Hempstead Plains Grassland
Ecological Community Mapping and Rare Plant Survey

New York Natural Heritage Program

The NY Natural Heritage Program is a partnership between the NYS Department of Environmental Conservation (NYSDEC) and the State University of New York College of Environmental Science and Forestry.

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New York
Natural Heritage
Program

Established in 1985, the New York Natural Heritage Program (NYNHP) is a program of the State University of New York College of Environmental Science and Forestry (SUNY ESF). Our mission is to facilitate conservation of rare animals, rare plants, and significant ecosystems. We accomplish this mission by combining thorough field inventories, scientific analyses, expert interpretation, and the most comprehensive database on New York's distinctive biodiversity to deliver the highest quality information for natural resource planning, protection, and management. The Program is funded by grants and contracts from government agencies whose missions involve natural resource management, private organizations involved in land protection and stewardship, and both government and private organizations interested in advancing the conservation of biodiversity.

NY Natural Heritage is housed within NYS DEC's Division of Fish, Wildlife & Marine Resources. The program is staffed by more than 25 scientists and specialists with expertise in ecology, zoology, botany, information management, and geographic information systems.

NY Natural Heritage maintains New York's most comprehensive database on the status and location of rare species and natural communities. We presently monitor 181 natural community types, 803 rare plant species, and 474 rare animal species across New York, keeping track of more than 13,500 locations where these species and communities have been recorded. The database also includes detailed information on the relative rareness of each species and community, the quality of their occurrences, and descriptions of sites. The information is used by public agencies, the environmental conservation community, developers, and others to aid in land-use decisions. Our data are essential for prioritizing those species and communities in need of protection and for guiding land-use and land-management decisions where these species and communities exist.

In addition to tracking recorded locations, NY Natural Heritage has developed models of the areas around these locations important for conserving biodiversity, and models of the distribution of suitable habitat for rare species across New York State.

NY Natural Heritage also houses *i*MapInvasives, an online tool for invasive species reporting and data management.

NY Natural Heritage has developed two notable online resources: Conservation Guides include the biology, identification, habitat, and management of many of New York's rare species and natural community types; and NY Nature Explorer lists species and communities in a specified area of interest.

The program is an active participant in the NatureServe Network – an international network of biodiversity data centers overseen by a Washington D.C. based non-profit organization. There are currently Natural Heritage Programs or Conservation Data Centers in all 50 states and several interstate regions. There are also 10 programs in Canada, and many participating organizations across 12 Latin and South American Countries. Our collaboration with NatureServe and other states helps us put our information into a broader context. With NatureServe, we track the rarity of species and natural communities at global and state scales, allowing us to distinguish conservation priorities for species with just a few populations in the world to other species with a few populations in New York but many populations elsewhere. We can also pool our data to look across state and international lines. For example, New York data on rare species and natural communities along Lake Ontario have been combined with similar data from Canada to facilitate analyses of potential consequences of lake-level changes. New York information has also been combined with data from neighboring states to help us understand the significance of our best biodiversity sites relative to similar systems in southeastern Canada, New England, the Mid-Atlantic states, and other Great Lakes states.

Learn more at www.nynhp.org.

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A report prepared by the

New York Natural Heritage Program

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for

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March 2018

Please cite this report as follows: Edinger, G.J. and S.M. Young. 2018. Hempstead Plains Grassland Ecological Community Mapping and Rare Plant Survey. New York Natural Heritage Program, Albany, NY.

Cover photos: top left: Sandplain Agalinis (*Agalinis decemloba*) at plot A02;
top right: Hempstead Plains Grassland (*SJE*) at reference observation point A25;
bottom: Hempstead Plains Grassland (*Agrostis*) at plot A08.
Photos by Gregory J. Edinger

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EXECUTIVE SUMMARY

In less than 250 years the globally-rare Hempstead Plains grassland natural community that once covered over 50 square miles of western Long Island, has been reduced to a couple dozen acres on three Nassau County parcels that are surrounded by urban development and threatened by invasive plants. Aerial photography from the mid-1950s reveal that all remaining parcels with patches of Hempstead Plains grassland underwent some degree of human alteration related to air field and golf course development. Despite this long history of degradation, it is impressive to see that taken together, many of the characteristic native plants of the Hempstead Plains grassland have survived for decades, providing habitat for 14 rare plants tracked by the NY Natural Heritage Program. By targeting management and restoration efforts on the areas in fair to good conditions identified in this report, we estimate that up to 40 acres of Hempstead Plains grassland could be successfully restored.

We surveyed a total of 93 plots and observation points over ten days within the study area. We classified 16 natural communities in the five parcels. Three are variants of Hempstead Plains grassland community. Six are variants of successional old field. Three are variants of successional shrubland and three are variants of successional southern hardwoods. We also classified one forested wetland as a red maple-hardwood swamp We produced an ecological community map for each parcel. We estimate that there are 24.17 acres of Hempstead Plains grassland left in the study area, including all variants. Parcel A has 11.58 acres of two variants of Hempstead Plains grassland. Parcel C has 7.1 acres of two variants of Hempstead Plains grassland. Parcel D has 5.49 acres of two variants of Hempstead Plains grassland.

We assessed 78 plots and observation points within the study area using the Floristic Quality Assessment (FQA) methods. The Hempstead Plains grassland points in Table 15 should be the priority targets for HPG restoration and invasive prevention, since they have the "building blocks" needed for success. Similarly, the areas mapped as one of the three Hempstead Plains grassland variants on the Ecological Community Map for each parcel should also be priority targets for management and restoration.

We assessed 79 plots and observation points within the study area and tallied the number of non-native plant species and summed the percent cover all exotics present at each point. Non-native plants were present in 76 (96%) of the sample points. The number of non-native species per point ranged from zero to 14. The sum of non-native species cover per point ranged from zero to 100% non-native at 13 points. We present a non-native plant assessment for each parcel.

A total of 22 rare species locations were surveyed for 14 rare species over nine days within the study area. All of the rare species except two that were known from Parcels A-E were found again, but no new rare species were discovered. We present a rare plant assessment for each parcel.

The population of the globally rare Sandplain Agalinis (*Agalinis decemloba*) at the Hempstead Plains is the second largest in the state and has fluctuated between tens of plants and thousands of plants. The main population is within two fenced areas in the southeast side of Parcel A where they have been managed and counted since 1984. In an effort to augment these populations the fenced areas surrounding them could be gradually enlarged to encompass a larger area.

INTRODUCTION

Purpose and Study Area Overview

In early 2017, the Friends of Hempstead Plains at Nassau Community College, Inc., with support from the BAND Foundation, contracted the NY Natural Heritage Program to 1) survey and produce a digital map of the ecological communities for the Hempstead Plains Grassland study area comprised of five Nassau County parcels described below, and 2) survey the study area parcels for rare plants (including surveys of previously documented occurrences and de novo searches for new occurrences).

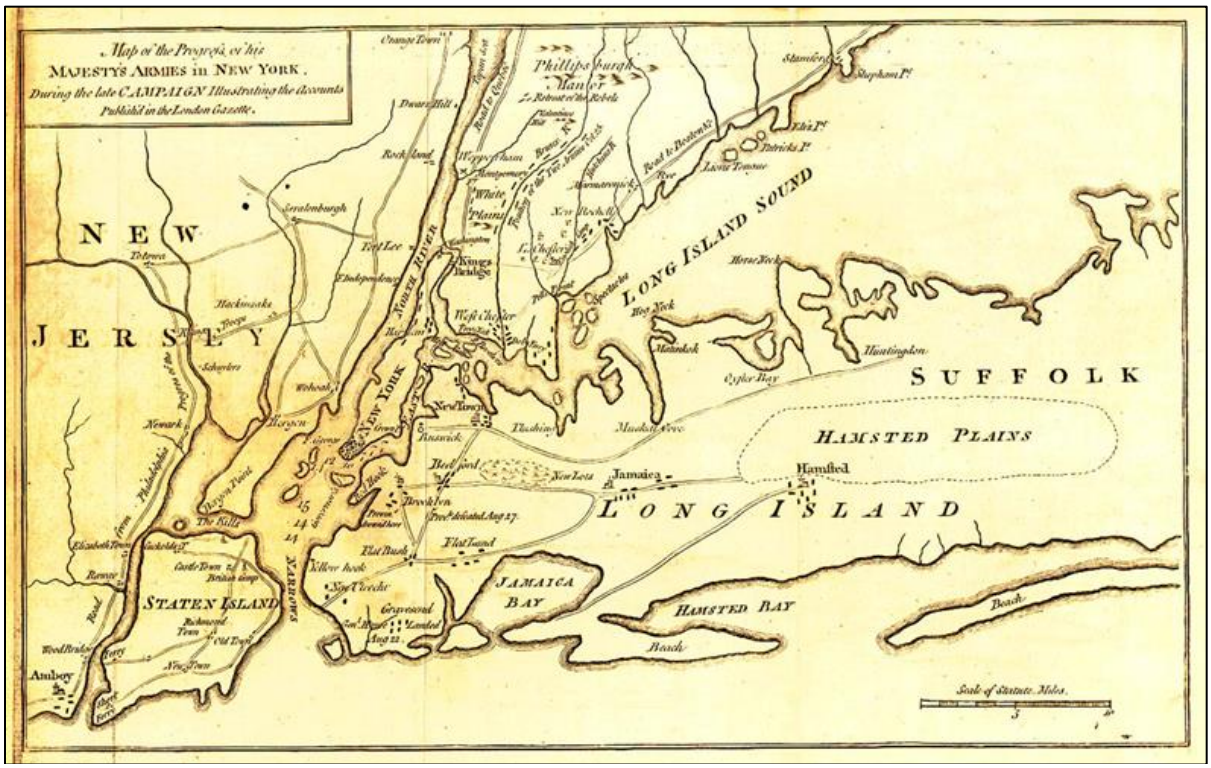

Figure 1. Map originally published in the Gentleman's Magazine in 1777 shows the extent of the "Hamsted Plains" on Long Island. https://www.awesomestories.com/asset/view/Giving-Up-on-New-York-in-1776//1

The Hempstead Plains Grassland is a remnant natural community that once covered approximately 38,000 acres on the outwash plains in west-central Long Island (Figure 1). It is now reduced to a few patches with the highest quality patch maintained by the Friends of Hempstead Plains at Nassau Community College, Inc. (Figure 2). The NY Natural Heritage Program recognizes this native prairie community as globally rare (there is nothing like it anywhere) and of very high conservation importance. In addition to being a unique natural community, a suite of rare plants still persists in the remnant patches. We fully support the Friends ongoing management actions and their desire to expand activity to nearby parcels. NYNHP surveys conducted in 2017 and presented in this report support this work by:

- determining a baseline, current condition state from which the results of future management activities can be compared;

- collecting data that could help determine the types of management needed (and potential for management success) at different locations throughout the target areas, based on current status of vegetation, topography, and soils;
- collecting data that would allow an estimation of current trends based on earlier samples to better understand management needs and current management success; and
- refining the statewide status of the rare plants located on site, which in turn could inform management priorities.

The NY Natural Heritage Program has over two decades of experience producing ecological community maps for public land managers and private conservation organizations. We have produced such maps for various state lands (e.g., NYS DEC Wildlife Management Areas and OPRHP State Parks) and multi-owner conservation areas (e.g., Wilton Wildlife Preserve and Park in Saratoga County, NY and the Great Swamp in eastern NY). However, it has been our involvement in the National Park Service (NPS) Vegetation Mapping Program that is most responsible for elevating our mapping capabilities to our current high standards. Since 2003 we have produced wall-to-wall vegetation association maps using the National Vegetation Classification (NVC) for six NPS sites and two National Wildlife Refuges in New York totaling 44,584 ha (110,169 acres). These vegetation association maps meet rigorous Federal Geographic Data Committee standards for vegetation classification and metadata, and national standards for spatial accuracy and data transfer.

Accurate vegetation maps are an extremely useful tool for land managers and biological researchers. Baseline information on plant community composition and rarity is critical to developing desired conditions and land management goals relating to native plant communities, non-native plant and insect species, and effects of deer browse and other disturbances. The identification and description of plant communities also provide habitat information important to understanding associated organisms.

The NY Natural Heritage Program has the largest and most complete database of rare plant information in New York. We began the mapping and assessment of rare plants in New York in 1983 and have compiled data on individual occurrences of 678 rare plants across the state. Our plant occurrences include information on location, size, condition, habitat, landscape context, trends, and management recommendations. The information is used to assist the conservation and protection efforts of government agencies, private organizations, and the general public, to provide information for use in the environmental review process, to provide information to educators and researchers about New York's rare plants, and to assist those in search of rare plants. Lastly, the NY Natural Heritage Program maintains The New York Rare Plant Status List (Young 2017), and the most current version is available online:
http://www.dec.ny.gov/docs/wildlife_pdf/2017rareplantlists.pdf.

We have continuous information on the status of rare plant surveys at the Hempstead Plains since our original surveys in 1983.

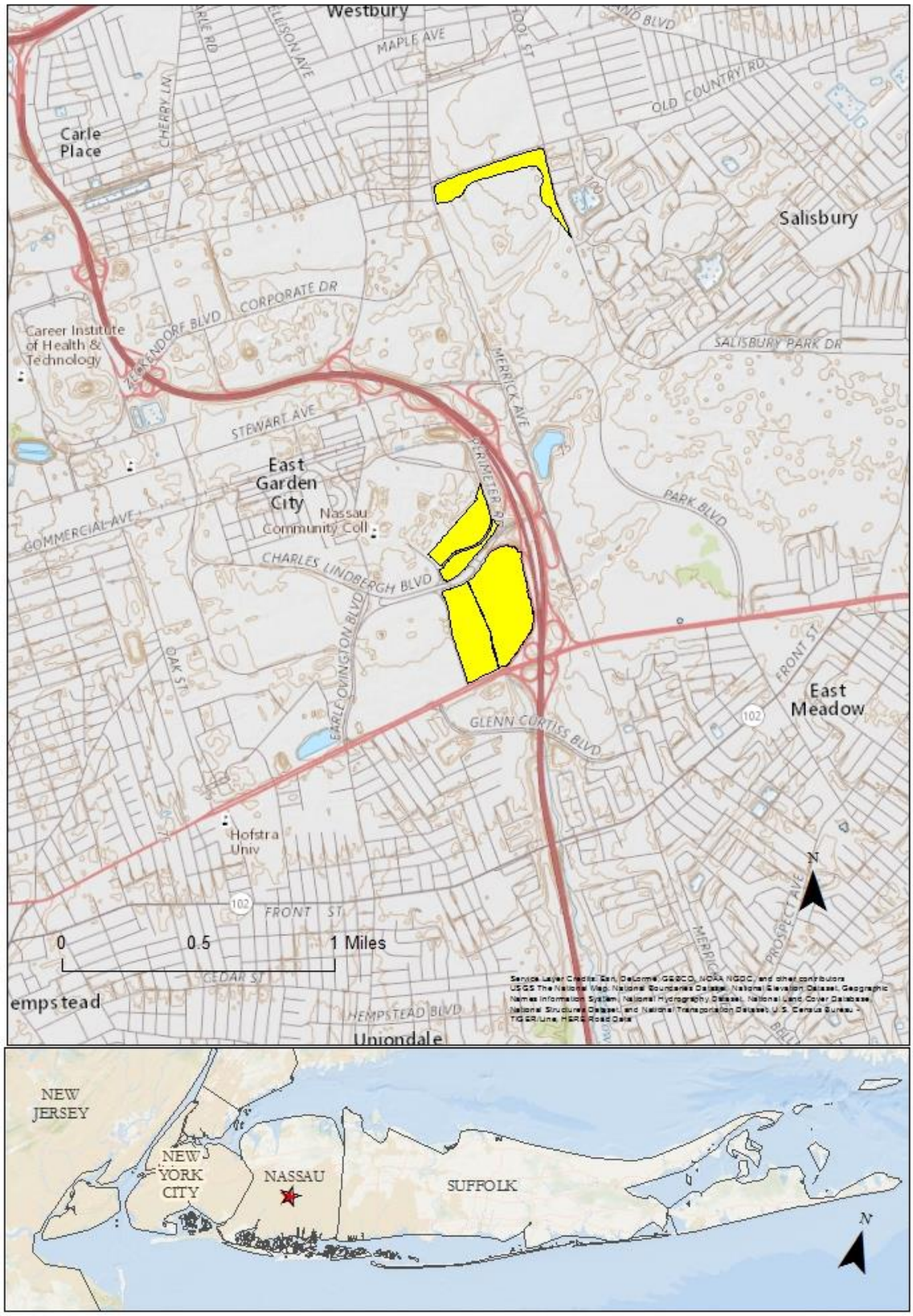

Figure 2. Hempstead Plains Grassland Study Area within Nassau County.

Study Area Physical Setting and Environment

The study area includes the following five Nassau County parcels (Figures 3, 4, and 5):

Parcel A (16 acres) is surrounded by a chain link fence along Perimeter Road to the east, southeast, and southwest with the Nassau Community College parking lot along the northwest boundary. The Hempstead Plains Education Center building is located at the south end of the fenced in area. See Appendix A for Parcel A maps.

Parcel B (6.5 acres) is located south of Parcel A between Charles Lindbergh Boulevard and Perimeter Road. The parcel is on north side of Charles Lindbergh Boulevard with no fence, but there is a chain link fence along the north parcel boundary along Perimeter Road. See Appendix B for Parcel B maps.

Parcel C (26 acres) is located east of the Long Island Marriott. The parcel is bounded on three sides by roads and a chain link fence: 1) north side along Charles Lindbergh Boulevard, 2) west side along James Doolittle Boulevard, and 3) south side along the Hempstead Bethpage Turnpike (Route 24). Access openings through the fence are located 1) at the northwest corner of the parcel about 75 m south of Charles Lindbergh Boulevard/James Doolittle Boulevard junction; 2) west side of the parcel about 200 m south of Charles Lindbergh Boulevard and opposite the Marriott main entrance ("Marriott opening" in this report), and 3) at the southwest corner of the parcel about 70 m north of the Hempstead Bethpage Turnpike/James Doolittle Boulevard junction. A north-south abandoned paved road defines the eastern boundary of the parcel ("Purcell Avenue" in this report). There are also access openings in the fence at the north and south ends of the abandoned paved road between Parcels C and D. See Appendix C for Parcel C maps.

Parcel D (42 acres) is located east of Parcel C and is bounded by the Charles Lindbergh Boulevard to the north, Hempstead Bethpage Turnpike to the south, a north-south abandoned paved road to the west, and the Meadowbrook Parkway exit ramp to Route 24 to the east. There are access openings in the fence at the north and south ends of the abandoned paved road ("Purcell Avenue" in this report) between Parcels C and D. See Appendix D for Parcel D maps.

Parcel E (21 acres) is located at the north end of Eisenhower Park and is bounded on three sides by roads: 1) Old Country Road to the north, 2) Merrick Ave. to the west, and 3) Salisbury Park Drive to the east. A golf course defines the south boundary of this parcel. A small parking spot is located on the west side of Salisbury Park Drive about 50 m south of Old Country Road. This spot is also a lock gated access to a small trailer/shack, but the parcel can be accessed by climbing over split rail fence. See Appendix E for Parcel E maps.

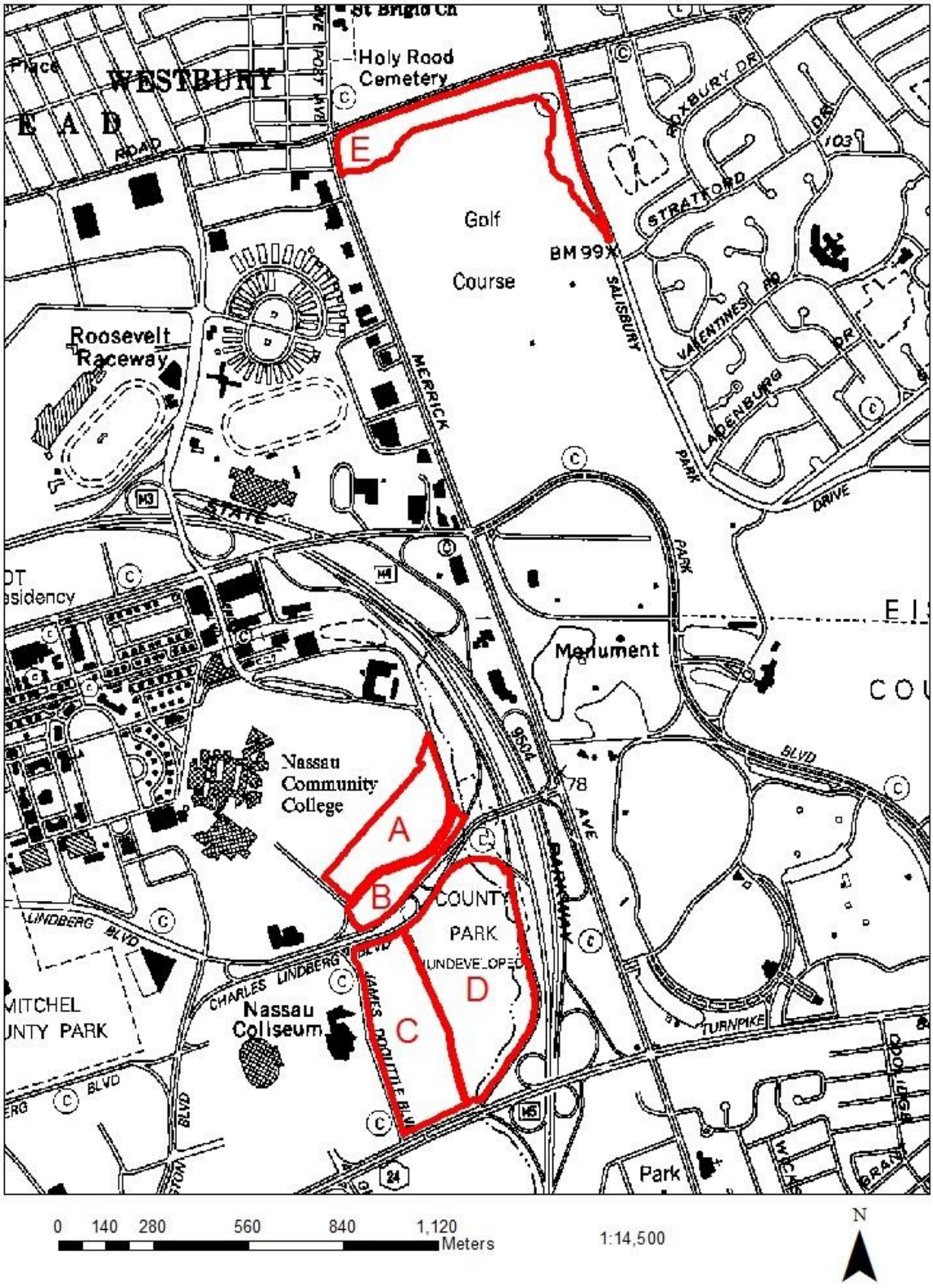

Figure 3. Hempstead Plains Grassland Study Area Parcels A-E DOT Planimetric Images.

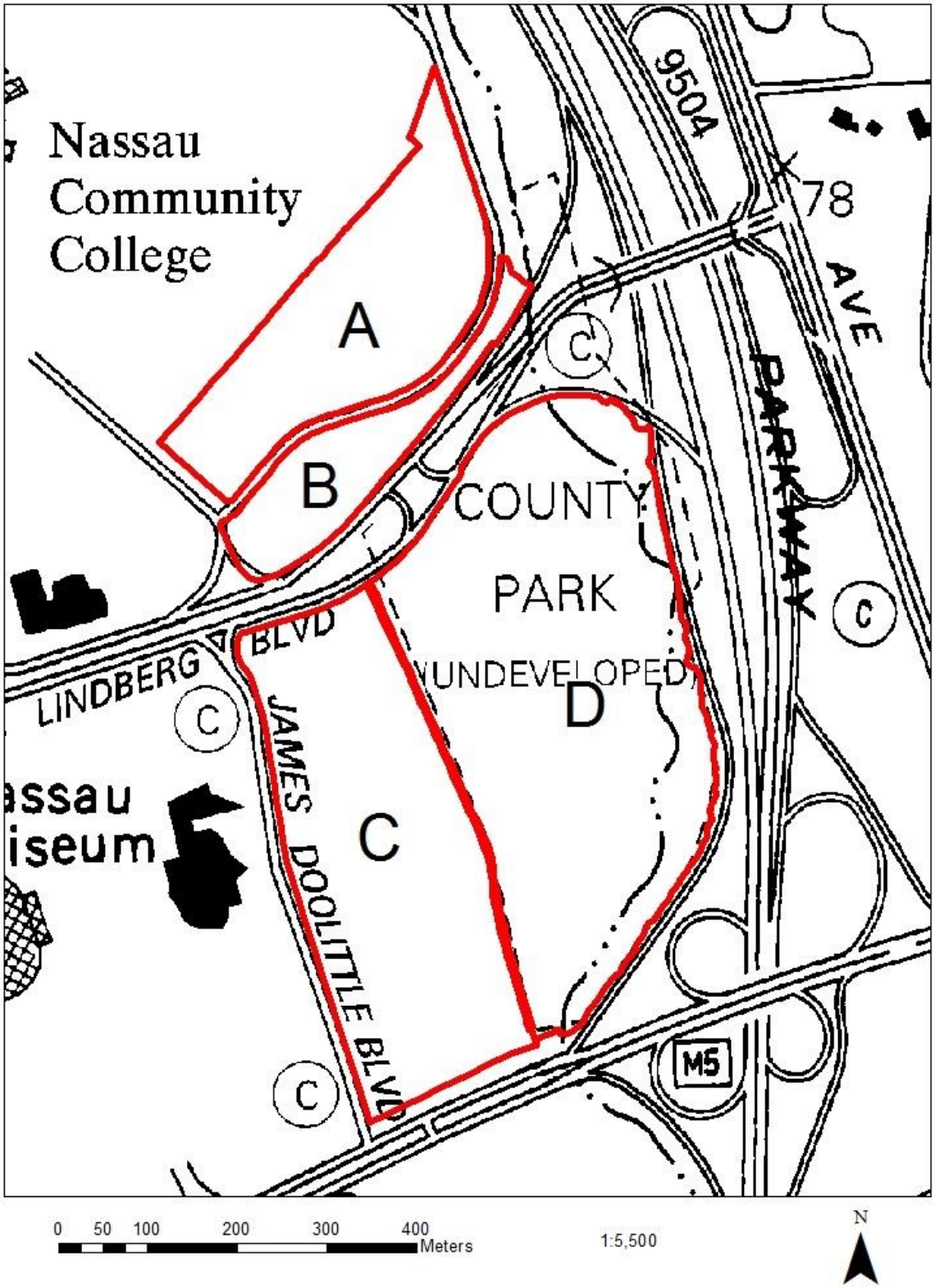

Figure 4. Hempstead Plains Grassland Study Area Parcels A-D DOT Planimetric Images.

Figure 5. Hempstead Plains Grassland Study Area Parcels A-D Long Island 2013 6-inch Natural Color.

The Hempstead Plains Grasslands have a long history of natural history research (*e.g.,* Cain et al. 1937, Ferguson 1925. Harper 1911, 1912, 1918, Hicks 1892, Jordan et al. 2002, Kirby 1905, Neidich-Ryder and Kennelly 2013, Seyfert 1973, Stalter 1981, Stalter and Lamont 1987, Stalter and Seyfert 1989, Watson 1860) and we direct readers to those publications for the details missing from this report. Additional information about the Hempstead Plains Grasslands can be found online:

NY Natural Heritage Program Conservation Guide for Hempstead Plains Grassland
http://www.acris.nynhp.org/guide.php?id=10008

Friends of Hempstead Plains at Nassau Community College, Inc.
http://www.friendsofhp.org/site/
http://www.friendsofhp.org/site/index.php?id=3

We reviewed available background information about the study area and what follows is a summary of the geophysical and landscape features that play an important role in determining what vegetation types can develop. At the landscape level we note the study area's position within mapped ecoregions and the influence of the underlying bedrock and surficial geology. At the local level we list the dominant soil types and note their correlation to the observed vegetation cover to past land use.

Ecoregions

The distribution of plant and animal species in New York closely corresponds with ecoregional boundaries. These areas of ecological homogeneity are defined by similarities in soil, physiography, climate, hydrology, geology, and vegetation. The study area falls within the following mapped ecoregional classifications:

EPA Ecoregions
The study area is in the Level IV Long Island Sound Coastal Lowland (59g) within the Level III Northeastern Coastal Zone (Bryce et al. 2010).

The Nature Conservancy – USDA Forest Service Ecoregions
The ecoregions are based on The Nature Conservancy (TNC) classifications for the U.S. and are modified from USDA Forest Service ecoregions (Bailey 1997). The study area is in the Long Island Coastal Lowland and Moraine Subsection of the North Atlantic Coast Ecoregion.

NYS DEC Ecozones
The study area is in the Coastal Lowlands Subzone (I01) within the Coastal Lowlands Ecozone (Dickinson 1983)

Geology

The bedrock geology of the study area is Late Cretaceous Coastal Plain Deposits comprised of silty clay, glauconitic sandy clay, sand, gravel of the Magothy Formation (Rickard and Fisher 1970, Figure 6). The surficial geology of the study area is outwash gravel and sand (Cadwell & Dineen 1987, Figure 7).

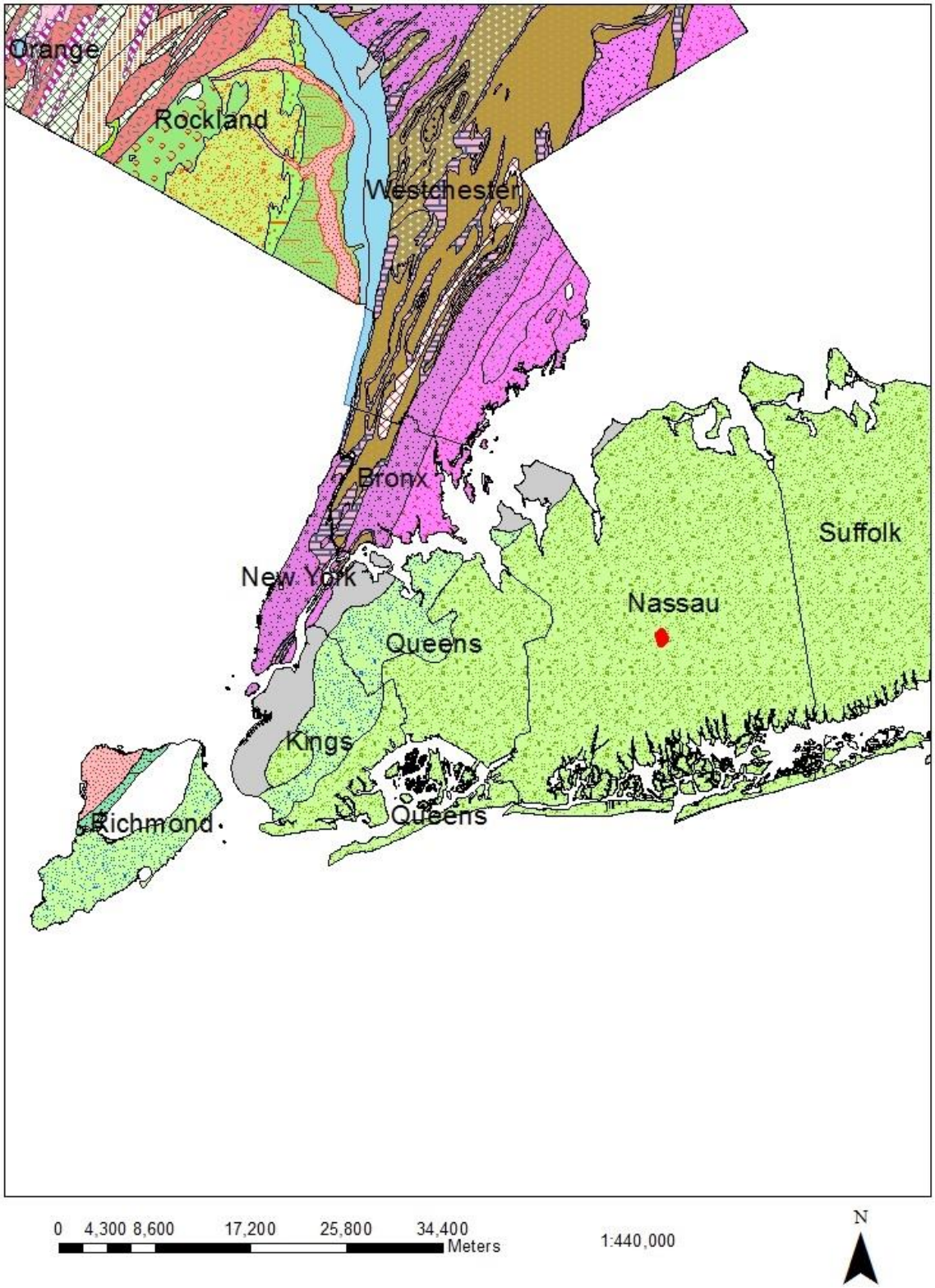

Figure 6. Bedrock Geology: Late Cretaceous Coastal Plain Deposits comprised of silty clay, glauconitic sandy clay, sand, gravel of the Magothy Formation. Study area (red) in Nassau Co.

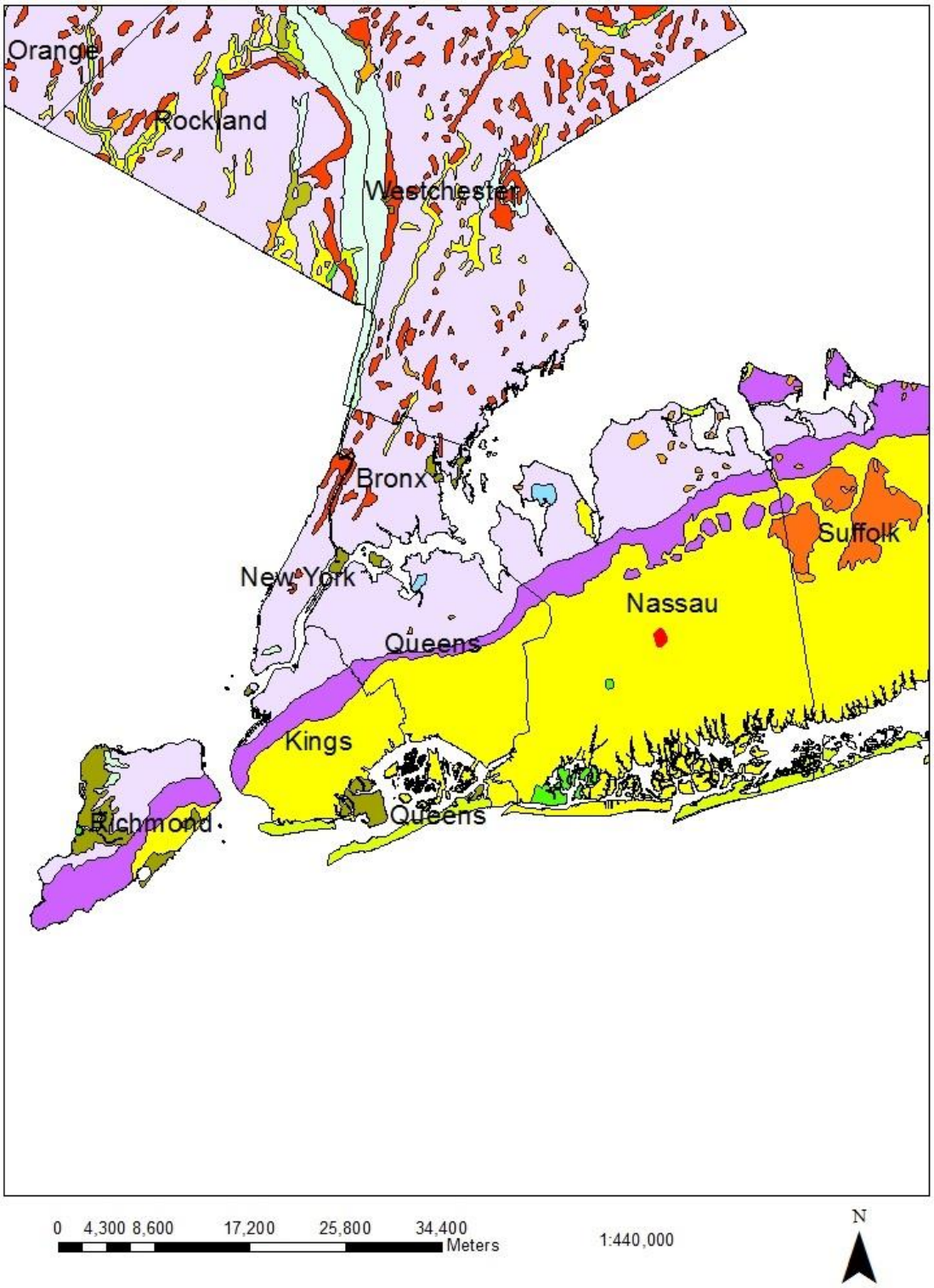

Figure 7. Surficial Geology: outwash gravel and sand (yellow). Study area (red) in Nassau Co.

Soils

A soil map of the study area is shown in Figure 8. The soil types are generally reflected by the vegetation; these associations are noted below. The three major soil units, drainage, and their distribution within the study area are as follows:

Hempstead silt loam – He (well-drained) – dominant soil type in Parcel A (except northeastern edge), Parcel B, Parcel C, and Parcel E (not pictured).

Plymouth loamy sand, 3 to 8 percent slopes – PlB (excessively drained) – dominant soil type in northeastern edge of Parcel A and the western half of Parcel D.

Urban Land-Mineola complex – Um dominant soil type in eastern half of Parcel D along East Meadow Brook.

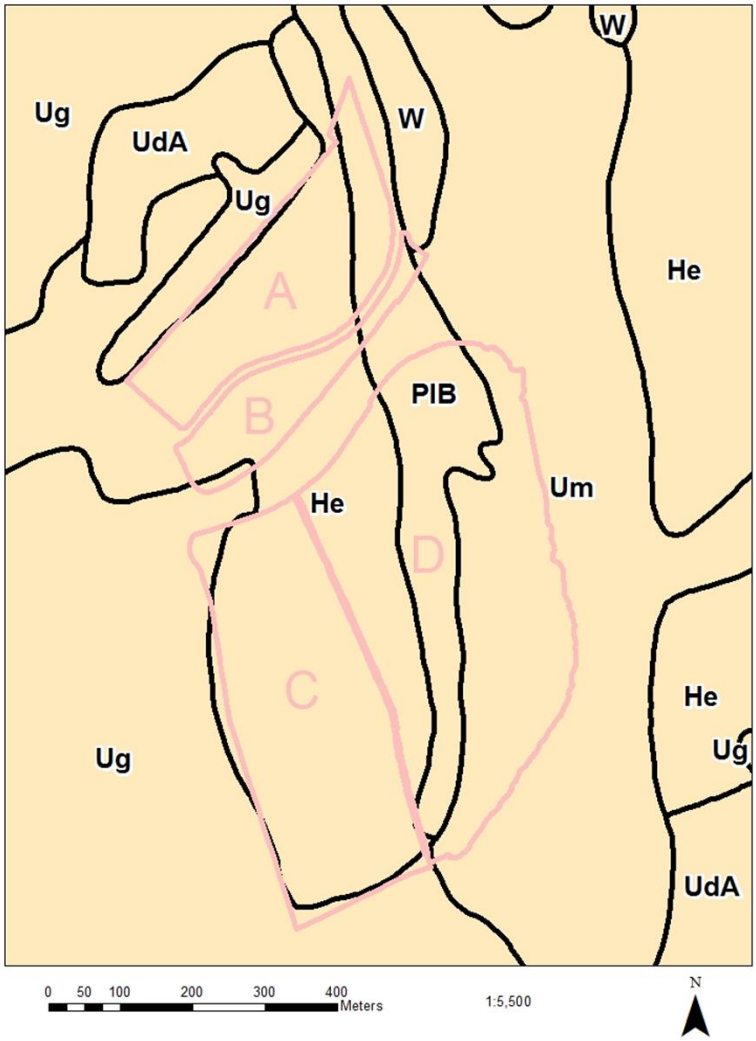

Figure 8. Hempstead Plains Grassland Study Area soil types (Parcels A-D). He: Hempstead silt loam, PlB: Plymouth loamy sand, 3 to 8 percent slopes, and Um: Urban Land-Mineola complex (USDA Soil Conservation Service 1987).

We used a one-inch (2.5 cm) diameter Tube Sampler Soil Probe to collect soil samples at 19 plot locations (Figure 9). We recorded soil texture, depth from surface, pH, and color for recognizable horizons. Soil profiles are included in pdf format for ecology sampling plots (Community Form 3). Notes on soil moisture and stoniness were also recorded. A summary of our soil findings for each parcel is presented below.

Figure 9. Soil core sample from Hempstead Plains grassland (*SJE*) plot A02.

Parcel A Soils

The majority (12.9 acres) of Parcel A is mapped as Hempstead silt loam (He) by the USDA Soil Conservation Service (1987, Figure 8). The remainder (3.24 acres) is mapped as Plymouth loamy sand (PlB). We sampled 11 soil cores in Parcel A (A01, A02, A03, A06, A07, A08, A12, A13, A14, A15, A16). Nearly every sample had about 2 cm of organic material on the surface. The uppermost soil layer in each sample was sandy loam, not silt loam as mapped, except A14 which was loamy sand to 23 cm. The sandy loam layer for those 10 cores had an average maximum depth of 17 cm (range 12-21 cm) and an average pH of 5.1 (range 4.7-5.7). Six of those cores (A01, A02, A03, A06, A07, A15) had a loamy sand layer under the sandy loam layer to an average maximum depth of 18 cm (range 15-22 cm) where the soil probe hit an impenetrable stony layer (e.g., Figure 9). We used a shovel to dig through the stony layer at plot A14 where the soil texture was very stony, hard-packed, sandy clay loam to 30 cm.

None of our soil cores matched the soil types mapped by the USDA Soil Conservation Service (1987, Figure 8). The soils in Parcel A were likely greatly altered over the last century. The top 11-inch layer of soil the Hempstead black silt loam described in the Soil Survey of Nassau County New York (USDA Soil Conservation Service 1987) was likely removed by past landscape grading related to the air field development to the north and west, and golf course to the east and south (Appendix H, Figure 72).

Parcel B Soils

The majority of Parcel B is mapped as Hempstead silt loam (He) by the USDA Soil Conservation Service (1987, Figure 8). We sampled one soil core in Parcel B (B07). The soil texture was loamy sand to 17 cm where the soil probe hit an impenetrable stony layer. This sample differed from the cores in Parcel A in that it lacked an organic layer on the surface and the pH was much higher (pH 7.1 versus 5.1). The elevated pH may be related to fill material deposited during road construction, or possibly soil alterations related to the large stands of invasive species, such as mugwort (*Artemisia vulgaris*) and Chinese lespedeza (*Lespedeza cuneata*).

The soils in Parcel B were likely greatly altered over the last century. The top 11-inch layer of soil the Hempstead black silt loam described in the Soil Survey of Nassau County New York (USDA Soil Conservation Service 1987) was likely removed by past landscape grading related to the air field development to the west, golf course to the east, and Charles Lindbergh Boulevard to the south (Appendix H, Figure 72).

Parcel C Soils

The majority of Parcel C is mapped as Hempstead silt loam (He) by the USDA Soil Conservation Service (1987, Figure 8). We attempted to sample four soil cores in Parcel C (C01, C02, C16, C17). The soil was very stony and impenetrable at the surface at plot C02, so we were unable to collect a soil core using the probe at that point. It appears that plots C01 and C02 line up with demolished road beds associated with the former air field pre-1956 (Appendix H, Figure 72). For the three cores where we could obtain soil samples the uppermost layer was sandy loam to an average depth of 15 cm (range 13-17 cm) where the soil probe hit an impenetrable stony layer. We used a shovel to dig through the stony layer at plot C16 where the soil texture was slightly loamy coarse sand to 25 cm. The average pH of the soil cores in Parcel C was 5.1 (range 4.9-5.2).

The soils in Parcel C were likely greatly altered over the last century. The top 11-inch layer of soil the Hempstead black silt loam described in the Soil Survey of Nassau County New York (USDA Soil Conservation Service 1987) was likely removed by past landscape grading related to the air field development to the west and golf course to the east (Appendix H, Figure 72).

Parcel D Soils

Parcel D is mapped as Hempstead silt loam (He) along the west side, Plymouth loamy sand (PlB) through the center, and Urban Land-Mineola complex along the east side by the USDA Soil Conservation Service (1987, Figure 8). We sampled two soil cores in Parcel D (D06, D10). The uppermost soil layer in D06 was sandy loam, not loamy sand as mapped, to a depth of 13 cm where the soil probe hit an impenetrable stony layer. The pH of the sandy loam was 4.7. The uppermost soil layer in D10 was loamy sand to a depth of 20 cm where the soil probe hit an impenetrable stony layer. The pH of the loamy sand was 4.9.

The loamy sand at plot D10 matched the soil type mapped by the USDA Soil Conservation Service (1987, Figure 8). Despite that match, the soils in Parcel D were likely greatly altered over the last century. The soils were likely removed by past landscape grading related to the golf course that extended across the parcel (Appendix H, Figure 72).

Parcel E Soils

The majority of Parcel E is mapped as Hempstead silt loam (He) by the USDA Soil Conservation Service (1987). We sampled one soil core in Parcel E (E09) at the best remaining grassland area in the western part of the parcel. The soil texture was sandy loam to 20 cm, then loamy sand to 45 cm, then stony loamy sand to 50 cm where the soil probe hit an impenetrable stony layer. This is the deepest soil probe sample obtained in 2017 out of 19 collected (Figure 10). The deeper soils appear to support more of the taller prairie grasses, such as *Schizachyrium scoparium, Sorghastrum nutans, Andropogon gerardi,* and *Andropogon virginicus*.

Interestingly the soils in Parcel E are deeper and darker compared to Parcels A-D, and closer to the description of Hempstead silt loam described in the Soil Survey of Nassau County New York (USDA Soil Conservation Service 1987). However, the soils in Parcel E were likely greatly altered over the last century due to past landscape grading related to the golf course to the south and road construction around the perimeter.

Figure 10. Soil sample from Parcel E at E09. Left: 0-30 cm. Right: 35-50 cm.

ECOLOGY METHODS

This study used the NY Natural Heritage Program system of data collection, mapping, and data synthesis. NY Natural Heritage is a partnership between the NYS Department of Environmental Conservation (NYSDEC) and the State University of New York College of Environmental Science and Forestry. It is also part of NatureServe (www.natureserve.org), a cooperative network of more than 80 Natural Heritage programs and conservation data centers throughout the Western Hemisphere. These programs specialize in compiling biodiversity information by conducting inventories of rare plants, rare animals, and ecologically significant natural communities aimed at identifying the most sensitive resources in a defined geographic area.

Preliminary Ecological Community Maps

Using GIS (ArcMap 10) we created a preliminary wall-to-wall ecological community map of the study area. We obtained the following GIS data layers from the NYS DEC GIS Data Selector: digital orthoimagery, soils, contours, bedrock and surficial geology, and NY Natural Heritage Program Element Occurrences. We screen digitized NY Natural Heritage ecological communities (Edinger *et al.* 2014) onto the following digital orthoimagery: Long Island 2013 6-inch Color Infrared digital orthoimagery. The preliminary community map was completed May 2017 and used during field surveys to navigate to polygons with similar vegetation cover signatures on aerial photos.

Ecology Field Methodology

In this study we used standard inventory methodology developed by The Nature Conservancy, NatureServe, and the Natural Heritage Network, and refined by NY Natural Heritage (Edinger *et al.* 2000). General survey methodology for natural communities involves collecting data on all or most of the following for each targeted community polygons: plant species composition and structure in all strata, unvegetated ground and water surfaces, slope, and aspect (Edinger *et al.* 2000). Taxonomic nomenclature followed the NY Flora Atlas (Werier 2015). These data allow an accurate identification of each community surveyed. Specifically, for this project we collected detailed observation points (*i.e.,* NY Natural Heritage Natural Community Form 1: Transect Observation Points) and relevé plots (*i.e.,* NY Natural Heritage Natural Community Form 3: Quantitative Community Characterization). The location of each observation point was recorded with a Garmin 60Cx GPS unit. The datum on the GPS unit was set to WGS 1984 and the coordinate system was set to decimal degrees. GPS coordinates for 10 m x 10 m plots were collected in the southwest corner of the plot. Observation point and relevé plot data were collected in field notebooks and entered into the NY Natural Heritage Field Form Database (FFDB) upon return from the field. A digital photograph was taken at most observation point locations.

We sampled eighteen 10 m x 10 m relevé plots within the grasslands throughout the study area (Figure 11 and Table 6). Field forms in pdf format for ecology sampling plots (Community Form 3) and observation points (Community Form 1) are included in the set of project deliverables.

Figure 11. Air photo of 10 m x 10 m plot A14 taken by remotely piloted aircraft (between white arrows) on August 29, 2017. Researchers standing near southwest corner of plot.

Ecological Community Classification

After we completed the field surveys, we quality-checked and labeled each plot and observation point record with the appropriate ecological community name from Ecological Communities of NYS (Edinger et al. 2014). In most cases we added a parenthetical tag to the name to identify variants observed in the field (e.g., Hempstead Plains grassland (*Panicum virgatum*)).

We classified 16 natural communities in the five parcels (Table 1). Three are variants of Hempstead Plains grassland community. Six are variants of successional old field. Three are variants of successional shrubland and three are variants of successional southern hardwoods. All natural community variants are split based on the dominant species (see Table 1 for variant names). We also classified one forested wetland as a red maple-hardwood swamp.

See the respective lettered Appendix for each parcel (e.g., Parcel A = Appendix A, Parcel B = Appendix B, etc.) at the end of report for the following:

1. 2013 6-inch natural color digital orthoimagery zoomed to parcel boundary.
2. 2013 6-inch color infrared digital orthoimagery zoomed to parcel boundary showing ecological community boundaries and ecology sampling points.
3. Ecological community map of the parcel with legend.
4. Table with list of ecological communities, acres mapped of each type, and total acres mapped.
5. Rare plant species map for the parcel.

Table 1. Natural Communities of the Hempstead Plains Grassland Study Area (Parcels A-E).

Terrestrial Communities

Open Uplands (<25% cover of trees >5 m height)
Hempstead Plains Grassland (HPG) types (<50% cover of shrubs/small trees <5 m height; five or more characteristic HPG species present from Table 2)

1. Hempstead Plains Grassland (*SJE*) – ***S****chizachyrium scoparium,* ***J****uncus greenei,* ***E****upatorium hyssopifolium* typically present; invasives <20%, such as *Agrostis capillaris, Artemisia vulgaris, Lespedeza cuneata, Cynanchum louiseae.*
2. Hempstead Plains Grassland (*Panicum virgatum*) – similar to #1 above, but dominated by *Panicum virgatum* ideally >50%.
3. Hempstead Plains Grassland (*Agrostis*) – similar to #1 above, but *Agrostis capillaris* >20%.

Successional Old Field types (<50% cover of shrubs/small trees <5 m height; 0-2(-3) characteristic HPG species present from Table 2)

4. Successional Old Field (*Agrostis*) –*Agrostis capillaris* >20%.
5. Successional Old Field (*Agrostis-Cynanchum*) – *Agrostis capillaris* >20% and *Cynanchum louiseae* 20 to >50%.
6. Successional Old Field (*Artemisia*) – *Artemisia vulgaris* >50% and *Lespedeza cuneata* absent or negligible.
7. Successional Old Field (*Lespedeza-Artemisia*) – *Lespedeza cuneata* + *Artemisia vulgaris* >50%.
8. Successional Old Field (*Schizachyrium*) – S*chizachyrium scoparium* dominated old field.
9. Successional Old Field (*Tridens*) – *Tridens flavus* dominated old field.

Successional Shrubland types (>50% cover of shrubs/small trees <5 m)

10. Successional Shrubland (*MPE*) – tall shrubland (>2 m) with ***M****alus toringo,* ***P****runus serotina,* ***E****laeagnus umbellata* typically present.
11. Successional Shrubland (*Rhus copallinum*) – short shrubland (<2 m) dominated by *Rhus copallinum.*
12. Successional Shrubland (*Rubus-Solidago*) – short shrubland (<2 m) dominated by *Rubus* spp. in the shrub layer and dominated by *Solidago* spp. in the herb layer.

Forested Uplands and Woodlands (Forests: 60% or more cover of trees >5 m; Woodlands: 25-60% cover of trees >5 m)

13. Successional Southern Hardwoods (*Ailanthus-Prunus*) – woodlands and forests dominated by *Ailanthus altissima* and *Prunus serotina; Pinus* spp. and *Quercus* spp. absent or negligible.
14. Successional Southern Hardwoods (*Prunus-Quercus*) – woodlands and forests dominated by *Prunus serotina* and *Quercus* spp.; *Pinus* spp. and *Ailanthus altissima* spp. absent or negligible.
15. Successional Southern Hardwoods (*Pinus-Prunus-Quercus*) – similar to #14, but *Pinus strobus* present in tree canopy (combined cover of *Pinus strobus* in all canopy layers >10%).

Palustrine Communities
Forested Mineral Soil Wetlands

16. Red Maple-Hardwood Swamp (*Quercus palustris*) – swamp or floodplain forest dominated by *Acer rubrum* along both sides of Meadow Brook. *Quercus palustris* is a common associated tree.

Summary descriptions derived from the observation points and plots from our 2017 surveys for each natural community variant listed in Table 1 are included in Appendix G. A representative digital photograph is also provided for each type in Appendix G.

Table 2. Characteristic Hempstead Plains grassland species included in this study:

Agalinis decemloba
Andropogon gerardii
Andropogon virginicus var. *virginicus*
Asclepias tuberosa
Baptisia tinctoria
Bulbostylis capillaris
Crocanthemum canadense
Crocanthemum propinquum
Cyperus lupulinus ssp. *macilentus*
Desmodium ciliare
Dichanthelium lindheimeri
Eupatorium hyssopifolium
Euthamia caroliniana
Hypericum gentianoides
Ionactis linariifolia
Juncus greenei
Lechea maritima
Lechea maritima var. maritima
Lespedeza capitata
Lespedeza virginica
Nuttallanthus canadensis
Panicum virgatum
Polygala nuttallii
Schizachyrium scoparium var. *scoparium*
Scleria pauciflora var. *caroliniana*
Solidago juncea
Solidago nemoralis ssp. *nemoralis*
Sorghastrum nutans
Trichostema dichotomum
Viola pedata

Final Map

After the plots and observation points were correctly labeled with the closest NY community name in the Field Forms Database (FFDB) we corrected the names of the corresponding polygons on the ecological community map in the GIS attribute table. We did this by systematically navigating to each observation point in GIS and confirming that each polygon classification matched the observation point classification. We split, merged, and otherwise corrected polygons as needed.

Using ArcMap 10, we revised polygon boundaries and labeled the remaining unsurveyed polygons by extrapolating information gained from the detailed field observation points, classification, aerial photography signatures, and other GIS data layers. We provided Friends of Hempstead Plains at Nassau Community College, Inc. a subset of the FFDB with plot and observation point data and corresponding pdfs of all NY Natural Heritage Natural Community Form 1 Observation Point Transects and Form 3 plots with this report.

RARE PLANT METHODS

Preliminary Rare Plant Maps and Information

Preliminary maps of known rare plant occurrences were made showing where rare plants had been seen in the past so they could be checked during this year's survey. Hand-written sketches and maps from our old field forms from the 1980s and 90s were also taken into the field to reconcile with the digital maps. The identification information for each plant was studied to help identify each plant in the field. See Table 5 for links to identification information.

Rare Plant Field Methodology

In this study, we used standard inventory methodology developed by The Nature Conservancy, NatureServe, and the Natural Heritage Network. General survey methodology for rare plants involves collecting data on the following for each targeted plant occurrence: directions to each group of plants, condition of the plants, size of the occurrence in numbers or area, local habitat description including associated species, surrounding landscape description, threats, and management comments. Taxonomic nomenclature followed the NY Flora Atlas (Werier 2015) and rare plant ranks followed The New York Rare Plant Status List (Young 2017). An iPhone 7plus was used to view maps and past written field forms so we could navigate to the documented occurrences we were not familiar with. Occurrence data was taken in a field notebook and later transcribed to our Field Form and Biotics databases. GPS points and tracks were recorded using a Garmin 64S hand held unit (Figure 12). Photos of the rare plants and their habitats were taken with the iPhone 7plus.

Figure 12. Rare plant GPS survey tracks Parcels A-D May through September 2017.

Rare Plants Surveyed

There were fourteen rare plants known to occur in the study area from NY Natural Heritage Program and partner surveys and they were resurveyed in 2017 (Table 3). All rare plants except *Stachys hyssopifolia* and *Asclepias viridiflora* were found again.

Table 3. Rare Plants of the Hempstead Plains Grassland Study Area (Parcels A-E) surveyed in 2017.

Scientific Name	Common Name	Year First Surveyed	Year Last Surveyed before 2017	Heritage and Protected Rank
Agalinis decemloba	Sandplain Agalinis	1984	2016	G3G4 S1 E
Aletris farinosa	Stargrass	1990	2010	G5 S2 T
Asclepias viridiflora	Green Milkweed	1984	2010	G5 S2 T
Carex mesochorea	Midland Sedge	1985	1985	G4G5 S2 T
Crocanthemum dumosum	Bushy Frostweed	1983	2003	G3 S2 T
Crocanthemum propinquum	Low Frostweed	2010	2010	G4 S2 T
Cuscuta pentagona	Five-angled Dodder	1991	1991	G4G5 S3 R
Desmodium ciliare	Hairy Small-leaved Tick-trefoil	1991	1997	G5 S2S3 T
Lespedeza angustifolia	Narrow-leaved Bush Clover	1985	1992	G5 S2 T
Polygala nuttallii	Nuttall's Milkwort	1985	1985	G5 S2 T
Scleria pauciflora	Few-flowered Nut Sedge	1983	1997	G5 S1 E
Sericocarpus linifolius	Narrow-leaved White-topped Aster	1992	1997	G5 S2 T
Stachys hyssopifolia var. *hyssopifolia*	Rough Hedge Nettle	1984	1991	G5T4T5 S2 T
Viola pedata	Birds-foot Violet	1984	1984	G5 S3 R

There were an additional twenty rare plants that were looked for that were not known from the study area, but are known from similar grassland habitats at nearby locations on the coastal plain presently or historically (Table 4). There was a small chance that they could also be found within the study area, but none were found.

Table 4. Additional rare plants that were searched for within the study area (Parcels A-E).

Scientific Name	**Common Name**	**Heritage and Protected Rank**
Aristida geniculata	Kearney's Threeawn	G5T5 S1 U
Asclepias verticillata	Whorled Milkweed	G5 S3 R
Cyperus odoratus	Fragrant Flat Sedge	G5 S3 R
Cyperus schweinitzii	Schweinitz's Flat Sedge	G5 S3 R
Digitaria filiformis	Slender Crab Grass	G5 S1 E
Eupatorium torreyanum	Fringed Boneset	G5T4T5 S2 T
Eurybia spectabilis	Showy Aster	G5 S2 T
Hypericum stragulum	Low St. Johns Wort	G5T4 S1 E
Lechea racemulosa	Illinois Pinweed	G5 S3 R
Lespedeza stuevei	Velvety Bush Clover	G4? S2 T
Linum medium var. *texanum*	Southern Yellow Flax	G5T5 S2 T
Monarda punctata var. *punctata*	Dotted Horse Mint	G5T5? S1 U
Paspalum laeve	Field Beadgrass	G4G5 S1 E
Polygala incarnata	Pink Milkwort	G5 SX U
Pycnanthemum muticum	Blunt Mountain Mint	G5 S2S3 T
Spiranthes vernalis	Spring Ladies' Tresses	G5 S1S2 E
Symphyotrichum concolor	Eastern Silvery Aster	G5 SH E
Viola brittoniana	Coast Violet	G4G5 S1
Viola pectinata	Pectinate Violet	G4G5 SH U
Viola primulifolia	Primrose-leaved Violet	G5 S2 T

Detailed information about almost all the rare plants surveyed can be found in the Plant Conservation Guides provide by the NY Natural Heritage Program. The following table lists them with their web address.

Table 5. Rare plant information web links.

Scientific Name	Conservation Guide Website
Agalinis decemloba	http://www.acris.nynhp.org/guide.php?id=9350
Aletris farinosa	http://www.acris.nynhp.org/guide.php?id=9650
Asclepias viridiflora	http://www.acris.nynhp.org/guide.php?id=8733
Carex mesochorea	http://www.acris.nynhp.org/guide.php?id=9504
Crocanthemum dumosum	http://www.acris.nynhp.org/guide.php?id=8943
Crocanthemum propinquum	http://www.acris.nynhp.org/guide.php?id=8944
Cuscuta pentagona	http://www.acris.nynhp.org/guide.php?id=36199
Desmodium ciliare	http://www.acris.nynhp.org/guide.php?id=9039
Lespedeza angustifolia	Guide not yet available. Google link.
Polygala nuttallii	Guide not yet available. Google link.
Scleria pauciflora	http://www.acris.nynhp.org/guide.php?id=9602
Sericocarpus linifolius	http://www.acris.nynhp.org/guide.php?id=8860
Viola pedata	Guide not yet available. Google link.

CONDITION ASSESSMENT METHODS

The presence of non-native invasive plant species in a natural community generally lowers the condition ranking factor and the overall element occurrence rank using Heritage Methodology. This may reduce the conservation value of the community relative to those in better condition, but may be used to identify areas needing invasive species management or restoration. We conducted three condition assessments of the study area primarily based on the distribution and abundance of non-native invasive plants. The first was a Floristic Quality Assessment of the plots and observation points collected during ecology surveys, the second was broader ranking of the invasive plants throughout the study area, and the third was an assessment of the non-native plants at each plot and observation point.

Floristic Quality Assessment of Plots and Observation Points

Vascular plant nomenclature for each plot and observation point (henceforth "point") was updated prior to analyses per Werier (2015). Each species was assigned a coefficient of conservatism value ("C" value) that reflects a species' fidelity to a remnant plant assemblage in NYS (i.e., 10 = highly conservative/narrow ecological tolerance, 0 = cosmopolitan) (Swink and Wilhelm 1994). Coefficients of conservatism values for the native vascular plants of New York follow Ring (2016).

We calculated the following scores for each point with species cover data (Appendix F, Table 14):

1. Total Richness: Number of unique vascular plant species recorded at the point.
2. Percent Native: Percent of species in #1 above listed as native to New York state per Werier (2015).
3. Percent Invasives: Percent of species in #1 above listed as invasive in New York state by The New York State Invasive Species Council, in consultation with the Invasive Species Advisory Committee: http://www.nyis.info/?action=israt_nn_plant .
4. Total Mean C: The average Coefficient of Conservatism value for all species in #2 above.
5. Weighted Mean C: Sum of each species C-value multiplied by its cover values, then divided by the sum of cover values for all species at each point.
6. Floristic Quality: Mean C of all plants multiplied by the square-root of number of all plants at each point.
7. Weighted Floristic Quality: Cover-weighted Mean C for all species multiplied by the square-root of all species.

Invasive Plant Ranking and Assessment

We reviewed and compiled invasive plant location data collected during ecology and rare plant surveys and assessed and ranked the invasive plants for the study area (Appendix I, Table 17 and Table 18). The invasive rank is the rank assigned by the state invasive species ranking committee and reflects the result of a detailed analysis and protocol designed to assess the invasive nature of non-native species and their impact on native species and natural ecosystems in New York State (Jordan et al. 2012). Included in this assessment are species ranked very high to medium and three species that have not yet been ranked but are considered invasive by the authors and should be controlled.

Non-native Plant Assessment of Plots and Observation Points

We assessed 79 plots and observation points within the study area and tallied the number of non-native plant species and summed the percent cover of all exotics present at each point (Appendix I, Table 19).

ECOLOGY RESULTS

Ecological Communities Overview

We surveyed a total of 93 plots and observation points over ten days (July 31-August 4 and August 28-September 1) within the study area (Table 6, Table 7). We sampled 18 relevé plots (10 m x 10 m) and 62 detailed observation points with vegetation cover data. The remaining 13 points were used as reference points to confirm a community type at that location, list species present without cover, confirm community boundaries, document the location of notable features (*e.g.,* invasive plant populations, garbage dumping, etc.). Field forms in pdf format for ecology sampling plots (Community Form 3) and observation points (Community Form 1) are included in the set of project deliverables. Digital photographs taken at each plot and observation point are included in the set of project deliverables as well.

Table 6. Distribution of plots and observation points by parcel.

Parcel	No. of 10 m x 10 m Plots Sampled with vegetation cover and soil core	No. of detailed Observation Points with vegetation cover data	No. of Reference Observation Points without vegetation cover data	Total No. of Plots and Observation Points per parcel
A	10	15	1	26
B	1	9	1	11
C	4	22	5	31
D	2	8	2	12
E	1	8	4	13
Total	18	62	13	93

Refer to the related ecology sampling point maps in the respective parcel appendix for point locations (e.g., Appendix A for Parcel A maps, Appendix B for Parcel B maps, etc.).

Table 7. Relevé plots and Observation Points sampled within the study area in 2017.

Plot/ Observation Point	Ecological Community	Survey Date	Decimal Degrees Latitude	Decimal Degrees Longitude
A01	Hempstead Plains grassland (*SJE*)	7/31/2017	40.73097	-73.58451
A02	Hempstead Plains grassland (*SJE*)	7/31/2017	40.72897	-73.58458
A03	Hempstead Plains grassland (*SJE*)	8/1/2017	40.73011	-73.58454
A04	Successional southern hardwoods (Ailanthus-Prunus)	8/1/2017	40.73138	-73.58454
A05	Successional shrubland (*MPE*)	8/1/2017	40.73126	-73.58459
A06	Hempstead Plains grassland (Agrostis)	8/1/2017	40.73063	-73.58440
A07	Hempstead Plains grassland (*SJE*)	8/1/2017	40.72936	-73.58466
A08	Hempstead Plains grassland (Agrostis)	8/1/2017	40.72900	-73.58569
A09	Successional shrubland (Rhus copallinum)	8/1/2017	40.72911	-73.58593
A10	Successional old field (Lespedeza-Artemisia)	8/1/2017	40.72926	-73.58621
A11	Successional shrubland (Rubus-Solidago)	8/1/2017	40.72865	-73.58543
A12	Hempstead Plains grassland (Panicum virgatum)	8/1/2017	40.72849	-73.58578
A13	Hempstead Plains grassland (Agrostis)	8/28/2017	40.72792	-73.58741
A14	Hempstead Plains grassland (Agrostis)	8/29/2017	40.72792	-73.58691
A15	Hempstead Plains grassland (Agrostis)	8/29/2017	40.72829	-73.58687
A16	Hempstead Plains grassland (Agrostis)	8/29/2017	40.73010	-73.58508
A17	Hempstead Plains grassland (Agrostis)	9/1/2017	40.72857	-73.58708
A18	Successional shrubland (*MPE*)	9/1/2017	40.72868	-73.58718
A19a	Successional shrubland (Rubus-Solidago)	9/1/2017	40.72914	-73.58496
A19b	Successional shrubland (*MPE*)	9/1/2017	40.72921	-73.58474
A20	Hempstead Plains grassland (*SJE*)	9/1/2017	40.72856	-73.58493
A21	Successional old field (Artemisia)	9/1/2017	40.72845	-73.58473
A22	Successional shrubland (Rhus copallinum)	9/1/2017	40.72843	-73.58561
A23	Successional shrubland (Rhus copallinum)	9/1/2017	40.72804	-73.58646
A24	Successional old field (Lespedeza-Artemisia)	9/1/2017	40.72749	-73.58716
A25	Hempstead Plains grassland (reference)	9/1/2017	40.72963	-73.58460
B01	Successional old field (Artemisia)	8/2/2017	40.72677	-73.58672
B02	Successional old field (Lespedeza-Artemisia)	8/2/2017	40.72678	-73.58634
B03	Successional shrubland (Rhus copallinum)	8/2/2017	40.72707	-73.58624
B04	Successional southern hardwoods (Ailanthus-Prunus)	8/2/2017	40.72720	-73.58644
B05E	Successional old field (Artemisia)	8/2/2017	40.72745	-73.58589
B05N	Successional southern hardwoods (Ailanthus-Prunus)	8/2/2017	40.72758	-73.58623
B05ref	Paved road/path	8/2/2017	40.72738	-73.58610
B05S	Successional old field (Artemisia)	8/2/2017	40.72725	-73.58609
B05W	Successional old field (Artemisia)	8/2/2017	40.72738	-73.58627
B06	Successional old field (Lespedeza-Artemisia)	8/2/2017	40.72739	-73.58555
B07	Successional old field (Schizachyrium)	8/2/2017	40.72787	-73.58566
C01	Hempstead Plains grassland (*SJE*)	8/2/2017	40.72215	-73.58466
C02	Hempstead Plains grassland (*SJE*)	8/2/2017	40.72255	-73.58534
C03a	Successional shrubland (*MPE*)	8/3/2017	40.72154	-73.58559
C03b	Unpaved road/path	8/3/2017	40.72145	-73.58562
C04	Successional southern hardwoods (Prunus-Quercus)	8/3/2017	40.72266	-73.58514
C05	Hempstead Plains grassland (*SJE*)	8/3/2017	40.72232	-73.58556
C06	Hempstead Plains grassland (*SJE*)	8/3/2017	40.72286	-73.58585
C07	Hempstead Plains grassland (*SJE*)	8/3/2017	40.72333	-73.58592
C08	Hempstead Plains grassland (*SJE*)	8/3/2017	40.72398	-73.58648
C09	Successional shrubland (Rhus copallinum)	8/3/2017	40.72559	-73.58627
C10	Successional shrubland (*MPE*)	8/3/2017	40.72610	-73.58552
C11	Unpaved road/path	8/3/2017	40.72603	-73.58553
C12a	Successional shrubland (*MPE*)	8/3/2017	40.72577	-73.58523
C12bref	Trash (reference)	8/3/2017	40.72400	-73.58466
C13	Successional old field (Artemisia)	8/3/2017	40.72199	-73.58360

Plot/ Observation Point	Ecological Community	Survey Date	Decimal Degrees Latitude	Decimal Degrees Longitude
C14a	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72266	-73.58472
C14b	Successional shrubland (*MPE*)	8/30/2017	40.72257	-73.58489
C15	Successional shrubland (Rhus copallinum)	8/30/2017	40.72274	-73.58438
C16	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72297	-73.58429
C17	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72328	-73.58447
C18a	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72382	-73.58444
C18bref	Paved road/path (reference)	8/30/2017	40.72512	-73.58475
C18cref	Paved road/path (reference)	8/30/2017	40.72487	-73.58469
C18dref	Unpaved road/path (reference)	8/30/2017	40.72397	-73.58498
C19	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72368	-73.58471
C20a	Successional southern hardwoods (Prunus-Quercus)	8/30/2017	40.72348	-73.58469
C20bref	Hempstead Plains grassland (reference)	8/30/2017	40.72346	-73.58450
C21	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72244	-73.58423
C22	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72234	-73.58432
C23	Hempstead Plains grassland (*SJE*)	8/30/2017	40.72214	-73.58447
C24	Successional shrubland (*MPE*) (reference)	8/30/2017	40.58587	-73.58587
D01	Hempstead Plains grassland (Panicum virgatum)	8/3/2017	40.72300	-73.58330
D02	Hempstead Plains grassland (Agrostis)	8/3/2017	40.72226	-73.58315
D03	Hempstead Plains grassland (Panicum virgatum)	8/3/2017	40.72497	-73.58352
D04	Hempstead Plains grassland (Panicum virgatum)	8/3/2017	40.72519	-73.58380
D05	Hempstead Plains grassland (Panicum virgatum)	8/3/2017	40.72532	-73.58355
D06	Hempstead Plains grassland (Panicum virgatum)	8/4/2017	40.72692	-73.58331
D06ref	Hempstead Plains grassland (reference)	8/3/2017	40.72707	-73.58327
D07	Successional southern hardwoods (Prunus-Quercus)	8/31/2017	40.72609	-73.58253
D08	Red maple-hardwood swamp (Quercus palustris)	8/31/2017	40.72399	-73.58223
D09a	Successional southern hardwoods (Pinus-Prunus)	8/31/2017	40.72338	-73.58364
D09bref	Successional southern hardwoods (reference)	8/31/2017	40.72312	-73.58373
D10	Hempstead Plains grassland (Panicum virgatum)	8/31/2017	40.72514	-73.58329
E01	Mowed lawn with trees	8/4/2017	40.74782	-73.58614
E02	Successional old field (Tridens)	8/4/2017	40.74761	-73.58666
E03	Successional old field (Agrostis)	8/4/2017	40.74731	-73.58657
E04	Successional old field (Agrostis)	8/4/2017	40.74712	-73.58649
E05	Successional shrubland (Rubus-Solidago)	8/4/2017	40.74692	-73.58594
E06aref	Successional old field (reference)	8/4/2017	40.74769	-73.58538
E06b	Successional old field (Agrostis-Cynanchum)	8/4/2017	40.74776	-73.58515
E07	Successional old field (Agrostis-Cynanchum)	8/4/2017	40.74796	-73.58455
E08a	Successional shrubland (*MPE*)	8/4/2017	40.74809	-73.58390
E08bref	Building	8/4/2017	40.74896	-73.58017
E09	Successional old field (Agrostis)	9/1/2017	40.74682	-73.58641
E10ref	Successional old field (Agrostis-Cynanchum)	9/1/2017	40.74771	-73.58495
E11ref	Successional old field (Agrostis-Cynanchum)	9/1/2017	40.74781	-73.58420

Ecological Communities Parcel Assessment

Refer to the related ecology sampling point maps in the respective parcel appendix for point locations (e.g., Appendix A for Parcel A maps, Appendix B for Parcel B maps, etc.). Coordinates for each point are included in Table 7. GPS coordinates for 10 m x 10 m plots were collected in the southwest corner of the plot.

Parcel A Ecological Communities

Eleven ecological communities (*sensu* Edinger et al. 2014) including variants were mapped in Parcel A totaling 16.14 acres (Appendix A, Figure 38, Table 9). Four were natural communities with characteristic native species present (11.95 acres, 74%). Three were cultural communities or developed areas (0.2 acres, 1.2%). The Education Center, solar panel array, and tool shed are not depicted on the map, because these features were not present on the 2013 aerial photos used to produce the community delineation. Lastly, four communities were dominated by non-native, invasive species (3.99 acres, 24.7%).

Parcel A contains the largest and best quality patches of Hempstead Plains grassland (HPG) in the study area (11.58 acres, 72%). Areas classified as Hempstead Plains grassland (*SJE*) should be the first priority for HPG restoration and invasive species management. Native and non-native woody plants should be eliminated or maintained at very low levels (e.g., <10% cover) within this type and throughout Parcel A. Invasive herbs, such as *Artemisia vulgaris, Lespedeza cuneata,* and *Agrostis capillaris* should be eliminated or maintained at very low levels (e.g., <10% cover). Areas classified as Hempstead Plains grassland (*Agrostis*) should be the second priority for HPG restoration and invasive species management, but it will likely be more challenging in these areas given the prevalence of *Agrostis capillaris*. The good news is that the eight plots and points in this type consistently contained 6-9 characteristic Hempstead Plains grassland plants (Table 2, Table 15). Restoration may be more successful in these areas compared to other areas that lack these species in the seed bank.

Parcel A is still recovering from significant past disturbances related to the air field development to the north and west, and golf course to the east and south. The former runway ran along the northwest fence line of Parcel A. Aerial photos from 1956 (Figure 13) show that the runway shoulder was graded downslope into Parcel A to the southeast for about 70 m to a low point near Plot A08. Both sides of the concrete drainage swale (Point A25), first visible on 1956 aerial photos (Figure 13), were also graded downslope to direct water away from the runway into the swale and toward Meadow Brook. Areas of Parcel A that were not disturbed as part of the air field were landscaped and graded into a golf course evident on 1955 aerial photos (Appendix H, Figure 72). The top 11-inch layer of soil the Hempstead black silt loam described in the Soil Survey of Nassau County New York (USDA Soil Conservation Service 1987) was likely removed by past landscape grading. It is somewhat surprising that Hempstead Plains grassland species recovered and persisted given the extent and level of past human disturbances.

Figure 13. Parcel A along southeast edge of runway. Note newly installed concrete swale in 1956.
http://www.vanderbiltcupraces.com/blog/article/amazing_aerials_from_the_cradle_of_aviation_2_1955_mitchel_field_and_salisb

Figure 14. Parcel A showing concrete swale (white arrow) in 2013.

The area north and west of the concrete drainage swale was subject to a prescribed burn circa 1993 (Figure 15).

Figure 15. 1993 air photo of Parcel A showing prescribed fire burn units after fire (black area) north and west of the concrete drainage swale (white arrow). Photo on display at the Hempstead Plains Education Center.

Parcel B Ecological Communities

Six ecological communities (*sensu* Edinger et al. 2014) including variants were mapped in Parcel B totaling 5.61 acres (Appendix B, Figure 42, Table 10). Two were natural communities with characteristic native species present (0.24 acres, 4.3%). One was a cultural community or developed area (0.01 acres, <1%) determined to be a remnant slab of concrete road ("Purcell Avenue") that extended north from between Parcels C and D prior to 1956 (Appendix H, Figure 72). Three communities were dominated by non-native, invasive species (5.36 acres, 95.5%).

No patches of remnant Hempstead Plains grassland (HPG) were found in Parcel B. However, a very small patch (0.14 acres) of successional old field dominated by little bluestem (*Schizachyrium scoparium*) was found at Plot B07. This field may have been artificially created as a result of past landscape grading. Only three characteristic Hempstead Plains species (Table 2) were recorded, and thus classified as a successional old field, but one that is not dominated by non-native, invasive species. While this area could be targeted for HPG restoration and invasive species management it is in the very low priority category.

Unfortunately, over 95% of Parcel B is comprised of communities dominated by non-native, invasive species (e.g., *Artemisia vulgaris, Lespedeza cuneata,* and *Ailanthus altissima*). The dominance of mugwort (*Artemisia vulgaris*) in Parcel B was documented during NY Natural Heritage surveys in 1999. HPG restoration and invasive species management would be very challenging and likely unsuccessful in these areas.

Parcel C Ecological Communities

Nine ecological communities (*sensu* Edinger et al. 2014) including variants were mapped in Parcel C totaling 25.46 acres (Appendix C, Figure 45, Table 11). Four were natural communities with characteristic native species present (14.29 acres, 56.1%). Three were cultural communities or developed areas (0.78 acres, 3%). Two communities were dominated by non-native, invasive species (10.39 acres, 40.8%).

Parcel C contains the largest and best quality patches of Hempstead Plains grassland associated with successional red cedar woodland (7.1 acres, 28%). Parcel C also has the largest patches of successional shrubland dominated by winged sumac (*Rhus copallinum*) (3.14 acres, 12.3%).

Areas classified as Hempstead Plains grassland (*SJE*) should be the first priority for HPG restoration and invasive species management. The best remnant patches of Hempstead Plains grassland appear to line up with demolished road beds associated with the former air field pre-1956 (Appendix H, Figure 72). Native and non-native woody plants should be eliminated or maintained at very low levels (e.g., <10% cover) within this type. Invasive herbs, such as *Artemisia vulgaris, Lespedeza cuneata,* and *Agrostis capillaris* should be eliminated or maintained at very low levels (e.g., <10% cover). Areas classified as Hempstead Plains grassland//Successional red cedar woodland should be the second priority for HPG restoration and invasive species management. The third priority for HPG restoration and invasive species management should be the two shrubland types: successional shrubland (*Rhus copallinum*) and successional shrubland (*MPE*). Native and non-native woody plants should be eliminated or maintained at very low levels (e.g., <10% cover) within these shrublands and throughout Parcel C. Nearly all of Parcel C appears to be clear of woody vegetation via mowing on 2007 aerial photography (Figure 16).

Figure 16. Left: north end of Parcel C mowed in 2007 (note mower tire tracks). Right: north end of Parcel C in 2013 (note woody plant invasion).

Parcel C is still recovering from significant past disturbances primarily related to the air field development within the parcel and to the west and north, and golf course to the east (mostly in Parcel D, Appendix H, Figure 72). The top 11-inch layer of soil the Hempstead black silt loam described in the Soil Survey of Nassau County New York (USDA Soil Conservation Service 1987) was likely removed by past landscape grading. It is somewhat surprising that Hempstead Plains grassland species recovered and persisted given the extent and level of past human disturbances.

Parcel D Ecological Communities

Seven ecological communities (*sensu* Edinger et al. 2014) including variants were mapped in Parcel D totaling 41.42 acres (Appendix D, Figure 49, Table 12). Five were natural communities with characteristic native species present (19.41 acres, 46.9%). One was a cultural community or developed area (2.48 acres, 6%). One community was dominated by non-native, invasive species (19.53 acres, 47.2%).

Parcel D contains the largest and best quality patches of Hempstead Plains grassland dominated by switch grass (*Panicum virgatum*) (5.35 acres, 13%). Nearly all of the patches of this type are associated the network of ATV trails that extend north to south through the center of the parcel.

Areas classified as Hempstead Plains grassland (*Panicum virgatum*) should be the first priority for HPG restoration and invasive species management in Parcel D. Native and non-native woody plants

should be eliminated or maintained at very low levels (e.g., <10% cover) within this type. The woodlands and forests in Parcel D should be a very low target for HPG restoration and invasive species management.

Parcel D is still recovering from significant past disturbances primarily related to the development of a golf course within the parcel and ATV trespassing (Appendix H, Figure 72).

Parcel E Ecological Communities

Ten ecological communities (*sensu* Edinger et al. 2014) including variants were mapped in Parcel E totaling 21.01 acres (Appendix E, Figure 53, Table 13). Two were natural communities with characteristic native species present (3.25 acres, 15.5%). Four were cultural communities or developed areas (6.49 acres, 31%). Four communities were dominated by non-native, invasive species (11.27 acres, 53.6%).

No patches of remnant Hempstead Plains grassland were found in Parcel E. However, the western third of the parcel does have grass-dominated successional old field with the best part located near Plot E09. Native grasses recorded in Parcel E include *Schizachyrium scoparium, Sorghastrum nutans, Andropogon gerardi,* and *Andropogon virginicus*. Otherwise the parcel contains few other characteristic HPG species (Table 2). Interestingly, the soils in Parcel E are deeper and darker compared to Parcels A-D, and closer to the description of Hempstead silt loam described in the Soil Survey of Nassau County New York (USDA Soil Conservation Service 1987).

Areas classified as successional old field (*Agrostis*) could be targeted for HPG restoration and invasive species management, but it will likely be more challenging in these areas given the prevalence of *Agrostis capillaris* along with the lack of characteristic HPG species (Table 2).

Over half of Parcel E is comprised of communities dominated by non-native, invasive species (e.g., *Agrostis capillaris, Cynanchum louiseae*). HPG restoration and invasive species management in the eastern two-thirds of the parcel would be very challenging and likely unsuccessful in these areas.

Hempstead Plains Grassland Element Occurrence

In 1999, the NY Natural Heritage Program ecologists estimated that there were about 36 acres of Hempstead Plains grassland left in Nassau County (16 acres in good condition in Parcel A and about 20 restorable acres in Parcel D). We have revised these totals based on our 2017 surveys and we now estimate that there are 24.17 acres of Hempstead Plains grassland left (Table 8a, Figure 17) including all variants. Parcel A has 11.58 acres of two variants of Hempstead Plains grassland. Parcel C has 7.1 acres of two variants of Hempstead Plains grassland. Parcel D has 5.49 acres of two variants of Hempstead Plains grassland.

Table 8a. Hempstead Plains grassland variants per parcel.

Hempstead Plains Grassland Variant Name	Parcel	Acres	Parcel Subtotal Acres
Hempstead Plains grassland (Agrostis)	A	5.25	
Hempstead Plains grassland (SJE)	A	6.33	11.58
Hempstead Plains grassland (SJE)	C	0.24	
Hempstead Plains grassland//Successional red cedar woodland	C	6.86	7.1
Hempstead Plains grassland (Agrostis)	D	0.14	
Hempstead Plains grassland (Panicum virgatum)	D	5.35	5.49
Hempstead Plains grassland all variants total	A, C, D	24.17	

If the variants of successional old field and successional shrubland in Parcel A were restored to Hempstead Plains grassland, then the total for that parcel would be revised back to almost 16 acres, or 99% of the parcel (Table 8b). If the variants of successional shrubland in Parcel C were restored to Hempstead Plains grassland, then the total would be increased to a little over 20 acres in that parcel (Table 8b). Given the amount of forested area in Parcel D, there is not much opportunity to enlarge the Hempstead Plains grassland in that parcel, rather the goal should be to maintain and improve the existing patches of Hempstead Plains grassland (*Panicum virgatum*) variant and reduce the number of ATV trails bisecting grassland patches in that parcel. Together the potential restorable Hempstead Plains grassland in Parcels A, C, and D is about 40 acres (Table 8b).

Table 8b. Potential restorable Hempstead Plains grassland per parcel. Priority restoration parcels highlighted in yellow.

Parcel	Total Acres	2017 HPG Acres	Percent of HPG in Parcel in 2017	Total Restorable HPG Acres	Percent of Parcel Restorable to HPG
A	16.14	11.58	72%	15.94	99%
B	5.61	0	0%	0.14*	2%
C	25.45	7.1	28%	20.26	81%
D	41.42	5.49	13%	6.75**	16%
E	21.01	0	0	3.46***	16%
Total A-E	109.63	24.17	22%	46.55	42%

*Restoration of the successional old field (*Schizachyrium*) to HPG in Parcel B would be very low priority.
**Total represents a reduction of the ATV trails in Parcel D by half and restoring these areas to HPG.
***Restoration of the successional old field (*Agrostis*) to HPG in Parcel E would be low priority.

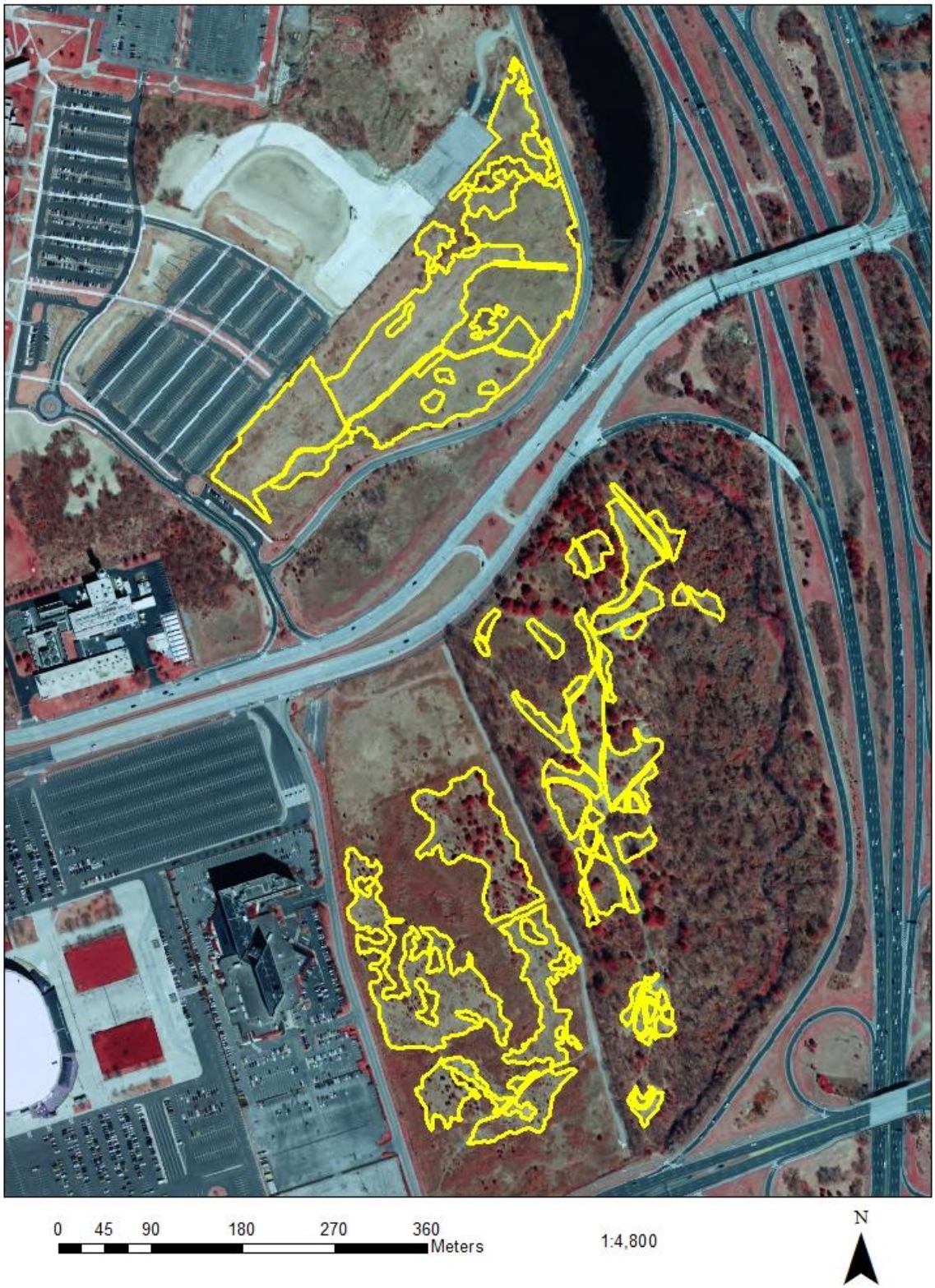

Figure 17. Hempstead Plains Grassland Element Occurrence Map (EOID 3865). Includes all Hempstead Plains Grassland variants surveyed in 2017.

RARE PLANT RESULTS

Rare Plant Overview

A total of 22 rare species locations were surveyed for 14 rare species over nine days (May 16-18, July 18-20, and September 6-8) within the study area (Table 3). All of the rare species except one that were known from Parcels A-E were found again, but no new rare species were discovered. Only *Aletris farinosa* and *Stachys hyssopifolia* were not rediscovered on Parcels A-D where they had been seen before, but *Aletris farinosa* was relocated on Parcel E. Digital photographs of each species and habitat were taken at each location and are included in the set of project deliverables.

Rare Plant Assessment by Parcel

Parcel A Rare Plants

There is a total of ten rare plants documented from this parcel (Appendix A, Figure 40) although the green milkweed, (*Asclepias viridiflora*), is just north of the parcel boundary in an extension of the grasslands with plans to be developed. Eight of the rare species were relocated which is the highest number of species in any of the parcels. The two species that could not be relocated were green milkweed and rough hedge nettle (*Stachys hyssopifolia*). All of the species are grasslands species and could benefit by management of the grasslands to prevent encroachment by woody species and invasive species. Each species might also benefit from an attempt to augment populations by collecting seed and spreading them around in good quality grassland.

Sandplain Agalinis (*Agalinis decemloba*): Sandplain Agalinis is a globally rare species in the broomrape family with only five natural occurrences in New York. This species was first documented in the Hempstead Plains in 1897 and probably flourished in the extensive grasslands present at that time. In 2017, its scientific and common names were changed from *Agalinis acuta* and Sandplain gerardia to reflect recent studies of the taxonomy of the species.

Figure 18. Counting Sandplain Agalinis *(Agalinis decemloba*) in enclosure (left) and flower (right).

The population at the Hempstead Plains is the second largest in the state and has fluctuated between tens of plants and thousands of plants. The main population is within two fenced areas in the southeast side of Parcel A where they have been managed and counted since 1984. In an effort to augment these populations the fenced areas surrounding them could be gradually enlarged to encompass a larger area.

Green Milkweed (*Asclepias viridiflora*): The green milkweed, located the northeast corner of Parcel A, has fluctuated between one and thirteen plants over the years since it was first discovered in 1984. It was last seen in 2010 when nine plants were counted but in 2017 no plants were seen after intensive surveys of the area by multiple people. The area is being invaded by tree of heaven but there is enough grassland remaining that the plants could still be there, especially if the area was mowed once a year in the early spring.

Figure 19. Green Milkweed (*Asclepias viridiflora*) habitat (left) and plant seen in 2010 (right).

Midland Sedge (*Carex mesochorea*): In 1985 during a survey of the Hempstead Plains, Bob Zaremba collected some sedges and later identified one of them as the rare Midland sedge. He knew he had collected it in Parcel A but did not record the exact locality. In May 2017, this species was rediscovered in an area of 1 x 1 meters in the north central part of Parcel A near the line of birdhouses and resurveyed again in July. In September, a second group of plants was found east of the Education Center in a 2 x 2 m square area. These two groups of plants at Hempstead Plains are one of eight occurrences in the state but none of them have more than 100 plants so this population is about average size for the state.

Figure 20. Walter Burak and Juliana Quant stand next to the location of Midland Sedge (*Carex mesochorea*) at the north location (left) and a close-up photo of fertile spikelet (right).

Early Frost Weed (*Crocanthemum propinquum*): This wildflower in the rock rose family was confirmed in Parcel A in 2010 after some confusion as to whether it was *Crocanthemum dumosum*. There are two areas of plants close together in good grassland habitat dominated by *Juncus greenei*, one 10 m x 10 m and the other 4 m x 5 m in size. These areas encompass hundreds of plants making it the second largest population in the state.

Figure 21. Early Frost Weed (*Crocanthemum propinquum*) habitat (left) and a close-up photo showing connecting rhizomes between plants (right).

Narrow-Leaved Bush Clover (*Lespedeza angustifolia*): This wildflower in the pea family was first discovered in Parcel A in 1985 when one plant was seen. It was recorded again in 1992 when many seedlings were seen but there was never an exact location recorded except in the general area of the *Agalinis* fences. That may have been because this species was not considered exceptionally rare until it was moved to the active list from the watch list in 2003. One plant was discovered in the large *Agalinis* fenced area in 2017, so this species is still not common here. Almost all the fifteen occurrences in the state, all on Long Island, are less than 50 plants at each site so this plant has never been very abundant.

Figure 22. The large *Agalinis* enclosure (above) supports habitat that is also amenable to Narrow-Leaved Bush Clover (*Lespedeza angustifolia*). The plant on the right is only eight inches tall which is small for this species. This is the only plant seen here.

Nuttall's Milkwort (*Polygala nuttallii*): This wildflower in the milkwort family was first recorded on Parcel A in 1985 when 200 to 300 plants were found but it was not surveyed again until 2017 because it was not considered rare enough in the state to be put on the active list until 2010. In combination with the plants found in Parcel D this is now the largest occurrence in the state. There was a total of 44 plants found in the two *Agalinis* fences in this parcel.

Figure 23. Nuttall's Milkwort (*Polygala nuttallii*) habitat in *Agalinis* enclosure (top) and close-up photo of plant (bottom). It is the only milkwort with branched stems.

Few-Flowered Nut Sedge (*Scleria pauciflora*): This nut sedge is the only species that has been recorded in three parcels, the population in Parcel A, along with those in Parcels C and D, comprise the largest occurrence in the state. The plants in Parcel A were first recorded in 1989 when one plant was seen near the *Agalinis* plants. In 2017, 50 plants were counted inside the larger *Agalinis* enclosure which alone would make it the largest population in the state. The plants in this area were very large and healthy.

Figure 24. Few-Flowered Nut Sedge (*Scleria pauciflora*) in *Agalinis* enclosure. A large healthy plant (left) and close-up photo of flowering stems with white achene (right and bottom).

R**ough Hedge Nettle** (*Stachys hyssopifolia* var. *hyssopifolia*): This wildflower in the mint family was first documented in Parcel A in 1984 by Bob Zaremba who gave it an occurrence rank of B (good) which means that there were probably tens of plants if not more. A specimen was taken by Bob and deposited at the New York State Museum but no photographs were taken. At that time, it was thought to be very rare in the state but the information from this site was not included in the Heritage database at the time and a map of its location was not made. There was only a dot on a field form map where the general locality was, west of the *Agalinis* fences. When it was noted on a field form in 1991 the plant was on the rare plant watch list and no data was taken. It was searched for during the 2017 survey but no plants were seen.

Figure 25. Rough Hedge Nettle (*Stachys hyssopifolia* var. *hyssopifolia*) in flower on eastern Long Island.

Bird's-foot Violet (*Viola pedata*): This beautiful wildflower in the violet family is on the New York rare watch list and only large populations are entered into the Heritage database. It is ranked as rare. The violet has been recorded from the Hempstead Plains from the late 1800s when large populations were described, but presently this is the only population in Nassau County. The plants occur in the larger *Agalinis* enclosure in Parcel A, but only three clumps were seen during this survey.

Figure 26. Bird's-foot Violet (*Viola pedata*).

Five-angled Dodder (*Cuscuta pentagona*): This herbaceous, orange-colored vine in the dodder family is also on the New York rare watch list and ranked as rare. It is the only existing population known from Nassau County and was recorded from the northwest corner of Parcel A in 1991. In 2017, it was not seen in its original location but one plant was seen in July within the large *Agalinis* enclosure. This plant is an annual and probably moves around the site over time.

Figure 27. Five-angled Dodder (*Cuscuta pentagona*).

Parcel B Rare Plants

No rare plants have ever been found in this highly disturbed parcel and none were seen in 2017.

Parcel C Rare Plants

Little-leaf Tick Trefoil (*Desmodium ciliare*): This wildflower in the pea family was first discovered in 1991 in the northwest corner of Parcel C (Group 1) and in the Marriott opening (Group 2). It was surveyed again in 1997 but the number of plants never exceeded 50. These areas were more open with fewer shrubs during that time. In 2017, plants were seen in Group 1 but not in Group 2. The area around Group 1 had succeeded to more shrubs, especially winged sumac, but more plants were seen here than any time in the past with 141 stems seen in a 400-meter square area. This area could probably use more management to keep it more open at a time that would not affect the growth of these plants.

Figure 28. Little-leaf Tick Trefoil (*Desmodium ciliare*) beginning to flower with the terminal inflorescence (left) and the terminal inflorescence in fruit showing the fruits with 1-3 segments (right).

Few-Flowered Nut Sedge (*Scleria pauciflora*): The four groups of this nut sedge at the Hempstead Plains make it the largest occurrence in the state, but this group (Group 4 in Parcel C) is the smallest. It was first noted in 1983 when this area, the Marriott opening, was much more open than it is now but it never had more than 20 plants. A small patch of plants of 14 stems was found in 2017 in a small depression on the edge of the opening within a shrubby area. This area will probably be gone soon if the encroaching shrubs are not controlled.

Figure 29. Few-Flowered Nut Sedge (*Scleria pauciflora*) habitat (top) and a close-up photo of the spikelet showing the white achene (bottom).

Sandplain Agalinis (*Agalinis decemloba*): There were two occurrences of this species in Parcel D that were documented in the 1980s up until 2012, but no plants have been seen here since then. One group of plants was in the northeast grassland associated with *Crocanthemum dumosum*. This area still contains grassland but has not been managed over the years for the optimum growth of *Agalinis*. Two plants were seen here in each of the years 2008, 2009, and 2012 by Betsy Gulotta. No plants were seen in 2017. There is a small chance that a seed bank remains and more plants could return with proper management. The other occurrence was in the northwest corner of the parcel along the trail that comes into the parcel from Purcell Avenue and contained *Aletris farino*sa and *Scleria pauciflora*. This area has become overgrown with shrubs and exotic species and all the rare plants are considered extirpated here.

Figure 30. Grassland habitat where Sandplain Agalinis (*Agalinis decemloba*) was found in the past.

Stargrass (*Aletris farinosa*): Two small occurrences of this wildflower in the Narthecium family were discovered here in 1990. One occurrence was in the northwest corner of the parcel along the trail that comes in to the parcel from Purcell Avenue and the other was in a small grassland area in the north central part of the parcel in an area that also contains the *Sericocarpus linifolius*. The northwest occurrence is now considered extirpated and plants in the central occurrence have not been seen since 1997. They were not seen in 2017 after an extensive search of the area. Since there is still some habitat here this area should be checked a few more times before considering the plants extirpated.

Figure 31. Overgrown northwest occurrence looking west where Stargrass (*Aletris farinosa*) was found in the past.

Bushy Rock Rose (*Crocanthemum dumosum*): This occurrence of small wildflowers in the rock rose family is one of twelve in the state, all from Long island, but the only existing occurrence in Nassau County and the farthest west in the state. The plants were first noted in in 1985 at the northwest corner of Parcel D in a grassland dominated by *Panicum virgatum*. There were 10 plants counted in 1985 and this rose to 160 in 2003. During the 1990s, a snow fence barrier was erected around the area but by 2017 the fence had long deteriorated with only a few slats, wire, and metal posts remaining. There were 160 plants counted in 2017, so the population remains viable as long as the area does not succeed to shrubs. There is a small population of *Crocanthemum canadense*, a very similar species, just to the north of the *C. dumosum* plants.

Figure 32. Betsy Gulotta looking at plants of Bushy Rock Rose (*Crocanthemum dumosum*) in grassland habitat in Parcel D (top). Plants in flower in May with bright yellow petals (bottom).

Nuttall's Milkwort (*Polygala nuttallii*): Along with the plants found in Parcel A this is the largest occurrence in the state. There was a total of 312 plants found in 5 groups in this parcel, an area where they had not been previously recorded. The plants preferred the edges of paths and ATV trails where there was little competition from other plants except for three plants that were often in association with them, *Dichanthelium lindheimeri*, *Hypericum gentianoides*, and *Panicum virgatum*. This is a plant that occurs in disturbance habitats like path edges that are difficult to manage because they must be kept open by disturbance but at the same time not destroyed by the same disturbance when they are growing and flowering. As long as there are open sandy areas with exposed soil these plants should continue to do well.

Figure 33. Eroded paths and trail borders provide good habitat for Nuttall's Milkwort (*Polygala nuttallii*). On the right is a flowering plant in the middle of a patch of rosette grass.

Few-Flowered Nut Sedge (*Scleria pauciflora*): There were two groups of plants first recorded in Parcel D in the 1980s and 1990s, Group 2 in the north central part of the parcel with *Sericocarpus linifolius* and *Aletris farinosa*, and Group 3 in the northwest corner with *Scleria pauciflora* and *Aletris farinosa*. In 2017, only Group 2 remains since Group 3 has succumbed to succession by shrubs and invasive species. Group 2 has about 50 plants in a fairly small wet swale which is about the same number of plants as Group 1 but three times larger than Group 4. This area needs to be kept open and the hydrology protected to maintain this population.

Figure 34. Few-Flowered Nut Sedge (*Scleria pauciflora*) swale habitat.

Flax-leaf Whitetop (*Sericocarpus linifolius*): This wildflower in the Aster family is known from seven sites on Long Island, but this is the only existing occurrence in Nassau County and the farthest west in the state. It ranks alongside the Sayville Grasslands as the largest population in New York, although the area of plants is much smaller than Sayville. The plants were first noted in Parcel D in 1992 and 1997 when 1-4 plants were counted. In 2017, there were 2000-3000 stems counted in an area that is 25 by 10 meters. This stem count represents fewer plants since each plant has more than one stem but it is very difficult to count individual plants when the plants are so close together here and the stems intertwine. This area needs to be kept open and the hydrology protected to maintain this population.

Figure 35. On the left are many stems of Flax-leaf Whitetop (*Sericocarpus linifolius*) plants in the swale habitat. To the right is an inflorescence with heads of white ray and disk flowers.

Stargrass (*Aletris farinosa*): The population of this wildflower in the Narthecium family is the only existing one in Nassau County and the farthest west in the state. It was first documented in Parcel E by Bob Zaremba and Carol Neidich-Ryder in 1992 when they saw about 30 plants in the grassland along Old Country Road toward the east side of the property. In 2010, these plants were not visible but Carol showed plants to Steve Young in two groups near the fence along Salisbury Park Drive. Group 1 was near a large pin oak tree and contained three rosettes of leaves and a second group of plants was found to the south of the first plants in a grassy opening in the woodlands and contained only two rosettes. In 2017, there were no plants found along Old Country Road and 19 rosettes in Group 1 near the pin oak tree. There were no plants found in Group 2 since the area is more grown up and covered in a thick layer of leaves. The grassland along Old Country Road has been severely impacted by black swallowwort and could probably be considered extirpated. Group 1 near the pin oak is doing well and the grassland is of good quality and has not been impacted by swallowwort yet. Group 2 has been impacted by succession and is probably not there anymore but a mowing and clearing of the opening might benefit them.

Figure 36. Stargrass (*Aletris farinosa*) habitat (top) and close-up photo of flowering spike (right).

CONDITION ASSESSMENT RESULTS

Floristic Quality Assessment of Plots and Observation Points

We assessed 78 plots and observation points (henceforth "points") within the study area using the Floristic Quality Assessment (FQA) methods described earlier. We present calculated FQA metrics in Appendix F (Table 14) grouped by parcel and sorted by point number for the entire study area. The point with the highest total richness (29 species) is the Hempstead Plains grassland (*SJE*) at point A01. As for lowest total richness, there are three points with only two species (B02, B03, E04). Three points were comprised of 100% native species (A22, D05, D06) and three points were 0% native (B05N, C11, E08a). Seven points had native and non-native species, but no invasive plants (A07, A11, C19, D01, D03, E04, E05). Refer to the related ecology sampling point maps in the respective parcel appendix for point locations (e.g., Appendix A for Parcel A maps, Appendix B for Parcel B maps, etc.).

FQA mean scores and weighted scores are best compared by community type. A list of points for the three Hempstead Plains grassland variants sorted by Weighted Floristic Quality is presented in Appendix F (Table 15). The highest Weighted Floristic Quality scores for each variant follow:

1. Hempstead Plains grassland (*SJE*) at point A02 (score 22.45).
2. Hempstead Plains grassland (*Panicum virgatum*) at point D06 (score 21.71).
3. Hempstead Plains grassland (*Agrostis*) at points A14 (score 11.78) and A15 (score 11.77).

The points above could be considered as possible "reference grassland" locations for each type. Table 15 also includes a column at the far right with a tally of characteristic HPG species at each point from Table 2. The Hempstead Plains grassland (*SJE*) at point A02 had highest number of characteristic HPG species with 14. The Hempstead Plains grassland points in Table 15 should be the priority targets for HPG restoration and invasive prevention, since they have the "building blocks" needed for success. Similarly, the areas mapped as one of the three Hempstead Plains grassland variants listed above on the Ecological Community Map for each parcel should also be priority targets for management and restoration (Figure 17).

For completeness, we included a table of the non-Hempstead Plains grassland types in Appendix F (Table 16) sorted by Weighted Floristic Quality that also includes a column tallying characteristic HPG species. This table reveals that the successional shrubland (*Rhus copallinum*) at point C15 with a score of 18.41 and seven characteristic HPG speciesfrom Table 2 might be a good alternate location for HPG restoration. FQA scores in Table 16 should be compared by similar type.

Invasive Plant Ranking and Assessment

Hempstead Plains Preserve and Purcell Preserve

Since 1984 a total of 37 invasive plants have been documented as occurring in parcels A-D. Six were first documented in 1984, then 18 more were noted by 2014. In 2017, 12 more species were added to the list but three of the species were not seen again for a total of 34 species in 2017. See the tables in Appendix I for a list of the species found. The number of invasive plants may seem large but is

about average for natural parcels that are small and completely surrounded by development or have seen disturbance to their soils in the past. This is a common occurrence on Western Long Island where most of the large natural areas have been reduced to small parcels surrounded by development that is a constant source of new invasives. At times, this may seem overwhelming to land managers but with proper planning and execution, invasive species can be controlled to a degree that they will no longer be an immediate threat to the resources being preserved. Not all species are present in the same abundance, and management can be prioritized to preserve the most important resources keeping in mind that management will have to continue into perpetuity for some species. A detailed invasive species management plan should be written outlining the species priorities and the management practices to be used as well as the assessment and monitoring planned to evaluate and improve techniques. Before a plan can be written a mapping effort of all the invasive species should be undertaken and infestation locations entered into iMap Invasives for a more refined picture of how the species are distributed across the preserve. The preserve should also work with LIISMA (Long Island Invasive Species Management Area) personnel to help develop a plan and for assistance with controlling infestations.

Table 17 in Appendix I shows the list of invasive plants with taxonomic information about their plant family, scientific name, and common name. The invasive rank is the rank assigned by the state invasive species ranking committee and reflects the result of a detailed analysis and protocol designed to assess the invasive nature of non-native species and their impact on native species and natural ecosystems in New York State (Jordan et al. 2012). Included in this list are species ranked very high to medium and includes three species that have not yet been ranked but are considered invasive by the authors and should be controlled. There was some difficulty identifying the invasive bentgrass (*Agrostis*) that has spread in the western part of Parcel A but it resulted in a choice between two closely-related exotic species, *Agrostis capillaris* and *A. stolonifera*. We decided the plants are *A. capillaris* but either way they can both be invasive and the identification does not change the outcome of the community evaluation or management objectives. The next two columns show the first year the species was recorded and if they were seen during the 2017 survey. The last column shows the number of the invasive tier where each species is assigned. The tiers were developed by the New York Natural Heritage Program and iMap Invasives to help standardize the species lists among the PRISMs (Partnership for Regional Invasive Species Management) in the state and show how each species is being managed (Dean and Young 2017). The tiers were developed to categorize management within a PRISM but we have adopted it here to show how the species could be managed within the preserve.

The following are the definitions for each tier:

Tier 1: Early Detection. Species found at the preserve in the past but no longer present and still in the surrounding area. Highest level of survey efforts. Should conduct delineation surveys and assign to appropriate Tier if detected.

Tier 2: Eradication. Highest level of response efforts. High impact species with low enough abundance to make eradication feasible within the preserve. Need delineation surveys to determine extent.

Tier 3: Containment. The species is only in one part of the preserve but could spread to other parts. Target strategic management to slow the spread, as likely too widespread for eradication, but many

areas in the preserve could be at risk if left unattended. Use the IPMDAT (Invasive Plant Management Decision Action Tree [Zimmerman et al. 2011]) to determine control feasibility. Possible eradication candidate only if adequate resources and effective control methods available.

Tier 4: Local Control. The species is widespread in the preserve and eradication is not feasible; focus on localized management over time to contain, exclude, or suppress to protect high-priority resources like rare species or recreation assets. Be strategic when deciding if or where to control.

Tier 5: Monitor. Species that need more research, mapping, and monitoring to understand their invasiveness. This includes naturalized species and cultivated-only species that are known to be invasive in other regions but are not yet invasive here. Invasiveness may change with environmental or genetic changes. Should monitor populations on a regular basis to see if they are starting to become invasive and assign to appropriate Tier if invasive infestations detected. This often applies to species ranked medium.

With this tier system, the land manager might want to know the very high ranked species that are in low abundance and could be eradicated. On Table 17 we see that the species that are qualify are Japanese Angelica Tree, Black Swallowwort, Mile-a-minute Weed, Wineberry, Slender Spurge Cut-leaf Blackberry, and Far-eastern Smartweed. Depending on the control methods necessary to control these species they could probably be eradicated from the preserve in a few years and prevent worse problems in the future.

Eisenhower Plains – Parcel E

We did not have a previous plant list available for this parcel so we only have a list of invasive plants compiled in 2017. There are 14 invasive species in the parcel (Table 18) that have become very pervasive and will be difficult to eradicate, especially the large patch of Black Swallowwort that is both in the woods and the grassland. More detailed mapping of the species should be done to refine the tier list.

Non-native Plant Assessment of Plots and Observation Points

We assessed 79 plots and observation points (henceforth "points") within the study area and tallied the number of non-native plant species and summed the percent cover all exotics present at each point (Appendix I, Table 19). We did not conduct a detailed invasive plant survey of the study area and we prioritized the best quality remnant open grassland patches for survey, so it is very likely that many non-native plant locations were missed. The plot and observation point cover data can provide a spatial estimate of which species are currently present at high levels.

Non-native plants were present in 76 (96%) of the sample points. The number of non-native species per point ranged from zero at points A22, D04, and D05 to 14 at point A01. The sum of non-native species cover per point ranged from zero at points A22, D04, and D05 to 100% non-native at 13 points (Appendix I, Table 19). Note that summing cover of non-native species at each point can reach greater than 100%, because vegetation cover was recorded at multiple strata and can overlap. For example, *Malus toringo* may occur in the tree canopy at 40%, tree sapling layer at 40%, and tree seedling layer at 40% with a sum of 120%. In addition, non-native vines can blanket non-native shrubs with non-native herbs growing underneath. We capped non-native cover per point at 100% for this assessment. We present a non-native plant assessment for each parcel below. Refer to the related ecology sampling point maps in the respective parcel appendix for point locations (e.g., Appendix A for Parcel A maps, Appendix B for Parcel B maps, etc.).

Parcel A Non-native Plant Assessment

Of the 25 sample points in Parcel A only one had zero non-native plants, the successional shrubland (*Rhus copallinum*) at point A22. Six points had <10% cover of non-natives: A02 <1%, A03 4%, A11 <1%, A12 <1%, A19a 9%, A20 5%. Only one point (A21) had 100% cover of non-native plants in Parcel A.

The following nine non-native plants are high priority management targets in Parcel A:

1. *Agrostis capillaris* was found at 10 points (40%) with an average cover of 27%.
2. *Artemisia vulgaris* was found at five points (20%) with an average cover of 30%.
3. *Celastrus orbiculatus* was found at five points (20%) with an average cover of 22%.
4. *Cynanchum loiseae* was found at one point (A18) with 5% cover.
5. *Elaeagnus umbellata* was found at four points (16%) with an average cover of 14%.
6. *Festuca trachyphylla* was found at five points (20%) with an average cover of 17%.
7. *Lespedeza cuneata* was found at ten points (40%) with an average cover of 17%.
8. *Lonicera japonica* was found at five points (20%) with an average cover of 32%.
9. *Malus toringo* was found at eight points (32%) with an average cover of 11%.

Agrostis capillaris is the most abundant non-native plant in Parcel A based on the number of points and average cover followed by *Lonicera japonica* and *Artemisia vulgaris*.

Agrostis capillaris is found throughout Parcel A from the south end at point A13 to point A06 to the north. It is a common invasive plant of the Hempstead Plains grassland (*Agrostis*) community mapped within the parcel. It is most abundant in the central part of the parcel near point A18 (80%) and less abundant toward the peripheral fence line. Areas without *Agrostis capillaris* should be

monitored for new invasions of this species. Areas with low abundance (<10%) of *Agrostis capillaris,* (e.g., A07 to east and A10 to the west) might be good locations to begin active management to reduce or remove this species.

Artemisia vulgaris is mostly found within 20 m of the Parcel A perimeter fence (e.g., A01, A04, A10, A21, A24). It is either dominant or co-dominant in two successional old field variants mapped within the parcel: successional old field (*Artemisia*) and successional old field (*Lespedeza-Artemisia*). Areas in the central portion of Parcel A without *Artemisia vulgaris* should be monitored for new invasions of this species. *Artemisia vulgaris* is less abundant (<10%) in the variants of Hempstead Plains grasslands and these areas might be good locations to begin active management to reduce or remove this species (e.g., A01).

Celastrus orbiculatus is found at the south end of Parcel A near the Education Center (e.g., A14, A23, A24) and along the northwest perimeter fence (e.g., A10, A18). It is associated with the variants of successional shrubland: successional shrubland (*MPE*) at point A18 (20%) and successional shrubland (*Rhus copallinum*) at point A23 (45%). It is also a component-of the successional old field (*Lespedeza-Artemisia*) variant (A10 15%, A24 25%). Hempstead Plains grassland variants in Parcel A without *Celastrus orbiculatus* should be monitored for new invasions of this species. Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Elaeagnus umbellata is widely scattered in Parcel A and mostly associated with the successional shrubland (*MPE*) variant (e.g., A05, A18, A19b). Areas without *Elaeagnus umbellata* should be monitored for new invasions of this species. *Elaeagnus umbellata* is less abundant (<10%) in the variants of Hempstead Plains grasslands and these areas might be good locations to begin active management to reduce or remove this species (e.g., A20). Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Festuca trachyphylla is present at the north point (A04) and central portion of Parcel A (A02, A08, A09). It is present at relatively low cover in three Hempstead Plains grassland variant points (A01 8%, A02 <1%, and A08 7%) and these areas might be good locations to begin active management to reduce or remove this species. However, *Festuca trachyphylla* might be better managed by combining it with one of the other non-native species that co-occur with it (e.g., *Agrostis capillaris*), rather than target it separately.

Lespedeza cuneata is found at the south end of Parcel A near the Education Center (e.g., A13, A14, A24) with lower cover (5-20%) and along the northwest perimeter fence (e.g., A10, A16, A17) with much higher cover (30-50%). Areas in the central portion of Parcel A without *Lespedeza cuneata* should be monitored for new invasions of this species. *Lespedeza cuneata* is less abundant (<10%) in the variants of Hempstead Plains grasslands and these areas might be good locations to begin active management to reduce or remove this species (e.g., A01, A06, A13, A14, A20).

Lonicera japonica is mostly found within 20 m of the Parcel A perimeter fence (e.g., A06, A18, A21, A23). It is most abundant in the variants of successional shrubland (MPE) at points A18 (50%) and A19b (20%), successional shrubland (*Rhus copallinum*) at A23 (45%), and successional old field (*Artemisia*) at point A21 (60%). Areas in the central portion of Parcel A without *Lonicera japonica*

should be monitored for new invasions of this species. *Lonicera japonica* is less abundant (<10%) in the variants of Hempstead Plains grasslands and these areas might be good locations to begin active management to reduce or remove this species (e.g., A06). Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Malus toringo is found throughout Parcel A from the south end at point A13 to point A05 to the north. It is more abundant (20-38%) in the successional shrubland (*MPE*) community that forms various size patches throughout the parcel (e.g., A05, A18, A19b). Areas without *Malus toringo* should be monitored for new invasions of this species. *Malus toringo* is less abundant (<10%) in the variants of Hempstead Plains grasslands and these areas might be good locations to begin active management to reduce or remove this species (e.g., A13, A17, A20). Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Parcel B Non-native Plant Assessment

All ten sample points in Parcel B had at least one non-native plant. Six points (60%) had 90% or more cover of non-natives.

The following four non-native plants are high priority management targets in Parcel B:

1. *Artemisia vulgaris* was found at nine points (90%) with an average cover of 58%.
2. *Lespedeza cuneata* was found at six points (60%) with an average cover of 29%.
3. *Ailanthus altissima* was found at three points (30%) with an average cover of 32%.
4. *Rosa multiflora* was found at two points (20%) with an average cover of 4%.

Artemisia vulgaris is the most abundant non-native plant in the open areas of Parcel B based on the number of points and average cover followed by *Lespedeza cuneata*. *Ailanthus altissima* is the most abundant non-native plant in the forested parts of Parcel B. The following six non-native plants were found at one point in Parcel B: *Alliaria petiolata* at B03 with 15% cover; *Malus toringo* at B05W with 8% cover; *Lonicera japonica* at B04 with 12% cover; *Lonicera maackii* at B04 with 2% cover; *Elaeagnus umbellata* at B07 with 5% cover; and *Festuca trachyphylla* at B07 with 10% cover.

Artemisia vulgaris and *Lespedeza cuneata* are abundant in Parcel B. Reduction and removal of non-native species in this parcel would be very challenging. Restoring characteristic Hempstead Plains grassland species in this parcel would likely be unsuccessful. Restoration efforts and resources should be directed to parcels A, C, D, and possibly E.

Parcel C Non-native Plant Assessment

All 25 sample points in Parcel C had at least two non-native plants. Two points had <10% of non-natives: C14a 9% and C19 7%. Two points (C03a and C12a) had 100% cover of non-native plants.

The following nine non-native plants are high priority management targets in Parcel C:

1. *Agrostis capillaris* was found at nine points (36%) with an average cover of 7%.
2. *Ampelopsis glandulosa* was found at one point (C12a) with 60% cover.

3. *Artemisia vulgaris* was found at two points (8%) with an average cover of 7%
4. *Celastrus orbiculatus* was found at 14 points (56%) with an average cover of 15%.
5. *Elaeagnus umbellata* was found at 16 points (64%) with an average cover of 8%.
6. *Lespedeza cuneata* was found at two points (8%) with an average cover of 27%
7. *Lonicera japonica* was found at 10 points (40%) with an average cover of 9%.
8. *Malus toringo* was found at 21 points (84%) with an average cover of 14%.
9. *Rosa multiflora* was found at eight points (36%) with an average cover of 9%.

Malus toringo is the most abundant non-native plant in Parcel C based on the number of points and average cover followed by *Celastrus orbiculatus* and *Elaeagnus umbellata.*

Agrostis capillaris is found mostly at the southern quarter of Parcel C at points north and south of the trail that runs from the southwest fence opening to the abandoned road between Parcels C and D ("Purcell Avenue"). Point C08 located about half way up the western fence line is the only exception to that rule. *Agrostis capillaris* has much lower average cover in Parcel C (7%) compared to Parcel A (27%). Areas mapped as Hempstead Plains grassland (*SJE*) with low abundance (<15%) of *Agrostis capillaris* might be good locations to begin active management to reduce or remove this species.

Ampelopsis glandulosa is found at one point (C12a) with 60% cover as part of the successional shrubland (*MPE*) variant. We observed it growing on top of tall and short shrubs along the west side of the abandoned road between Parcels C and D ("Purcell Avenue"). It grows as a nearly continuous patch for the length of the abandoned road. *Ampelopsis glandulosa* likely occurs elsewhere in Parcel C, but those locations were not recorded during the 2017 ecology surveys. Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Artemisia vulgaris is found along the west side of the abandoned road between Parcels C and D ("Purcell Avenue"). It grows in scattered patches from the north end of the road (C10 3% and C12a 10%) as part of the successional shrubland (*MPE*) variant. *Artemisia vulgaris* dominant (80%) at point C13 at the south end of the abandoned road in the successional old field (*Artemisia*) variant. It was not recorded at any of the 14 Hempstead Plains grassland (*SJE*) points sampled in Parcel C. These areas should be monitored for new invasions of this species.

Celastrus orbiculatus is found throughout Parcel C in several community types. It is most abundant (70%) in the successional shrubland (*MPE*) variant at point C03a. *Celastrus orbiculatus* is found around the edges (2-18% cover) of the Hempstead Plains grassland (*SJE*) patches north and south of the trail that runs from the southwest fence opening to the abandoned road between Parcels C and D ("Purcell Avenue"). These areas might be good locations to begin active management to reduce or remove this species. Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Elaeagnus umbellata is found throughout Parcel C in several community types. It is a common associate of the successional shrubland (*MPE*). *Elaeagnus umbellata* is found around the edges (<20% cover) of the Hempstead Plains grassland (*SJE*) patches north and south of the trail that runs from the southwest fence opening to the abandoned road between Parcels C and D ("Purcell Avenue"). These areas might be good locations to begin active management to reduce or remove this species.

Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Lespedeza cuneata is found growing in the unmaintained trails at points C03b (3%) and C11 (50%). It was not recorded at any of the other 23 points sampled in Parcel C. These areas should be monitored for new invasions of this species.

Lonicera japonica is found throughout Parcel C in several community types. It is a common associate of the successional shrubland (*MPE*) at points C03a (20%) and C12a (5%). *Lonicera japonica* is found around the edges (2-10% cover) of the Hempstead Plains grassland (*SJE*) patches north and south of the trail that runs from the southwest fence opening to the abandoned road between Parcels C and D ("Purcell Avenue"). These areas might be good locations to begin active management to reduce or remove this species. Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (MPE) variant.

Malus toringo is widespread and abundant in Parcel C ranging from 4% cover (C01 and C14a) to 35% cover (C04 and C14b). Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) and Hempstead Plains grassland (*SJE*) variants.

Rosa multiflora is found throughout Parcel C in several community types. It is a common associate of the successional shrubland (*MPE*) and likely occurs elsewhere in Parcel C, but those locations were not recorded during the 2017 ecology surveys. *Rosa multiflora* is found around the edges (<10% cover) of the Hempstead Plains grassland (*SJE*) patches north and south of the trail that runs from the southwest fence opening to the abandoned road between Parcels C and D ("Purcell Avenue"). These areas might be good locations to begin active management to reduce or remove this species. Management of this species should be included as part of the overall woody plant management plan for the successional shrubland (*MPE*) variant.

Parcel D Non-native Plant Assessment

Of the 10 sample points in Parcel D two (20%) had zero non-native plants (D04 and D05). An additional four points had <10% cover of non-natives: D01 1%, D03 2%, D06 3%, D10 4%. Two points (D07 and D09a) had 100% cover of non-native plants. The number and cover of non-native plants in the Hempstead Plains grassland (*Panicum virgatum*) areas in Parcel D were lower compared to the Hempstead Plains grassland variants in Parcel A and C (Appendix I, Table 19).

The following nine non-native plants are high priority management targets in Parcel D:

1. *Acer plantanoides* was found at two points (D08 and D09a) with an average cover of 10%.
2. *Agrostis capillaris* was found at three points (D02 85%, D03 2%, and D10 2%) with an average cover of 30%.
3. *Ailanthus altissima* was found at two points (D07 and D08) with an average cover of 18%.
4. *Ampelopsis glandulosa* was found at one point (D07) with 45% cover.
5. *Aralia elata* was found at one point (D08) with 2% cover.
6. *Frangula alnus* was found at three points (30%) with an average cover of 4%.
7. *Lonicera maackii* was found at one point (D07) with 72% cover.

8. *Rosa multiflora* was found at 3 points (30%) with an average cover of 20%.
9. *Cynanchum louiseae* was found at one reference point (D09b), but percent cover was not recorded.

Agrostis capillaris is the most abundant non-native plant in the open areas of Parcel D based on the number of points and average cover (D02 85%, D03 2%, D10 2%). Areas mapped as Hempstead Plains grassland (*Panicum virgatum*) with low abundance of *Agrostis capillaris* (e.g., D03 and D10) might be good locations to begin active management to reduce or remove this species. Areas mapped as Hempstead Plains grassland (*Panicum virgatum*) in Parcel D without *Agrostis capillaris* should be monitored for new invasions of this species. *Agrostis capillaris* is abundant (85% cover) at point D02, but is still classified as a Hempstead Plains grassland (*Agrostis*) variant because six characteristic HPG species from Table 2 persist at this location.

Frangula alnus is present with low percent cover at two Hempstead Plains grassland (*Panicum virgatum*) points (D06 and D10). These areas might be good locations to begin active management to reduce or remove this species. Areas mapped as Hempstead Plains grassland (*Panicum virgatum*) in Parcel D without *Frangula alnus* should be monitored for new invasions of this species. It is also present in the surrounding forests, especially in areas with moister soil, such as the red maple-hardwood swamp along Meadow Brook at point D08.

Most of the woody non-native plants in Parcel D (#1, 3, 4, 5, 7, 8 above) are found in the forested areas (e.g., D07, D08, D09a, D09b) and not in the Hempstead Plains grassland (*Panicum virgatum*) variant. The forested areas in Parcel D may not be suitable for restoration to Hempstead Plains grassland, but if left unmanaged the invasives currently in the forests may spread into the remaining Hempstead Plains grassland (*Panicum virgatum*) patches.

Parcel E Non-native Plant Assessment
All eight sample points in Parcel E had at least one non-native plant. Two points (E06b and E08a) had 100% cover of non-native plants.

The following four non-native plants are high priority management targets in Parcel E:

1. *Agrostis capillaris* was found at seven points (88%) with an average cover of 44%.
2. *Cynanchum louiseae* was found at six points (75%) with an average cover of 27%.
3. *Elaeagnus umbellata* was found at three points (38%) with an average cover of 22%.
4. *Malus toringo* was found at two points (25%) with an average cover of 12%.

Agrostis capillaris is the most abundant non-native plant in Parcel E based on the number of points and average cover followed by *Cynanchum louiseae*.

Agrostis capillaris is found throughout Parcel E ranging from 15% cover at point E06b to 85% cover at point E04. It is a characteristic non-native plant of two communities in Parcel E: successional old field (*Agrostis*) at points E03, E04, and E09; and successional old field (*Agrostis-Cynanchum*) at points E06b, E07, E10ref, and E11ref. Given the widespread abundance of *Agrostis capillaris* in Parcel E, reduction and removal of this species will be very challenging.

Cynanchum louiseae is found throughout Parcel E, but is more abundant in the central and eastern parts of the parcel. It ranges from <1% cover at point E09 to 82% cover at point E06b. It is a characteristic non-native plant of the successional old field (*Agrostis-Cynanchum*) variant at points E06b, E07, E10ref, and E11ref. The grassland around Point E09 with low abundance of *Agrostis capillaris* might be a good area to begin active management to reduce or remove this species. Given the abundance of *Cynanchum louiseae* elsewhere in Parcel E, reduction and removal of this species will be very challenging.

Malus toringo and *Elaeagnus umbellata* are characteristic non-native woody plants of the successional shrubland (*MPE*) in Parcel E (e.g., point E08a). Management of these species should be included as part of the overall woody plant management in this parcel.

Areas classified as successional old field (*Agrostis*) could be targeted for HPG restoration and invasive species management, but it will likely be more challenging in these areas given the prevalence of *Agrostis capillaris* along with the lack of characteristic HPG species from Table 2

Over half of Parcel E is comprised of communities dominated by non-native, invasive species (e.g., *Agrostis capillaris, Cynanchum louiseae*). HPG restoration and invasive species management in the eastern two-thirds of the parcel would be very challenging and likely unsuccessful in these areas.

Other Ecological Community Condition Factors

We noted the incidence of garbage and illegal camp sites in the study area. For example, we found garbage, clothing, blankets, food containers, grills, broken lawn furniture, shopping carts, bicycles etc. near the following points:

C12b: Trash pile north side of unpaved road access into Parcel C from Purcell Avenue.
C18b: Hole in fence to Parcel D to abandoned camp strewn with garbage.
C18c: Second hole in fence to Parcel D 30 m south of C18b with red tent and bicycle.
C18d: Occupied camp site with dome tent north of terminus of unpaved road access into Parcel C from east side ("Purcell Avenue"). Safety concerns prevented ecological surveys of Parcel C north of this point.

In addition to the points above, we recorded the percent cover of trash at the following points: B03 <1%, B04 6%, B07 1%, C01 <1%, C02 <1%, D01 1%, D06 1%, D08 2%, D09a <1%, and E02 <1%.

We noted and mapped a network of ATV trails throughout the central and western portions of Parcel D. These trails are mapped as unpaved roads on the ecological community map and cover 2.48 acres, or about 6% of Parcel D. ATV trails are usually considered a threat to the condition of natural community occurrences, because they cause erosion and provide dispersal corridors for invasive plants. However, the Hempstead Plains grassland (*Panicum virgatum*) variant in Parcel D appears to have benefitted from some ATV activity. ATVs may be helping the grassland area stay open by preventing the invasion of woody plants. ATV disturbance combined with well-drained sandy soil and dense growing *Panicum virgatum* may all contribute to the observed lower cover of invasives. Somewhat surprisingly, we noted earlier that two of the three points in the study area with no invasive plants are in Parcel D adjacent to ATV trails (D04 and D05).

Final Products

- NY Natural Heritage Program field forms (pdfs) produced from data collected in the field.
- Updated Element Occurrence Record (EOR) for the Hempstead Plains Grassland natural community occurrence and for all rare plant records searched for.
- Wall-to-wall GIS map of the five parcels (A-E) showing current ecological community boundaries.
- Results of a Floristic Quality Assessment for each observation point/plot sampled.
- Electronic data containing all vegetation data collected, in tabular (or database) format.
- Electronic copies of all photographs taken for documentation.
- A final report describing our findings including methods, results, discussion, and management recommendations based on field data pointing to the best locations to restore Hempstead Plains Grassland vegetation and management recommendations for the rare plant populations.

ACKNOWLEDGEMENTS

We thank the following people for making this project a successful and enjoyable experience:

Betty Borowsky (Volunteer, Friends of Hempstead Plains at Nassau Community College, Inc.) – rare plant field assistance.
Walter Burak – rare plant field assistance.
Scott Emmons (Board of Directors, Friends of Hempstead Plains at Nassau Community College, Inc.) – project scoping.
Mike Feder – rare plant field assistance.
Neil Gifford (Conservation Director, Albany Pine Bush Preserve Commission) – invasive species management information and prioritization strategies.
Betsy Gulotta (Conservation Project Manager, Friends of Hempstead Plains at Nassau Community College, Inc.) – rare plant and ecology field assistance, site information, land use history, logistics.
Marilyn Jordan (Retired Senior Conservation Scientist, The Nature Conservancy) – invasive plant identification, past distribution, and management.
Rich Kelly – rare plant field assistance.
Clark Mitchell (BAND Foundation) – project scoping, ecology field assistance, organizing lunch meeting.
Juliana Quant – rare plant field assistance.
Jacob Roday (student researcher, Hofstra University) – site information, shared research goals.
David Stolarz (Board of Directors, Friends of Hempstead Plains at Nassau Community College, Inc.) – remotely piloted aircraft photos, site information, land use history, rare plant field assistance.
Diane Worden (Volunteer, Friends of Hempstead Plains at Nassau Community College, Inc.) – ecology field assistance Parcels C and D.
David Werier (Botanical and Ecological Consultant) – plant identification.

NY Natural Heritage Program Staff

Matt Buff (Database Manager) – database programming and support, producing the Access database subset for the study area.
Emily Cheadle (GIS Specialist) – GIS support, map quality control, report map production.
Nick Conrad (Information Resources Coordinator) – Biotics database technical support, Element Occurrence Record pdf production.
Jennifer Dean (Invasive Species Biologist) – Invasive species information, ranking, and tracking.
Greg Edinger (Chief Ecologist) – community inventory, classification, and mapping; report writing.
DJ Evans (Director) – administrative support, project proposal development.
Tim Howard (Director of Science) – project proposal development, technical support, Floristic Quality Assessment table production, ecology plant list production.
Heidi Krahling (Invasive Species Information Manager) – Invasive species information, ranking, and tracking.
Varun Mathukumalli (Database Specialist) – database programming and support, field form pdf production.
Fiona McKinney (Grants Specialist/Finance Administrator) – administrative support, budget planning.
Steve Young (Chief Botanist) – rare plant surveys, plant specimen identification, report writing.

REFERENCES

Bailey, R. Map: Ecoregions of North America. [revised]. 1997. Washington, DC, UDSA Forest Service in cooperation with The Nature Conservancy and the U. S. Geological Survey.

Bryce, S.A., G.E. Griffith, J.M. Omernik, G.J. Edinger, S. Indrick, O. Vargas, and D. Carlson. 2010. Ecoregions of New York (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey, map scale 1:250,000.

Cadwell, D.H. and R J. Dineen. Surficial geologic map of New York: Hudson - Mohawk Sheet. Scale 1:250,000. 1987. Albany, NY, The University of the State of New York, The State Education Department. Map and Chart Series No. 40. New York State Museum - Geologic Survey.

Cain, S.A., M. Nelson, and W. McLean. 1937. Andropogonetum Hempsteadi: A Long Island grassland vegetation type. The American Midland Naturalist 18(3):334-350.

Dean, J. and S.M. Young. 2017. Invasive Species Tiers: Standardizing species lists for each PRISM. Unpublished table. New York Natural Heritage Program, Albany, NY. September 2017.

Dickinson, Nathaniel R. 1983. Physiographic Zones of Southern and Western New York. New York State Department of Environmental Conservation, Wildlife Resources Center, Delmar, NY.

Edinger, G. J., D. J. Evans, A. D. Finton, D. M. Hunt, L. Lyons-Swift, and A. Olivero. 2000. Community field form instructions: Community Forms 1, 2, & 3. New York Natural Heritage Program, Latham, NY.

Edinger, G J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2014. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Ferguson, W.C. 1925. Ferns and flowering plants of the Hempstead Plains, Long Island, New York. Torreya 25(6):109-113.

Harper, R.M. 1911. The Hempstead Plains. A natural prairie on Long Island. Bulletin American Geographic Society 43:351-360.

Harper, R.M. 1912. The Hempstead Plains of Long Island. Torreya 12(12):277-287.

Harper, R.M. 1918. The vegetation of the Hempstead Plains. Mem. Torrey Botanical Club 17: 262-286.

Hicks, H. 1892. The flora of the Hempstead Plains, Long Island. Unpublished manuscript (thesis), Cornell University.

Jordan, M.J., B. Lund, and W.A. Jacobs. 2002. Effects of mowing, herbicide and fire on Artemisia vulgaris, Lespedeza cuneata and Euphorbia cyparissias at the Hempstead Plains grassland, Long Island, New York. Text of poster prepared for the Northeast Natural History Conference, New York State Museum, Albany N.Y., April 25-26, 2002. The Nature Conservancy, Long Island Chapter. Online. Available: http://tncweeds.ucdavis.edu/esadocs/euphcypa.html (accessed 2004).

Jordan, M.J., G. Moore and T.W. Weldy. 2012. New York State Ranking System for Evaluating Non-Native Plant Species for Invasiveness. Unpublished report. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY.

Kirby, J. 1905. Some plants of Hempstead Plains. The American Botanist 7:110-111.

Neidich-Ryder, C. and P. Kennelly. 2013. Mapping prairie remnants on the Hempstead Plains, Long Island, New York. Environ Monit Assess. Springer Science. Published online: 11 January 2014.

Rickard, L.V. and D.W. Fisher. Geologic map of New York: Finger Lakes Sheet. Scale 1:250,000. 1970. Albany, NY, The University of the State of New York, The State Education Department. New York State Museum and Science Services Map and Chart Series No. 15.

Ring, R.M. 2016. Coefficients of conservatism values for a Flora Quality Assessment Index of the native vascular plants of New York. New York Natural Heritage Program, Albany, NY

Seyfert, W.G. 1973. A study of the Hempstead Plains, Long Island, New York, and its vascular flora. M.S. thesis, C. W. Post College, Long Island University, Greenvale, NY.

Stalter, R. 1981. Some ecological observations of Hempstead Plains, Long Island, New York. Proc. of the Northeastern Weed Science Society 35:101-106.

Stalter, R. and E.E. Lamont. 1987. Vegetation of Hempstead Plains, Mitchell Field, Long Island, New York. Bull. Torr. Bot. Club 114: 330-335.

Stalter, R. and W. G. Seyfert. 1989. "The Vegetation History of Hempstead Plains, New York" (1989). Proceedings of the North American Prairie Conferences. 56.
http://digitalcommons.unl.edu/napcproceedings/56

Swink, F., and G. Wilhelm. 1994. Plants of the Chicago region. 921 pages. Indiana Academy of Science, Indianapolis, IN.

United States Department of Agriculture, Soil Conservation Service. 1987. Soil survey of Nassau County, New York. 156 pp.

Watson, Winslow C. 1860. The plains of Long Island. C. Van Benthuysen.

Werier, D. 2015. New York Flora Atlas. New York Flora Association, Albany, New York.

Young, S.M. 2017. New York Rare Plant Status Lists. New York Natural Heritage

Program, New York State Department of Environmental Conservation, Albany, NY. November 2017. 103 pp.

Zimmerman, C., M. Jordan, G. Sargis, H. Smith, K. Schwager. 2011. An Invasive Plant Management Decision Tool. Version 1.1. The Nature Conservancy, Arlington, Virginia.

APPENDIX A. Parcel A maps

Figure 37. Parcel A with Long Island 2013 6-inch Natural Color digital orthoimagery.

Figure 38. Parcel A with Long Island 2013 6-inch Color Infrared digital orthoimagery and ecology sampling points.

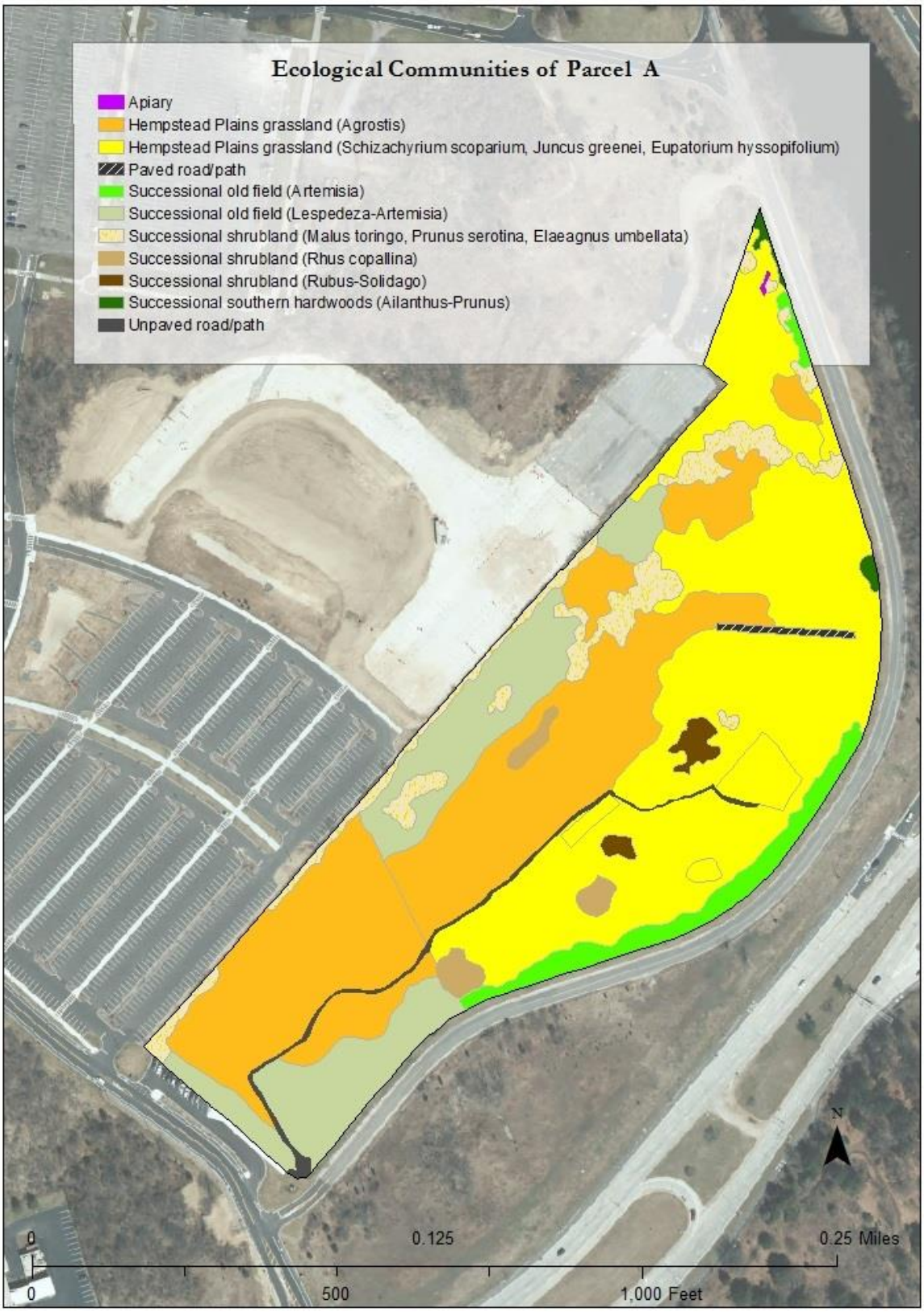

Figure 39. Ecological Communities of Parcel A.

Table 9. Distribution of Ecological Communities in Parcel A.

Ecological Community	**Acres**
Apiary (beehives)	<0.01
Hempstead Plains grassland (Agrostis)	5.25
Hempstead Plains grassland (*SJE*)	6.33
Paved road/path (concrete swale)	0.06
Successional old field (Artemisia)	0.62
Successional old field (Lespedeza-Artemisia)	2.27
Successional shrubland (*MPE*)	1.04
Successional shrubland (Rhus copallinum)	0.23
Successional shrubland (Rubus-Solidago)	0.14
Successional southern hardwoods (Ailanthus-Prunus)	0.06
Unpaved road/path (hiking trails)	0.14
Total	16.14

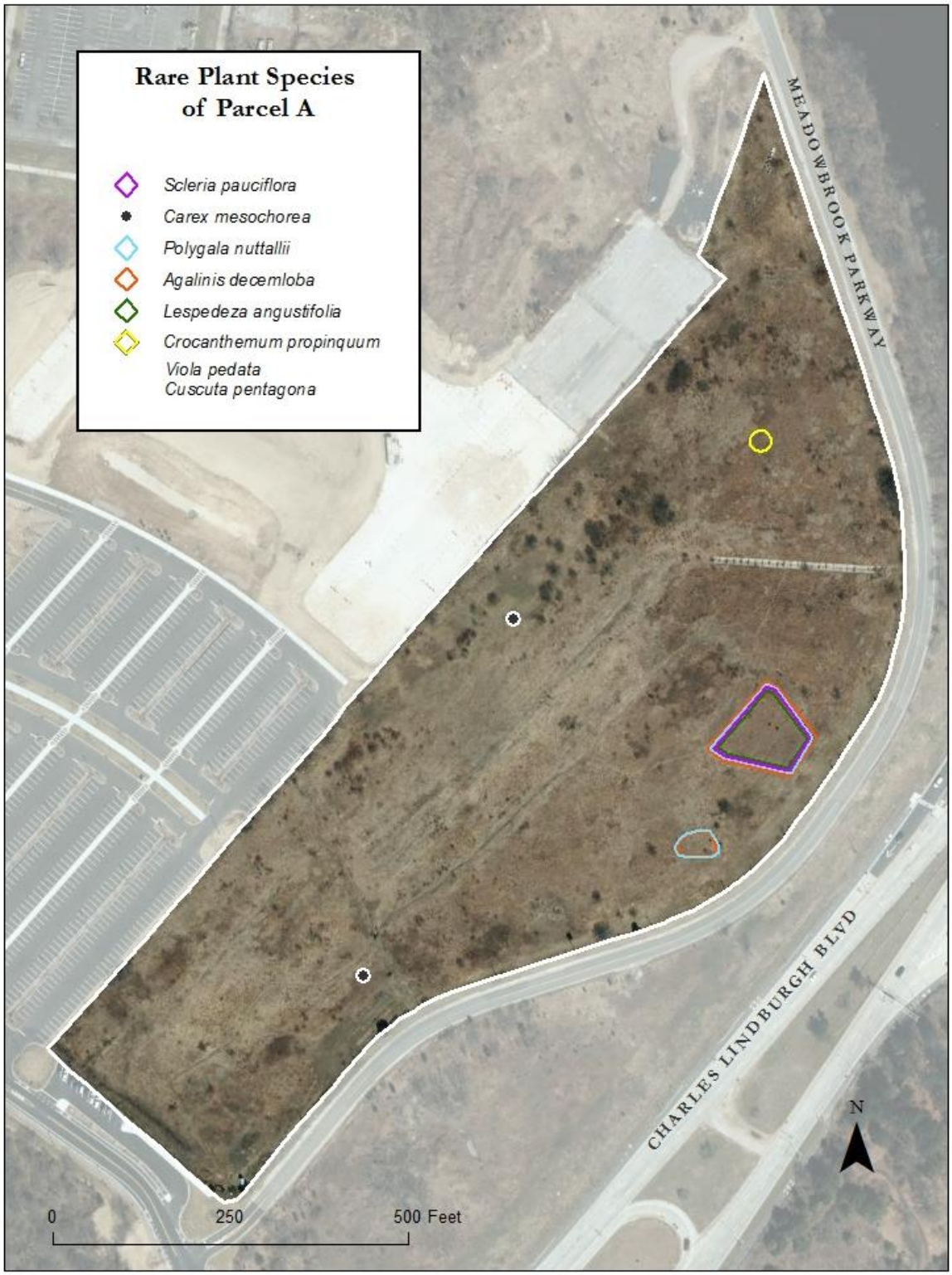

Figure 40. Rare Plant Species of Parcel A.

APPENDIX B. Parcel B maps

Figure 41. Parcel B with Long Island 2013 6-inch Natural Color digital orthoimagery.

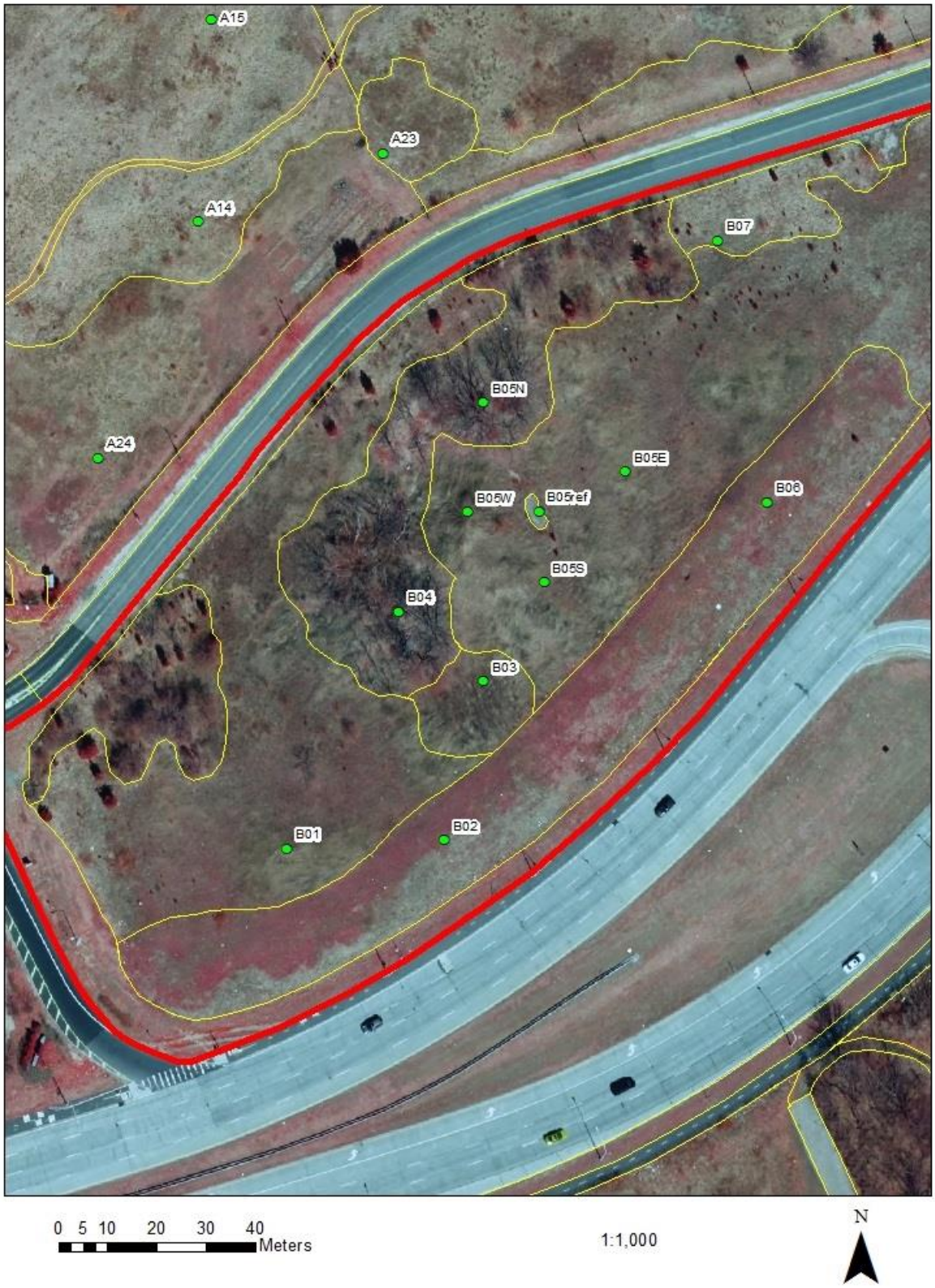

Figure 42. Parcel B with Long Island 2013 6-inch Color Infrared digital orthoimagery and ecology sampling points.

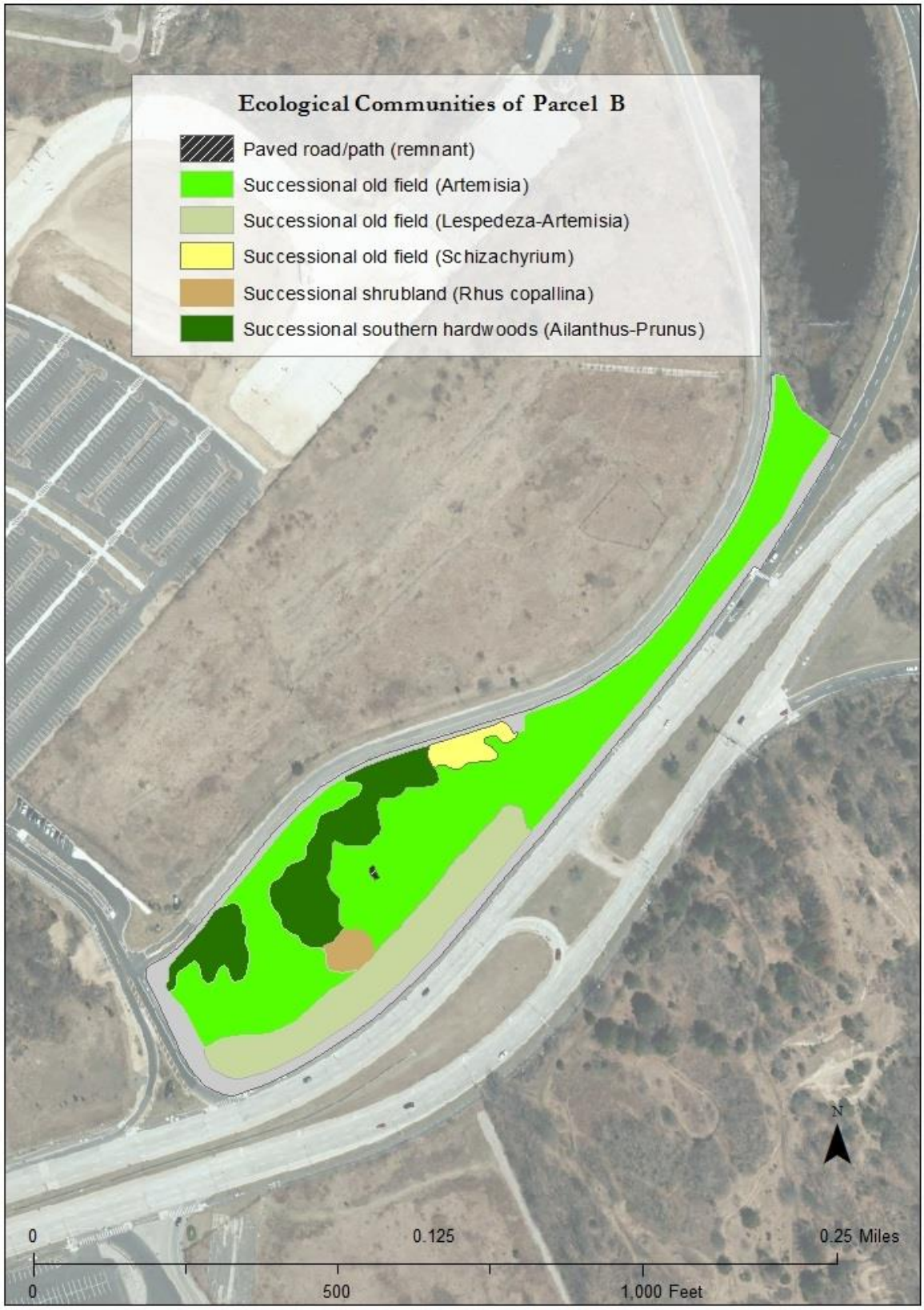

Figure 43. Ecological Communities of Parcel B.

Table 10. Distribution of Ecological Communities in Parcel B.

Ecological Community	**Acres**
Paved road/path (remnant)	<0.01
Successional old field (Artemisia)	3.51
Successional old field (Lespedeza-Artemisia)	0.96
Successional old field (Schizachyrium)	0.14
Successional shrubland (Rhus copallinum)	0.10
Successional southern hardwoods (Ailanthus-Prunus)	0.89
Total	5.61

APPENDIX C. Parcel C maps

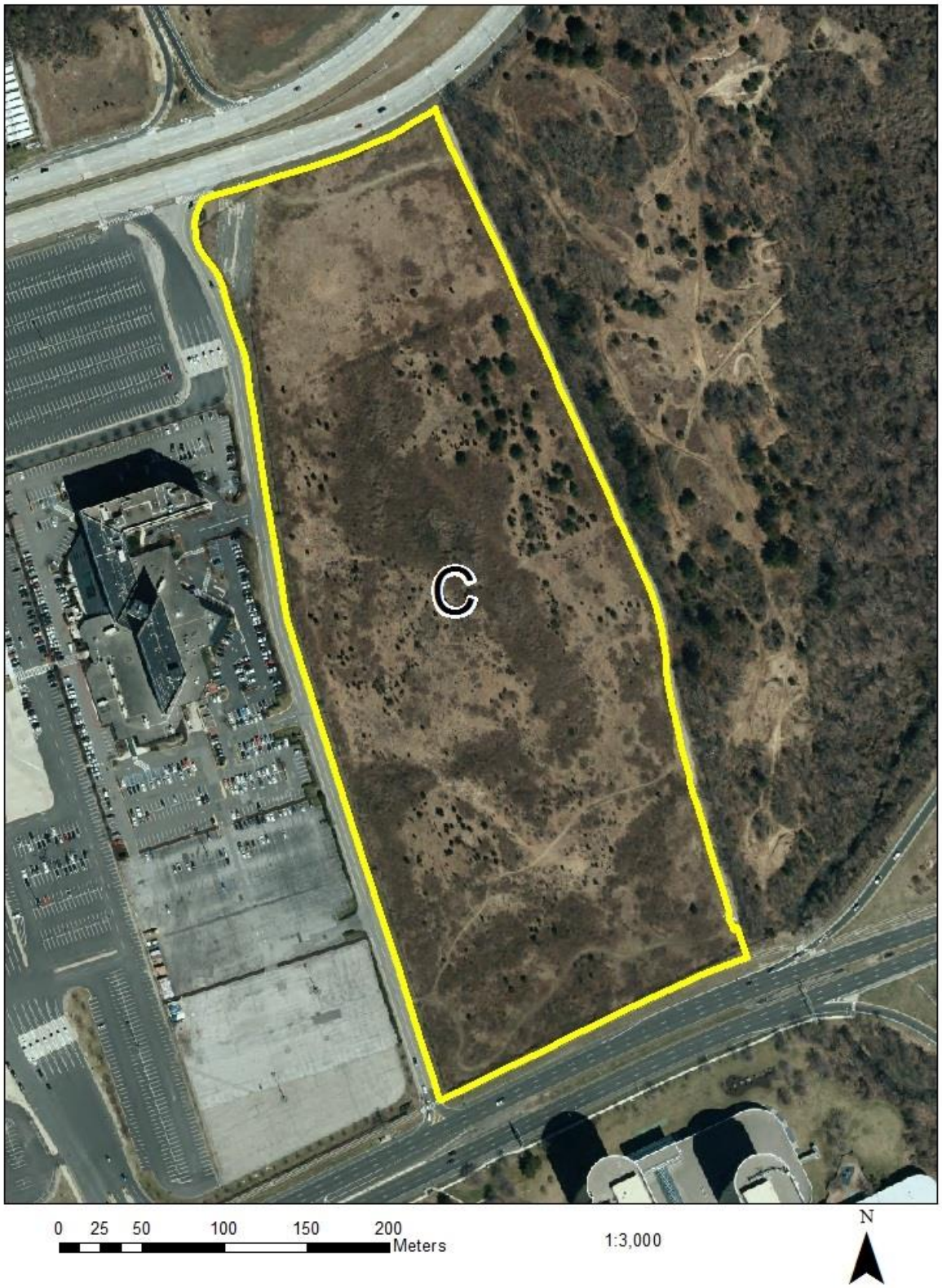

Figure 44. Parcel C with Long Island 2013 6-inch Natural Color digital orthoimagery.

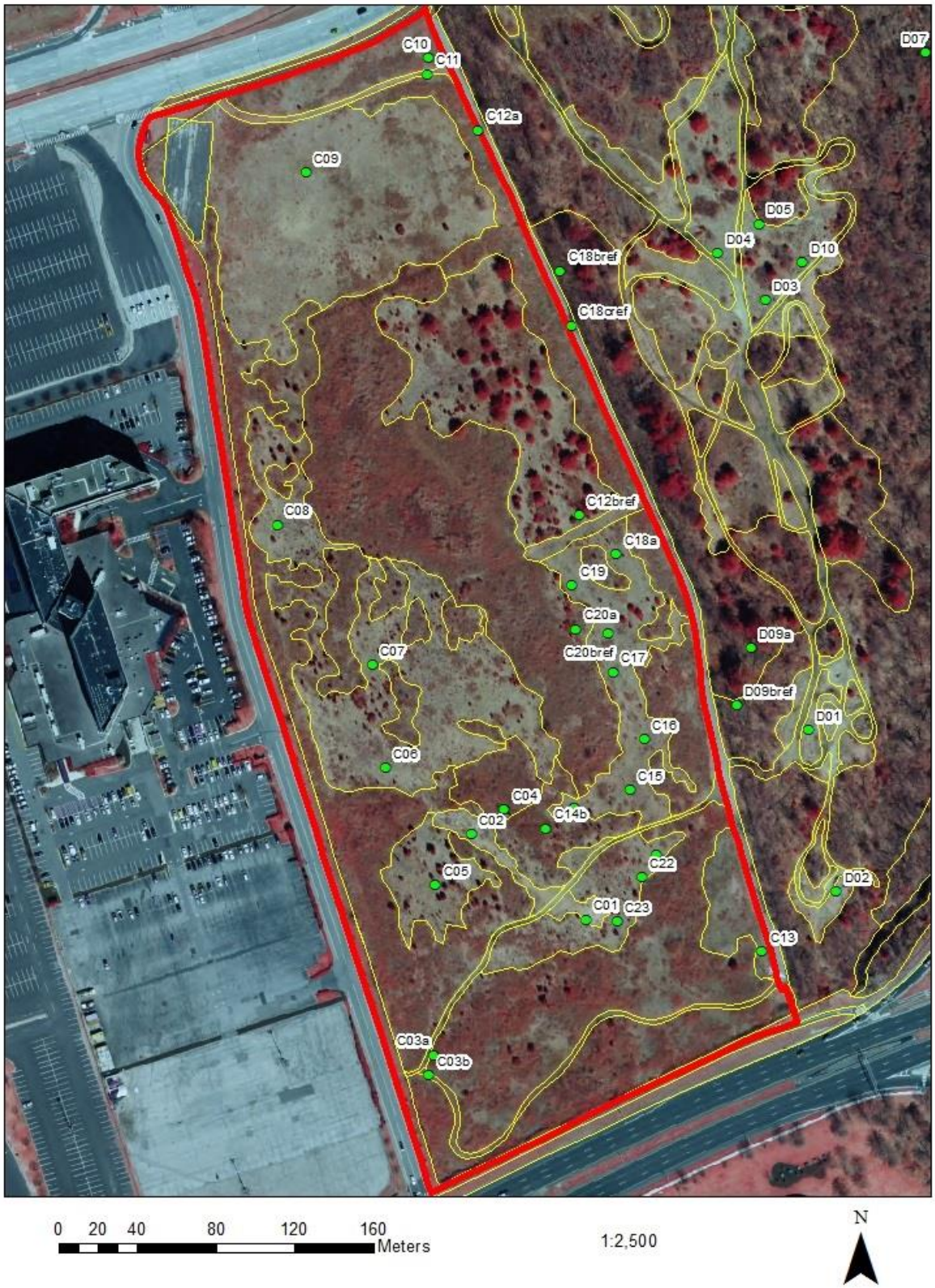

Figure 45. Parcel C with Long Island 2013 6-inch Color Infrared digital orthoimagery and ecology sampling points.

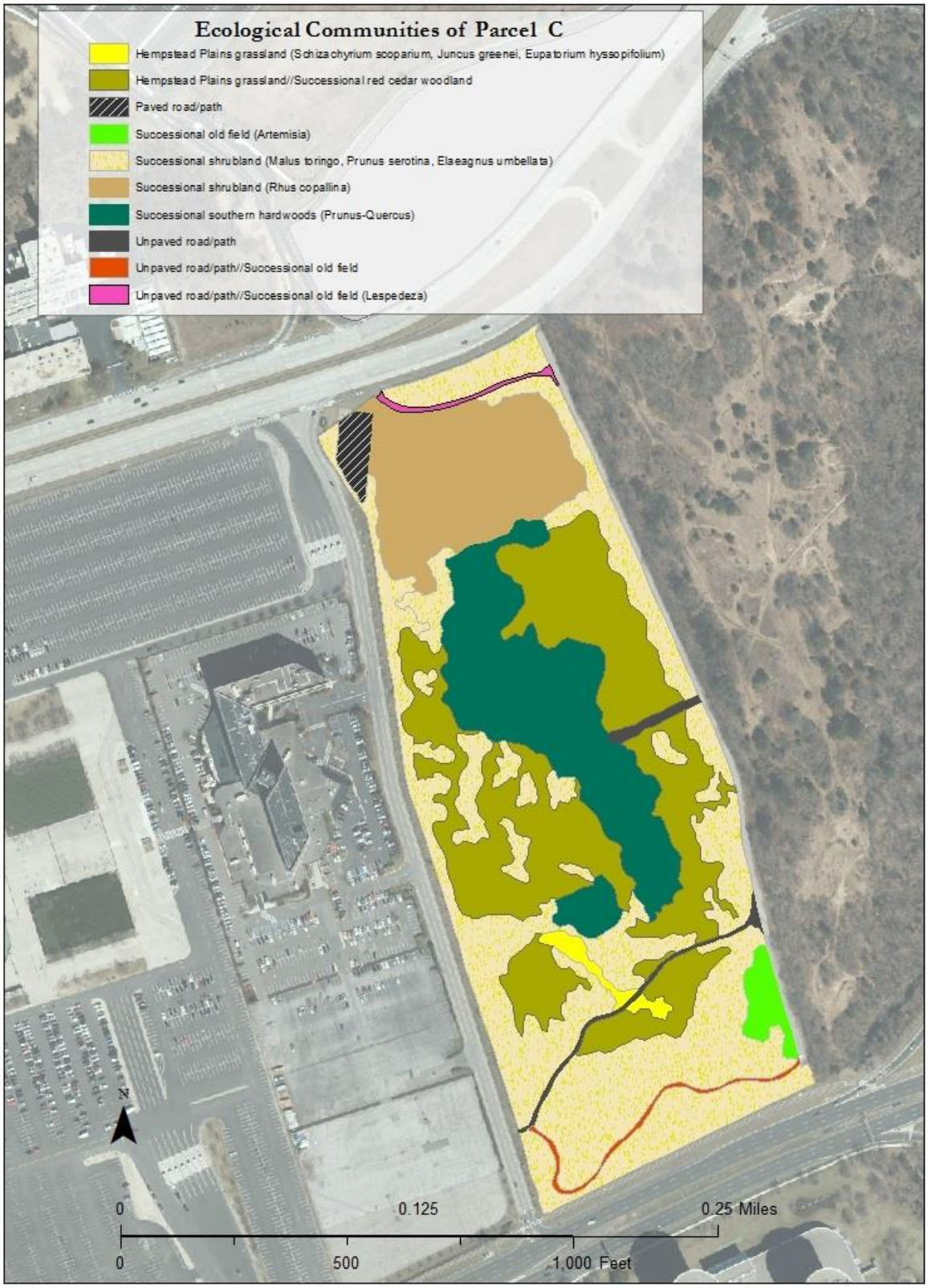

Figure 46. Ecological Communities of Parcel C.

Table 11. Distribution of Ecological Communities in Parcel C.

SCIEN_NAME	**ACRES**
Hempstead Plains grassland (*SJE*)	0.24
Hempstead Plains grassland//Successional red cedar woodland	6.86
Paved road/path	0.27
Successional old field (Artemisia)	0.37
Successional shrubland (*MPE*)	10.02
Successional shrubland (Rhus copallinum)	3.14
Successional southern hardwoods (Prunus-Quercus)	4.05
Unpaved road/path	0.26
Unpaved road/path//Successional old field	0.25
Total	25.45

Figure 47. Rare Plant Species of Parcel C.

APPENDIX D. Parcel D maps

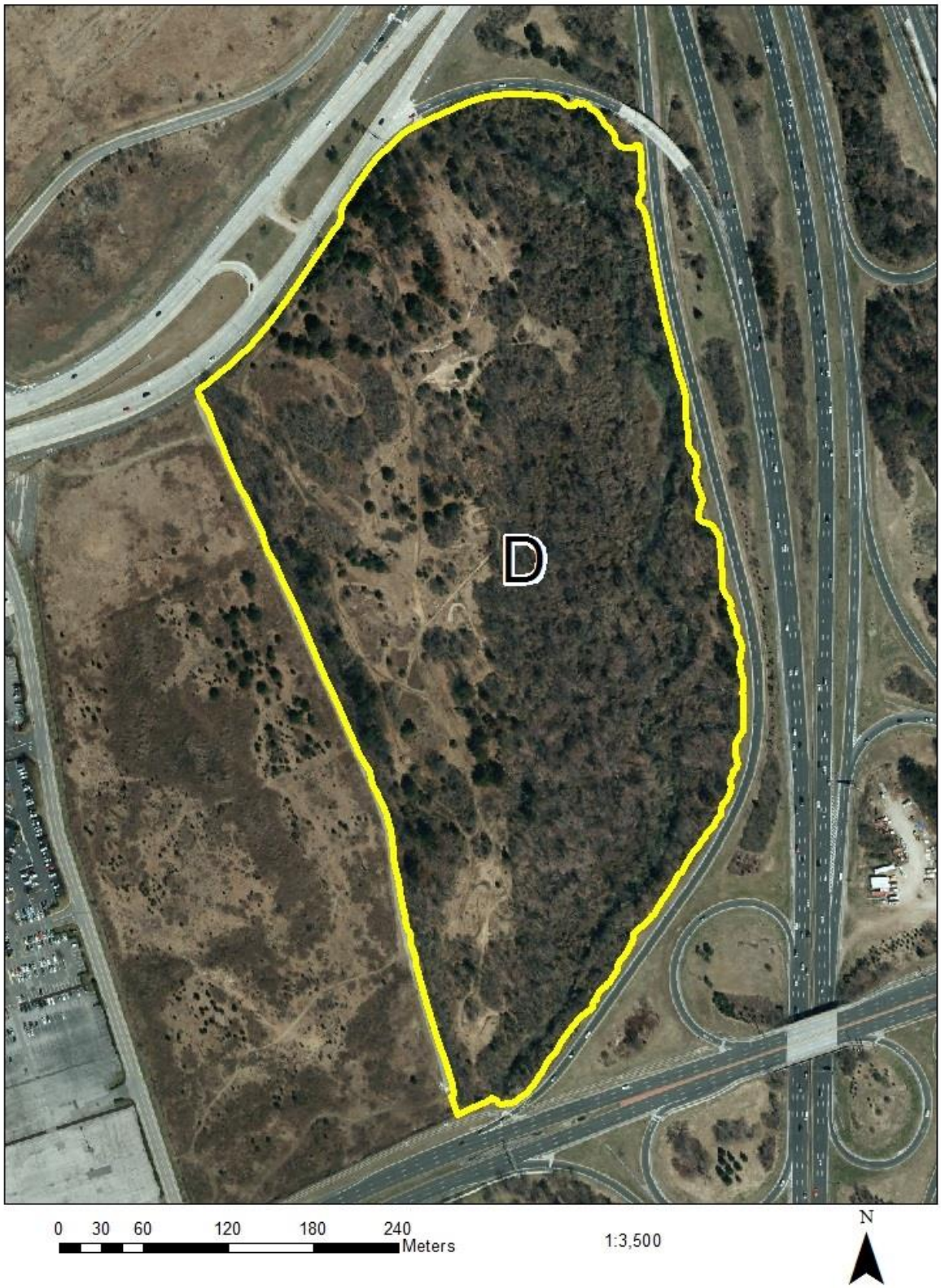

Figure 48. Parcel D with Long Island 2013 6-inch Natural Color digital orthoimagery.

Figure 49. Parcel D with Long Island 2013 6-inch Color Infrared digital orthoimagery and ecology sampling points.

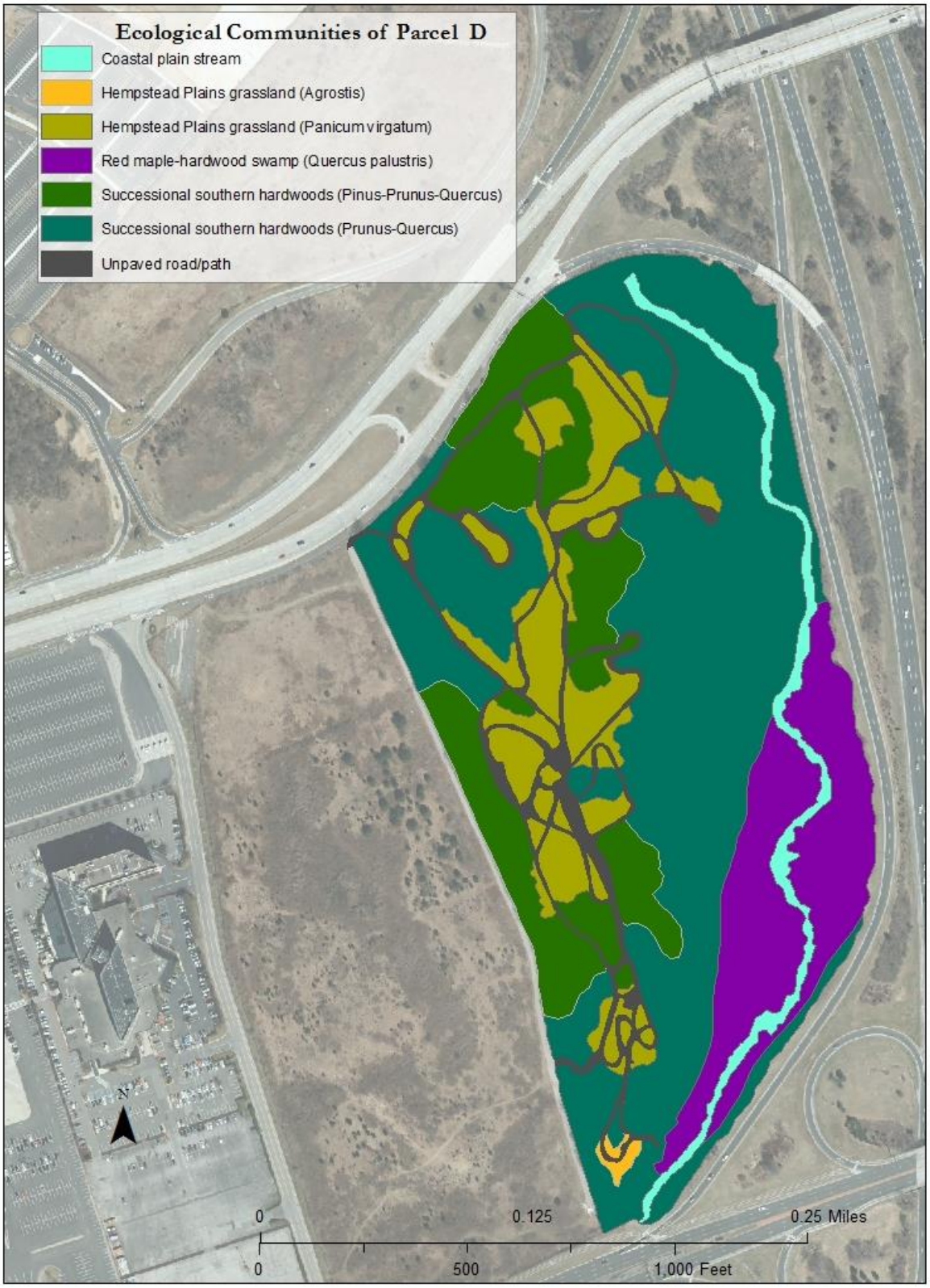

Figure 50. Ecological Communities of Parcel D.

Table 12. Distribution of Ecological Communities in Parcel D.

Ecological Community	Acres
Coastal plain stream	1.49
Hempstead Plains grassland (Agrostis)	0.14
Hempstead Plains grassland (Panicum virgatum)	5.35
Red maple-hardwood swamp (Quercus palustris)	5.74
Successional southern hardwoods (Pinus-Prunus-Quercus)	6.69
Successional southern hardwoods (Prunus-Quercus)	19.53
Unpaved road/path	2.48
Total	41.42

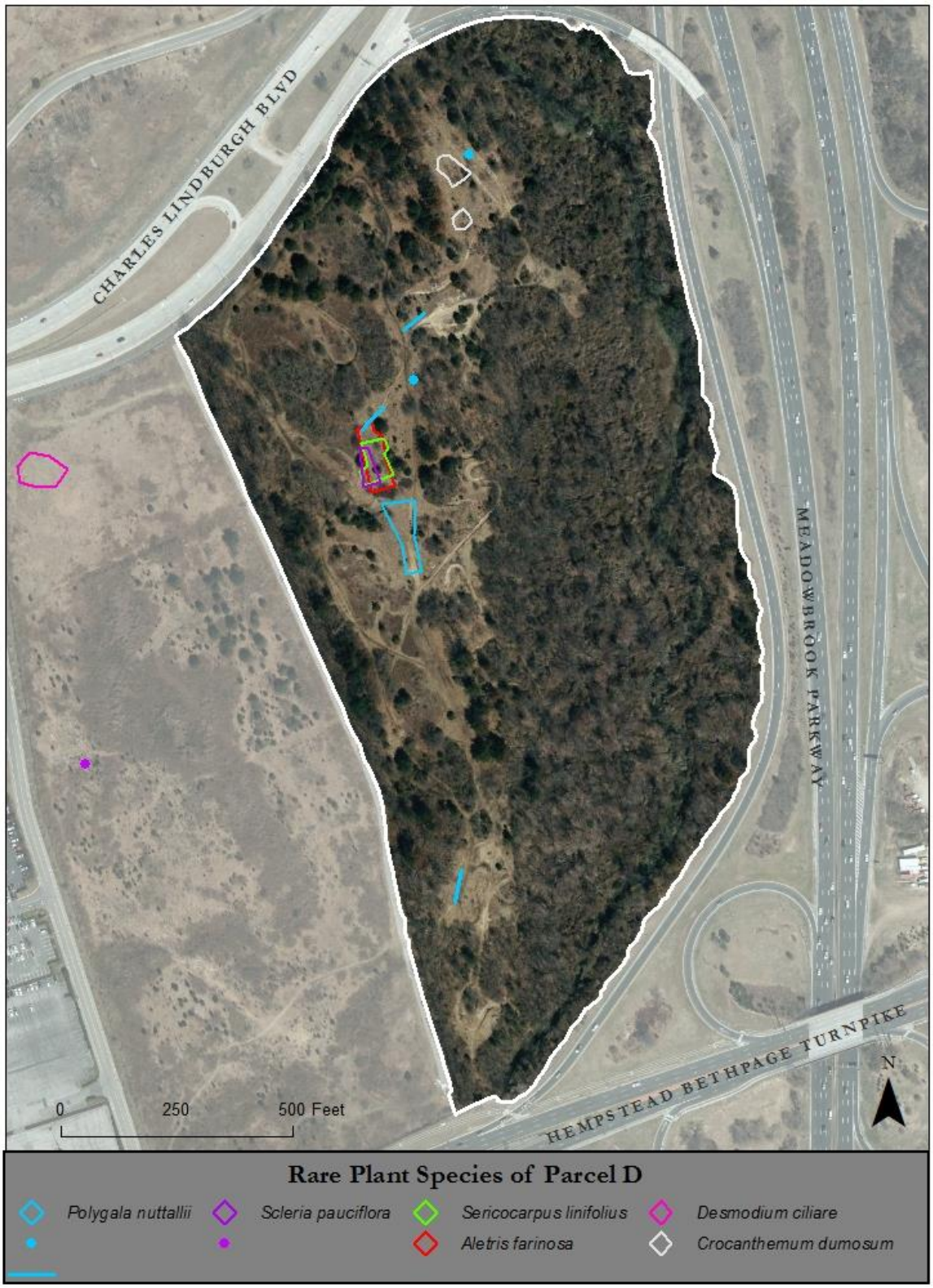

Figure 51. Rare Plant Species of Parcel D.

APPENDIX E. Parcel E maps

Figure 52. Parcel E with Long Island 2013 6-inch Natural Color digital orthoimagery.

Figure 53. Parcel E with Long Island 2013 6-inch Color Infrared digital orthoimagery and ecology sampling points.

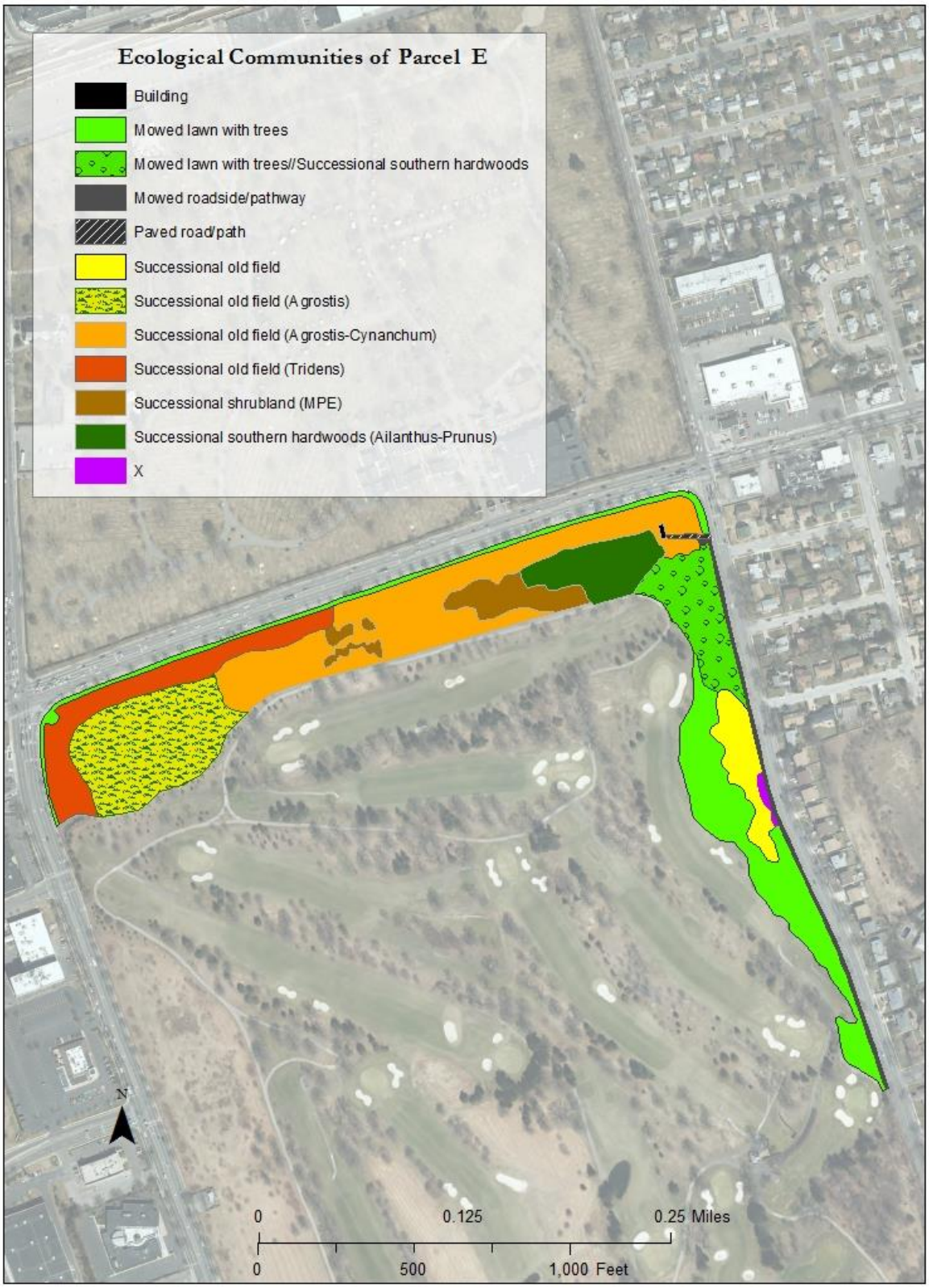

Figure 54. Ecological Communities of Parcel E.

Table 13. Distribution of Ecological Communities in Parcel E.

Ecological Community	**Acres**
Building	0.02
Mowed lawn with trees + "X"	6.06*
Mowed roadside/pathway	0.43
Paved road/path	0.05
Successional old field	1.04
Successional old field (Agrostis)	3.46
Successional old field (Agrostis-Cynanchum)	5.21
Successional old field (Tridens)	2.21
Successional shrubland (*MPE*)	1.17
Successional southern hardwoods (Ailanthus-Prunus)	1.43
Total	21.08

*Note: Polygon labelled "X" on map is 0.07 acres of mowed lawn with trees. The error was discovered after final map production.

Figure 55. Rare Plant Species of Parcel E.

APPENDIX F. Floristic Quality Assessment

Table 14. Floristic Quality Scores. Best score in each column highlighted in yellow and lowest in red.

Plot / Point	Community Name	Total Richness	% Native	% Invasives	Total Mean C	Weighted Mean C	Floristic Quality	Weighted Floristic Quality
A01	Hempstead Plains grassland (*SJE*)	29	51.72	27.59	1.24	2.28	6.69	12.29
A02	Hempstead Plains grassland (*SJE*)	21	85.71	4.76	3.81	4.90	17.46	22.45
A03	Hempstead Plains grassland (*SJE*)	16	75.00	6.25	3.00	3.44	12.00	13.76
A04	Successional southern hardwoods (Ailanthus-Prunus)	13	30.77	38.46	0.77	0.14	2.77	0.52
A05	Successional shrubland (*MPE*)	8	50.00	25.00	1.25	1.44	3.54	4.08
A06	Hempstead Plains grassland (Agrostis)	21	52.38	14.29	1.38	1.10	6.33	5.03
A07	Hempstead Plains grassland (*SJE*)	17	82.35	0.00	2.82	2.87	11.64	11.83
A08	Hempstead Plains grassland (Agrostis)	15	66.67	20.00	2.33	0.64	9.04	2.48
A09	Successional shrubland (Rhus copallinum)	9	66.67	11.11	2.22	3.89	6.67	11.68
A10	Successional old field (Lespedeza-Artemisia)	11	27.27	36.36	0.82	1.15	2.71	3.82
A11	Successional shrubland (Rubus-Solidago)	7	85.71	0.00	2.57	2.60	6.80	6.88
A12	Hempstead Plains grassland (Panicum virgatum)	16	87.50	6.25	3.06	3.89	12.25	15.56
A13	Hempstead Plains grassland (Agrostis)	8	50.00	25.00	1.38	1.60	3.89	4.53
A14	Hempstead Plains grassland (Agrostis)	22	72.73	13.64	2.32	2.51	10.87	11.78
A15	Hempstead Plains grassland (Agrostis)	25	72.00	12.00	1.88	2.35	9.40	11.77
A16	Hempstead Plains grassland (Agrostis)	21	66.67	9.52	2.14	1.49	9.82	6.82
A17	Hempstead Plains grassland (Agrostis)	10	70.00	10.00	2.30	0.57	7.27	1.81
A18	Successional shrubland (*MPE*)	12	33.33	58.33	0.92	0.41	3.18	1.41
A19a	Successional shrubland (Rubus-Solidago)	9	77.78	11.11	2.78	2.34	8.33	7.02
A19b	Successional shrubland (*MPE*)	8	50.00	37.50	1.50	1.38	4.24	3.89
A20	Hempstead Plains grassland (*SJE*)	17	76.47	17.65	3.00	4.21	12.37	17.34
A21	Successional old field (Artemisia)	7	71.43	28.57	0.71	0.15	1.89	0.40
A22	Successional shrubland (Rhus copallinum)	5	100.00	0.00	3.60	6.18	8.05	13.82
A23	Successional shrubland (Rhus copallinum)	8	75.00	25.00	2.13	0.69	6.01	1.96
A24	Successional old field (Lespedeza-Artemisia)	10	70.00	30.00	1.30	0.59	4.11	1.86
B01	Successional old field (Artemisia)	2	50.00	50.00	0.00	0.00	0.00	0.00
B02	Successional old field (Lespedeza-Artemisia)	9	44.44	44.44	0.56	0.05	1.67	0.16
B03	Successional shrubland (Rhus copallinum)	2	50.00	50.00	3.50	6.09	4.95	8.61
B04	Successional southern hardwoods (Ailanthus-Prunus)	7	28.57	71.43	0.71	0.52	1.89	1.38
B05E	Successional old field (Artemisia)	5	20.00	80.00	0.00	0.00	0.00	0.00
B05N	Successional southern hardwoods (Ailanthus-Prunus)	3	0.00	100.00	0.00	0.00	0.00	0.00
B05S	Successional old field (Artemisia)	5	20.00	80.00	0.60	0.06	1.34	0.13

Plot / Point	Community Name	Total Richness	% Native	% Invasives	Total Mean C	Weighted Mean C	Floristic Quality	Weighted Floristic Quality
B05W	Successional old field (Artemisia)	7	28.57	57.14	0.43	0.03	1.13	0.07
B06	Successional old field (Lespedeza-Artemisia)	4	50.00	50.00	1.00	0.02	2.00	0.05
B07	Successional old field (Schizachyrium)	27	37.04	29.63	0.67	1.33	3.46	6.91
C01	Hempstead Plains grassland (*SJE*)	22	63.64	18.18	1.91	2.66	8.95	12.49
C02	Hempstead Plains grassland (*SJE*)	24	62.50	25.00	2.25	2.74	11.02	13.43
C03a	Successional shrubland (*MPE*)	15	46.67	46.67	1.67	0.49	6.45	1.90
C03b	Unpaved road/path	9	22.22	55.56	0.00	0.00	0.00	0.00
C04	Successional southern hardwoods (Prunus-Quercus)	15	66.67	26.67	2.67	2.11	10.33	8.16
C05	Hempstead Plains grassland (*SJE*)	25	76.00	12.00	2.96	3.02	14.80	15.10
C06	Hempstead Plains grassland (*SJE*)	15	53.33	26.67	1.73	0.95	6.71	3.70
C07	Hempstead Plains grassland (*SJE*)	20	75.00	15.00	2.80	3.45	12.52	15.42
C08	Hempstead Plains grassland (*SJE*)	20	55.00	30.00	1.35	1.72	6.04	7.69
C09	Successional shrubland (Rhus copallinum)	6	66.67	16.67	2.17	4.70	5.31	11.52
C10	Successional shrubland (*MPE*)	9	44.44	55.56	0.78	0.83	2.33	2.48
C11	Unpaved road/path	3	0.00	100.00	0.00	0.00	0.00	0.00
C12a	Successional shrubland (*MPE*)	12	33.33	50.00	0.83	0.64	2.89	2.23
C13	Successional old field (Artemisia)	5	20.00	80.00	0.60	0.10	1.34	0.23
C14a	Hempstead Plains grassland (*SJE*)	15	80.00	6.67	2.87	3.10	11.10	12.03
C14b	Successional shrubland (*MPE*)	10	40.00	40.00	1.70	2.12	5.38	6.69
C15	Successional shrubland (Rhus copallinum)	17	76.47	5.88	3.24	4.47	13.34	18.41
C16	Hempstead Plains grassland (*SJE*)	21	71.43	14.29	2.48	2.97	11.35	13.60
C17	Hempstead Plains grassland (*SJE*)	22	63.64	22.73	2.68	2.83	12.58	13.28
C18a	Hempstead Plains grassland (*SJE*)	22	72.73	18.18	2.64	2.89	12.37	13.54
C19	Hempstead Plains grassland (*SJE*)	21	85.71	0.00	3.10	3.61	14.18	16.57
C20a	Successional southern hardwoods (Prunus-Quercus)	16	75.00	12.50	3.19	3.19	12.75	12.76
C21	hempstead Plains grassland (*SJE*)	22	72.73	18.18	2.50	2.68	11.73	12.58
C22	Hempstead Plains grassland (*SJE*)	20	65.00	20.00	1.85	2.90	8.27	12.96
C23	Hempstead Plains grassland (*SJE*)	20	70.00	20.00	2.20	1.86	9.84	8.33
D01	Hempstead Plains grassland (Panicum virgatum)	7	85.71	0.00	2.86	3.88	7.56	10.26
D02	Hempstead Plains grassland (Agrostis)	14	71.43	7.14	1.86	0.35	6.95	1.29
D03	Hempstead Plains grassland (Panicum virgatum)	15	93.33	0.00	3.67	3.80	14.20	14.71
D04	Hempstead Plains grassland (Panicum virgatum)	10	100.00	0.00	4.50	5.08	14.23	16.06
D05	Hempstead Plains grassland (Panicum virgatum)	15	100.00	0.00	4.60	4.05	17.82	15.70
D06	Hempstead Plains grassland (Panicum virgatum)	22	95.45	4.55	4.95	4.63	23.24	21.71
D07	Successional southern hardwoods (Prunus-Quercus)	20	60.00	35.00	2.65	1.40	11.85	6.28
D08	Red maple-hardwood swamp (Quercus palustris)	22	54.55	36.36	2.32	2.65	10.87	12.41

Plot / Point	Community Name	Total Richness	% Native	% Invasives	Total Mean C	Weighted Mean C	Floristic Quality	Weighted Floristic Quality
D09a	Successional southern hardwoods (Pinus-Prunus-Quercus)	21	52.38	38.10	2.57	1.67	11.78	7.65
D10	Hempstead Plains grassland (Panicum virgatum)	26	76.90	7.70	2.80	3.00	14.3	15.3
E02	Successional old field (Tridens)	5	40.00	20.00	0.60	0.08	1.34	0.18
E03	Successional old field (Agrostis)	9	44.44	22.22	1.67	1.58	5.00	4.73
E04	Successional old field (Agrostis)	2	50.00	0.00	1.50	0.96	2.12	1.36
E05	Successional shrubland (Rubus-Solidago)	4	75.00	0.00	2.00	1.67	4.00	3.34
E06b	Successional old field (Agrostis-Cynanchum)	7	28.57	57.14	0.57	0.18	1.51	0.47
E07	Successional old field (Agrostis-Cynanchum)	12	50.00	25.00	1.25	0.36	4.33	1.25
E08a	Successional shrubland (*MPE*)	3	0.00	66.67	0.00	0.00	0.00	0.00
E09	Successional old field (Agrostis)	6	66.67	16.67	2.67	4.19	6.53	10.26

Note: The Weighted Floristic Quality score in the far right column best reflected observed conditions in the field and corresponded with our characteristic HPG species tally exercise. We focus on this score in the following tables.

Table 15. Hempstead Plains grassland types in descending floristic quality.

Point / Plot	Community Name	Weighted Floristic Quality	Characteristic HPG species
A02	Hempstead Plains grassland (*SJE*)	22.45	14
A20	Hempstead Plains grassland (*SJE*)	17.34	10
C19	Hempstead Plains grassland (*SJE*)	16.57	7
C07	Hempstead Plains grassland (*SJE*)	15.42	11
C05	Hempstead Plains grassland (*SJE*)	15.10	8
A03	Hempstead Plains grassland (*SJE*)	13.76	9
C16	Hempstead Plains grassland (*SJE*)	13.60	10
C18a	Hempstead Plains grassland (*SJE*)	13.54	9
C02	Hempstead Plains grassland (*SJE*)	13.43	10
C17	Hempstead Plains grassland (*SJE*)	13.28	8
C22	Hempstead Plains grassland (*SJE*)	12.96	7
C21	Hempstead Plains grassland (*SJE*)	12.58	10
C01	Hempstead Plains grassland (*SJE*)	12.49	10
A01	Hempstead Plains grassland (*SJE*)	12.29	8
C14a	Hempstead Plains grassland (*SJE*)	12.03	6
A07	Hempstead Plains grassland (*SJE*)	11.83	8
C23	Hempstead Plains grassland (*SJE*)	8.33	8
C08	Hempstead Plains grassland (*SJE*)	7.69	6
C06	Hempstead Plains grassland (*SJE*)	3.70	5
D06	Hempstead Plains grassland (Panicum virgatum)	21.71	6
D04	Hempstead Plains grassland (Panicum virgatum)	16.06	9
D05	Hempstead Plains grassland (Panicum virgatum)	15.70	12
A12	Hempstead Plains grassland (Panicum virgatum)	15.56	7
D10	Hempstead Plains grassland (Panicum virgatum)	15.30	11
D03	Hempstead Plains grassland (Panicum virgatum)	14.71	9
D01	Hempstead Plains grassland (Panicum virgatum)	10.26	3
A14	Hempstead Plains grassland (Agrostis)	11.78	8
A15	Hempstead Plains grassland (Agrostis)	11.77	9
A16	Hempstead Plains grassland (Agrostis)	6.82	9
A06	Hempstead Plains grassland (Agrostis)	5.03	6
A13	Hempstead Plains grassland (Agrostis)	4.53	6
A08	Hempstead Plains grassland (Agrostis)	2.48	9
A17	Hempstead Plains grassland (Agrostis)	1.81	6
D02	Hempstead Plains grassland (Agrostis)	1.29	6

Table 16. Non-Hempstead Plains grassland types in descending floristic quality.

Point / Plot	Community Name	Weighted Floristic Quality	Characteristic HPG species
C15	Successional shrubland (Rhus copallinum)	18.41	7
A22	Successional shrubland (Rhus copallinum)	13.82	2
C20a	Successional southern hardwoods (Prunus-Quercus)	12.76	1
A09	Successional shrubland (Rhus copallinum)	11.68	4
C09	Successional shrubland (Rhus copallinum)	11.52	0
E09	Successional old field (Agrostis)	10.26	2
B03	Successional shrubland (Rhus copallinum)	8.61	0
C04	Successional southern hardwoods (Prunus-Quercus)	8.16	1
D09a	Successional southern hardwoods (Pinus-Prunus-Quercus)	7.65	0
A19a	Successional shrubland (Rubus-Solidago)	7.02	2
B07	Successional old field (Schizachyrium)	6.91	3
A11	Successional shrubland (Rubus-Solidago)	6.88	1
C14b	Successional shrubland (*MPE*)	6.69	0
D07	Successional southern hardwoods (Prunus-Quercus)	6.28	2
E03	Successional old field (Agrostis)	4.73	2
A05	Successional shrubland (*MPE*)	4.08	1
A19b	Successional shrubland (*MPE*)	3.89	1
A10	Successional old field (Lespedeza-Artemisia)	3.82	0
E05	Successional shrubland (Rubus-Solidago)	3.34	1
C10	Successional shrubland (*MPE*)	2.48	0
C12a	Successional shrubland (*MPE*)	2.23	0
A23	Successional shrubland (Rhus copallinum)	1.96	2
C03a	Successional shrubland (*MPE*)	1.90	0
A24	Successional old field (Lespedeza-Artemisia)	1.86	3
A18	Successional shrubland (*MPE*)	1.41	0
B04	Successional southern hardwoods (Ailanthus-Prunus)	1.38	0
E04	Successional old field (Agrostis)	1.36	0
E07	Successional old field (Agrostis-Cynanchum)	1.25	2
A04	Successional southern hardwoods (Ailanthus-Prunus)	0.52	2
E06b	Successional old field (Agrostis-Cynanchum)	0.47	1
A21	Successional old field (Artemisia)	0.40	0
C13	Successional old field (Artemisia)	0.23	1
E02	Successional old field (Tridens)	0.18	0
B02	Successional old field (Lespedeza-Artemisia)	0.16	1
B05S	Successional old field (Artemisia)	0.13	0
B05W	Successional old field (Artemisia)	0.07	0
B06	Successional old field (Lespedeza-Artemisia)	0.05	0
B01	Successional old field (Artemisia)	0.00	0

Point / Plot	Community Name	Weighted Floristic Quality	Characteristic HPG species
B05E	Successional old field (Artemisia)	0.00	0
E08a	Successional shrubland (*MPE*)	0.00	0
B05N	Successional southern hardwoods (Ailanthus-Prunus)	0.00	0
C03b	Unpaved road/path	0.00	0
C11	Unpaved road/path	0.00	0

APPENDIX G. Ecological Community Descriptions

1. Hempstead Plains grassland (*Schizachyrium scoparium, Juncus greenei, Eupatorium hyssopifolium*)

Plots and Observation Points (19): A01, A02, A03, A07, A20, C01, C02, C05, C06, C07, C08, C14a, C16, C17, C18a, C19, C21, C22, C23.

The tree canopy layer (6.3 m) has 2.3% cover. The most abundant trees are Juniperus virginiana var. virginiana (1.5%), Pinus strobus (<1%), Prunus serotina var. serotina (<1%), and Cornus florida (<1%).

The tall shrub layer (2.9 m) has 4.2% cover. The most abundant shrub is Elaeagnus umbellata (3.5%). The following shrubs have <1% cover each: Morella caroliniensis, Rhus copallinum var. copallinum, and Viburnum dentatum var. lucidum. The short shrub layer (1.2 m) has 4.3% cover. The most abundant shrub is Rhus copallinum var. copallinum (2.7%). The following shrubs have <1% cover each: Elaeagnus umbellata, Rosa multiflora, Viburnum dentatum var. lucidum, Lonicera morrowii, Morella caroliniensis, Vaccinium corymbosum, Lonicera tatarica, and Lonicera maackii. The dwarf shrub layer (0.3 m) has 13.1% cover. The most abundant shrubs are Rubus flagellaris (9.3%) and Rhus copallinum var. copallinum (3.4%). The following shrubs have <1% cover each: Rubus allegheniensis, Rosa multiflora, Lonicera morrowii, Lonicera tatarica, Rhus glabra, Frangula alnus, and Elaeagnus umbellata.

The tree sapling layer (2.9 m) has 10.7% cover. The most abundant saplings are Malus toringo (4.2%), Juniperus virginiana var. virginiana (3.7%), Prunus serotina var. serotina (2.6%), Pinus strobus (<1%), and Ailanthus altissima (<1%). The tall tree seedling layer (1.3 m) has 6.6% cover. The most abundant seedlings are Malus toringo (3.5%), and Juniperus virginiana var. virginiana (2.2%) with Prunus serotina var. serotina, Pinus thunbergii, and Ailanthus altissima (<1% cover each). The short tree seedling layer (0.3 m) has <1% cover and includes Malus toringo, Juniperus virginiana var. virginiana, Prunus serotina var. serotina, Ailanthus altissima, and Pinus thunbergii.

The vine layer on short shrubs and tree seedlings (1.4 m) has <1% cover of Celastrus orbiculatus and Toxicodendron radicans ssp. radicans. The short vine layer on the ground (0.3 m) has 7.8% cover comprised of Celastrus orbiculatus (3.4%), Toxicodendron radicans ssp. radicans (2.4%), and Lonicera japonica (1.8%).

The herbaceous layer (0.6 m) has 71.9% cover. The most abundant herbs are Schizachyrium scoparium var. scoparium (41.4%), Eupatorium hyssopifolium (6.8%), Lechea maritima (4.2%), Agrostis capillaris (3.5%), Solidago juncea (3.1%), Juncus greenei (2.7%), Euthamia caroliniana (2.0%), Sorghastrum nutans (1.8%), Solidago nemoralis ssp. nemoralis (1.7%), Tridens flavus var. flavus (1.6%), Carex pensylvanica (1.6%), and Anthoxanthum odoratum (1.1%).

The following herbs have <1% cover each: Panicum virgatum, Scleria pauciflora var. caroliniana, Dichanthelium lindheimeri, Trichostema dichotomum, Nuttallanthus canadensis, Asclepias tuberosa, Rumex acetosella ssp. pyrenaicus, Hypericum perforatum, Festuca trachyphylla, Baptisia tinctoria, Euphorbia cyparissias, Artemisia vulgaris, Lespedeza capitata, Lespedeza cuneata, Bromus tectorum, Andropogon virginicus var. virginicus, Lespedeza virginica, Lechea maritima var. maritima, Achillea millefolium, Apocynum cannabinum, Solidago canadensis var. canadensis, Agalinis decemloba, Ambrosia artemisiifolia, Plantago lanceolata, Verbascum thapsus, Hypericum gentianoides, Erigeron annuus, Cyperus lupulinus ssp. macilentus, Desmodium ciliare, Eragrostis spectabilis, Panicum capillare ssp. capillare, Symphyotrichum lateriflorum, Rudbeckia hirta var. pulcherrima, Gnaphalium uliginosum, Crocanthemum propinquum, Bulbostylis capillaris, Plantago aristata, Helenium flexuosum, Potentilla canadensis, Pseudognaphalium obtusifolium, Viola pedata, Poa pratensis, Oxalis stricta, Ionactis linariifolia, Strophostyles helvola, Dactylis glomerata, Linaria vulgaris, Daucus carota, and Krigia virginica.

The non-vascular layer has 4% cover comprised of mosses (2.1%) including Polytrichum sp. and lichens (1.4%) including Cladonia cristatella.

The unvegetated surface has 34.2% cover comprised of litter and duff (28.9%), small rocks <10 cm (4.1%), sand <2 mm (<1%), bare soil (<1%), and trash (<1%).

Figure 56. Hempstead Plains grassland (*Schizachyrium scoparium, Juncus greenei, Eupatorium hyssopifolium*) Parcel A (Plot A02).

2. Hempstead Plains grassland (*Panicum virgatum*)

Plots and Observation Points (7): A12, D01, D03, D04, D05, D06, D10

The tree canopy layer (7 m) has 2.1% cover of Betula populifolia.

The tall shrub layer (2.5 m) has 0.7% cover comprised of Vaccinium corymbosum (0.6%) and Frangula alnus (0.1%). The short shrub layer (0.6 m) has 2.4% cover. The most abundant shrubs are Rhus copallinum var. copallinum (1.0%), Rubus allegheniensis (0.7%), Lyonia mariana (0.4%), Vaccinium corymbosum (0.3%), and Frangula alnus (<1%). The dwarf shrub layer (0.3 m) has 8% cover. The most abundant shrubs are Rubus flagellaris (6.7%), Rhus copallinum var. copallinum (0.9%), Lyonia mariana (0.4%), Rubus allegheniensis (0.1%), and Viburnum dentatum var. lucidum (<1%).

The tree sapling layer (2.7 m) has 2.9% cover. The most abundant saplings are Prunus serotina var. serotina (1.0%), Pinus strobus (0.6%), Juniperus virginiana var. virginiana (0.6%), Quercus palustris (0.6%), Frangula alnus (0.1%), Quercus rubra (<1%), and Quercus velutina (<1%). The tall tree seedling layer (1 m) has 1% cover. The following tree seedlings have <1% cover each: Frangula alnus, Juniperus

virginiana var. virginiana, Quercus rubra, Quercus velutina, Acer rubrum var. rubrum, Malus toringo, and Prunus serotina var. serotina. The short tree seedling layer (0.3 m) has <1% cover. The following tree seedlings have <1% cover each: Quercus palustris, Prunus serotina var. serotina, Acer rubrum var. rubrum, Malus toringo, Frangula alnus, Quercus rubra, and Quercus coccinea.

The vine layer on short shrubs and tree seedlings (1 m) has <1% cover of Toxicodendron radicans ssp. radicans. The short vine layer on the ground (0.2 m) has 1.4% cover comprised of Toxicodendron radicans ssp. radicans (1.3%), Parthenocissus quinquefolia (<1%), and Lonicera japonica (<1%).

The herbaceous layer (1 m) has 84% cover. The most abundant herbs are Panicum virgatum (59.3%), Andropogon gerardii (5.4%), Euthamia caroliniana (3.4%), Eupatorium hyssopifolium (3.1%), Carex pensylvanica (2.6%), Crocanthemum canadense (1.7%), Baptisia tinctoria (1.4%), Solidago rugosa var. rugosa (1.1%), and Schizachyrium scoparium var. scoparium (1.1%).

The following herbs have <1% cover each: Eupatorium sessilifolium, Trichostema dichotomum, Agrostis capillaris, Juncus greenei, Dichanthelium lindheimeri, Hypericum gentianoides, Solidago juncea, Bulbostylis capillaris (0.3%), Rumex acetosella ssp. pyrenaicus (0.1%), Solidago nemoralis ssp. nemoralis, Nuttallanthus canadensis, Polygala nuttallii, Dichanthelium columbianum, Avenella flexuosa, Gnaphalium uliginosum, Lespedeza capitata, and Linaria vulgaris.

The non-vascular layer has 5.9% cover comprised of mosses (1.6%) including Polytrichum sp. and lichens (1.4%).

The unvegetated surface has 32% cover comprised of litter and duff (28.6%), small rocks <10 cm (2.3%), sand <2 mm (0.6%), wood (FWD) <7.5 cm (0.4%), and trash (0.3%).


Figure 57. Hempstead Plains grassland (*Panicum virgatum*) Parcel D (Point D03).

3. Hempstead Plains grassland (*Agrostis*)

Plots and Observation Points (8): A13, A17, A06, A08, A14, A15, A16, D02.

The tall shrub layer (0.7 m) has <1% cover of Rhus copallinum var. copallinum. The short shrub layer (0.6 m) has 1.3% cover comprised of Rhus copallinum var. copallinum (0.8%) and Rubus allegheniensis (0.5%). The dwarf shrub layer (0.3 m) has 9.1% cover comprised of Rubus flagellaris (4.4%), Rubus allegheniensis (3.8%), and Rhus copallinum var. copallinum (1.0%).

The tall tree seedling layer (0.9 m) has 1.1% cover comprised of Malus toringo (0.8%) and Prunus serotina var. serotina (0.4%). The tree short seedling layer (0.3 m) has <1% cover Malus toringo and Prunus serotina var. serotina.

The short vine layer (0.4 m) has 2.1% cover comprised of Lonicera japonica (1.3%), Celastrus orbiculatus (0.6%), and Toxicodendron radicans ssp. radicans (0.3%).

The herbaceous layer (0.6 m) has 89% cover. The most abundant herbs are Agrostis capillaris (39.6%), Schizachyrium scoparium var. scoparium (13.6%), Lespedeza cuneata (12.0%), Eupatorium hyssopifolium (7.0%), Euphorbia cyparissias (2.0%), Andropogon virginicus var. virginicus (1.6%), Euthamia caroliniana (1.6%), Panicum virgatum (1.6%), Juncus greenei (1.4%), Euthamia graminifolia

(1.3%), Sorghastrum nutans (1.3%), Achillea millefolium (1.0%), Rumex acetosella ssp. pyrenaicus (1.0%), and Anthoxanthum odoratum (1.0%).

The following herbs have <1% cover each: Trichostema dichotomum, Festuca trachyphylla, Eragrostis spectabilis, Festuca rubra ssp. rubra, Diodia teres, Solidago juncea, Ambrosia artemisiifolia, Dactylis glomerata, Apocynum cannabinum, Tridens flavus var. flavus, Asclepias tuberosa, Hypericum perforatum, Verbascum thapsus, Lespedeza capitata, Dichanthelium lindheimeri, Nuttallanthus canadensis, Linaria vulgaris, Erigeron annuus, Cyperus lupulinus ssp. macilentus, Panicum capillare ssp. capillare, Plantago lanceolata, Artemisia vulgaris, Ionactis linariifolia, Juncus tenuis, Plantago aristata, Solidago rugosa var. rugosa, Strophostyles helvola, Hypericum gentianoides, Allium vineale, and Oxalis stricta.

The non-vascular layer (5 m) has 2.1% cover and mosses (2.5%), such as Polytrichum sp., and lichens (0.1%).

The unvegetated surface has 30.4% cover comprised of litter and duff (33.8%) and bare soil (0.3%).

Figure 58. Hempstead Plains grassland (*Agrostis*) Parcel A (Plot A08).

4. Successional old field (*Agrostis*)

Plots and Observation Points (2): E03, E09.

The tall tree seedling layer (1 m) has <1% cover of Malus toringo and Juniperus virginiana var. virginiana.

The short vine layer (0.3 m) has 4% cover of Cynanchum louiseae (4.0%).

The herbaceous layer (0.4 m) has 95% cover. The most abundant herbs are Agrostis capillaris (35.0%), Sorghastrum nutans (30.0%), Schizachyrium scoparium var. scoparium (27.5%), Euphorbia cyparissias (6.0%), and Andropogon gerardii (1.5%),

The following herbs have <1% cover each: Asclepias syriaca, Linaria vulgaris, Erechtites hieraciifolius var. hieraciifolius, Aristida dichotoma var. dichotoma.

The unvegetated surface has 35% cover of litter and duff.

Figure 59. Successional old field (*Agrostis*) Parcel E (Plot E09).

5. Successional old field (*Agrostis-Cynanchum*)

Plots and Observation Points (2): E06b, E07.

The tall shrub layer (4.3 m) has 5% cover of Elaeagnus umbellata. The short shrub layer (1 m) has 1% cover of Rosa multiflora.

The tree sapling layer (3.6 m) has 7.5% cover. The most abundant tree saplings are Morus alba (2.5%), Malus toringo (2.0%), Prunus serotina var. serotina (1.5%), and Juniperus virginiana var. virginiana (1.5%).

The vine layer on tall shrubs and tree saplings (2 m) has 3.5% cover of Cynanchum louiseae. The short vine layer on the ground (0.4 m) has 52.5% cover of Cynanchum louiseae (52.5%).

The herbaceous layer (0.4 m) has 46.5% cover. The most abundant herbs are Agrostis capillaris (35.0%), Schizachyrium scoparium var. scoparium (5.0%), Asclepias syriaca (4.0%), and Linaria vulgaris (1.5%).

The following herbs have <1% cover each: Cirsium vulgare, Apocynum cannabinum, Asclepias tuberosa, and Phytolacca americana var. americana.

Figure 60. Successional old field (*Agrostis-Cynanchum*) Parcel E (Point E06b).

6. Successional old field (*Artemisia*)

Plots and Observation Points (6): A21, C13, B01, B05E, B05S, B05W.

The tall shrub layer (5 m) has 1.3% cover of Malus toringo. The short shrub layer (1.3 m) has <1% cover of Rosa multiflora and Elaeagnus umbellata. The dwarf shrub layer (0.3 m) has <1% cover of Rubus flagellaris.

The tree sapling layer (2.3 m) has 1% cover comprised of Juniperus virginiana var. virginiana (0.5%) and Ailanthus altissima (0.5%). The tall tree seedling layer (1.4 m) has <1% cover of Ailanthus altissima.

The short vine layer (1 m) has 10% cover of Lonicera japonica.

The herbaceous layer (1.2 m) has 94% cover. The most abundant herbs are Artemisia vulgaris (82.5%), Solidago canadensis var. canadensis (5.5%), Euthamia graminifolia (2.5%), and Lespedeza cuneata (1.5%).

The following herbs have <1% cover each: Daucus carota, Nuttallanthus canadensis, Solidago rugosa var. rugosa, Hypericum perforatum, Asclepias syriaca, Apocynum cannabinum, and Verbascum Thapsus.

The unvegetated surface (85 m) is comprised of litter and duff (13.3%) and bare soil (<1%).

Figure 61. Successional old field (*Artemisia*) Parcel B (Point B01).

7. Successional old field (*Lespedeza-Artemisia*)

Plots and Observation Points (4): A10, A24, B02, B06.

The short shrub layer (0.6 m) has 6% cover comprised of Rhus copallinum var. copallinum (4.5%) and Malus toringo (1.5%). The dwarf shrub layer (0.4 m) has 4% cover comprised of Rubus flagellaris (2.8%), and Rubus allegheniensis (1.3%).

The short vine layer (0.6 m) has 10% cover of Celastrus orbiculatus.

The herbaceous layer (1.3 m) has 82.5% cover. The most abundant herbs are Lespedeza cuneata (50.0%), Artemisia vulgaris (33.8%), Solidago juncea (2.5%), and Agrostis capillaris (1.3%).

The following herbs have <1% cover each: Apocynum cannabinum, Euthamia graminifolia, Nuttallanthus canadensis, Oxalis stricta, Oenothera biennis, Hypericum perforatum, Asclepias syriaca, Rudbeckia hirta var. pulcherrima, Achillea millefolium, Euphorbia cyparissias, and Eupatorium hyssopifolium.

Figure 62. Successional old field (*Lespedeza-Artemisia*) Parcel B (Point B06).

8. Successional old field (*Schizachyrium scoparium*)

Plots and Observation Points (1): B07.

The short shrub layer (1.7 m) has 5% cover of Elaeagnus umbellata. The dwarf shrub layer (0.2 m) has 10% cover of Rubus flagellaris.

The tree sapling layer (2.8 m) has 4% cover of Crataegus monogyna (2.0%) and Malus toringo (2.0%). The tall tree seedling layer (1 m) has 3% cover comprised of Ailanthus altissima (2.0%), Prunus serotina var. serotina (<1%), and Juniperus virginiana var. virginiana (<1%). The short tree seedling layer (0.5 m)

has 2% cover comprised of Ailanthus altissima (1.0%), Prunus serotina var. serotina (<1%), and Juniperus virginiana var. virginiana (<1%).

The short vine layer (0.2 m) has 2% cover of Lonicera japonica (2.0%).

The herbaceous layer (0.6 m) has 72% cover. The most abundant herbs are Schizachyrium scoparium var. scoparium (25.0%), Artemisia vulgaris (20.0%), Festuca trachyphylla (10.0%), Lespedeza cuneata (7.0%), Solidago nemoralis ssp. nemoralis (3.0%), Solidago juncea (2.0%), Solidago canadensis var. canadensis (1.0%), Erigeron annuus (1.0%), and Plantago lanceolata (1.0%).

The following herbs have <1% cover each: Panicum capillare ssp. capillare, Dactylis glomerata, Daucus carota, Verbascum thapsus, Oxalis stricta, Plantago aristata, Potentilla recta, Rudbeckia hirta var. pulcherrima, Achillea millefolium, and Leucanthemum vulgare.

The non-vascular layer has 1% cover of mosses (1.0%) and lichens (<1%).

The unvegetated surface has 36% cover comprised of litter and duff (30.0%), bare soil (5.0%), trash (1.0%), and small rocks <10 cm (<1%).

Figure 63. Successional old field (*Schizachyrium scoparium*) Parcel B (Plot B07).

9. Successional old field (*Tridens*)

Plots and Observation Points (1): E02.

The tree canopy layer (18 m) has 4% cover comprised of Pinus strobus (2.0%) and Picea pungens (2.0%).

The short vine layer (0.2 m) has 10% cover of Cynanchum louiseae.

The herbaceous layer (0.2 m) has 60% cover comprised of Tridens flavus var. flavus (40.0%) and Agrostis capillaris (20.0%).

The unvegetated surface has 50% cover comprised of litter and duff (50.0%) and trash (<1%).

Figure 64. Successional old field (*Tridens*) Parcel E (Point E02).

10. Successional shrubland (*Malus toringo, Prunus serotina, Elaeagnus umbellata*)
Plots and Observation Points (8): A05, A18, A19b, C03a, C10, C12a, C14b, E08a.

The tall shrub layer (3.3 m) has 30% cover. The most abundant tall shrubs are Elaeagnus umbellata (15.6%), Rhus typhina (11.9%), Malus toringo (3.8%), Rosa multiflora (0.9%), and Rhus copallinum var. copallinum (0.6%). The short shrub layer (1.1 m) has 14.4% cover. The most abundant short shrubs are Rosa multiflora (7.6%), Rhus typhina (2.5%), and Elaeagnus umbellata (2.3%) with Rhus copallinum var. copallinum, Malus toringo, and Rubus allegheniensis (<1% cover each). The dwarf shrub layer (0.5 m) has 2.9% cover. The most abundant dwarf shrub is Rubus allegheniensis (1.3%). The following dwarf

shrubs have <1% cover each: Rubus flagellaris, Malus toringo, Rhus typhina, Rhus copallinum var. copallinum, and Rosa multiflora.

The tree sapling layer (3.6 m) has 25.3% cover. The most abundant saplings are Prunus serotina var. serotina (11.1%), Malus toringo (10.4%), Frangula alnus (1.3%), and Juniperus virginiana var. virginiana (1.1%) with Ailanthus altissima, Prunus virginiana var. virginiana, and Crataegus monogyna (<1% cover each). The tall tree seedling layer (1.8 m) has 9.6% cover. The most abundant seedlings are Malus toringo (4.4%), Ailanthus altissima (2.5%), Prunus serotina var. serotina (1.3%), and Juniperus virginiana var. virginiana (1.1%) with Robinia pseudoacacia, Frangula alnus, and Crataegus monogyna (<1% cover each). The short tree seedling layer (0.5 m) has 1.6% cover. The following tree seedlings have <1% cover each: Ailanthus altissima, Crataegus monogyna, Prunus serotina var. serotina, Malus toringo, and Juniperus virginiana var. virginiana.

The vine layer on tall shrubs and tree saplings (2.4 m) has 16.3% cover. The most abundant vines Ampelopsis glandulosa var. brevipedunculata (7.5%), Celastrus orbiculatus (6.3%), Vitis labrusca (1.3%), and Lonicera japonica (1.3%). The short vine layer on the short shrubs and tree seedlings (0.7 m) has 36.5% cover. The most abundant vines are Celastrus orbiculatus (11.3%), Lonicera japonica (11.0%), Toxicodendron radicans ssp. radicans (9.9%), Cynanchum louiseae (4.4%), and Ampelopsis glandulosa var. brevipedunculata (0.3%).

The herbaceous layer (0.8 m) has 7.3% cover. The most abundant herbs are Festuca rubra ssp. rubra (2.5%), Artemisia vulgaris (2.3%), and Hypericum perforatum (1.0%)

The following herbs have <1% cover each: Solidago canadensis var. canadensis, Asclepias syriaca, Euthamia caroliniana, Symphyotrichum lateriflorum, Lespedeza cuneata, Tridens flavus var. flavus, Apocynum cannabinum, and Solidago juncea.

Figure 65. Successional shrubland (*Malus toringo, Prunus serotina, Elaeagnus umbellata*) Parcel A (Point A05).

11. Successional shrubland (*Rhus copallinum*)

Plots and Observation Points (6): A09, A22, A23, B03, C09, C15.

The tall shrub layer (4.5 m) has 14.7% cover comprised of Rhus copallinum var. copallinum (14.2%) and Elaeagnus umbellata (<1%). The short shrub layer (1.2 m) has 37.8% cover. The most abundant short shrubs are Rhus copallinum var. copallinum (33.3%), Rubus allegheniensis (10.0%), and Rhus typhina (2.0%). The dwarf shrub layer (0.3 m) has 24.2% cover. The most abundant dwarf shrubs are Rhus copallinum var. copallinum (17.5%), Rubus flagellaris (5.0%), Rubus allegheniensis (2.2%), and Elaeagnus umbellata (<1%).

The tree sapling layer (2.8 m) has 3.2% cover. The most abundant tree sapling is Malus toringo (1.7%) with Prunus serotina var. serotina, Quercus palustris, and Juniperus virginiana var. virginiana (<1% cover each). The tall tree seedling layer (1.7 m) has 2% cover comprised of Juniperus virginiana var. virginiana (1.2%) and Malus toringo (0.8%).

The short vine layer (0.5 m) has 16.7% cover comprised of Celastrus orbiculatus (7.5%), Toxicodendron radicans ssp. radicans (5.0%), and Lonicera japonica (4.2%).

The herbaceous layer (0.6 m) has 27% cover. The most abundant herbs are unknown grass (6.7%), Agrostis capillaris (5.5%), Schizachyrium scoparium var. scoparium (4.7%), Euthamia caroliniana (3.0%), Alliaria petiolata (2.5%), and Festuca trachyphylla (1.7%),

The following herbs have <1% cover each: Tridens flavus var. flavus, Solidago juncea, Eupatorium hyssopifolium, Rumex acetosella ssp. pyrenaicus, Ionactis linariifolia, Asclepias tuberosa, Lespedeza cuneata, Dichanthelium lindheimeri, Lespedeza capitata, Juncus greenei, Apocynum cannabinum, Solidago rugosa var. rugosa, and Panicum capillare ssp. capillare.

The non-vascular layer has <1% cover of mosses including Polytrichum sp.

The unvegetated surface has 17.8% cover comprised of litter and duff (14.5%), bare soil (3.3%), wood (FWD) <7.5 cm (<1%), trash (<1%), and small rocks <10 cm (<1%).

Figure 66. Successional shrubland (*Rhus copallinum*) Parcel A (Point A22).

12. Successional shrubland (*Rubus-Solidago*)

Plots and Observation Points (3): A11, A19a, E05.

The short shrub layer (0.8 m) has 75% cover of Rubus allegheniensis. The dwarf shrub layer (0.2 m) has 1.7% cover of Rubus flagellaris.

The tree sapling layer (2.2 m) has 3.3% cover. The most abundant tree saplings are Malus toringo (1.3%), Ailanthus altissima (<1%), Quercus palustris (<1%), and Prunus serotina var. serotina (<1%). The tall tree seedling layer (1.5 m) has 1.7% cover. The most abundant tree seedlings are Malus toringo (1.0%), Prunus serotina var. serotina (<1%), and Juniperus virginiana var. virginiana (<1%).

The short vine layer (0.8 m) has <1% cover of Toxicodendron radicans ssp. radicans.

The herbaceous layer (0.8 m) has 52.7% cover. The most abundant herbs are Solidago rugosa var. rugosa (21.7%), Agrostis capillaris (20.0%), unknown grass (6.7%), Euthamia caroliniana (1.7%), and Carex pensylvanica (1.7%).

The following herbs have <1% cover each: Eupatorium hyssopifolium, Apocynum cannabinum, Solidago juncea, and Linaria vulgaris.

Figure 67. Successional shrubland (*Rubus-Solidago*) Parcel A (Point A11).

13. Successional southern hardwoods (*Ailanthus-Prunus*)

Plots and Observation Points (3): A04, B04, B05N.

The tree canopy layer (11.7 m) has 48.3% cover comprised of Ailanthus altissima (43.3%) and Prunus serotina var. serotina (7.0%). The tree subcanopy layer (7.5 m) has 11.7% cover of Ailanthus altissima.

The tall shrub layer (3 m) has 1.7% cover. The following tall shrubs have <1% cover each: Rhus typhina, Rosa multiflora, and Lonicera maackii. The short shrub layer (1.2 m) has 3% cover comprised of Rosa multiflora (2.7%) and Lonicera maackii (<1%).

The tree sapling layer (3.5 m) has 9.3% cover of Ailanthus altissima. The tall tree seedling layer (1.5 m) has 1.7% cover of Ailanthus altissima.

The short vine layer (0.6 m) has 4% cover of Lonicera japonica.

The herbaceous layer (1 m) has 48.3% cover. The most abundant herbs are Artemisia vulgaris (30.0%), and Festuca trachyphylla (20.0%).

The following herbs have <1% cover each: Agrostis capillaris, Aristida dichotoma var. dichotoma, Hypericum perforatum, Lespedeza cuneata, Linaria vulgaris, Solidago juncea, Achillea millefolium, Tridens flavus var. flavus.

The unvegetated surface has 28.7% cover comprised of litter and duff (20.0%), bare soil (6.7%), and trash (2.0%).

Figure 68. Successional southern hardwoods (*Ailanthus-Prunus*) Parel B (Point B04).

14. Successional southern hardwoods (*Prunus-Quercus*)

Plots and Observation Points (3): C04, C20a, D07.

The tree canopy layer (17 m) has 35% cover. The most abundant trees are Prunus serotina var. serotina (15.0%), Quercus palustris (14.3%), Pinus strobus (3.3%), Fraxinus americana (2.0%), and Ailanthus altissima (2.0%). The tree subcanopy layer (18 m) has 12.3% cover. The most abundant trees are Prunus serotina var. serotina (6.7%), Ailanthus altissima (5.0%), Morus alba (1.7%), and Sassafras albidum (1.0%).

The tall shrub layer (3.7 m) has 31.7% cover. The most abundant tall shrubs are Lonicera maackii (13.3%), Rosa multiflora (11.0%), Elaeagnus umbellata (5.0%), Frangula alnus (1.7%), and Rhus copallinum var. copallinum (0.7%). The short shrub layer (1.4 m) has 23.7% cover. The most abundant short shrubs are Lonicera maackii (10.0%), Rosa multiflora (9.3%), Rhus copallinum var. copallinum (2.0%), Viburnum dentatum var. lucidum (1.3%), Frangula alnus (<1%), and Sambucus nigra ssp. canadensis (<1%). The dwarf shrub layer (0.3 m) has 2.7% cover. The most abundant dwarf shrubs are Rubus flagellaris (1.0%), Lonicera maackii (<1%), Rosa multiflora (<1%), and Frangula alnus (<1%).

The tree sapling layer (4.7 m) has 33.7% cover. The most abundant tree saplings are Malus toringo (16.7%), Prunus serotina var. serotina (6.7%), Juniperus virginiana var. virginiana (4.7%), Ailanthus altissima (2.0%), Pinus thunbergii (1.0%), Quercus palustris (1.0%), Cornus florida (1.0%), and Quercus coccinea (<1%). The tall tree seedling layer (1.3 m) has 6% cover. The most abundant tall tree seedlings are Malus toringo (5.0%), Juniperus virginiana var. virginiana (<1%), and Sassafras albidum (<1%). The short tree seedling layer (0.2 m) has <1% cover of Sassafras albidum and Quercus sp.

The liana in the tree canopy (18 m) has 11.7% cover. The most abundant vines are Ampelopsis glandulosa var. brevipedunculata (6.7%), Celastrus orbiculatus (3.3%), and Vitis labrusca (1.7%). The tall vine layer on shrubs and tree saplings (5.5 m) has 13.3% cover. The most abundant vines are Toxicodendron radicans ssp. radicans (8.3%), Celastrus orbiculatus (3.3%), and Lonicera japonica (1.7%). The short vine layer (1.8 m) has 38.7% cover. The most abundant vines are Toxicodendron radicans ssp. radicans (15.0%), Ampelopsis glandulosa var. brevipedunculata (8.3%), Lonicera japonica (7.7%), Vitis labrusca (3.3%), Celastrus orbiculatus (2.7%), and Parthenocissus quinquefolia (1.7%).

The herbaceous layer (1 m) has 11% cover. The most abundant herbs are Carex pensylvanica (6.7%), Solidago juncea (2.3%), and Circaea canadensis (1.7%) with Polygonatum biflorum var. biflorum, Verbascum thapsus, Tridens flavus var. flavus, and Nuttallanthus canadensis (<1% cover each).

The non-vascular layer has <1% cover of Polytrichum sp. The unvegetated surface has 4% cover of litter and duff.

Figure 69. Successional southern hardwoods (*Prunus-Quercus*) Parcel C (Point C04).

15. Successional southern hardwoods (*Pinus-Prunus-Quercus*)

Plots and Observation Points (1): D09a.

The emergent tree layer (28 m) has 16% cover of Pinus strobus. The tree canopy layer (16 m) has 25% cover comprised of Prunus serotina var. serotina (22.0%) and Quercus palustris (4.0%). The tree subcanopy layer (8 m) has 42% cover. The most abundant trees are Acer platanoides (12.0%), Prunus serotina var. serotina (10.0%), Prunus avium (8.0%), Quercus velutina (8.0%), Quercus palustris (4.0%), Fraxinus americana (4.0%), Ailanthus altissima (4.0%), and Pinus strobus (2.0%).

The tall shrub layer (2.5 m) has 7% cover. The most abundant tall shrubs are Rosa multiflora (5.0%), Frangula alnus (1.0%), and Ligustrum vulgare (1.0%). The short shrub layer (1.8 m) has 3% cover. The most abundant short shrubs are Viburnum dilatatum (1.0%), Rubus allegheniensis (1.0%), and Taxus baccata (1.0%). The dwarf shrub layer (0.4 m) has <1% cover of Viburnum dilatatum.

The tree sapling layer (4 m) has 29% cover. The most abundant saplings are Malus toringo (25.0%), Acer platanoides (2.0%), Quercus rubra (1.0%), and Prunus serotina var. serotina (1.0%). The tall tree seedling layer (1.5 m) has 12% cover comprised of Malus toringo (12.0%) and Acer platanoides (<1%). The short tree seedling layer (0.3 m) has 3% cover. The most abundant short seedlings are Malus toringo (2.0%), Quercus palustris (<1%), and Quercus velutina (<1%).

The vine layer on tall shrubs and tree saplings (2 m) has 7% cover. The most abundant vines are Lonicera japonica (5.0%), Toxicodendron radicans ssp. radicans (1.0%), and Parthenocissus quinquefolia (1.0%). The short vine layer (0.4 m) has 82% cover. The most abundant short vines are Lonicera japonica (65.0%), Toxicodendron radicans ssp. radicans (15.0%), and Parthenocissus quinquefolia (2.0%).

The herbaceous layer (0.4 m) has 5% cover. The most abundant herbs are Carex sp. (2.0%), Eurybia divaricata (2.0%), and Polygonatum biflorum var. biflorum (1.0%).

The unvegetated surface has 70% cover comprised of litter and duff (60.0%), wood (FWD) <7.5 cm (6.0%), wood (CWD) >7.5 cm (4.0%), and trash (<1%).

Figure 70. Successional southern hardwoods (Pinus-Prunus-Quercus) Parcel D (Point D09a).

16. Red maple-hardwood swamp (*Quercus palustris*)

Plots and Observation Points (1): D08.

The tree canopy layer (24 m) has 65% cover. The most abundant trees are Acer rubrum var. rubrum (50.0%), Prunus serotina var. serotina (25.0%), and Quercus palustris (4.0%). The tree subcanopy layer (12 m) has 23% cover. The most abundant trees are Ailanthus altissima (8.0%), Prunus serotina var. serotina (8.0%), Acer platanoides (5.0%), and Malus toringo (4.0%).

The tall shrub layer (2.1 m) has 1% cover of Sambucus nigra ssp. canadensis. The short shrub layer (0.6 m) has 4% cover. The most abundant short shrubs are Aralia elata (2.0%), Rosa multiflora (1.0%), and Rubus allegheniensis (1.0%). The dwarf shrub layer (0.5 m) has 1% cover of Rosa multiflora.

The tree sapling layer (3 m) has 32% cover. The most abundant tree saplings areMalus toringo (20.0%), Malus sp. (10.0%), and Frangula alnus (2.0%). The tall tree seedling layer (1.5 m) has 5% cover of Frangula alnus. The short tree seedling layer (0.4 m) has <1% cover of Malus toringo.

The liana layer in the subcanopy (12 m) has 20% cover of Toxicodendron radicans ssp. radicans. The short vine layer (0.3 m) has 40% cover. The most abundant vines are Toxicodendron radicans ssp. radicans (25.0%), Vitis labrusca (5.0%), Lonicera japonica (5.0%), and Parthenocissus quinquefolia (5.0%).

The herbaceous layer has 5% cover. The most abundant herbs are Carex swanii (2.0%), Alliaria petiolata (1.0%), and Solidago rugosa var. rugosa (1.0%) with Bidens frondosa, Maianthemum racemosum ssp. racemosum, and Commelina communis (<1% cover each).

The unvegetated surface has 60% cover comprised of litter and duff (50.0%), wood (FWD) <7.5 cm (5.0%), wood (CWD) >7.5 cm (3.0%), and trash (2.0%).

Figure 71. Red maple-hardwood swamp (*Quercus palustris*) Parcel D (Point D08).

APPENDIX H. Historical Aerial Photographs

Figure 72. 1955 air photo showing the abandoned north-south road between Parcels C and D (indicated by the two white arrows).

Mitchell Field (Parcel C) is to the west (left) of the road and the golf course (Parcel D) is to the east (right) in 1955. Initial grading for the Meadowbrook Parkway is evident along the east side of the golf course. Parcel A lies just below the north (top) white arrow.

http://www.vanderbiltcupraces.com/blog/article/amazing_aerials_from_the_cradle_of_aviation_2_1955_mitchel_field_and_salisb

APPENDIX I. Invasive Species Assessment

Table 17. Parcels A-D Invasive Species Assessment

Scientific Family Name	Scientific Name	Common Name	Invasive Rank	First Year	2017 Survey	Invasive Tier
Aceraceae	*Acer platanoides*	NORWAY MAPLE	VH	2017	X	3
Brassicaceae	*Alliaria petiolata*	GARLIC MUSTARD	VH	2004	X	3
Araliaceae	*Aralia elata*	JAPANESE ANGELICA TREE	VH	2017	X	2
Celastraceae	*Celastrus orbiculatus*	ORIENTAL BITTERSWEET	VH	2004	X	4
Apocynaceae	*Cynanchum louiseae*	BLACK SWALLOW-WORT	VH	2004	X	2
Elaeagnaceae	*Elaeagnus umbellata*	RUSSIAN OLIVE	VH	2004	X	4
Ranunculaceae	*Ficaria verna*	LESSER CELANDINE	VH	2017	X	2
Caprifoliaceae	*Lonicera japonica*	JAPANESE HONEYSUCKLE	VH	1984	X	4
Caprifoliaceae	*Lonicera maackii*	AMUR HONEYSUCKLE	VH	2017	X	3
Caprifoliaceae	*Lonicera morrowii*	FLY HONEYSUCKLE	VH	2004	X	3
Polygonaceae	*Persicaria perfoliata*	MILE-A-MINUTE VINE	VH	2017	X	2
Poaceae	*Phragmites australis*	OLD WORLD REED GRASS	VH	1984		1
Fabaceae	*Robinia pseudoacacia*	BLACK LOCUST	VH	2017	X	2
Rosaceae	*Rosa multiflora*	MULTIFLORA ROSE	VH	2004	X	4
Rosaceae	*Rubus phoenicolasius*	WINE BERRY	VH	2017	X	2
Simaroubaceae	*Ailanthus altissima*	TREE-OF-HEAVEN	H	1984	X	3
Asteraceae	*Artemisia vulgaris*	COMMON MUGWORT	H	1984	X	4
Euphorbiaceae	*Euphorbia cyparissias*	CYPRESS SPURGE	H	2004	X	3
Rhamnaceae	*Frangula alnus*	EUROPEAN ALDER	H	2004	X	3
Fabaceae	*Lespedeza cuneata*	CHINESE LESPEDEZA	H	2004	X	4

Vitaceae	*Ampelopsis glandulosa*	PORCELAIN BERRY	H	2017	X	3
Asteraceae	*Centaurea stoebe ssp. micranthos*	SPOTTED KNAPWEED	H	2017	X	3
Euphorbiaceae	*Euphorbia virgata*	SLENDER SPURGE	H	2017	X	2
Poaceae	*Bromus tectorum*	CHEATGRASS	M	2004	X	5
Fabaceae	*Coronilla varia*	CROWN VETCH	M	2004	X	5
Oleaceae	*Ligustrum vulgare*	EUROPEAN PRIVET	M	2004	X	5
Moraceae	*Morus alba*	WHITE MULBERRY	M	1984	X	3
Pinaceae	*Pinus thunbergii*	JAPANESE BLACK PINE	M	2017	X	5
Poaceae	*Poa compressa*	CANADA BLUEGRASS	M	2004	X	5
Poaceae	*Poa pratensis*	KENTUCKY BLUEGRASS	M	2004	X	5
Rosaceae	*Prunus avium*	SWEET CHERRY	M	2017	X	5
Rosaceae	*Rubus laciniatus*	CUT-LEAF BLACKBERRY	M	2004	X	2
Solanaceae	*Solanum dulcamara*	TRAILING NIGHTSHADE	M	2004		5
Fabaceae	*Vicia cracca*	TUFTED VETCH	M	1984		5
Poaceae	*Agrostis capillaris*	CREEPING BENT	U	2004	X	4
Rosaceae	*Malus toringo*	TORINGO CRAB-APPLE	U	2004	X	4
Polygonaceae	*Persicaria extremiorientalis*	FAR-EASTERN SMARTWEED	U	2017	X	2

Ranks: VH=very high, H=high, M=medium, U=unranked but invasive (Jordan et al. 2012)

Tier Ranks (Dean and Young 2017):

Tier 1: Early Detection. Species found at the preserve in the past but no longer present and still in the surrounding area. Highest level of survey efforts. Should conduct delineation surveys and assign to appropriate Tier if detected.

Tier 2: Eradication. Highest level of response efforts. High impact species with low enough abundance to make eradication feasible within the preserve. Need delineation surveys to determine extent.

Tier 3: Containment. The species is only in one part of the preserve but could spread to other parts. Target strategic management to slow the spread, as likely too widespread for eradication, but many areas in the preserve could be at risk if left unattended. Use the IPMDAT to determine control feasibility. Possible eradication candidate only if adequate resources and effective control methods available.

Tier 4: Local Control. The species is widespread in the preserve and eradication not feasible; focus on localized management over time to contain, exclude, or suppress to protect high-priority resources like rare species or recreation assets. Be strategic when deciding if/where to control.

Tier 5: Monitor. Species that need more research, mapping, and monitoring to understand their invasiveness. This includes naturalized species and cultivated-only species that are known to be invasive in other regions but are not yet invasive here. Invasiveness may change with environmental or genetic changes. Should monitor populations on a regular basis to see if they are starting to become invasive and assign to appropriate Tier if invasive infestations detected.

Table 18. Parcel E Invasive Species Assessment

Scientific Family Name	Scientific Name	Common Name	Invasive Rank	First Year	Invasive Tier
Celastraceae	*Celastrus orbiculatus*	ORIENTAL BITTERSWEET	VH	2017	3
Apocynaceae	*Cynanchum louiseae*	BLACK SWALLOW-WORT	VH	2017	4
Elaeagnaceae	*Elaeagnus umbellata*	RUSSIAN OLIVE	VH	2017	3
Caprifoliaceae	*Lonicera maackii*	AMUR HONEYSUCKLE	VH	2017	3
Caprifoliaceae	*Lonicera morrowii*	FLY HONEYSUCKLE	VH	2017	3
Rosaceae	*Rosa multiflora*	MULTIFLORA ROSE	VH	2017	3
Simaroubaceae	*Ailanthus altissima*	TREE-OF-HEAVEN	H	2017	3
Asteraceae	*Artemisia vulgaris*	COMMON MUGWORT	H	2017	3
Euphorbiaceae	*Euphorbia cyparissias*	CYPRESS SPURGE	H	2017	3
Rhamnaceae	*Frangula alnus*	EUROPEAN ALDER	H	2017	3
Oleaceae	*Ligustrum vulgare*	EUROPEAN PRIVET	M	2017	2
Poaceae	*Poa pratensis*	KENTUCKY BLUEGRASS	M	2017	5
Rosaceae	*Pyrus calleryana*	CALLERY PEAR	M	2017	4
Rosaceae	*Malus toringo*	TORINGO CRAB-APPLE	U	2017	3

References

Dean, Jennifer and Stephen M. Young. 2017. Invasive Species Tiers: Standardizing species lists for each PRISM. Unpublished table. New York Natural Heritage Program, Albany, NY. September 2017.

Jordan, M.J., G. Moore and T.W. Weldy. 2008 (2012 update). New York State Ranking System for Evaluating Non-Native Plant Species for Invasiveness.

Unpublished report. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY.

Table 19. Non-native plant assessment by plot/observation point.

Point/Plot	No. of non-native species	Sum of percent cover of non-native species	Most abundant non-native species (percent cover)
A01	14	39	Artemisia vulgaris 8, Euphorbia cyparissias 8, Festuca trachyphylla 8, Lespedeza cuneata 4
A02	3	<1	Frangula alnus <1, Festuca trachyphylla <1, Helenium flexuosum <1
A03	4	4	Rumex acetocella 4
A04	9	100	Festuca trachyphylla 60, Artemisia vulgaris 35, Ailanthus altissima 18, Rosa multiflora 2
A05	6	73	Malus toringo 38, Festuca rubra 20, Elaeagnus umbellata 15
A06	10	54	Agrostis capillaris 30, Anthoxanthum odoratum 8, Lonicera japonica 5, Achillea millifolium 4, Lespedeza cuneata 3
A07	3	13	Rumex acetocella 8, Agrostis capillaris 5
A08	5	88	Agrostis capillaris 80, Festuca trachyphylla 7
A09	3	41	Agrostis capillaris 30, Festuca trachyphylla 10, Lespedeza cuneata 1
A10	8	92	Lespedeza cuneata 50, Artemisia vulgaris 15, Celastrus orbiculatus 15, Malus toringo 6, Agrostis capillaris 5
A11	1	<1	Linaria vulgaris <1
A12	2	<1	Linaria vulgaris <1
A13	4	62	Agrostis capillaris 35, Euphorbia cyparissias 15, Malus toringo 7, Lespedeza cuneata 5
A14	6	38	Agrostis capillaris 20, Lespedeza cuneata 7, Celastrus orbiculatus 5, Lonicera japonica 5
A15	7	29	Agrostis capillaris 20, Festuca rubra 5
A16	7	64	Lespedeza cuneata 30, Agrostis capillaris 22, Rumex acetocella 8, Achillea millefolium 2
A17	3	76	Lespedeza cuneata 50, Agrostis capillaris 25, Malus toringo 1
A18	8	100	Lonicera japonica 50, Elaeagnus umbellata 35, Ailanthus altissima 30, Celastrus orbiculatus 20, Malus toringo 10, Cynanchum louiseae 5
A19a	2	9	Malus toringo 7, Ailanthus altissima 2
A19b	4	43	Lonicera japonica 20, Malus toringo 20, Elaeagnus umbellata 2, Frangula alnus 1
A20	4	5	Elaeagnus umbellata 2, Malus toringo 2, Lespedeza cuneata 1
A21	2	100	Artemisia vulgaris 60, Lonicera japonica 60
A22	0	0	
A23	2	70	Celastrus orbiculatus 45, Lonicera japonica 25
A24	3	75	Artemisia vulgaris 30, Celastrus orbiculatus 25, Lespedeza cuneata 20
B01	1	95	Artemisia vulgaris 95
B02	13	90	Lespedeza cuneata 60, Artemisia vulgaris 30
B03	1	15	Alliaria petiolata 15
B04	6	100	Ailanthus altissima 90, Artemisia vulgaris 15, Lonicera japonica 12, Lonicera maackii 2, Rosa multiflora 3

Point/Plot	No. of non-native species	Sum of percent cover of non-native species	Most abundant non-native species (percent cover)
B05E	4	82	Artemisia vulgaris 75, Lespedeza cuneata 5
B05N	3	100	Ailanthus altissima 90, Artemisia vulgaris 40, Rosa multiflora 5
B05S	4	99	Artemisia vulgaris 95, Lespedeza cuneata 2
B05W	11	100	Artemisia vulgaris 90, Malus toringo 8, Ailanthus altissima 2, Lespedeza cuneata 2
B06	2	100	Lespedeza cuneata 70, Artemisia vulgaris 60
B07	17	52	Artemisia vulgaris 20, Festuca trachyphylla 10, Lespedeza cuneata 7, Elaeagnus umbellata 5, Ailanthus altissima 3
C01	8	30	Agrostis capillaris 15, Celastrus orbiculatus 7, Malus toringo 4, Festuca trachyphylla 2
C02	9	45	Celastrus orbiculatus 18, Malus toringo 10, Elaeagnus umbellata 6, Hypericum perforatum 5, Lonicera morrowii 2
C03a	8	100	Celastrus orbiculatus 70, Malus toringo 30, Lonicera japonica 20, Elaeagnus umbellata 13, Crataegus monogyna 7
C03b	6	87	Centaurea stoebe 50, Daucus carota 25, Rosa multiflora 5, Artemisia vulgaris 3, Lespedeza cuneata 3, Hypericum perforatum 1
C04	5	93	Malus toringo 35, Lonicera japonica 20, Celastrus orbiculatus 18, Elaeagnus umbellata15, Rosa multiflora 5
C05	6	41	Agrostis capillaris 15, Malus toringo 12, Elaeagnus umbellata 7, Anthoxanthum odoratum 5
C06	7	23	Malus toringo 7, Elaeagnus umbellata 5, Celastrus orbiculatus 3, Agrostis capillaris 3, Anthoxanthum odoratum 3
C07	5	19	Malus toringo 10, Anthoxanthum odoratum 5, Elaeagnus umbellata 3
C08	9	53	Malus toringo 17, Celastrus orbiculatus 15, Elaeagnus umbellata 7, Agrostis capillaris 5, Anthoxanthum odoratum 5
C09	2	13	Malus toringo 10, Elaeagnus umbellata 3
C10	5	47	Celastrus orbiculatus 25, Frangula alnus 10, Rosa multiflora 6, Artemisia vulgaris 3, Elaeagnus umbellata 3
C11	3	90	Lespedeza cuneata 50, Daucus carota 25, Melilotus albus 15
C12a	8	100	Ampelopsis glandulosa 60, Rosa multiflora 50, Celastrus orbiculatus 15, Artemisia vulgaris 10, Elaeagnus umbellata 5, Lonicera japonica 5, Malus toringo 5
C13	4	86	Artemisia vulgaris 80, Daucus carota 5
C14a	3	9	Malus toringo 4, Celastrus orbiculatus 2, Agrostis capillaris 2
C14b	6	71	Malus toringo 35, Elaeagnus umbellata 15, Celastrus orbiculatus 10, Rosa multiflora 8, Lonicera japonica 3
C15	4	10	Malus toringo 5, Agrostis capillaris 3, Rumex acetocella 2
C16	6	43	Malus toringo 14, Celastrus orbiculatus 10, Agrostis capillaris 10, Lonicera japonica 8
C17	8	39	Malus toringo 17, Lonicera japonica 10, Celastrus orbiculatus 5, Elaeagnus umbellata 5, Rosa multiflora 2
C18a	6	24	Malus toringo 18, Lonicera japonica 2, Rosa multiflora 1, Elaeagnus umbellata 1, Lonicera morrowii 1
C19	3	7	Malus toringo 6, Pinus thunbergii 1
C20a	4	47	Malus toringo 30, Lonicera japonica 8, Rosa multiflora 6, Pinus thunbergii 3
C21	6	44	Elaeagnus umbellata 18, Malus toringo 13, Celastrus orbiculatus 5, Agrostis capillaris 5, Lonicera japonica 2
C22	7	44	Malus toringo 15, Lonicera japonica 10, Elaeagnus umbellata 7, Celastrus orbiculatus 6, Agrostis capillaris 6

Point/Plot	No. of non-native species	Sum of percent cover of non-native species	Most abundant non-native species (percent cover)
C23	6	22	Elaeagnus umbellata 17, Malus toringo 4, Rosa multiflora 1
D01	1	1	Rumex acetocella 1
D02	4	85	Agrostis capillaris 85
D03	1	2	Agrostis capillaris 2
D04	0	0	
D05	0	0	
D06	1	3	Frangula alnus 3
D07	8	100	Lonicera maackii 72, Rosa multiflora 52, Ampelopsis glandulosa 45, Ailanthus altissima 27, Celastrus orbiculatus 10
D08	10	64	Malus toringo 24, Malus sp. 10, Ailanthus altissima 8, Frangula alnus 7, Acer platanoides 5, Aralia elata 2, Rosa multiflora 2
D09a	10	100	Lonicera japonica 70, Malus toringo 39, Acer platanoides 14, Prunus avium 8, Rosa multiflora 5
D09b	1	NR	Cynanchum louiseae – present
D10	6	4	Frangula alnus 2, Agrostis capillaris 2
E02	3	32	Agrostis capillaris 20, Cynanchum louiseae 10, Picea pungens 1
E03	5	65	Agrostis capillaris 45, Euphorbia cyparissias 12, Cynanchum louiseae 8
E04	1	85	Agrostis capillaris 85
E05	1	60	Agrostis capillaris 60
E06b	5	100	Cynanchum louiseae 82, Agrostis capillaris 15, Elaeagnus umbellata 5
E07	6	99	Agrostis capillaris 55, Cynanchum louiseae 30, Elaeagnus umbellata 5, malus toingo 4, Rosa multiflora 2
E08a	3	100	Elaeagnus umbellata 55, Cynanchum louiseae 30, Malus toringo 20
E09	2	25	Agrostis capillaris 25, Cynanchum louiseae <1

APPENDIX J. Hempstead Plains Plant List

Table 20. Hempstead Plains Plant List (Parcels A-D).

Scientific Family Name	Scientific Name	Common Name	Native Status	Heritage Rank	Invasive Rank	Date	First Year	1984 List	2017 Survey
Euphorbiaceae	*Acalypha gracilens*	SLENDER THREE-SEEDED MERCURY	Native			8/10/2004	2004		
Aceraceae	*Acer negundo*	BOXELDER	Native				2017		X
Aceraceae	*Acer platanoides*	NORWAY MAPLE	Non-Native		VH		2017		X
Aceraceae	*Acer saccharinum*	SILVER MAPLE	Native				2017		X
Asteraceae	*Achillea millefolium*	COMMON YARROW	Non-Native			7/18/2004	1984	X	X
Orobanchaceae	*Agalinis decemloba*	SANDPLAIN GERARDIA	Native	G1 S1		8/30/2004	1984	X	X
Orobanchaceae	*Agalinis purpurea*	PURPLE GERARDIA	Native			9/11/2004	1984	X	X
Poaceae	*Agrostis canina*	VELVET BENT	Non-Native			6/21/2006	2006		
Poaceae	*Agrostis capillaris*	RHODE ISLAND BENT	Non-Native				2017		X
Poaceae	*Agrostis hyemalis*	TICKLEGRASS	Native			6/3/2004	2004		
Poaceae	*Agrostis stolonifera*	CREEPING BENT	Non-Native			6/21/2006	1984	X	X
Simaroubaceae	*Ailanthus altissima*	TREE-OF-HEAVEN	Non-Native		H	8/10/2004	1984	X	X
Poaceae	*Aira caryophyllea*	SILVER HAIRGRASS	Non-Native			5/11/2004	2004		
Fabaceae	*Albizia julibrissin*	MIMOSA	Non-Native		L	9/6/2004	2004		
Nartheciaceae	*Aletris farinosa*	WHITE COLICROOT	Native	G5 S2		8/18/1989	1989		
Brassicaceae	*Alliaria petiolata*	GARLIC MUSTARD	Non-Native		VH	5/11/2004	2004		X
Liliaceae	*Allium vineale*	ONION GRASS	Non-Native			6/25/2004	1984	X	X
Amaranthaceae	*Amaranthus retroflexus*	RED-ROOTED AMARANTH	Native			7/31/2004	1984	X	
Asteraceae	*Ambrosia artemisiifolia*	RAGWEED	Native			9/6/2004	1984	X	X
Asteraceae	*Ambrosia trifida*	GIANT RAGWEED	Native			9/1/1984	1984	X	
Vitaceae	*Ampelopsis glandulosa*	PORCELAIN BERRY	Non-Native		H		2017		X
Asteraceae	*Anaphalis margaritacea*	EARLY-EVERLASTING	Native			7/18/2004	1984	X	
Poaceae	*Andropogon gerardii*	BIG BLUESTEM	Native			9/11/2004	1984	X	X
Poaceae	*Andropogon virginicus*	BROOM-SEDGE	Native			9/6/2004	1984	X	X
Asteraceae	*Antennaria plantaginifolia*	PUSSY' S-TOES	Native			6/3/2004	1984	X	X
Poaceae	*Anthoxanthum odoratum*	SWEET VERNALGRASS	Non-Native			6/3/2004	2004		X
Apocynaceae	*Apocynum cannabinum*	INDIAN HEMP	Native			7/26/2004	1984	X	X
Brassicaceae	*Arabidopsis thaliana*	MOUSE-EAR CRESS	Non-Native			5/11/2004	2004		X
Araliaceae	*Aralia elata*	JAPANESE ANGELICA TREE	Non-Native		VH		2017		X
Caryophyllaceae	*Arenaria serpyllifolia*	THYME-LEAF SANDWORT	Non-Native			5/11/2004	1984	X	
Poaceae	*Aristida dichotoma* var. *dichotoma*	CHURCHMOUSE THREE-AWN	Native			8/30/2004	2004		X
Poaceae	*Aristida oligantha*	PRAIRIE THREE-AWN	Native			9/11/2004	2004		
Rosaceae	*Aronia melanocarpa*	BLACK CHOKEBERRY	Native				2017		X
Asteraceae	*Artemisia biennis*	BIENNIAL WORMWOOD	Non-Native			9/15/1984	1984	X	
Asteraceae	*Artemisia vulgaris*	COMMON MUGWORT	Non-Native		H	9/11/2004	1984	X	X
Apocynaceae	*Asclepias syriaca*	COMMON MILKWEED	Native			7/18/2004	1984	X	X
Apocynaceae	*Asclepias tuberosa*	BUTTERFLY-WEED	Native			7/18/2004	1984	X	X
Apocynaceae	*Asclepias viridiflora*	GREEN MILKWEED	Native	G5 S2		7/15/1984	1984	X	
Fabaceae	*Baptisia tinctoria*	WILD INDIGO	Native			7/18/2004	1984	X	X
Brassicaceae	*Barbarea vulgaris*	WINTER CRESS	Non-Native			5/11/2004	2004		X
Gentianaceae	*Bartonia virginica*	BARTONIA	Native			7/18/2004	2004		
Asteraceae	*Bidens frondosa*	DEVIL'S BEGGAR-TICKS	Native			9/1/1984	1984	X	X
Poaceae	*Bromus erectus*	UPRIGHT BROME	Non-Native			6/1/1984	1984	X	
Poaceae	*Bromus hordeaceus* ssp. *hordeaceus*	SOFT BROME	Non-Native			6/3/2004	2004		
Poaceae	*Bromus japonicus*	JAPANESE BROME	Non-Native				2017		X
Poaceae	*Bromus tectorum*	CHEATGRASS	Non-Native		M	6/3/2004	2004		X

Cyperaceae	*Bulbostylis capillaris*	SAND-RUSH	Native			9/11/2004	2004		X
Convolvulaceae	*Calystegia sepium*	HEDGE BINDWEED	Non-Native			6/25/2004	1984	X	
Brassicaceae	*Capsella bursa-pastoris*	SHEPHERD'S-PURSE	Non-Native			6/25/2004	1984	X	
Cyperaceae	*Carex mesochorea*	MIDLAND SEDGE	Native	G4G5 S2			2017		X
Cyperaceae	*Carex pensylvanica*	PENSYLVANIA SEDGE	Native			5/11/2004	1984	X	X
Cyperaceae	*Carex swanii*	SWAN'S SEDGE	Native			6/25/2004	2004		X
Juglandaceae	*Carya glabra*	PIGNUT HICKORY	Native			9/1/1984	1984	X	
Bignoniaceae	*Catalpa speciosa*	NORTHERN CATALPA	Native				2017		X
Celastraceae	*Celastrus orbiculatus*	ORIENTAL BITTERSWEET	Non-Native		VH	10/5/2004	2004		X
Asteraceae	*Centaurea jacea*	BROWN KNAPWEED	Non-Native			7/1/1984	1984	X	
Asteraceae	*Centaurea nigra*	BLACK KNAPWEED	Non-Native			7/18/2004	2004		
Asteraceae	*Centaurea stoebe* ssp. *micranthos*	SPOTTED KNAPWEED	Non-Native		H		2017		X
Caryophyllaceae	*Cerastium fontanum* ssp. *vulgare*	COMMON MOUSE-EAR CHICKWEED	Non-Native			5/11/2004	1984	X	X
Chenopodiaceae	*Chenopodium album*	LAMB'S-QUARTERS	Non-Native			9/6/2004	1984	X	
Asteraceae	*Cichorium intybus*	CHICORY	Non-Native			7/26/2004	1984	X	
Solanaceae	*Circaea canadensis*	ENCHANTER'S NIGHTSHADE	Native				2017		X
Asteraceae	*Cirsium arvense*	CREEPING THISTLE	Non-Native			8/15/1984	1984	X	
Asteraceae	*Cirsium vulgare*	BULL-THISTLE	Non-Native			8/10/2004	1984	X	X
Commelinaceae	*Commelina communis*	ASIAN DAYFLOWER	Non-Native			6/15/1984	1984	X	X
Myricaceae	*Comptonia peregrina*	SWEET-FERN	Native			6/3/2004	2004		
Asteraceae	*Coreopsis lanceolata*	LANCE-LEAVED COREOPSIS	Non-Native			8/10/2004	2004		
Fabaceae	*Coronilla varia*	CROWN VETCH	Non-Native		M	6/25/2004	2004		X
Rosaceae	*Crataegus monogyna*	ENGLISH HAWTHORN	Non-Native			9/11/2004	2004		X
Cistaceae	*Crocanthemum dumosum*	BUSHY ROCKROSE	Native	G3 S2		5/15/2004	2004		X
Cistaceae	*Crocanthemum propinquum*	LOW FROSTWEED	Native	G4 S2		5/15/1984	1984	X	X
Cuscutaceae	*Cuscuta gronovii*	COMMON DODDER	Native			7/18/2004	2004		
Cuscutaceae	*Cuscuta pentagona*	FIVE-ANGLED DODDER	Native	G4G5 S3			2017		X
Apocynaceae	*Cynanchum louiseae*	BLACK SWALLOW-WORT	Non-Native		VH	6/3/2004	2004		X
Cyperaceae	*Cyperus lupulinus* var. *macilentus*	GREAT PLAINS FLAT SEDGE	Native			6/25/2004	2004		X
Poaceae	*Dactylis glomerata*	ORCHARD GRASS	Non-Native			6/3/2004	1984	X	X
Poaceae	*Danthonia spicata*	POVERTY GRASS	Native			6/3/2004	1984	X	X
Apiaceae	*Daucus carota*	QUEENS-ANNE'S-LACE	Non-Native			7/26/2004	1984	X	X
Fabaceae	*Desmodium ciliare*	LITTLE-LEAF TICK TREFOIL	Native	G5 S2S3		9/8/1997	1997		X
Caryophyllaceae	*Dianthus armeria*	DEPTFORD PINK	Non-Native			6/3/2004	1984	X	
Poaceae	*Dichanthelium clandestinum*	DEER-TONGUE GRASS	Native			7/18/2004	2004		X
Poaceae	*Dichanthelium colombianum*	DISTRICT OF COLUMBIA ROSETTE GRASS	Native				2017		X
Poaceae	*Dichanthelium lindheimeri*	LINDHEIMER'S ROSETTE GRASS	Native				2017		X
Poaceae	*Digitaria ischaemum*	SMOOTH CRABGRASS	Non-Native			7/31/2004	2004		
Poaceae	*Digitaria sanguinalis*	TALL CRABGRASS	Non-Native			7/31/2004	1984	X	X
Rubiaceae	*Diodia teres*	BUTTONWEED	Native			8/10/2004	1984	X	X
Poaceae	*Diphasiastrum digitatum*	SOUTHERN GROUND CEDAR	Native				2017		X
Brassicaceae	*Draba verna*	WHITLOW-GRASS	Non-Native			5/11/2004	2004		
Elaeagnaceae	*Elaeagnus umbellata*	RUSSIAN OLIVE	Non-Native		VH	5/11/2004	2004		X
Poaceae	*Eleusine indica*	YARD GRASS	Non-Native			8/10/2004	2004		
Poaceae	*Eragrostis pectinacea*	CAROLINA LOVEGRASS	Native			7/31/2004	2004		
Poaceae	*Eragrostis spectabilis*	PURPLE LOVEGRASS	Native			8/10/2004	1984	X	X
Asteraceae	*Erechtites hieraciifolia* var. *hierciifolia*	AMERICAN PILEWORT	Native			7/31/2004	1984	X	X
Asteraceae	*Erigeron annuus*	SMALL DAISEY FLEABANE	Native			6/15/1984	1984	X	X
Asteraceae	*Erigeron canadensis* var. *canadensis*	HORSEWEED	Native			7/26/2004	2004		X
Asteraceae	*Erigeron strigosus*	DAISY-FLEABANE	Native			6/3/2004	1984	X	X
Geraniaceae	*Erodium cicutarium* ssp. *cicutarium*	COMMON STORK'S BILL	Non-Native				2017		X
Asteraceae	*Eupatorium hyssopifolium*	HYSSOP-LEAVED THOROUGHWORT	Native			8/30/2004	1984	X	X
Asteraceae	*Eupatorium serotinum*	LATE THOROUGHWORT	Native				2017		X
Euphorbiaceae	*Euphorbia cyparissias*	CYPRESS SPURGE	Non-Native		H	5/11/2004	2004		X
Euphorbiaceae	*Euphorbia maculata*	SPOTTED SPURGE	Native			7/26/2004	2004		X
Euphorbiaceae	*Euphorbia virgata*	SLENDER SPURGE	Non-Native		H		2017		X

Asteraceae	*Eurybia divaricata*	WHITE WOOD ASTER	Native			2017		X
Asteraceae	*Euthamia caroliniana*	SLENDER FRAGRANT GOLDENROD	Native		8/30/2004	1984	X	X
Asteraceae	*Euthamia graminifolia*	GRASS-LEAVED GOLDENROD	Native		8/30/2004	1984	X	X
Asteraceae	*Eutrochium maculatum*	JOE-PYE WEED	Native		9/1/1984	1984	X	
Polygonaceae	*Fallopia scandens*	CLIMBING FALSE-BUCKWHEAT	Native		7/18/2004	2004		X
Poaceae	*Fectuca rubra*	RED FESCUE	Non-Native		6/3/2004	1984	X	
Poaceae	*Festuca filiformis*	HAIR FESCUE	Non-Native		6/1/1984	1984	X	
Poaceae	*Festuca myuros*	FOX-TAIL FESCUE	Non-Native		6/25/2004	2004		
Poaceae	*Festuca trachyphylla*	SHEEP FESCUE	Non-Native		6/3/2004	2004		X
Ranunculaceae	*Ficaria verna*	LESSER CELANDINE	Non-Native	VH		2017		X
Rhamnaceae	*Frangula alnus*	EUROPEAN ALDER-BUCKTHORN	Non-Native	H	7/26/2004	2004		X
Oleaceae	*Fraxinus americana*	WHITE ASH	Native		9/11/2004	2004		X
Amaranthaceae	*Froelichia gracilis*	COTTONWEED	Non-Native		7/31/2004	2004		
Asteraceae	*Galinsoga ciliata*	SHAGGY SOILDER	Non-Native		8/1/1984	1984	X	
Rubiaceae	*Galium album*	HEDGE BEDSTRAW	Non-Native			2017		X
Ericaceae	*Gaylussacia baccata*	BLACK HUCKLEBERRY	Native		6/1/1984	1984	X	
Asteraceae	*Helenium flexuosum*	PURPLE-HEADED SNEEZE WEED	Native		8/1/1984	1984	X	X
Malvaceae	*Hibiscus syriacus*	ROSE-OF-SHARON	Non-Native			2017		X
Clusiaceae	*Hypericum gentianoides*	ORANGE-GRASS	Native		8/10/2004	1984	X	X
Clusiaceae	*Hypericum perforatum*	COMMON ST. JOHN'S-WORT	Non-Native	L	6/25/2004	1984	X	X
Asteraceae	*Hypochaeris radicata*	HAIRY CAT'S-EAR	Non-Native		6/25/2004	2004		
Liliaceae	*Hypoxis hirsuta*	STARGRASS	Native		6/3/2004	1984	X	X
Juncaceae	*Juncus anthelatus*	WIEGAND'S RUSH	Native			2017		X
Juncaceae	*Juncus greenei*	GREENE'S RUSH	Native		6/3/2004	1984	X	X
Juncaceae	*Juncus secundus*	LOPSIDED RUSH	Native		6/25/2004	2004		
Juncaceae	*Juncus tenuis*	PATH RUSH	Native		6/3/2004	1984	X	X
Cupressaceae	*Juniperus horizontalis*	CREEPING JUNIPER	Non-Native			2017		X
Cupressaceae	*Juniperus virginiana*	EASTERN RED CEDAR	Native		7/26/2004	1984	X	X
Asteraceae	*Krigia virginica*	DWARF DANDELION	Native		5/11/2004	1984	X	X
Asteraceae	*Lactuca canadensis*	WILD LETTUCE	Native		6/6/2004	1984	X	X
Asteraceae	*Lactuca serriola*	PRICKLY LETTUCE	Non-Native		7/31/2004	2004		
Lamiaceae	*Lamium purpureum*	PURPLE DEAD NETTLE	Non-Native			2017		X
Fabaceae	*Lathyrus latifolius*	BREAD-LEAVED EVERLASTING-PEA	Native		7/1/1984	1984	X	
Cistaceae	*Lechea maritima*	BEACH PINWEED	Native		8/30/2004	2004		X
Cistaceae	*Lechea minor*	THYME-LEAVED PINWEED	Native		9/1/1984	1984	X	
Brassicaceae	*Lepidium campestre*	FIELD CRESS	Native		6/1/1984	1984	X	
Brassicaceae	*Lepidium virginicum*	POOR-MAN'S PEPPERGRASS	Native		6/3/2004	2004		
Fabaceae	*Lespedeza angustifolia*	NARROW-LEAVED BUSH-CLOVER	Native		8/27/1992	1992		X
Fabaceae	*Lespedeza capitata*	ROUND-HEADED BUSH-CLOVER	Native		8/10/2004	1984	X	X
Fabaceae	*Lespedeza cuneata*	CHINESE LESPEDEZA	Non-Native	H	9/11/2004	2004		X
Fabaceae	*Lespedeza intermedia*	WAND LIKE BUSH-CLOVER	Native		9/11/2004	2004		
Fabaceae	*Lespedeza virginica*	SLENDER BUSH-CLOVER	Native			2017		X
Asteraceae	*Leucanthemum vulgare*	OX-EYE DAISY	Non-Native		7/1/1984	1984	X	X
Oleaceae	*Ligustrum vulgare*	EUROPEAN PRIVET	Non-Native	M		2004		
Plantaginaceae	*Linaria vulgaris*	BUTTER-AND-EGGS	Non-Native		6/3/2004	1984	X	X
Linderniaceae	*Lindernia dubia* var. *anagallidea*	LONG STALKED FALSE PIMPERNEL	Native		8/15/1984	1984	X	
Poaceae	*Lolium perenne*	ENGLISH RYEGRASS	Non-Native		6/25/2004	1984	X	
Caprifoliaceae	*Lonicera japonica*	JAPANESE HONEYSUCKLE	Non-Native	VH	6/3/2004	1984	X	X
Caprifoliaceae	*Lonicera maackii*	AMUR HONEYSUCKLE	Non-Native	VH		2017		X
Caprifoliaceae	*Lonicera morrowii*	FLY HONEYSUCKLE	Non-Native	VH	6/25/2004	2004		X
Onagraceae	*Ludwigia palustris*	WATER PURSLANE	Native		8/15/1984	1984	X	
Lamiaceae	*Lycopus americanus*	AMERICAN BUGLEWEED	Native		9/15/1984	1984	X	
Ericaceae	*Lyonia mariana*	STAGGERBUSH	Native		7/18/2004	2004		X
	Lysimachia terrestris	SWAMP CANDLES	Native			2017		X
Asparagaceae	*Maianthemum racemosum* ssp. *racemosum*	CANADA MAYFLOWER	Native			2017		X
Rosaceae	*Malus pumila*	CULTIVATED APPLE	Non-Native		5/15/1984	1984	X	

Rosaceae	*Malus toringo*	TORINGO CRAB-APPLE	Non-Native			5/11/2004	2004		X
Fabaceae	*Melilotus albus*	WHITE SWEET-CLOVER	Non-Native			6/25/2004	1984	X	X
Fabaceae	*Melilotus officinalis*	YELLOW SWEET CLOVER	Non-Native			8/1/1984	1984	X	
Molluginaceae	*Mollugo verticillata*	CARPETWEED	Non-Native			6/25/2004	1984	X	X
Myricaceae	*Morella caroliniensis*	BAYBERRY	Native				2017		X
Moraceae	*Morus alba*	WHITE MULBERRY	Non-Native		M	6/1/1984	1984	X	X
Plantaginaceae	*Nuttallanthus canadensis*	OLD-FIELD TOADFLAX	Native			5/11/2004	1984	X	X
Onagraceae	*Oenothera biennis*	COMMON EVENING-PRIMROSE	Native			8/10/2004	1984	X	X
Oxalidaceae	*Oxalis stricta*	YELLOW WOOD-SORREL	Native			6/3/2004	1984	X	X
Poaceae	*Panicum capillare* ssp. *capillare*	WITCHGRASS	Native			8/30/2004	2004		X
Poaceae	*Panicum dichotomiflorum* var. *dichotomiflorum*	SMOOTH PANIC GRASS	Native			6/3/2004	2004		
Poaceae	*Panicum virgatum*	SWITCHGRASS	Native			8/10/2004	1984	X	X
Vitaceae	*Parthenocissus quinquefo1ia*	VIRGINIA CREEPER	Native			8/1/1984	1984	X	X
Polygonaceae	*Persicaria aviculare*	COMMON KNOTWEED	Native			8/1/1984	1984	X	
Polygonaceae	*Persicaria extremiorientalis*	FAR-EASTERN SMARTWEED	Non-Native				2017		X
Polygonaceae	*Persicaria hydropiper*	WATER PEPPER	Non-Native				2017		X
Polygonaceae	*Persicaria lapathifolium*	DOCK-LEAVED KNOTWEED	Native			8/1/1984	1984	X	
Polygonaceae	*Persicaria longiseta*	LONG-BRISTLED SMARTWEED	Non-Native			7/18/2004	2004		
Polygonaceae	*Persicaria maculata*	SPOTTED LADY'S THUMB	Native			8/1/1984	1984	X	X
Polygonaceae	*Persicaria pensylvanica*	PENSYLVANIA SMARTWEED	Native			8/1/1984	1984	X	X
Polygonaceae	*Persicaria perfoliata*	MILE-A-MINUTE VINE	Non-Native		VH		2017		X
Poaceae	*Phleum pratense*	COMMON TIMOTHY	Native			6/15/1984	1984	X	
Poaceae	*Phragmites australis*	OLD WORLD REED GRASS	Non-Native		VH	5/15/1984	1984	X	
Phytolaccaceae	*Phytolacca americana*	POKEWEED	Native			9/6/2004	1984	X	X
Urticaceae	*Pilea pumila var. pumila*	GREEN-FRUITED CLEARWEED	Native				2017		X
Asteraceae	*Pilosella caespitosa*	YELLOW HAWKWEED	Non-Native			7/1/1984	1984	X	
Asteraceae	*Pilosella officinarum*	MOUSE-EAR HAWKWEED	Non-Native			6/25/2004	2004		
Asteraceae	*Pilosella x floribunda*	SMOOTH HAWKWEED	Non-Native			6/3/2004	2004		
Pinaceae	*Pinus strobus*	WHITE PINE	Native				2017		X
Pinaceae	*Pinus thunbergii*	JAPANESE BLACK PINE	Non-Native		M		2017		X
Plantaginaceae	*Plantago aristata*	BRACTED PLANTAIN	Non-Native			6/3/2004	1984	X	X
Plantaginaceae	*Plantago lanceolata*	ENGLISH PLANTAIN	Non-Native			5/11/2004	1984	X	X
Plantaginaceae	*Plantago major*	COMMON PLANTAIN	Non-Native			7/31/2004	1984	X	
Plantaginaceae	*Plantago rugelii*	RUGEL'S PLANTAIN	Native				2017		X
Poaceae	*Poa annua*	ANNUAL BLUE GRASS	Non-Native			6/15/1984	1984	X	
Poaceae	*Poa compressa*	CANADA BLUEGRASS	Non-Native		M	6/21/2004	2004		
Poaceae	*Poa pratensis*	KENTUCKY BLUEGRASS	Non-Native		M	5/11/2004	2004		X
Polygalaceae	*Polygala nuttallii*	NUTTALL'S MILKWORT	Native	G5 S2		7/17/1985	1985		X
Polygalaceae	*Polygala polygama*	RACEMED MILKWORT	Native			6/3/2004	1984	X	
Polygalaceae	*Polygala verticillata*	WHORLED MILKWART	Native			8/1/1984	1984	X	
Asparagaceae	*Polygonatum biflorum*	SOLOMON'S SEAL	Native				2017		X
Polygonaceae	*Polygonum aviculare*	COMMON KNOTWEED	Non-Native			6/3/2004	2004		
Salicaceae	*Populus tremuloides*	TREMBLING ASPEN	Native			5/15/1984	1984	X	
Portulacaceae	*Portulaca oleracea*	PURSLANE	Non-Native			7/26/2004	2004		
Rosaceae	*Potentilla argentea*	SILVERY CINQUEFOIL	Non-Native			6/3/2004	1984	X	X
Rosaceae	*Potentilla canadensis*	DWARF CINQUEFOIL	Native			5/11/2004	1984	X	X
Rosaceae	*Potentilla norvegica*	THREE-LEAF CINQUEFOIL	Native			6/25/2004	1984	X	
Rosaceae	*Potentilla recta*	SULFUR CINQUEFOIL	Non-Native			6/3/2004	1984	X	X
Rosaceae	*Potentilla simplex*	COMMON CINQUEFOIL	Native			5/11/2004	1984	X	
Lamiaceae	*Prunella vulgaris* ssp. *vulgaris*	SELF HEAL	Non-Native			6/1/1984	1984	X	
Rosaceae	*Prunus avium*	SWEET CHERRY	Non-Native		M		2017		X
Rosaceae	*Prunus serotina*	WILD BLACK CHERRY	Native			9/6/2004	1984	X	X
Rosaceae	*Prunus virginiana*	CHOKE CHERRY	Native				2017		X
Asteraceae	*Pseudognaphalium obtusifolium*	SWEET EVERLASTING	Native			8/10/2004	1984	X	X
Lamiaceae	*Pycnanthemum flexuosum*	APPALACHIAN MOUTAIN MINT	Native			8/1/1984	1984	X	

Lamiaceae	*Pycnanthemum tenuifolium*	NARROW-LEAVED MOUNTAIN-MINT	Native			7/18/2004	2004		X
Fagaceae	*Quercus coccinea*	SCARLET OAK	Native			8/30/2004	2004		X
Fagaceae	*Quercus palustris*	PIN OAK	Native				2017		X
Fagaceae	*Quercus rubra*	RED OAK	Native				2017		X
Fagaceae	*Quercus velutina*	BLACK OAK	Native				2017		X
Brassicaceae	*Raphanus raphanistrum*	WILD RADISH	Non-Native			6/25/2004	2004		
Anacardiaceae	*Rhus copallinum*	WINGED SUMAC	Native			9/6/2004	1984	X	X
Anacardiaceae	*Rhus glabra*	SMOOTH SUMAC	Native			5/1/1984	1984	X	X
Anacardiaceae	*Rhus typhina*	STAGHORN SUMAC	Native			8/30/2004	2004		X
Fabaceae	*Robinia pseudoacacia*	BLACK LOCUST	Non-Native		VH		2017		X
Rosaceae	*Rosa multiflora*	MULTIFLORA ROSE	Non-Native		VH	9/6/2004	2004		X
Rosaceae	*Rosa virginiana*	VIRGINIA ROSE	Native			7/18/2004	2004		
Rosaceae	*Rubus allegheniensis*	NORTHERN BLACKBERRY	Native			8/10/2004	2004		X
Rosaceae	*Rubus flagellaris*	NORTHERN DEWBERRY	Native			8/10/2004	1984	X	X
Rosaceae	*Rubus hispidus*	SWAMP DEWBERRY	Native			6/25/2004	1984	X	
Rosaceae	*Rubus laciniatus*	CUT-LEAF BLACKBERRY	Non-Native		M	8/10/2004	2004		X
Rosaceae	*Rubus pensylvanicus*	PENNSYLVANIA BLACKBERRY	Native				2017		X
Rosaceae	*Rubus phoenicolasius*	WINE BERRY	Non-Native		VH		2017		X
Asteraceae	*Rudbeckia hirta*	BLACK-EYED-SUSAN	Non-Native			7/18/2004	1984	X	
Polygonaceae	*Rumex acetosella* ssp. *pyrenaicus*	SHEEP SORREL	Non-Native			5/11/2004	1984	X	X
Polygonaceae	*Rumex crispus*	CURLY DOCK	Non-Native			7/26/2004	1984	X	
Caprifoliaceae	*Sambucus nigra spp. canadensis*	COMMON ELDERBERRY	Native			9/6/2004	2004		
Caryophyllaceae	*Saponaria officinalis*	COMMON SOAPWORT	Non-Native			6/1/1984	1984	X	
Lauraceae	*Sassafras albidum*	SASSAFRAS	Native				2017		X
Poaceae	*Schenodonorus arundinaceus*	MEADOW FESCUE	Non-Native			6/3/2004	2004		
Poaceae	*Schizachyrium scoparium*	LITTLE BLUESTEM	Native			9/11/2004	1984	X	X
Cyperaceae	*Schoenoplectus americanus*	CAHIR MAKEER'S BULRUSH	Native			9/1/1984	1984	X	
Cyperaceae	*Scirpus cyperinus*	COMMON WOOL-GRASS	Native			9/1/1984	1984	X	
Caryophyllaceae	*Scleranthus annuus*	KNAWEL	Non-Native			7/18/2004	1984	X	
Cyperaceae	*Scleria pauciflora*	FEW FLOWERED NUT SEDGE	Native	G5 S1			2017		X
Asteraceae	*Senecio vulgaris*	COMMON GROUNDSEL	Non-Native			8/30/2004	2004		
Asteraceae	*Sericocarpus linifolius*	NARROW-LEAVED WHITE-TOPPED ASTER	Native	G5 S2		9/1/1984	1984	X	
Poaceae	*Seteria faberi*	GIANT FOXTAIL	Non-Native			7/31/2004	1984	X	X
Cucurbitaceae	*Sicyos angulatus*	BUR CUCUMBER	Native				2017		X
Caryophyllaceae	*Silene antirrhina*	SLEEPY CATCH-FLY	Native			7/18/2004	2004		X
Caryophyllaceae	*Silene latifolia*	WHITE CAMPION	Non-Native			6/25/2004	1984	X	X
Iridaceae	*Sisyrinchium atlanticum*	ATLANTIC BLUE-EYED GRASS	Native				2017		X
Iridaceae	*Sisyrinchium* sp.	BLUE-EYED GRASS	Native			5/11/2004	1984	X	
Smilacaceae	*Smilax rotundifolia*	COMMON GREENBRIAR	Native				2017		X
Solanaceae	*Solanum dulcamara*	TRAILING NIGHTSHADE	Non-Native		M	6/3/2004	2004		
Asteraceae	*Solidago altissima*	TALL GOLDENROD	Native			9/6/2004	2004		
Asteraceae	*Solidago canadensis*	CANADA GOLDENROD	Native				2017		X
Asteraceae	*Solidago juncea*	EARLY GOLDENROD	Native			7/26/2004	1984	X	X
Asteraceae	*Solidago nemoralis*	GRAY GOLDENROD	Native			8/30/2004	1984	X	X
Asteraceae	*Solidago puberula*	DOWNY GOLDENROD	Native			9/1/1984	1984	X	
Asteraceae	*Solidago rugosa* var. *rugosa*	ROUGH GOLDENROD	Native			9/11/2004	1984	X	X
Asteraceae	*Solidago speciosa*	SHOWY GOLDENROD	Native				2017		X
Poaceae	*Sorghastrum nutans*	INDIAN GRASS	Native			9/11/2004	1984	X	X
Caryophyllaceae	*Spergula arvensis*	CORN-SPURRY	Non-Native			5/11/2004	2004		
Caryophyllaceae	*Spergularia rubra*	COMMON SAND-SPURRY	Non-Native			6/25/2004	2004		
Rosaceae	*Spiraea alba var. latifolia*	BROAD-LEAVED MEADOWSWEET	Native				2017		X
Lamiaceae	*Stachys hyssopifolia* var. *hyssopifolia*	HYSSOP HEDGE-NETTLE	Native	G5T4T5 S2		7/18/2004	1984	X	
Caryophyllaceae	*Stellaria graminea*	GRASS-LEAVED STARWORT	Non-Native			6/1/1984	1984	X	
Fabaceae	*Strophostyles helvola*	TRAILING WILD BEAN	Native			7/31/2004	2004		
Asteraceae	*Symphyotrichum dumosm*	BUSHY ASTER	Native			10/5/2004	1984	X	

Asteraceae	*Symphyotrichum pilosum* var. *pringlei*	HEATH ASTER	Native			10/5/2004	2004		
Asteraceae	*Taraxacum officinale*	COMMON DANDELION	Non-Native			6/25/2004	1984	X	X
Anacardiaceae	*Toxicodendron radicans*	POISON IVY	Native			9/6/2004	1984	X	X
Asteraceae	*Tragopogon dubius*	GOAT'S-BEARD	Non-Native			6/3/2004	2004		
Asteraceae	*Tragopogon pratensis*	MEADOW SALSIFY	Non-Native			6/1/1984	1984	X	
Lamiaceae	*Trichostema dichotomum*	BLUE-CURLS	Native			8/10/2004	1984	X	X
Poaceae	*Tridens flavus* var. *flavus*	TALL REDTOP	Native			8/30/2004	2004		X
Fabaceae	*Trifolium agrarium*	LARGE HOP CLOVER	Non-Native			6/15/1984	1984	X	
Fabaceae	*Trifolium arvense*	RABBIT'S-FOOT CLOVER	Non-Native			6/25/2004	1984	X	
Fabaceae	*Trifolium dubium*	SMALL HOP CLOVER	Non-Native				2017		X
Fabaceae	*Trifolium pratense*	RED CLOVER	Non-Native			6/25/2004	1984	X	
Fabaceae	*Trifolium procumbens*	PINNATE HOP CLOVER	Non-Native			6/15/1984	1984	X	
Fabaceae	*Trifolium repens*	WHITE CLOVER	Non-Native			6/25/2004	1984	X	
Typhaceae	*Typha latifolia*	WIDE LEAVED CAT-TAIL	Native			6/1/1984	1984	X	
Ericaceae	*Vaccinium corymbosum*	HIGHBUSH BLUEBERRY	Native			9/6/2004	2004		X
Scrophulariaceae	*Verbascum blattaria*	MOTH MULLEIN	Non-Native			7/18/2004	1984	X	X
Scrophulariaceae	*Verbascum thapsus*	COMMON MULLEIN	Non-Native			7/26/2004	1984	X	X
Verbenaceae	*Verbena hastata*	BLUE VERVAIN	Native			8/10/2004	1984	X	X
Verbenaceae	*Verbena urticifolia*	WHITE VERVAIN	Native			8/10/2004	2004		
Caprifoliaceae	*Viburnum dentatum* var. *lucidum*	NORTHERN ARROWWOOD	Native			9/6/2004	2004		X
Fabaceae	*Vicia cracca*	TUFTED VETCH	Non-Native		M	7/1/1984	1984	X	
Violaceae	*Viola lanceolata*	LANCE-LEAF VIOLET	Native			5/11/2004	1984	X	
Violaceae	*Viola pedata*	BIRD'S-FOOT VIOLET	Native	G5 S3		5/11/2004	1984	X	X
Violaceae	*Viola sagittata* var. *ovata*	NORTHERN DOWNY VIOLET	Native			5/11/2004	1984	X	
Vitaceae	*Vitis labrusca*	FOX GRAPE	Native			8/10/2004	2004		X
Vitaceae	*Vitis riparia*	RIVERBANK GRAPE	Native				2017		X