
									h																									H	*Setaria pumila* (Poir.) Roemer & J.A. Schultes ssp. *pumila*	Yellow Foxtail	227
																										h								H	*Smilax herbacea* L.	Carrion-flower	228
																										h									*Smilax rotundifolia* L.	Comon Greenbrier	229
																				h												h			*Solanum dulcamara* L.	Climbing Nightshade	230
																										h								H	*Solidago juncea* Ait.	Early Goldenrod	231
									h																									H	*Solidago altissima* L. ssp. *altissima*	Tall Goldenrod	232
																										h								H	*Solidago bicolor* L.	White goldenrod	233
						h			h					h																				H	*Solidago gigantea* Ait.	Late Goldenrod	234
						h	**h**					h								h			h			h			h			h		H	*Solidago rugosa* P. Mill.	Wrinkle-leaved Goldenrod	235
																																	h	H	*Sparganium* L.	bur-reed	236
													h																					H	*Stellaria* L.	starwort	237
																							s											T,S	*Swida alternifolia* (L. f.) Small	Alternate-leaved Dogwood, Pagoda Dogwood	238
s																				s		s											s	S	*Swida amomum* (P. Mill.) Small	Silky Dogwood	239
								h	h																							h		H	*Symphyotrichum lanceolatum* (Willd.) Nesom ssp. *lanceolatum*	Lance-leaved American-aster	240
																																h		H	*Symphyotrichum lateriflorum* (L.) A. & D. Löve	Calico American-aster	241
					h		h							h																		h		H	*Symphyotrichum pilosum* (Willd.) Nesom	Awl American-aster	242
																				h														H	*Symphyotrichum puniceum* (L.) A. & D. Löve var. *puniceum*	Purple-stemmed American-aster	243
											h	h	h	**h**																		**h**		H	*Symphyotrichum racemosum* (Ell.) Nesom	Small White American-aster	244
																				h	h	h												H	*Symplocarpus foetidus* (L.) Salisb. *ex* Nutt.	Skunk-cabbage	245
																				s														T,S	*Syringa vulgaris* L.	Common Lilac	246
		h										**h**																						H	*Taraxacum* F. H. Wiggers	dandelion	247
																												s						S	*Taxus cuspidata* Sieb. & Zucc.	Japanese Yew	248
																				h														H	*Thalictrum pubescens* Pursh	Tall Meadow-rue	249
													t																						*Thuja occidentalis* L.	Arbor Vitae	250
													t																					T	*Thuja plicata* Donn ex D. Don	Western Redcedar	251
							h																											H	*Thymus pulegioides* L.	Lemon Thyme	252
																		t										t						T	*Tilia cordata* Mill.	Littleleaf Linden	253
													h				**h**		h	**s,h**	**h**	**h**	**h**		**t,h**	**h**	**h**							S,L	*Toxicodendron radicans* (L.) Kuntze	Poison Ivy	254
																									h									S	*Toxicodendron vernix* (L.) Kuntze	Poison Sumac	255
							h																											H	*Tridens flavus* (L.) A.S. Hitchc. var. *flavus*	Tall Red-Top	256
		h	h						h																									H	*Trifolium arvense* L.	Rabbit-foot-clover	257
												h																						H	*Trifolium pratense* L.	Red Clover	258
												h																						H	*Trifolium repens* L.	White Clover	259
																													s					T	*Tsuga canadensis* (L.) Carr.	Eastern Hemlock	260
																															h	**h**		H	*Typha latifolia* L.	Broad-leaved Cat-tail	261
																									t	h								T	*Ulmus americana* L.	American Elm	262
																										h								**SS**	*Vaccinium pallidum* Ait.	Early Low Blueberry	263
													h																	h				H	*Verbascum thapsus* L.	Common Mullein	264
									h																							h		H	*Verbena hastata* L. var. *hastata*	Blue Vervain	265
									h																									H	*Verbena urticifolia* L.	White Vervain	266
																	h															h		H	*Vernonia noveboracensis* (L.) Michx.	New York Ironweed	267
																										h									*Veronica officinalis* L.	Common Speedwell	268
																										h								S	*Viburnum acerifolium* L.	Maple-leaved Viburnum	269
																				s														S	*Viburnum dentatum* L. var. *lucidum* Ait.	Northern Arrowwood	270
												s																						S	*Viburnum opulus* L. ssp. *opulus*	Geulder-rose	271
																													h					H	*Viola arvensis* Murr.	European Field Violet	272

Woodbridge CC Habitat Map Unit																																					
1	2	4	5	6	7	9	10	11	12	13	14	14	14, 16, 17-20, 22, 25, 28, 29	14, 17	14	14	15	21	23	23	23	23(+30)	24	24	27, 32	31	33	33	34	34	35	35	35	LIFE FORM	Taxon	Common Name	Taxon Index #
Woodbridge CC Habitat /Community Type																																					
Open ditch/ water-course ca. SW ponds	Greens	Cart paths	Sand traps	Open sand (volleyball court)	Sand Barren	Wet Meadow	Dry-mesic grass-land ca. sand barren	Mesic (& dry-mesic?) meadows	Cell tower disturbed area	Warm season grass-land in rough	Fairways wet-mesic	Fairways - dry-mesic	Roughs - mesic & dry-mesic	Roughs - wet-mesic	Pond-side wet grass-land	Fairway wet draw-down "pannes"	Rubus - Milkweed meadow	Egdes (incl. forest edges not along roads)	Wetland forest	SW red maple swamp	Seepage forest in NE forest	Draw-down swamp adj to pond	Dry-mesic roadside forest on old roadway	Rocky Dry - mesic Sugar Maple-White Ash forest	Upland copses on golfcourse (prob not original forest)	Near old-growth oak forest complex	Wet-mesic A-F forest (ca. wet meadow)	Road-side wet-mesic forest	Gardens (incl. parking lot borders)	Tennis courts	Samller Ponds	Pond shore & bank	SW pond				
		h																																H	*Viola sagittata* var. *ovata* (Nutt.) Torr. & Gray	Downy Violet	273
																										h								L	*Vitis aestivalis* Michx.	Summer Grape	274
																									t	t?,h								L	*Vitis* L.	unidentified grape	275
																				h			t,h					h						L	*Vitis labrusca* L.	Fox Grape	276
					h																													L	*Vitis riparia* Michx.	River Grape	277
								h																										L	*Wisteria* Nutt., nom. conserv.	wisteria	278
																																			Vascular Plants Not Outside of Cultivation		
																													s					T,S	*Acer palmatum* Thunb.	Japanese Maple	
																													s						*Andromeda floribunda*		
																													s,h						*Buxus* L.	boxwood	
																													h						*Echinacea*	purple coneflower	
																													s						*Hydrangea "Annabelle"*		
													s																s						*Salix integra*	Dappled Willow	
																													t						*Cercis canadensis*	Redbud	
																														s(edge)				S	*Rhododendron* L.	non-native Rododendron	
																													h					H	*Setaria italica* (L.) Beauv.	Millet Foxtail	
																													h					S	*Spiraea japonica* L. f.	Japanese Meadowsweet	
																													s					S	*Swida alba*	Variegated Red Twig Dogwood	
																													s					T	*Tsuga canadensis* (L.) Carr.	Eastern Hemlock	
																												s						S	*Taxus cuspidata* Sieb. & Zucc.	Japanese Yew	
																												t							*Tilia cordata* Mill.	Littleleaf Linden	
																													h						*Yucca filamentosa* L.	Yucca	
																																			Non-vascular plants		
					m																													M/L	*Cladina* sp[p].	reindeer lichen	
					m																													M/L	crustose lichen	crustose lichen	
					m																													M/L	*Polytrichum* sp[p].	haircap moss	

TABLE NOTES:

Abreviations:
ssp. subspecies
var. variety

Life form codes:
T tree (woody, not a vine, > 5m high at maturity)
S shrub (woody, non a vine, 1-5m high at maturity)
H herbaceous
L liana (high-climbing woody vine)
GV woody trailing vine
SS subshrub, max ht << 1 m, acc. to refs.
SS subshrub, max ht to 1 m, acc. to refs.
SS* subshrub, aerial parasite

Stratum codes (when code is bold + underlined, sp. is a dominant generally; when bold w/o underline, locally dominant or generally frequent; in paratheses, taxon is present nearby in similar habitat outside of study area) :
t tree layer (woody, > 5m high)
s shrub layer (woody, 1-5m high)
h herb layer (herbaceous any height; woody, < 1m)
m moss/liverwort/lichen

Appendix 4

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Abies balsamea (L.) P. Mill.	Balsam Fir		T	non-native	Probably all trees present planted, but may reproduce					Endangered (native populations only)	1
Acer nigrum Michx. f. × *Acer saccharum* Marsh.?	Sugar Maple x Black Maple hybrid	hyb?	T	native							2
Acer platanoides L.	Norway Maple		T	non-native	Several of red-foliage form planted	I					3
Acer rubrum L.	Red Maple		T	native							4
Acer saccharum Marsh. var. *saccharum*	Sugar Maple		T	native				•			5
Achillea millefolium L.	Yarrow			native				•			6
Agrostis canina L.	Velvet Bentgrass	sp.?	H	non-native							7
Agrostis capillaris L.	Rhode Island Bent		H	non-native							8
Agrostis gigantea Roth	Black Bent		H	non-native							9
Agrostis stolonifera L.	Creeping Bent		H	native							10
Ailanthus altissima (P. Mill.) Swingle	Tree-of-heaven		T	non-native		I	banned				11
Alisma L.	water plantain		H	native							12
Alliaria petiolata (Bieb.) Cavara & Grande	Garlic Mustard		H	non-native		I	banned				13
Alnus serrulata (Ait.) Willd.	Smooth Ader		T,S	native							14
Ambrosia artemisiifolia L.	Common Ragweed		H	native							15
Ambrosia trifida L.	Giant Ragweed		H	native							16
Amelanchier canadensis (L.) Medik.	Eastern Shadbush	sp.?	T,S	native	Large specimen, probably planted						17
Andropogon virginicus L. var. *virginicus*	Broom-sedge		H	native							18
Anthoxanthum odoratum L.	Sweet Vernal Grass		H	non-native							19
Aralia nudicaulis L.	Wild Sarsaparilla		SS	native							20
Arisaema triphyllum (L.) Schott	Jack-in-the-pulpit		H	native							21
Artemisia vulgaris L. var. *vulgaris*	Mugwort		H	non-native		I	banned				22
Asclepias syriaca L.	Common Milkweed		H	native				•			23
Athyrium angustum (Willd.) C. Presl.	Narrow Lady Fern		H	native							24
Berberis thunbergii DC.	Japanese Barberry		S	non-native		I					25
Betula alleghaniensis Britt.	Yellow Birch		T	native							26
Betula lenta L.	Black Birch		T	native							27
Bidens connata Muhl. *ex* Willd.	Swamp Beggar-ticks	sp.?	H	native							28
Bidens frondosa L.	Devil's Beggar-ticks	sp.?	H	native							29
Buddleja davidii Franch.	Orange-eye Butterfly-bush	sp.?	S	non-native							30
Calamagrostis canadensis (Michx.) Beauv.	Bluejoint		H	native							31
Carex appalachica J. Webber & P.W. Ball	a sedge		H	native							32
Carex cephaloidea (Dewey) Dewey	a sedge	sp.?	H	native							33
Carex cephalophora Muhl. *ex* Willd.	a sedge		H	native							34
Carex digitalis Willd. var. *digitalis*	a sedge		H	native							35
Carex L.	a sedge	sp.?	H	native							36
Carex laxiculmis Schwein. var. *laxiculmis*	a sedge		H	native							37
Carex laxiflora Lam.	a sedge	sp.?	H	native							38

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Carex lupulina Muhl. *ex* Willd.	Hop Sedge		H	native							39
Carex lurida Wahlenb.	a sedge		H	native							40
Carex muehlenbergii Schkuhr ex Willd.	a sedge		H	native							41
Carex pensylvanica Lam.	a sedge		H	native							42
Carex radiata (Wahlenb.) Small	a sedge	sp.?	H	native							43
Carex scoparia Schkuhr *ex* Willd.	Broom Sedge		H	native							44
Carex stipata Muhl. *ex* Willd. var. *stipata*	a sedge		H	native							45
Carex striatula Michx.	Lined Sedge		H	native							46
Carex stricta Lam.	Tussock Sedge		H	native							47
Carex swanii (Fern.) Mackenzie	a sedge		H	native							48
Carex virescens Muhl. *ex* Willd.	a sedge		H	native							49
Carex vulpinoidea Michx.	a sedge		H	native							50
Carpinus caroliniana Walt. ssp. *virginiana* (Marsh.) Furlow	American Hornbeam		T,S?	native							51
Carya glabra (P. Mill.) Sweet	Pignut Hickory		T	native				•			52
Carya ovata (P. Mill.) K. Koch	Shagbark Hickory	sp.?	T	native	To ~30"						53
Carya tomentosa (Poir. in Lam.) Nutt.	Mockernut Hickory		T	native							54
Catalpa speciosa (Warder) Warder ex Engelm.	Northern Catalpa	sp.?	T	non-native	Should be treated as an invasive						55
Celastrus orbiculatus Thunb.	Asiatic Bittersweet		L	non-native		I	banned				56
Cephalanthus occidentalis L.	Bouttonbush		S	native							57
Chimaphila maculata (L.) Pursh	Spotted Wintergreen		SS,GV?	native							58
Cinna arundinacea L.			H	native							59
Circaea canadensis (L.) Hill	Large Enchanter's-nightshade		H	native							60
Cirsium arvense (L.) Scop.	Canada Thistle	sp.?	H	non-native		P	banned				61
Clethra alnifolia L.	Coastal Sweetpepperbush		S	native							62
Cuscuta gronovii Willd. *ex* J.A. Schultes	Hazel Dodder		H	native							63
Cyperus esculentus L. var. *leptostachyus* Boeck.	Nut flatsedge		H	native				•			64
Cyperus L.	umbrella-sedge	sp.?	H								65
Cyperus strigosus L.	an umbrella-sedge		H	native							66
Dactylis glomerata L.	Orchard Grass		H	non-native							67
Danthonia compressa Austin *ex* Peck	Canada Bluestem		H	native							68
Daucus carota L.	Queen Anne's Lace		H	non-native							69
Dennstaedtia punctilobula (Michx.) T. Moore	Hay-scented Fern		H	native							70
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark	a panic grass		H	native							71
Dichanthelium clandestinum (L.) Gould	Deertongue		H	native							72
Digitaria sanguinalis (L.) Scop.	Hairy Crabgrass		H	non-native							73
Dryopteris marginalis (L.) Gray	Marginal Wood Fern		H	native							74
Echinochloa crus-galli (L.) Beauv.	Barnyard-grass			non-native							75
Echinochloa muricata (Beauv.) Fern.	Amercian Barnyard Grass		H	native							76

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Eleocharis obtusa (Willd.) J.A. Schultes var. *obtusa*	a spikerush		H	native							77
Eleocharis R. Br.	spikerush		H	native							78
Eleusine indica (L.) Gaertn.	Goosegrass		H	non-native							79
Elodea nuttallii (Planch.) St. John	a waterweed		H	native							80
Elymus repens (L.) Gould	Quackgrass		H	non-native							81
Epilobium coloratum Biehler	Purple-leaved Willow-herb			native							82
Epilobium L.	unidentified willow-herb		H	native							83
Eragrostis capillaris (L.) Nees	Lace Lovegrass	sp.?	H	native							84
Eragrostis pilosa (L.) Beauv.	India Love-grass	sp.?	H	non-native							85
Eragrostis spectabilis (Pursh) Steud.	Purple Love-grass		H	native							86
Eragrostis von Wolf	lovegrass		H	?							87
Erechtites hieraciifolius (L.) Raf. *ex* DC.	Fireweed		H	native							88
Erigeron annuus (L.) Pers.	Eastern Daisy Fleabane		H	native							89
Erigeron canadensis L.	Horseweed		H	native							90
Euonymus alatus (Thunb.) Sieb.	Winged Euonymus		S	non-native		I					91
Euonymus europaeus L.	European Spindle-tree		S	non-native	Unclear if adventive or planted						92
Euphorbia maculata L.	Eyebane		H	native							93
Euphorbia nutans Lag.	Eyebane Sandmat		H	native					IND.		94
Eurybia divaricata (L.) Nesom	Wood Aster		H	native							95
Euthamia graminifolia (L.) Nutt.	Grass-leaved Goldenrod		H	native							96
Eutrochium dubium (Willd. ex Poir.) E.E. Lamont	Coastal Plain Joe-Pye Weed		H	native							97
Fagus grandifolia Ehrh.	Amercian Beech		T	native							98
Fallopia ×bohemica (Chrtek & Chrtková) J.P. Bailey	Japanese × Giant Knotweed		H	non-native							99
Fallopia sachalinensis (F.S. Petrop. ex Maxim.) R. Decr.	Giant Knotweed	sp?	H	non-native		I	banned				100
Fallopia scandens (L.) Holub	Climbing False Buckwheat	sp.?	H	native							101
Festuca filiformis Pourret	Fine-leaved Sheep Fescue		H	non-native							102
Festuca rubr a L.	Red Fescue		H	non-native							103
Fimbristylis autumnalis (L.) Roemer & J.A. Schultes	a sedge		H	native							104
Fraxinus americana L.	White Ash		T	native	To ~48" DBH. Several EAB-infected and dying, some healthy-looking						105
Fraxinus pennsylvanica Marsh.	Green Ash		T	native							106
Galium L.	unidentified bedstraw		H	depends on sp. ID							107
Gaylussacia baccata (Wangenh.) K. Koch	Black Huckleberry		SS	native							108
Geum canadense Jacq.	White Avens	sp?	H	native							109
Gleditsia triacanthos L.	Honey Locust		T	non-native	planted						110
Hamamelis virginiana L.	American Witch-hazel		S	native							111

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Hieracium caespitosum Dumort.	Yellow Hawkweed	sp.?	H	non-native							112
Holcus lanatus L.	Common Velvetgrass		H	non-native							113
Houstonia caerulea L.	Little Bluet		H	native							114
Hypericum majus (Gray) Britt.	Greater Canada St. John's-wort		H	native							115
Hypericum mutilum L.	Small-flowered St. John's-wort		H	native							116
Hypericum perforatum L.	Common St. Johnswort		H	non-native							117
Ilex verticillata (L.) Gray	Common Winterberry		S	native							118
Impatiens capensis Meerb.	Spotted Touch-me-knot.		H	native							119
Impatiens L.	touch-me-not		H	native							120
Iris pseudacorus L.	Yellow Iris	sp.?	H	non-native		I	banned				121
Juncus pylaei Laharpe			H	native							122
Juncus tenuis Willd.	Path rush		H	native							123
Juniperus communis L. var. *depressa* Pursh	Common Juniper		S	native							124
Juniperus virginiana L. var. *virginiana*	Eastern Red Cedar		T,S	native				•			125
Kalopanax septemlobus (Thunb.) Koidz.	Castor-aralia		T	non-native		R					126
Lactuca serriola L.	Prickly Lettuce			non-native							127
Leersia oryzoides (L.) Sw.	Rice Cut-grass		H	native							128
Leersia virginica Willd.	White Cut-grass		H	native							129
Lemna L.	unidentified duckweed		H	native							130
Lepidium L.	pepperweed		H	depends on sp. ID							131
Ligustrum obtusifolium Sieb. & Zucc.	Border Privet		S	non-native		P					132
Ligustrum ovalifolium Hassk.	California Privet		S	non-native		P					133
Linaria vulgaris P. Mill.	Butter-and-eggs		H	non-native							134
Lindera benzoin (L.) Blume	Northern Spicebush		S	native							135
Lindernia dubia (L.) Pennell	False Pimpernel		H	native							136
Liriodendron tulipifera L.	Tuliptree		T	native							137
Lobelia inflata L.	Indian Tobacco		H	native							138
Lolium perenne L.	Perennial Rye Grass		H	non-native							139
Lonicera japonica Thunb.	Japanese Honeysuckle		L	non-native		I	banned				140
Ludwigia palustris (L.) Ell.	Water Purslane		H	native							141
Luzula multiflora (Ehrh.) Lej. ssp. *multiflora*	Common Wood Rush		H	native							142
Lysimachia nummularia L.	Moneywort		H	non-native		P					143
Maianthemum canadense Desf.	Canada May-flower		H	native							144
Malus pumila P. Mill.	crab-apple		T,S	non-native							145
Mentha ×piperita L.	Peppermint (hybrid)			non-native							146
Microstegium vimineum (Trin.) A. Camus	Japanese Siltgrass			non-native		I	banned				147
Mikania scandens (L.) Willd.	Climbing Hempvine			native							148
Miscanthus sinensis Andersson	Eulalia			non-native		P					149
Mollugo verticillata L.	Carpetweed			non-native							150
Monotropa uniflora L.	One-flowered Indian-pipe			native							151
Morus alba L.	White Mulberry		T,S	non-native							152

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Myosotis scorpioides L.	Forget-me-not			non-native		I	banned				153
Nasturtium officinale Ait. f.	Two-rowed Watercress		H	non-native		P					154
Nyssa sylvatica Marsh.	Blakc Gum		T	native	18" prob. planted						155
Oenothera parviflora L.	Common evening-primrose			native							156
Onoclea sensibilis L.	Sensitive Fern		H	native							157
Osmorhiza claytonii (Michx.) C.B. Clarke	Sweet Cicely	sp.?	H	native							158
Osmunda regalis L. var. *spectabilis* (Willd.) Gray	Royal Fern		H	native							159
Oxalis stricta L.	Showy Yellow Wood-sorrel	sp.?	H	native							160
Panicum dichotomiflorum Michx.	Fall Panicum			native							161
Parathelypteris noveboracensis (L.) Ching	New York Fern			native							162
Parthenocissus quinquefolia (L.) Planch.	Virginia Creeper	sp.?		native							163
Paspalum setaceum Michx. var. *muhlenbergii* (Nash) D. Banks	a bead grass			native							164
Persicaria arifolia (L.) Haroldson	Halberd-leaved Tear-thumb			native							165
Persicaria hydropiper (L.) Opiz	Common Smartweed			non-native	Behaving like an invasive around pond						166
Persicaria hydropiperoides (Michx.) Small	Mild Water-pepper			native							167
Persicaria longiseta (Bruijn) Kitagawa	Bristle Knotweed		H	non-native		I	banned				168
Persicaria maculosa S.F. Gray	Lady's-thumb Smartweed			non-native							169
Persicaria pensylvanica (L.) G. Maza	Pinkweed			native							170
Persicaria punctata (Ell.) Small	Dotted Smartweed		H	native							171
Persicaria sagittata (L.) H. Gross	Arrow-leaved Tear-thumb			native							172
Persicaria virginiana (L.) Gaertn.	Jumpseed		H	native							173
Phalaris arundinacea L.	Reed Canary-grass		H	native and introduced							174
Phleum pratense L.	Timothy	gen.?		non-native							175
Phytolacca americana L. var. *americana*	Pokeweed		H	native							176
Picea abies (L.) Karst.	Norway Spruce		T	non-native	probably planted, but may reproduce						177
Picea glauca (Moench) Voss	White Spruce		T	non-native	probably planted						178
Pinus rigida P. Mill.	Pitch Pine		T	native	24" DBH, probably planted			•			179
Pinus strobus L.	Eastern White Pine		T	native							180
Plantago lanceolata L.	English Plantain		H	non-native							181
Plantago major L.	Common Plantain			non-native							182
Plantago rugelii Dcne.	Rugel's Plantain										183
Platanus occidentalis L.	Sycamore		T	native							184
Poa pratensis L. ssp. *pratensis*	Kentucky Bluegrass		H	non-native							185
Poa trivialis L. ssp. *trivialis*	Rough-sheathed Bluegrass	sp.?	H	native							186
Polygonatum pubescens (Willd.) Pursh	Hairy Solomon's-seal			native							187
Polygonum aviculare L.	Doorweed			non-native							188
Polypodium virginianum L.	Rock Polypody	sp.?		native							189
Polystichum acrostichoides (Michx.) Schott	Christmas Fern		H	native							190

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Populus deltoides Bartr. *ex* Marsh. var. *deltoides*	Eastern Cottonwood		T	native							191
Potamogeton crispus L.	Crispy-leaved Pondweed		H	non-native		I	banned				192
Potamogeton spirillus Tuckerman	Northern Snail-seed Pondweed			native							193
Prunus serotina Ehrh. var. *serotina*	Black Cherry		T	native							194
Pteridium aquilinum (L.) Kuhn	Bracken Fern		H	native							195
Pyrus calleryana Dcne.	Callery Pear			non-native							196
Quercus alba L.	Eastern White Oak		T	native							197
Quercus bicolor Willd.	Swamp White Oak		T	native	To ~35" DBH, suspect at least larger planted						198
Quercus montana Willd.	Chestnut Oak		T	native							199
Quercus palustris Muenchh.	Pin Oak		T	native	To ~40" DBH, suspect at least larger planted						200
Quercus rubra L.	Northern Red Oak		T	native							201
Quercus velutina Lam.	Black Oak		T	native	To ~30" DBH			•			202
Ranunculus recurvatus Poir. var. *recurvatus*	Hooked Crowfoot		H	native							203
Rosa multiflora Thunb. *ex* Murr.	Multiflora Rose		S,L	non-native		I	banned				204
Rosa palustris Marsh.	Swamp Rose		S	non-native							205
Rubus allegheniensis Porter	Common Blackberry		S	native							206
Rubus argutus Link	Southern Blackberry	sp.?	S	native							207
Rubus flagellaris Willd.	Northern Dewberry	sp.?	SS(?),GV	native							208
Rubus pensilvanicus Poir.	Pennsylvania Blackberry	sp.?	S	native							209
Rubus phoenicolasius Maxim.	Wineberry		S	non-native		I	banned				210
Rudbeckia hirta L.	Black-eyed Susan		H	non-native							211
Rumex crispus L. ssp. *crispus*	Curly Dock		H	non-native							212
Rumex obtusifolius L.	Bitter Dock		H	non-native							213
Sagittaria latifolia Willd.	Common Arrowhead			native							214
Salix ×sepulcralis Semonkai	weeping willow hybrid	hyb.?	T	non-native							215
Salix cinerea L.	florist's pussy willow		S	non-native							216
Salix cinerea L. ssp. *oleifolia* (Sm.) Macreight	florist's pussy willow		T,S	non-native		R					217
Sambucus nigra L. ssp. *canadensis* (L.) R. Bolli	Black Elderberry		S	native							218
Sanguinaria canadensis L.	Bloodroot		H	native							219
Sassafras albidum (Nutt.) Nees	Sassafras		T	native							220
Schedonorus arundinaceus (Schreb.) Dumort	Tall Fescue		H	non-native							221
Schizachyrium scoparium (Michx.) Nash var. *scoparium*	Little Bluestem		H	native				•			222
Schoenoplectus tabernaemontani (K.C. Gmel.) Palla	Soft-stemmed Bulrush		H	native							223
Scorzoneroides autumnalis (L.) Moench	Fall Dandelion		H	non-native							224
Senecio viscosus L.	Sticky Ragwort			non-native							225

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Setaria faberi (Herrm.)	Chinese Foxtail		H	non-native							226
Setaria pumila (Poir.) Roemer & J.A. Schultes ssp. *pumila*	Yellow Foxtail		H	non-native							227
Smilax herbacea L.	Carrion-flower		H	native							228
Smilax rotundifolia L.	Comon Greenbrier			native							229
Solanum dulcamara L.	Climbing Nightshade			non-native		P	banned				230
Solidago juncea Ait.	Early Goldenrod	sp.?	H	native							231
Solidago altissima L. ssp. *altissima*	Tall Goldenrod		H	native							232
Solidago bicolor L.	White goldenrod	sp.?	H	native							233
Solidago gigantea Ait.	Late Goldenrod		H	native							234
Solidago rugosa P. Mill.	Wrinkle-leaved Goldenrod		H	native							235
Sparganium L.	bur-reed		H	native							236
Stellaria L.	starwort	gen.?	H	non-native							237
Swida alternifolia (L. f.) Small	Alternate-leaved Dogwood, Pagoda Dogwood		T,S	native							238
Swida amomum (P. Mill.) Small	Silky Dogwood		S	native							239
Symphyotrichum lanceolatum (Willd.) Nesom ssp. *lanceolatum*	Lance-leaved American-aster		H	native							240
Symphyotrichum lateriflorum (L.) A. & D. Löve	Calico American-aster		H	native							241
Symphyotrichum pilosum (Willd.) Nesom	Awl American-aster		H	native							242
Symphyotrichum puniceum (L.) A. & D. Löve var. *puniceum*	Purple-stemmed American-aster		H	native							243
Symphyotrichum racemosum (Ell.) Nesom	Small White American-aster		H	native							244
Symplocarpus foetidus (L.) Salisb. *ex* Nutt.	Skunk-cabbage		H	native							245
Syringa vulgaris L.	Common Lilac		T,S	non-native							246
Taraxacum F. H. Wiggers	dandelion	sp.?	H	non-native							247
Taxus cuspidata Sieb. & Zucc.	Japanese Yew		S	non-native							248
Thalictrum pubescens Pursh	Tall Meadow-rue		H	native							249
Thuja occidentalis L.	Arbor Vitae			native and non-native						Endangered (native populations only)	250
Thuja plicata Donn ex D. Don	Western Redcedar	sp.?	T	non-native	planted hedge						251
Thymus pulegioides L.	Lemon Thyme		H	non-native							252
Tilia cordata Mill.	Littleleaf Linden		T	non-native	Most likely planted						253
Toxicodendron radicans (L.) Kuntze	Poison Ivy		S,L	native							254
Toxicodendron vernix (L.) Kuntze	Poison Sumac		S	native							255
Tridens flavus (L.) A.S. Hitchc. var. *flavus*	Tall Red-Top		H	native/non-native							256
Trifolium arvense L.	Rabbit-foot-clover		H	non-native							257
Trifolium pratense L.	Red Clover		H	non-native							258
Trifolium repens L.	White Clover		H	non-native							259
Tsuga canadensis (L.) Carr.	Eastern Hemlock		T	native							260
Typha latifolia L.	Broad-leaved Cat-tail		H	native							261

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #
Ulmus americana L.	American Elm		T	native							262
Vaccinium pallidum Ait.	Early Low Blueberry		**SS**	native				•			263
Verbascum thapsus L.	Common Mullein		H	non-native							264
Verbena hastata L. var. *hastata*	Blue Vervain		H	native							265
Verbena urticifolia L.	White Vervain	gen.?	H	native							266
Vernonia noveboracensis (L.) Michx.	New York Ironweed		H	native							267
Veronica officinalis L.	Common Speedwell			non-native							268
Viburnum acerifolium L.	Maple-leaved Viburnum		S	native							269
Viburnum dentatum L. var. *lucidum* Ait.	Northern Arrowwood		S	native							270
Viburnum opulus L. ssp. *opulus*	Geulder-rose		S	non-native	planted hedge						271
Viola arvensis Murr.	European Field Violet		H	native							272
Viola sagittata var. *ovata* (Nutt.) Torr. & Gray	Downy Violet		H	native							273
Vitis aestivalis Michx.	Summer Grape		L	native							274
Vitis L.	unidentified grape		L	native							275
Vitis labrusca L.	Fox Grape		L	native							276
Vitis riparia Michx.	River Grape		L	native							277
Wisteria Nutt., nom. conserv.	wisteria		L	non-native		R					278
Vascular Plants Not Outside of Cultivation											
Acer palmatum Thunb.	Japanese Maple		T,S	non-native							
Andromeda floribunda		sp.?		non-native							
Buxus L.	boxwood	sp.?		non-native							
Echinacea	purple coneflower	sp.?		non-native							
Hydrangea "Annabelle"				non-native							
Salix integra	Dappled Willow			non-native							
Cercis canadensis	Redbud			non-native							
Rhododendron L.	non-native Rododendron	sp.?	S	non-native							
Setaria italica (L.) Beauv.	Millet Foxtail	sp.?	H	non-native							
Spiraea japonica L. f.	Japanese Meadowsweet		S	non-native							
Swida alba	Variegated Red Twig Dogwood		S	non-native							
Tsuga canadensis (L.) Carr.	Eastern Hemlock		T	native							
Taxus cuspidata Sieb. & Zucc.	Japanese Yew	sp.?	S	non-native							
Tilia cordata Mill.	Littleleaf Linden			non-native							
Yucca filamentosa L.	Yucca			non-native							
Non-vascular plants											
Cladina sp[p].	reindeer lichen	sp.?	M/L	native							
crustose lichen	crustose lichen		M/L	native							
Polytrichum sp[p].	haircap moss		M/L	native							

TABLE NOTES:

Appendix 4. Annotated list of vascular plant taxa recorded by Moorhead Jul 2 - Sept 11, 2017, at Country Club of Woodbridge.

Taxon	Common Name	ID confidence	LIFE FORM	Native vs. non-native in CT[1]	Comments	CIPWG Invasive Status[2]	Legal Invasive Status in CT[3]	GCN[4] species	Flora Conservanda (2012) Division[5]	Legal E/T/SC status in CT[6]	Taxon Index #

[1]"native" and "non-native" means native or non-native to Connecticut, according to Dreyer et al. 2013. Native and naturalized vascular plants of Connecticut checklist. Memoirs of the Connecticut Botanical Society No. 5. 232 pp.

[2](CIPWG = CT Invasive Plant Working Group) I = on current Inavisive Plant List as an Invasive; P = on current Invasive Plant List as "Potentially Invasive"; ED = on current Early Detection List; R = on current Research List

[3]"banned " means it is illegal in Connecticut to import, move, sell, purchase, cultivate, or distribute this species, per Connecticut Public Acts 02-136 and 04-203

[4]GCN species are plants listed as species of "Greatest Conservation Need" in Appendix 1c. of Connecticut's 2015 Wildlife Action Plan (URL: http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Review)

[5]RE Brumback, W.E. et al. 2013. Flora Conservanda: New England 2012. The New England Plant Conservation Program (NEPCoP) List of Plants in Need of Conservation. Rhodora 115(964):313-408. Division 1 = Globally Rare Taxa; Division 2 (≤20 sites) and 2a (>20 sites) = Regionally Rare taxa; Division IND. = NE distribution and abundance uncertain

[6]listing status of plant in the Regulations of Connecticut State Agencies Sections 26-306-4 to 26-306-6, pubilshed in the Connecticut Law Journal June 29, 2004.

Abreviations:

gen.? idenitification uncertain at genus level
hyb.? idenitification of which hybrid is uncertain
ID identification
sp.? identification uncertain at species level
ssp. subspecies
var. variety

Life form codes:

T tree (woody, not a vine, > 5m high at maturity)
S shrub (woody, non a vine, 1-5m high at maturity)
H herbaceous
L liana (high-climbing woody vine)
GV woody trailing vine
SS subshrub, max ht << 1 m, acc. to refs.
SS subshrub, max ht to 1 m, acc. to refs.
SS* subshrub, aerial parasite

Appendix 5

Appendix 5. Animal taxa observed by Moorhead (July - Sep 11, 2017), Fischer (Jul 2, 2017), and others on other dates at Country Club of Woodbridge.

Scientific Name	Common Name	Life form	Native vs. non-native in CT	GCN Species[1]	Comments	Source
Branta canadensis	Canada Goose	Bird	native		1 adult , 3 chicks	JPF
Spinus tristis	American Goldfinch	Bird	native			JPF
Turdus migratorius	American Robin	Bird	native			JPF
Icterus galbula	Baltimore Oriole	Bird	native	•		B&JW
Hirundo rustica	Barn Swallow	Bird	native			JPF
Poecile atricapillus	Black-capped Chickadee	Bird	native			JPF
Cyanocitta cristata	Blue Jay	Bird	native			JPF
Bombycilla cedrorum	Cedar Waxwing	Bird	native			JPF
Chaetura pelagica	Chimney Swift	Bird	native	•		JPF
Spizella passerina	Chipping Sparrow	Bird	native			JPF
Quiscalus quiscula	Common Grackle	Bird	native			JPF
Picoides pubescens	Downy Woodpecker	Bird	native			JPF
Tyrannus tyrannus	Eastern Kingbird	Bird	native	•		JPF
Sturnus vulgaris	European Starling	Bird	non-native		Pest species[2]	JPF
Spizella pusilla	Field Sparrow	Bird	native	•		B&JW
Dumetella carolinensis	Gray Catbird	Bird	native			JPF
Ardea herodias	Great Blue Heron	Bird	native			B&JW
Myiarchus crinitus	Great Crested Flycatcher	Bird	native			JPF
Butorides virescens	Green Heron	Bird	native			JH
Haemorhous mexicanus	House Finch	Bird	non-native			JPF
Passer domesticus	House Sparrow	Bird	non-native		Pest species[2], using nest boxes at the golf course	JPF
Troglodytes aedon	House Wren	Bird	native			JPF
Zenaida macroura	Morning Dove	Bird	native			JPF
Cardinalis cardinalis	Northern Cardinal	Bird	native			B&JW
Colaptes auratus	Northern Flicker	Bird	native	•		JPF
Stelgidopteryx serripennis	Northern Rough-winged Swallow	Bird	native			WHM
Dryocopus pileatus	Pileated Woodpecker	Bird	native			JH
Setophaga pinus	Pine Warbler	Bird	native			JPF
Melanerpes carolinus	Red-bellied Woodpecker	Bird	native			WHM
Buteo lineatus	Red-shouldered Hawk	Bird	native			JPF, WHM
Buteo jamaicensis	Red-tailed Hawk	Bird	native			JPF
Agelaius phoeniceus	Red-winged Blackbird	Bird	native			B&JW
Melospiza melodia	Song Sparrow	Bird	native			JPF

Appendix 5. Animal taxa observed by Moorhead (July - Sep 11, 2017), Fischer (Jul 2, 2017), and others on other dates at Country Club of Woodbridge.

Scientific Name	Common Name	Life form	Native vs. non-native in CT	GCN Species[1]	Comments	Source
Tachycineta bicolor	Tree Swallow	Bird	native			JPF
Baeolophus bicolor	Tufted Titmouse	Bird	native			B&JW
Cathartes aura	Turkey Vulture	Bird	native			JPF
Vireo gilvus	Warbling Vireo	Bird	native			JPF
Sitta carolinensis	White-breasted Nuthatch	Bird	native			JPF
Meleagris gallopavo	Wild Turkey	Bird	native			JPF
Aix sponsa	Wood Duck	Bird	native		1 adult female with 7 chicks in largest pond	JPF
Canis latrans	Coyote	Mammal	native			JH
Tamias striatus	Eastern Chipmunk	Mammal	native			JPF
Sciurus carolinensis	Eastern Gray Squirrel	Mammal	native			JPF
Blarina brevicauda	Northern Short-tailed Shrew	Mammal	native		One found dead in fairway	WHM
Procyon lotor	Raccoon	Mammal	native			WHM
Vulpes vulpes	Red Fox	Mammal	native			JH
Didelphis virginianus	Virginia Opossum	Mammal	native		recently deceased joeys found in copse along cart path	WHM
Odocoileus virginianus	White-tailed Deer	Mammal	native			JPF
Marmota monax	Woodchuck	Mammal	native		Burrows in forest on site, live animal seen on adjacent property	WHM
Terrapene carolina carolina	Eastern Box Turtle	Reptile	native	•		JH
Chelydra serpentine serpentine	Snapping Turtle	Reptile	native			WHM
Lithobates catesbeianus	American Bullfrog	Amphibian	native			JPF
Lithobates clamitans	Green Frog	Amphibian	native			JPF
?	catfish	Fish	?			JH
?	sunfish	Fish	?			JH
Micropterus salmoides	Large-mouth Bass	Fish	non-native			JH
Pieris rapae	Cabbage White	Invert./Lep./Butterflies	non-native			WHM
Celastrina neglecta	Summer Azure	Invert./Lep./Butterflies	native		sp. ID based on obs. date: 8/27	WHM
several species	bees	Invert./Anthophila	native and/or non-native		sand traps and volley ball court	WHM
several species	wasps	Invert./Vespidae	native and/or non-native		sand traps and volley ball court	WHM
several species	ants	Invert./Vespidae	native and/or non-native		sand traps and volley ball court	WHM
at least one species	ant lions	Invert./Myrmeleontidae	?		some dirt/sand cart paths	WHM
several species	dragonflies	Invert./Od./Anisoptera	native		about ponds, fairways, and roughs	WHM
several species	damselflies	Invert./Od./Zygoptera	native		about ponds	WHM

TABLE NOTES:

Appendix 5. Animal taxa observed by Moorhead (July - Sep 11, 2017), Fischer (Jul 2, 2017), and others on other dates at Country Club of Woodbridge.

Scientific Name	Common Name	Life form	Native vs. non-native in CT	GCN Species[1]	Comments	Source

[1]"GCN Species" are species listed as of "Greatest Conservation Need" in Connecticut's 2015 Wildlife Action Plan. On-line technical report. URL: http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Review

[2]these non-native species are not protected by the Migratory Bird Treaty Act -- it is legal to kill or otherwise harrass these species, and often necessary to do so to prevent competition for nest sites with native birds.

Abbreviations:

ID	Identification
Invert.	Invertebrate
Lep.	Lepidoptera (butterflies and moths)
obs.	observation
Od.	Odonate (dragonfiles and damselflies)
sp.	species

Sources

JPF James P. Fischer, summer 2017 observation

WHM W. H. Moorhead, summer & early fall 2017 observations

JH Jeff Hughes, 88 Woodfield Rd, by neighbor to site, reported that he observed these in the past

B&JW Bruce & Jean Webber, summer 2017 observations

Appendix 6

Curriculum Vitae

William H. Moorhead III

486 Torrington Road
Litchfield, Connecticut 06759
(860) 567-4920
whmoorhead@optonline.net

TECHNICAL EXPERTISE

- Inventory for Rare/Threatened/Endangered plants, plant & natural communities, and Critical Habitats
- Mapping of vegetation, plant/natural communities using both traditional and modern tools and techniques (including various remote sensing coverages and GIS softwares)
- Classification and mapping of vegetation, plant and natural communities, and Critical Habitats in the northeastern U.S.
- Various methods for sampling vegetation and plant populations, for purposes of description and monitoring over time
- Restoration, management, and monitoring of rare plant populations and plant/natural communities
- Interpretation and ground-truthing aerial photographic imagery and other remote sensing coverages
- Delineation of Tidal Wetlands in Connecticut
- Federal Jurisdictional ("Army Corps") Wetlands delineation
- Sampling, identification, and analysis of freshwater aquatic macro-invertebrate communities for water quality evaluation
- Lecturer and instructor in native and invasive plant identification, rare plant and plant/community inventory, ecology and management, and wetland delineation, at secondary school, college undergraduate, graduate school, and adult professional levels
- Wetland restoration and mitigation planning, implementation, and monitoring
- Review and technical critique of wetlands permit and other environmental applications
- Review of conservation & management plans, technical journal articles, books relating to rare plant conservation, identification and ecology
- Invasive plant control and eradication in rare plant/natural communities and Critical Habitats

PROFESSIONAL EXPERIENCE

Twenty-eight years distributed in above-listed areas

EMPLOYMENT

10/00-present **Independent Consulting Field Botanist/Ecologist:** rare plant and natural community, Critical Habitat survey and inventory; classification and mapping of ecological

communities and Critical Habitats; wetland delineation; technical support of environmental permit applications; technical support of oppositions to environmental .
MAJOR PROJECTS:

- Contract botanical survey for MA NHESP in June, 2010, to relocate/update status of not-recently-observed State-listed plant populations in Berkshire County, in support of BIOMAPS 2 critical habitat mapping project. Twenty-seven populations documented.
- Contract botanical survey for MA NHESP in 2009, for globally rare sedge *Eleocharis diandra*, along Connecticut River in MA. Eight *Eleocharis diandra* populations documented, *Eleocharis ovata* documented for the first time (3 populations) on the CT River, 21 populations of other State-listed plants documented.
- Contract botanical survey for MA NHESP, 2008-2009, surveying for State-listed plants within 500-m-radius of Housatonic River from Pittsfield to Sheffield, MA. Approx. 138 new State-listed plant populations documented, including rediscovery of 1 State-Historic species and 1 Berkshire County-Historic species, 19 previously known populations relocated & updated.
- From 2008-2009, employed part-time by University of Connecticut Dept. of Ecology & Evolutionary Biology to create a digital GIS coverage of natural communities identified In Connecticut's Comprehensive Wildlife Conservation Strategy as "Critical Habitats", using a synthesis of interpretation of remote sensing imagery, Connecticut Natural Diversity Database data, and data from past and current field surveys of my own and others. Responsible for creating or editing more than 2000 critical habitat polygons and populating associated attribute data base.
- Principal Investigator in 2006-2009 research project, funded by the Long Island Sound License Plate Fund, describing and mapping the complex mosaic of plant communities in a 330-acre brackish tidal wetland system on the lower Connecticut River, involving collection and analysis of 950 stratified random floristic plots.
- In 2006, employed by Parsons (consultant to CONN-DOT), conducted an inventory of State-listed endangered plants and significant natural communities, and classified and mapped vegetation of 500-ac Groton-New London Airport; 9 new State-listed species documented on property.
- Research and preparation, 2004-2006, of the Eightmile River Watershed Biodiversity Report, commissioned by the National Park Service and the Eightmile River Wild & Scenic Study Committee.
- Co-investigator in 2005-2007 rare plant and natural community survey for private landowner of 600+ ac in Alford and West Stockbridge, MA; 5 new State-listed and 3 Watch-list species documented.
- In 2005, as subcontractor to The Maguire Group (consultant to CONN-DOT), classified and described vegetation and natural communities, and performed avian point counts along 15 avian survey transects (14 cumulative miles) in the proposed Rte. 11 corridor in Salem, East Lyme, Montville, and Waterford, CT; ancillary to main tasks, new occurrences of 1 Federally-Threatened and 4 State-listed plants were documented.
- Co-investigator in 2004 survey to rediscover a State-historic plant in Greenfield, Massachusetts, funded by a Massachusetts Natural Heritage and Endangered Species Program's Small Research Grant; occurrences of 5 State-listed and 4 Watch-list species documented.
- In 2003 and 2004, botanical consultant to Northwest Conservation District and King's

Mark Environmental Review Team, in review of large proposed golf course-subdivision project in Norfolk, CT; 5 new State-rare species occurrences documented.

- Survey, 2003-2006, of the 62-mi^2 Eightmile River watershed in Middlesex and New London Counties, CT, for rare plants and significant natural communities, commissioned by the National Park Service and the Eightmile River Wild & Scenic Study Committee; 35 new rare species occurrences (more than doubling number of know extant occurrences) and 101 priority natural community occurrences were documented; results delivered as digital GIS product.
- Farmington River Watershed Association's 2002 Farmington River Biodiversity Project: 7-month inventory of rare plants and priority natural communities in 7-town (214 mi^2) study area in the lower Farmington River watershed; approx. 100 new rare species populations documented, tripling number of known extant occurrences, and 160 priority natural community occurrences documented.
- Inventory, 2000-2007, of nine parcels in western Connecticut ranging from 60 to 400 acres, in technical support of applications for State Open Space Acquisition Grants by local and national land preservation groups, including Trust For Public Land, Roxbury Land Trust, Sharon Land Trust, Cornwall Land Trust, and Southbury Land Trust.

7/96 – 1/05 **Contract Inventory Botanist/Ecologist for Connecticut Natural Diversity Data Base, Connecticut Department of Environmental Protection:**

Scope of services:

- Survey for and documentation of State-listed vascular plants. Highlights of this work: rediscovery of 19 State-Historic taxa; ~390 new populations and unmapped historic sites discovered/rediscovered; first state records for 2 native species; and first state records for several non-native species.
- Vegetation reconnaissance and collection of relevé data from plant communities of special conservation significance; data used in development of state and national vegetation classifications.
- Rare plant inventory and classification and digital (GIS) mapping of the vegetation of the 2000-acre Canaan Mountain Natural Area Preserve in North Canaan and Canaan, Litchfield Co., CT.
- Rare plant inventory, classification and mapping of the vegetation of 570-acre Kitchel Natural Area Preserve in Colebrook, Litchfield Co., CT.
- Rare plant inventory, classification and mapping of the vegetation of Pachaug Great Meadow and Mount Misery Natural Area Preserves (cumulatively 626 acres) in Voluntown, New London Co., CT.
- Classification and digital (GIS) mapping of the vegetation of 280-ac Matianuck Natural Area Preserve, in Windsor, Hartford Co., CT.
- Assistance with environmental review, periodic reevaluation of state ranks and legal status of species in state, training of interns, coordination with The Nature Conservancy and other NGOs.

2/94 – 7/96 **Ecologist: Virginia's Natural Heritage Program (VA Department of Conservation and Recreation, Division of Natural Heritage)**:

Key responsibilities:

- Together with the Division's other two ecologists, development of vegetation classifications of study areas in Virginia's mountain provinces and in the southeastern coastal plain, via the collection and analysis of relevé data using the Braun-Blanquet tabular comparison approach. Project leader responsibility for:
  - an intensive vegetation survey of a 4000-ha study area in the George Washington National Forest in the Ridge and Valley Province. Tasks included collection and analysis of 50+ relevés, classification and mapping of the vegetation at the Land Type Phase level, and production of accompanying report for U.S.D.A. Forest Service contract
  - Nature Conservancy contract calling for collection/assemblage of relevés from Virginia's pitch pine-scrub oak woodland and related vegetation. Tasks included collection of new relevés, a Braun-Blanquet analysis and classification of these and existing relevés, and production of a report.
- Analysis of relevé data and other community data to advance Virginia state vegetation classification.
- Inventory for and collection of relevés and other documentation from Virginia's globally rare, state-rare, and exemplary natural communities, both in fulfillment of contracts with the Jefferson National Forest, Dept. of Defense, and NASA, and *de novo* inventory.
- Technical assistance, including advice and collection of relevé data, to natural area preserve stewardship section in development of resource management plans
- Technical assistance, including project review, to the environmental review section.

6/93 - 1/94 **Independent Consulting Field Ecologist, doing business as Western Highlands Consulting, Woodbury, Connecticut.**

Key Projects:

- Contract work for CT-DEP-Natural Diversity Data Base: performing field surveys to locate and characterize occurrences of RTE plant species; collecting relevé data from Atlantic White Cedar swamp and calcareous fens for use in development of state and national vegetation classifications
- Sampling and identification of stream macro-invertebrates, using RBP III and other protocols, as subcontractor to several environmental consulting firms.
- Survey, characterization, and mapping of vegetation and habitats for several clients in support of land use permit applications, *e.g.* wetlands permit applications, Superfund clean-up plans.

1/91 - 6/93 **Environmental Analyst (Biological): Office of Long Island Sound Programs (OLISP), Connecticut Department of Environmental Protection.**

Key responsibilities:

- investigation of violations of State Tidal Wetlands Act and Structures, Dredging, and Fill Statutes, using botanical/ecological expertise and aerial photo interpretive skills to determine jurisdictional boundaries, identify violations, determine degree of environmental harm and make recommendations to the Commissioner for appropriate site remediation requirements

- negotiation of consent orders with violators of Tidal Wetlands and Structures & Dredging Acts
- provide testimony at enforcement hearings and trials
- documentation of State-listed species occurrences
- technical assistance within my areas of expertise to OLISP Permitting and Coastal Programs sub-offices, other DEP bureaus and State agencies, municipalities, and private entities
- coordination of the Long Island Sound Clean Water Account Research Fund
- review and evaluation of site remediation and restoration plans
- review and processing of applications for Structures & Dredging and Tidal Wetlands permits.

3/83 - 12/90 **Consulting Field Biologist/Ecologist, Stereo-photogrammetrist, and Seller of Maps, doing business as Western Highlands Consulting, Woodbury, Connecticut.** Field biology/ecology component less than ½ time until about 12/87, full-time thereafter. Representative projects:

- Survey and mapping of occurrences of RTE plant species and critical habitats in and near the proposed right-of-way for the Iroquois Gas Transmission System Ltd. 24" natural gas pipeline: surveyed the entire CT portion and part of the NY portion, a total of approximately 700 acres and 55 linear miles. Also provided botanical support for the delineation of Federal Jurisdictional Wetlands. 3/90-6/91.
- Sampling, identification, and analysis of freshwater aquatic macro-invertebrate communities, using RBP III and other protocols, as subcontractor to The Ecological Consulting Services (EcoS), East Haven (now Hamden), CT.
- Performed multi-season bird and wildlife inventories, vegetation inventories and habitat/plant community maps, water quality assessments of streams, ponds, and lakes, delineation of Federal Jurisdictional Wetlands, delineation of watercourses, and site design evaluations, working as subcontractor to EcoS on a number of residential and commercial development projects seeking permits in Colchester, Fairfield, Marlborough, Glastonbury, Westport, West Hartford, East Lyme, Stamford, Cromwell, and Rocky Hill, Connecticut. 9/85-3/90.
- Produced an evaluation of construction-related sedimentation impacts and a wetland restoration plan for a 5-acre inland wetland on the site of the Mall at Buckland Hills, Manchester, CT, 8/89-8/90. Client: Fuss & O'Neill, Inc., Manchester, CT.
- Performed a biological/ecological inventory of a large seasonal pond, provided site design recommendations, and testified before the Glastonbury Conservation Commission on behalf of The Balf Co., Newington, CT, in support of their application for a town mining/excavation permit, 4/89-2/90. Client: Fuss & O'Neill, Inc.
- Planning and installation of a number of interpretive nature trails on Girl Scouts of America properties, 4/84-5/90.
- Provided technical support to a citizen's group opposing a proposed 19-lot subdivision in Brooklyn, CT, in the form of application review and testimony before the local zoning commission on biological issues, 11/89.

SPECIAL PROJECTS

Partner in research funded in part by The Nature Conservancy into changes in vegetation due to beaver activity at Beckley Bog, Norfolk, CT, 5/87-7/90.

EDUCATION

1986 **B.S. Chemistry with concentration in Biology**, Charter Oak College, based on course work completed at Middlesex Community College, University of Connecticut, and Central Connecticut State University.

1983 **A.S. Environmental Science**, Middlesex Community College.

***Post-graduate course work*:**

2005 ***Isoetes* Identification –** 1.5-day identification and ecology workshop, Delta Institute of Natural History, Bowdoin, ME. Instructor: Carl Lewis.

2005 ***Dryopteris* and its Hybrids** – 1.5-day identification workshop, Delta Institute of Natural History, Bowdoin, ME. Instructor: James D. Montgomery.

2002 **Dragonflies and Damselflies of Southern New England** – 1-day workshop, Center for Conservation & Biodiversity, University of Connecticut. Instructors: Dave Wagner, Mike Thomas.

1996 ***Carex* section Ovales Identification Workshop** – 2-day course, University of Connecticut and Connecticut Museum of Natural History. Intructor: Dr. Anton Reznicek.

1996 ***Sphagnum* Identification Workshop** – 2-day course, University of Connecticut and Connecticut Museum of Natural History. Instructor: Dr. Anton Damman.

1995 **Prescribed Burn Crew Training Workshop** – 2 day workshop, certificate, Virginia Dept. of Conservation and Recreation, Division of Natural Heritage.

1993 **Field Methods in Ecology** (EEB 452) - graduate level, 2 credits, University of Connecticut. Instructor: Dr. Anton Damman. Grade: A.

1993 **Soils** (PLSC 250) - undergraduate level, 3 credits, University of Connecticut. Grade: A.

1992 **Sedge Identification and Ecology** – 1-week workshop, certificate, Eagle Hill Wildlife Research Station, Steuben, ME. Instructor: Dr. Anton Reznicek.

1991 **Wetland Evaluation Technique (W.E.T. III)** – 32-hour training seminar, certificate, National Highway Institute, Federal Highway Administration.

1989 **Delineation of Federal Jurisdictional Wetlands** - training seminar, certificate, The National Wetland Science Training Cooperative.

1987 **Geomorphology** - graduate level, 3 credits, University of New Haven. Grade: A.

PRESENTATIONS

Moorhead, W.H. "Old Growth Forests of Peters Mountain, Alleghany County, Virginia." Presented at the 73rd Annual Meeting of the Virginia Academy of Science, May 23-26, 1995, VMI, Lexington, VA.

REPRESENTATIVE TECHNICAL REPORTS

Moorhead, W.H. III. 2010. A Survey for Rare Plants at Aton Forest: Results of Moorhead Field Surveys 2005-2010. 31 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III, C. Chadwick, S. Prisloe, J. Barrett, and N.E. Barrett. 2009. The Vegetation Mosaic of Ragged Rock Creek Tidal Marsh, Connecticut River, Old Saybrook, Connecticut. A final report to Department of Environmental Protection, State of Connecticut. A Long Island Sound License Plate Research Fund project. 39 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2006. Eightmile River Watershed Biodiversity Report. Prepared for the Eightmile River Wild and Scenic Study Committee. 138 pp. plus digital GIS product.

Moorhead, W.H. III. 2005. Pachaug Great Meadow Natural Area Preserve and Mount Misery Brook – Rhododendron Sanctuary Natural Area Preserve, Voluntown, New London County, Connecticut: A Survey of Rare Vascular Plant Species and Provisional Classification and Mapping of Vegetation and Natural Communities. 69 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2004. Final Summary Report of Eightmile River Watershed Rare Plant and Community Survey, 19 Jun – 27 Oct 2003. 19 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2004. Matianuck Sand Dunes Natural Area Preserve, Windsor, Hartford County, Connecticut: Provisional Classification and Mapping of Vegetation and Natural Communities. 23 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2003. Farmington River Watershed Association 2002 Biodiversity Project. Rare Plant and Natural Community Inventory. Summary Report. 22 pp. plus

Moorhead, W.H. III. 2001. Kitchel Natural Area Preserve, Litchfield County, Connecticut. A survey of rare vascular plant species and significant natural communities and provisional classification and mapping of vegetation and natural communities. 69 pp. plus appendices.

Moorhead, W.H. III. 2000. Canaan Mountain Natural Area Preserve, Litchfield County, Connecticut: a survey of rare vascular plant species and significant natural communities, and provisional mapping of vegetation and natural communities. Unpublished report submitted to the Connecticut Natural Diversity Data Base, Connecticut Dept. of Environmental Protection. 128 pp. plus appendices.

Fleming, G.P. and W.H. Moorhead III. 1998. Comparative wetlands ecology study of the Great Dismal Swamp, Northwest River, and North Landing River in Virginia. Natural Heritage Tech. Rep. 98-9, VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the U.S. EPA.
181 pp. plus appendices

Fleming, G.P. and W.H. Moorhead III. 2000. Plant communities and ecological land units of the

Peters Mountain area, James River Ranger District, George Washington and Jefferson National Forests, Virginia. Natural Heritage Tech. Rep. 00-07, VA Dept. of VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the USDA Forest Service. 195 pp. plus appendices

Fleming, G.P. and W.H. Moorhead III. 1996. Ecological land units of the Laurel Fork area, Highland County, Virginia. Natural Heritage Tech. Rep. 96-08, VA Dept. of VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the USDA Forest Service. 114 pp. plus appendices

Belden, A. Jr. and W.H. Moorhead III. 1996. A Natural Heritage Inventory of the Clinch Ranger District III, George Washington and Jefferson National Forests, Virginia. Natural Heritage Tech. Rep. 96-10, VA Dept. of VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the USDA Forest Service. 106 pp. plus appendix.

Ludwig, J.C., W.H. Moorhead, and A. Belden. 1995. A Natural Heritage Inventory of the Clinch Ranger District II, George Washington and Jefferson National Forests. Natural Heritage Tech. Report 95-3. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage. Unpuplished report submitted to the USDA Forest Service. 66 pp. plus appendices.

Hobson, C.S., D.J. Stevenson, and W.H. Moorhead. 1995. A Natural Heritage Inventory of the Polecat Creek Watershed, Caroline County, Virginia and Preliminary Results of a Mark-Recapture Study of *Elliptio complanata*. Natural Heritage Tech. Report 95-12. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage. Unpuplished report submitted to the Chesapeake Bay Local Assistance Department. 60 pp. plus appendices.

REFEREED PUBLICATIONS

Moorhead, W. H. III and E. J. Farnsworth. 2004. *Floerkea proserpinacoides* Willd. (False mermaid-weed) Conservation and Research Plan for New England. New England Wild Flower Society, Framingham, Massachusetts, USA. 76 pp.

Van Alstine, N.E., W.H. Moorhead, III, Allen Belden, Jr., T.J. Rawinski, and J.C. Ludwig. 1996. Recently discovered populations of small whorled pogonia (*Isotria medeoloides*) in Virginia. Banisteria 7:3-10.

AFFILIATIONS

Josselyn Botanical Society, 2010 - present (member)
New England Plant Conservation Program (NEPCoP), CT Task Force, 1996 – present (member)
Aton Forest, Inc. Research Committee, 2009 – present (board member)
Board of Directors, CT Chapter, The American Chestnut Foundation, 2009 - present (board member)
Flora Novae Angliae Advisory Committee, 2005 – present (committee member)
Flora Conservanda Update Committee, 2008 – present (committee member)
New England Botanical Club, 1999 – present (member).

Southern Appalachian Botanical Society, 1997 – present (member).
Torrey Botanical Society, 2001 – present (member).
Natural Areas Association, 1996 – 2002 (member).
North American Benthological Society, 1989 – 1993 (member).
The Wildlife Society, 1990 – 1993 (member).

References and samples of previous work furnished upon request

Appendix 7

James P. Fischer

278 North Shore Rd.
P.O. Box 916
Litchfield, CT 06759

jfischer973@gmail.com
Cell: (860) 921-6694

Education

The State University of New York, College of Environmental Science and Forestry, Syracuse, NY
Masters of Science - Environmental and Forest Biology, August 2003
Thesis Title: *The role of* Peromyscus leucopus *demography and* Ixodes scapularis *parasitism in the transmission of Lyme disease.*

The State University of New York, College of Environmental Science and Forestry, Syracuse, NY
Bachelors of Science - Environmental and Forest Biology, May 1996

Youngstown State University, Youngstown, Ohio
Biology/Pre-Forestry, 1991-1993

Professional Experiences

Research Director: White Memorial Conservation Center, Litchfield, CT (Sept. 2008 – current)
Research Activities:

- Conduct inventory and monitoring of species and critical habitats
  - Small terrestrial mammals via trapping and scat collection methods
  - Meso-predator & larger mammals via tracking and remote-trigger cameras
  - White-tailed deer density and herd composition via spotlighting from vehicle using Distance sampling
  - Porcupine colonization
  - Bat roost exit counts
  - Bat acoustic survey monitoring
  - Cavity nesting songbird productivity via nest-boxes
  - USGS Breeding Bird Survey (two routes) point counts
  - Christmas and Summer Bird Counts with local Audubon chapter
  - Waterfowl productivity via nest-boxes
  - Crayfish via minnow traps, seine nets, and dip nets
  - Amphibians via cover-boards and calls
  - Snakes via cover-boards
  - Spotted Turtle via basking turtle traps
  - Prevalence of Chytrid fungus infecting amphibians
  - Invasive species inventory and management (plants, inverts. and vertebrates)
  - Earthworm species inventory and ecological associations including soil parameter assessments
  - Deer tick monitoring
- Perform field necropsy of various wildlife species
- Supervised and directed staff Wildlife Biologist and Seasonal Research Technician by setting project goals and objectives

- Coordinate all external research activities on 4,000 ac. biological station from government agencies, academic institutions, and non-government organizations

Research Activities continued:

- Develop and coordinate citizen science projects
- Outreach Program activities to the public and professional colleagues via monthly electronic e-mailed newsletter, quarterly newsletter articles, weblog, reports, presentations, and posters
- Interview with local news media
- Reports submitted to Executive Director and Board of Trustees
- Author grant applications
- Communicate with neighboring land owners about Research Program activities
- Direct and advise high school and college interns
- Manage state and federal permits

Volunteer Management & Educational Activities

- Train volunteers for Citizen Science projects through Adult Education Workshops
- Facilitate monthly volunteer meetings
- Respond to phone calls from general public about wildlife questions
- Facilitate professional development workshops
- Teach environmental science advanced placement high school teachers ecological survey techniques
- Lead occasional environmental education activities to school-aged children
- Curate museum exhibits
- Currently Initiating an Energy Conservation/Alternative Energy curriculum that accompanies photovoltaic, geothermal, wind turbine, and other energy conservation measures installed at facility from 2009 – 2011.
- Worked with cosponsoring organizations of educational activities on facilitating speakers requirements, establishing program budgets, and promotions

Administrative Tasks

- Assist website development with private contractors
- Advise managing staff and volunteers
- Advise staff with office computer, software, and information technology tasks
- Respond to phone calls dealing with programs and registrations
- Manage budget and purchase supplies
- Proficient with MS Office Suite 2010 & earlier versions; familiar with ArcGIS

Wildlife Research Biologist: White Memorial Cons. Ctr., Litchfield, CT (Sept. 2006 – Sept. 2008)

- Conduct surveys for rarely observed critical wildlife species
- Managed volunteer corps
- Developed grant applications awarded $7,400
- Managed budget and purchase supplies

Vertebrate Collections Manager: University of Connecticut, Systematic Research Collections, Department of Ecology and Evolutionary Biology, Storrs, CT
(June 2006 – Dec. 2007)

- Managed all activities of collections including specimen loans, budget, ordering supplies, and other administrative tasks.
- Supervised student assistants
- Databased specimen information
- Preserved vertebrate specimens using standard museum techniques

- Taught undergraduate and graduate students standard specimen preservation techniques as part of course curriculum

(October 2003-May 2004)

- Reorganized and databased over 60,000 vertebrate specimens which are housed in a new research facility.

Endangered Species Scientific Advisory Committee Member: State of Connecticut, Department of Energy and Environmental Protection
(2006 – current)

- Periodically review the status of mammal species and advise CT DEEP of changes to species listing

Research Assistant: State of Connecticut, Department of Environmental Protection, Wildlife Division,
(March 2006 – Sept. 2006)

- Developed and awarded two grants totaling $20,000
- Designated Principal Investigator of project
- Coordinated trapping at over 15 locations throughout the state targeting water shrew (*Sorex palustris)* and southern bog lemming *(Synaptomys cooperi),* a rarely observed species and state listed species of Special Concern, respectively
- Trained employees small mammal trapping skills

(April 2005 – October 2005)

- Developed and awarded grant equaling $11,500
- Designated Principal Investigator of project
- Coordinated trapping at 11 locations along Connecticut's coastline targeting least shrew *(Cryptotis parva)*, a state listed Endangered species
- Managed state coastal wetland permit for this project

Independent Research Contractor: State of Connecticut, Department of Environmental Protection, Wildlife Division, (January 2003 – 2005)

- Developed and awarded grant equaling $11,500
- Designated Principal Investigator of project
- Conducted trapping at 8 locations throughout northern Connecticut assessing the status and habitat associations of the northern flying squirrel *(Glaucomys sabrinus)* in the state.

Seasonal Technician: State of Connecticut, Department of Environmental Protection, Wildlife Division, Sessions Woods Wildlife Management Area, Burlington, CT
Outreach Program (2003)

- Developed database to track volunteer activity
- Constructed mobile and permanent exhibits
- Trained CT DEP, Wildlife Division, "Master Wildlife Conservationist" volunteers

West Nile Virus Bird Courier (Summers 2002 and 2003)

- Transported birds from local health departments to the University of Connecticut for further testing
- Analyzed data that streamlined courier services during subsequent seasons

Research Assistant: Powdermill Biological Station, Carnegie Museum of Natural History, Rector, PA

(2001 – 2002)

- Investigated the role of mycophageous (fungus eating) small mammals in forest regeneration.
- Small mammal live trapping monthly
- Diagnosed the presence of and identified fungal species by spore in feces

Teaching Assistant: Adirondack Ecological Center, Huntington Wildlife Forest, SUNY-CESF, Newcomb, NY (March 2001)

- *Winter Mammalian Ecology*. Assist professors teaching a course that presented the mammalian adaptations to winter environments. The class incorporated lecture and laboratory exercises.

Graduate Research Assistant: Roosevelt Wild Life Station, State University of New York, CESF, Syracuse, New York 2000 - 2001

- Developed grant equaling $8600
- Preparation of website and computer simulation model that explained the role of white-footed mice *(Peromyscus leucopus)* demographics and seasonal black legged tick (*Ixodes scapularis*) phenology in the ecology of Lyme Disease.

Graduate Research Assistant: The Research Foundation, State University of New York, CESF, Syracuse, New York 1998 - 2000

- Analyzed white-footed mouse mark-recapture data with Program MARK and Program DISTANCE.
- Analyzed black-legged tick phenology data and relating this to the epidemiology of Lyme Disease

Research Technician: Fire Island National Seashore, Suffolk Co., NY, for The Research Foundation, State University of New York, CESF, Syracuse, New York 1996 - 1998

- Live-trapped, marked, and handled small mammal
- Anesthetized white-tailed deer (*Odocoileus virginianus*) using remotely-fired darts
- Training in the use of remote capture techniques, anesthetization, and support drugs for large mammals by National Park Service.
- Estimated population density and sex/age composition of white-tailed deer population using Program DISTANCE
- Measured tick burdens on small mammals, white-tailed deer, and bird species
- Developed independent experiment investigating the effect of ear-tagging on the tick burden of white-footed mice.
- Captured songbirds using mist-nets and potter cage traps throughout the year
- Monitored black-legged tick phenology weekly
- Developed working relationships with stakeholders and NPS personnel

Summer Technician: Adirondack Ecological Center, Huntington Wildlife Forest, SUNY-CESF, Newcomb, NY 1995

- Live trapped and marked small mammals
- Monitored waterfowl nest boxes and banded migratory ducks
- Aided graduate student research projects

Research Assistant: Youngstown State University, Herbarium, Youngstown, OH 1992 - 1993

- Identified, collected, and prepared herbarium specimens of local, continental, and international origin.

Grants and Funding

2006 Seherr-Thoss Foundation $7,400
Title: Assistance for equipment and supplies to aid the Wildlife Research and Conservation Program at White Memorial Conservation Center.

2005 Connecticut's Endangered Species/Wildlife Income Tax Check-off Fund $10,000
Title: Assessing the status, geographic distribution, and habitat associations of the water shrew in Connecticut.

2005 Connecticut's Endangered Species/Wildlife Income Tax Check-off Fund $10,000
Title: Assessing the status, geographic distribution, and habitat associations of the southern bog lemming in Connecticut.

2004 Connecticut's Endangered Species/Wildlife Income Tax Check-off Fund $11,500
Title: Assessing the status, geographic distribution, and habitat associations of the least shrew in coastal Connecticut.

2003 Connecticut's Endangered Species/Wildlife Income Tax Check-off Fund $11,500
Title: Assessing the status and habitat associations of the northern flying squirrel and southern flying squirrel in northern Connecticut.

2000 2001 Roosevelt Wild Life Station, State University of New York, College of Environmental Science and Forestry, Syracuse, NY Graduate Research Assistantship coauthor Dr. H. Brian Underwood (Principal Investigator/Major Professor) $8,600

Posters and Presentations

Fischer, J. P. 2011. Initial Survey of Crayfish Species (Order Decopoda) at White Memorial Foundation, Litchfield and Morris, Litchfield Co., CT, USA. Connecticut Conference on Natural Resources, University of Connecticut, Storrs, CT.

Fazzino, L., J. P. Fischer, and C. R. Kocer. 2007. Examination of breeding barn owl (*Tyto alba*) diet analysis in Connecticut. Connecticut Conference on Natural Resources, University of Connecticut, Storrs, CT.

Fischer, J. P. 2007. Examination of water shrew (*Sorex palustris*) microhabitat associations at White Memorial Foundation, Litchfield Co., CT, USA. Connecticut Conference on Natural Resources, University of Connecticut, Storrs, CT

Fischer, J. P. 2003. Connecticut's small mammals. Connecticut Outdoor and Environmental Educators Associations Annual Conference. University of Connecticut, Storrs, CT.

Fischer, J. P. and H. B. Underwood. 1999. The effects of ear tagging on the recruitment, distribution, and drop-off rate of *Ixodes scapularis* on the body of *Permyscus leucopus*. The American Society of Mammalogists Annual Conference, Seattle, Washington.

Publications

Technical Audience

Underwood, H. B., F. D. Verret, and J. P. Fischer. 1998. Density and herd composition of white-tailed deer on Fire Island National Seashore. United States National Park Service Technical Report. 42 pp.

General Audience

J. P. Fischer and D. Rosgen. 2011 – current. *Wildlife Monitor:* A weblog that details the activities of the Research and Conservation Programs of White Memorial Conservation Center, Inc., Litchfield, CT, USA. http://wmrcp.blogspot.com
Over 20,000 page visits to the weblog in the first year to read from over 160 posts

J. P. Fischer. 2010 – current. *White Memorial's Research and Conservation Forum*: monthly newsletter e-mailed to over 200 volunteers and colleagues detailing the programs accomplishments.

J. P. Fischer. 2003. Flying squirrels: the nighttime gliders. Connecticut Wildlife. 23:12-13.

Community Service and Involvement

Torrington Toastmasters Club, Torrington, CT (2011 – current)
Litchfield Socrates Café (2011)
Constance B. Ripley Land Trust Board Member, Litchfield, CT (2010 – current)
Aton Ecological Forest Board Member, Norfolk, CT (2008 – 2010)
Winchester Land Trust Board Member, Winsted, CT (2007 – 2009)
Eagle Scout Rank, Boy Scouts of America, Moraine Trails Council, PA (1991)
Vigil Honor, Order of the Arrow, B.S.A., Moraine Trails Council, PA (1991)