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Draft Hempstead Lake State Park Invasive Species Management Plan

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# Hempstead Lake State Park

# Invasive Species Management and Native Species Enhancement Plan

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**Cover photo: Invasive exotic vines climbing over shrubs and trees in Hempstead Lake State Park. 2017 August 9, NYS OPRHP.**

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# Executive Summary

### *Introduction*

This Invasive Species Management and Native Species Enhancement Plan prepared by New York State Office of Parks, Recreation and Historic Preservation (OPRHP) outlines the goals, strategies, inter-agency cooperation and follow-up to be utilized by the Long Island Regional Environmental Office for management efforts at Hempstead Lake State Park (HLSP). Control of invasive plant species is necessary to improve biodiversity and aesthetics, and to prevent future invasions of this valuable habitat in the suburban landscape.

This plan provides background information about the park and invasive species concerns, and outlines a process through which management can be implemented. This involves a series of goals and objectives that are adaptable to changing conditions. The plan also provides an overview of ongoing invasive species control efforts at the site. The overall vision of this plan is to promote and restore native biodiversity to the greatest extent possible. This plan is modeled after existing OPRHP invasive species management plans (Webster et al. 2017, O'Brien et al. 2010).

### *Park Overview*

Hempstead Lake State Park (HLSP) is a 900-acre park located in the Town of Hempstead, southwestern Nassau County, in the Long Island OPRHP Region. HLSP is bordered by residential neighborhoods, a golf course, and an athletic complex. The park was established in 1925 and is highly valued for birdwatching, dog walking, picnicking, horseback riding, fishing, tennis, and other recreation. Invasive species reduce the quality of habitat in the park for wildlife, crowd out native species, and damage the aesthetic value of the park.

The soils of the park are comprised of silty clay, glauconitic silty clay, sand, and gravel. Hempstead is part of the outwash plain from the last glaciation, in which glaciers stopped north of Hempstead. There are several natural community types in the park, including coastal oak-heath forest, red maple-black gum swamp, successional old field, and coastal plain pond shore (designated as a significant community by the New York Natural Heritage Program). The flora and fauna are typical of suburban areas of Long Island.

### *Invasive Species at the Park*

Hempstead Lake State Park's position in the suburban landscape leaves it vulnerable to infestation by invasive species. Thirty-five invasive plant species have been observed in the park, along with three native vines that pose structural threats. In recent years, NYS OPRHP staff have cut invasive vines off trees and fences, removed Japanese knotweed along the trails, and cleared the upstream face of the Hempstead Lake Dam. The New York State Parks Invasive Species Strike Teams have also removed parrot feather (*Myriophyllum aquaticum*) and young Oriental bittersweet stems (*Celastrus orbiculatus*) manually.

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### *Roles and Responsibilities for Implementation*

The implementation of this plan will involve coordination between OPRHP staff at the park, the regional office and the Environmental Stewardship and Planning (ESP). Hereafter, this collective will be referred to as the Implementation Panel. They will meet annually to discuss logistics, feasibility, specific actions, progress, and revisions to the plan.

### *Goals and Implementation*

The goals/planning steps presented in the plan include:

1. Inventory and Map Invasive Species
2. Prioritize Invasive Species for Control and Set Targets – Rank invasive species according to the feasibility of control and significance of impact on the environment. Determine realistic, attainable goals for invasive species control.
3. Control and Remove Invasive Species – Select control methods and develop removal plans.
4. Native Species Enhancements – Plan enhancements, choose species, and plant native species.
5. Maintain Native Ecological Systems – Monitor sites to prevent re-invasion and to identify and maintain areas free of invasive species.
6. Promote Stewardship – Train, educate, and provide outreach to staff and the public to provide ongoing support for plan success.

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# Introduction

The mission of OPRHP calls for responsible stewardship of natural resources while providing appropriate recreational and interpretive opportunities to the public. This Invasive Species Management and Native Species Enhancement Plan is consistent with OPRHP's mission "to be responsible stewards of our valuable natural, historic and cultural resources" (OPRHP 2014).

## Introduction to Invasive Species Management

Invasive species are defined as species (e.g., plants or animals) non-native to the ecosystem that cause or are likely to cause economic or environmental harm or harm to human health. Invasive species can develop extremely large populations, usually due to a lack of competition or predation, thereby causing adverse effects such as a loss of wildlife habitat and impacts to landscapes and ecosystems. The basic steps involved in managing invasive species are inventory, control, monitoring, and restoration (or enhancement). The vision of this plan is to promote and enhance native biodiversity to the greatest extent possible. This plan describes the goals, objectives and actions needed to achieve this vision.

## Introduction to Native Species Enhancement

Native species restoration is a widely-used term that implies returning an ecosystem to a previous, well-functioning, native state. Improvements to ecosystem function or sustainability (including invasive species control and planting native species) are known as *enhancements* (NYC Parks Natural Resources Group 2001). The term "enhancement" is more suitable for our endeavors at Hempstead Lake State Park, since restoring this area – a small region in a highly-developed landscape – to a historic state is not practical.

The maintenance of healthy urban greenspace has many benefits (e.g., offsetting climate change, absorbing storm water runoff, reduction of urban heat island effect, improved air quality), but native species in particular are key for improving biodiversity in such spaces. Greater biodiversity improves ecosystems, both in terms of their resilience and their capacity to provide the aforementioned ecosystem services (NYC Parks 2014).

## Invasive Species Management Model

The decision to develop an invasive species management plan for Hempstead Lake State Park came about due to an identified need for a more standardized and streamlined approach to invasive species control on site. This plan is modeled after existing OPRHP invasive species management plans (Webster et al. 2017, O'Brien et al. 2010).

Six overall goals have been identified and should be implemented to control invasive species at Hempstead Lake State Park.

1. Inventory and Map Invasive Species
2. Prioritize Invasive Species for Control and Set Targets
3. Control and Remove Invasive Species
4. Native Species Enhancements

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5. Maintain Native Ecological Systems
6. Promote Stewardship

Each of these goals is further broken down into achievable objectives with actions. This plan is to be implemented in an adaptive management approach. Adaptive management is the systematic acquisition and application of reliable information to improve natural resource management (Wilhere 2002). An illustration of this adaptive management approach is in Figure 1. By documenting the effects of management efforts, this approach can guide managers toward optimal strategies. Managers should evaluate the effects of management each year and make changes as necessary.

This plan is consistent with the findings and recommendations of the NY Invasive Species Task Force along with other plans developed by organizations involved in invasive species management. Using this approach will help maximize efficiency of efforts and prevent duplication of work.

This plan should be seen as a *living document* – that is, it should be updated regularly to reflect the status of management efforts. To facilitate this, the sections that need regular updating have headings that begin with the phrase "Current status."

As part of this plan, we are establishing targets for both the invasive species control and native enhancement efforts. Targets should be reassessed at the beginning of each season, and the success in meeting previous targets should inform future goal-setting.

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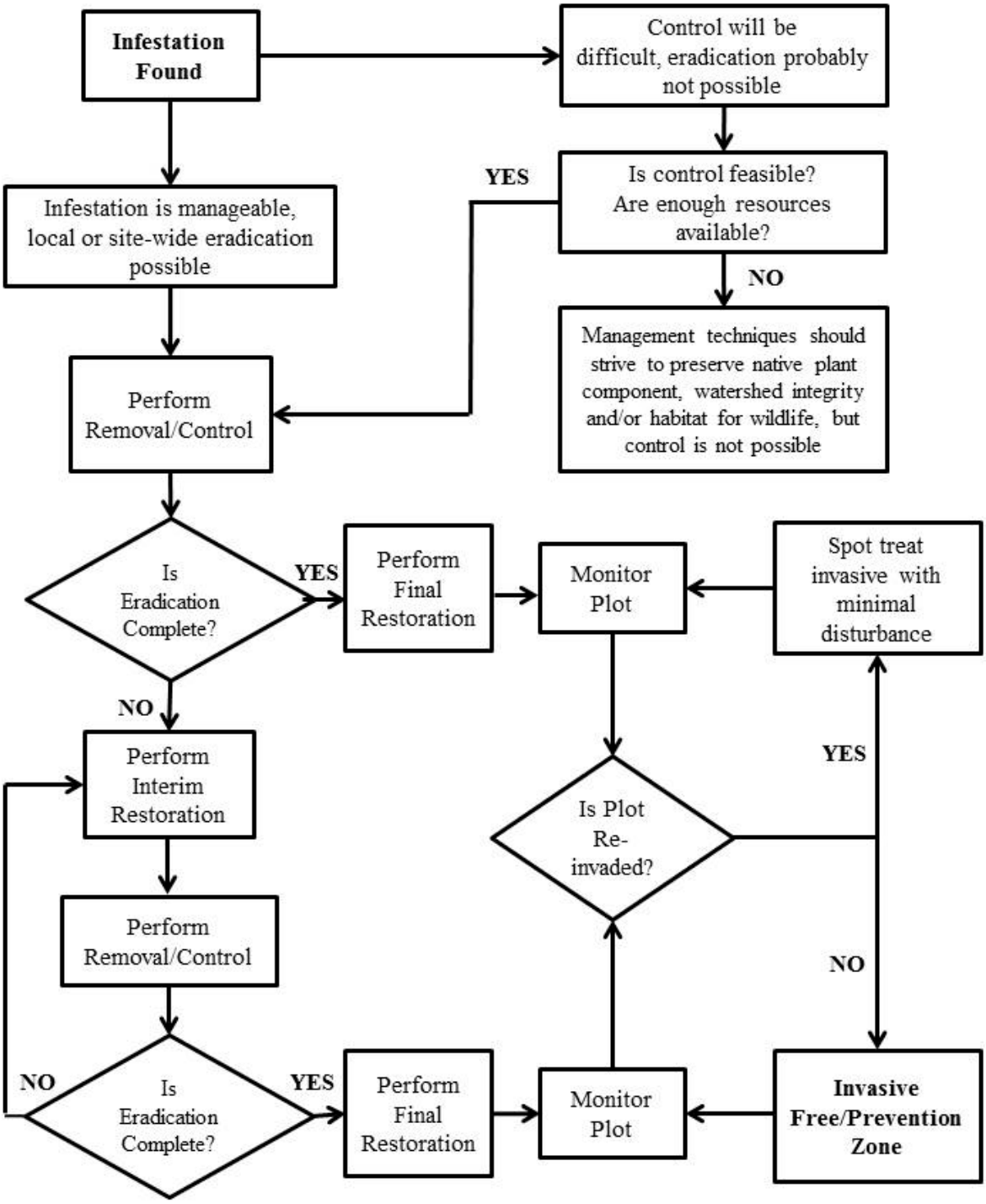


Figure 1. Invasive species removal and native species restoration (enhancement) model.

## Roles and Responsibilities for Implementation

Implementation of this plan will involve coordination between OPRHP staff at the park, the regional office and the Department of Environmental Stewardship and Planning (ESP).

Hereafter, this collective will be referred to as the Implementation Panel. For example, representatives might include the Park Manager, Maintenance Manager, Regional Environmental Manager and/or Biologist, and the Environmental Analyst. This team is also responsible for delegating all responsibilities associated with the execution of the plan.

The Implementation Panel should meet annually to discuss implementation of the management plan and specific actions that will be taken during the year, the recommendations herein should be reevaluated over time. Yearly plans must take into account the availability of funding and staff, and results of the previous year's progress.

On-the-ground players enacting this plan will include a variety of personnel, which may include: the regional Invasive Species Strike Team, hired contractors, regional environmental staff, park maintenance staff, and volunteers. Communication among these groups is critical. Ultimately, the delegation of tasks is the responsibility of the Implementation Panel. Continued participation in the Long Island PRISM (LIISMA) is an important role for the agency, and regional environmental staff will continue to attend these meetings and find ways that the agency can fully participate in its activities. We will also seek collaboration with NYC DEC, US NFWS, and regional colleges to share ideas and opportunities for funding and staffing.

## State Park Overview

### Location and Surroundings

Hempstead Lake State Park (HLSP) is a 900-acre park located in the Town of Hempstead, southwestern Nassau County, in the Long Island OPRHP Region (Figure 2). HLSP is bordered by residential neighborhoods, a golf course, and an athletic complex. The park provides greenspace in an otherwise highly developed area. The park's main feature is Hempstead Lake - the largest body of freshwater on Long Island. In addition to the lake (a dammed reservoir), there are two ponds in the north end (Northwest Pond and Northeast Pond) and two ponds in the south end (McDonald Pond and South Pond). A major highway, the Southern State Parkway, runs through the north end of the park between Hempstead Lake and the northern ponds.

### Uses and Invasive Species Conflicts

The park is highly valued for birdwatching, dog walking, picnicking, horseback riding, fishing, tennis, and other recreation. Recreational facilities offered by the park include sports facilities (for baseball, basketball, soccer, and tennis), a boat launch, an indoor carousel, a dog walk area, picnic areas, and pavilions. It has playgrounds, comfort stations, a superintendent's house, and a park police headquarters building.

The park has several trails running through it, some of which connect to the surrounding neighborhood. These include the Hempstead Lake Bridle Trail and several walking trails. There is also a Hike/Bike Trail which runs along the eastern boundary, parallel to the bridle trail.

Invasive species reduce the quality of habitat in the park for wildlife, crowd out native species, and damage the aesthetic value of the park. Thus, there is clearly a need to provide careful stewardship to manage invasive species. One of the challenges is the prevalence of planted invasive species (e.g., English ivy) in the surrounding residential neighborhoods.

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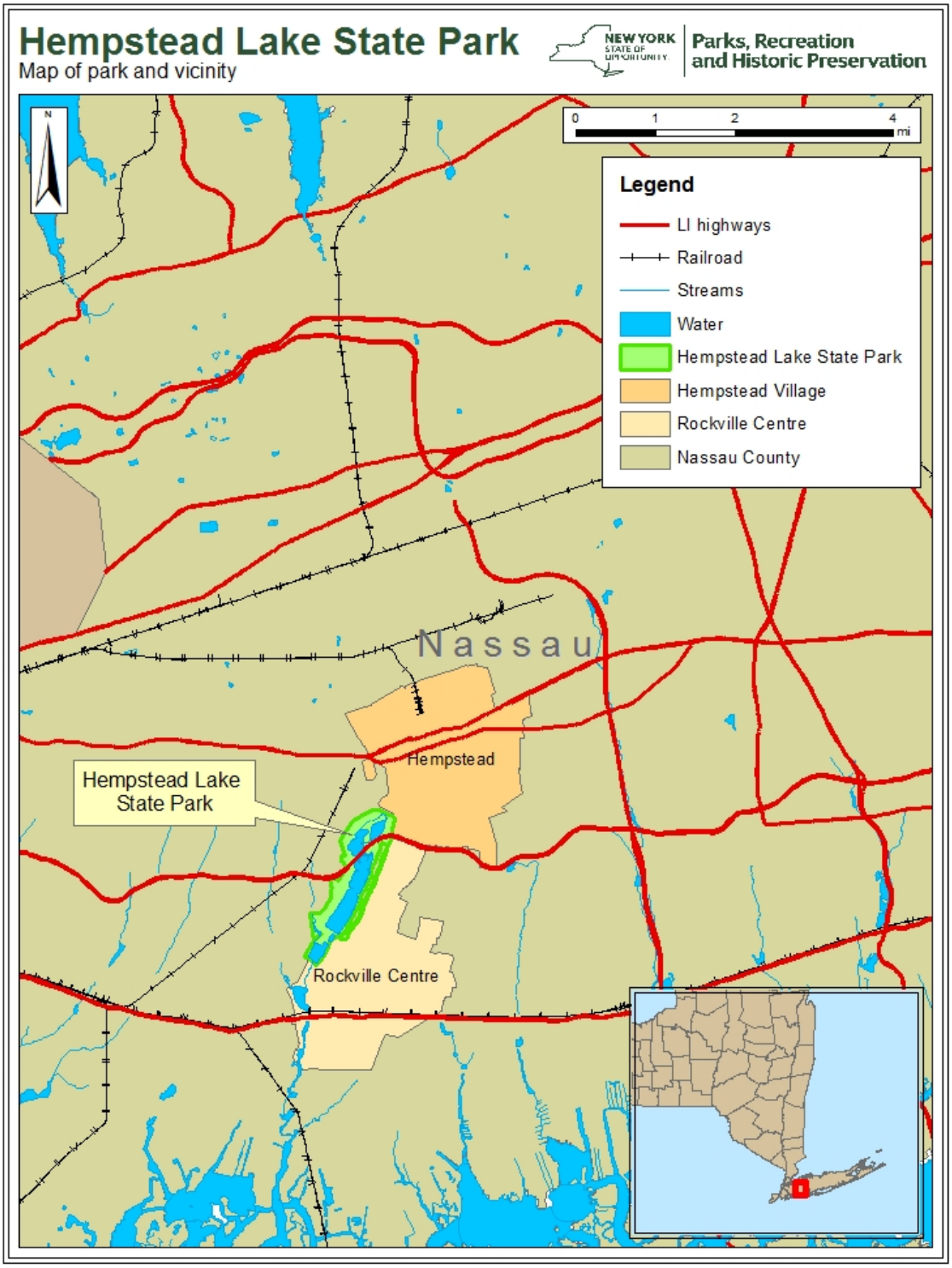


**Figure 2 – Hempstead Lake State Park location map**

## Establishment of the Park

The property which became HLSP was once held by the City of Brooklyn as a backup water supply. In 1874, The Brooklyn City Water Works created the Hempstead Storage Reservoir (now, Hempstead Lake) by damming the Mill River (also known as Hempstead Creek). The resulting reservoir covers 167 acres. When New York City was consolidated in 1898, the reservoir was abandoned. There are a few structures in place from the time when the reservoir was used, including two brick gatehouses located at the south ends of Hempstead Lake and South Pond, respectively.

In 1924, New York State revised and expanded its comprehensive state park and parkway plan, and established the Long Island state park region. Hempstead Lake was established as a State Park in 1925. It is one of Long Island's oldest state parks.

When the park was established, the Southern State Parkway looped around the southern shore of the lake between exits 18 and 19. In 1947, the route of the highway is straightened, which necessitated the construction of an earthen dam across the northern third of the lake. This created two ponds in the North end of the park: Northeast Pond and Northwest Pond. (Information in this section drawn from Howe 2017).

## Natural Resources

### *Geology, Topography and Soils*

The geology underlying HLSP is Monmouth Group, Matawan Group, and Magothy Formation. This is comprised of silty clay, glauconitic silty clay, sand, and gravel. Hempstead is part of the outwash plain from the last glaciation, in which glaciers stopped north of Hempstead. There is very little topographic variation within the park.

### *Ecological Communities*

There are 13 natural communities in HLSP, if the impoundments are included (New York Natural Heritage Program 2015). Of these, one is designated as a significant community: coastal plain pond shore. The other natural communities include forests (coastal oak-heath, coastal oak-hickory, successional southern hardwood), swamps (red maple-black gum, red maple-hardwood, shallow emergent marsh, shrub swamp), impoundments, and successional habitats (old field, shrubland). Most areas are some combination of these communities. There are also mowed and developed areas of the park. Refer to Edinger et al. (2014) for the descriptions and explanations of community types, and see Figure 3 for a map.

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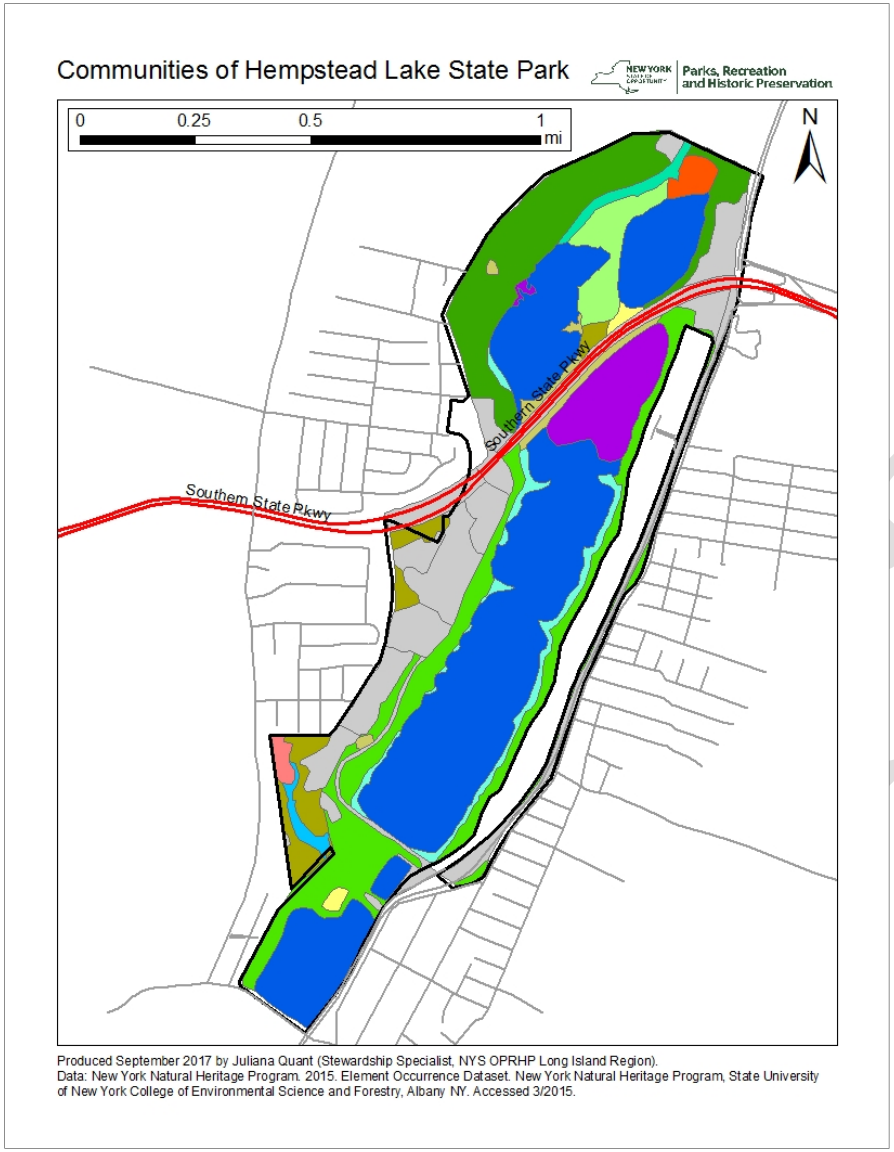


Successional Southern Hardwoods

**Figure 3 - Map of ecological communities at Hempstead Lake State Park**

### *Flora*

The flora of the site is typical of its ecological communities. However, non-native species have invaded the park to a significant degree, and have altered the typical floral composition of the communities.

### *Endangered, Threatened and Rare Plant Species*

In HLSP, there are monitored populations of two rare plant species: hyssopleaf thoroughwort (*Eupatorium hyssopifolium* var. *hyssopifolium*) and globe-fruited ludwigia (*Ludwigia sphaerocarpa*). Both species are imperiled in New York State (rank S2). The thoroughwort is located in the area of the coastal plain pond shore (a significant community), while the ludwigia is located in a shrub swamp. (Rare plant species data from New York Natural Heritage Program 2015.)

### *Fauna*

The site's wildlife is typical of the region and the suburban setting, including a wide diversity of mammals, birds, fish, amphibian, reptiles, and insect species that are commonly found in the Northeastern United States. There are no known populations of endangered, threatened, or rare animal species.

## A History of Invasive Plants at Hempstead Lake State Park

Hempstead Lake State Park's position in the suburban landscape leaves it vulnerable to infestation by invasive species. Some invasive species in the park are (or were) used as landscape plants in neighboring residential areas. Additionally, traffic through the park by pedestrians, horses, and bicycles can introduce the seeds of invasive species.

In recent years, NYS OPRHP has been taking on the invasive species in the park. The park maintenance staff has been trying to control growth by cutting the vines on trees, removing Japanese knotweed along the trails, cutting ivy and other vines off fences, and clearing the upstream face of the Hempstead Lake Dam. Parks staff has used a power take-off (PTO) driven brush mower, hand tools, and (in some cases) application of chemical herbicides.

The New York State Parks Invasive Species Strike Teams have also worked in HLSP. In 2017, the Long Island Strike Team worked in the park, removing parrot feather (*Myriophyllum aquaticum*) and young Oriental bittersweet stems (*Celastrus orbiculatus*) manually.

As steps into future management in the park, inventory efforts (detailed below) were initiated in 2016 and 2017, and the writing of this plan began in 2017.

## Conservation Goals for Hempstead Lake State Park

Invasive species detract from the enjoyability of the park (see "Uses and Invasive Species Conflicts," above). There are several potential benefits from invasive species management at HLSP, including the following:

- Providing a healthy habitat for wildlife and an enjoyable aesthetic appearance for patrons;

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- Stewarding land in a way that minimizes the contribution of invasive seeds to the surrounding landscape;
- Conserving biodiversity by managing rare species and significant communities responsibly;
- Protecting structural elements of the park such as canopy trees and fences; and
- Being a good neighbor to adjacent landowners.

While aiming for these benefits it is important to take a practical approach. With this in mind, we will prioritize areas that are relatively uninvaded thus far, are along frequently used trails, or overlap with significant communities and rare species habitats. We will also minimize removals in areas that would expose the neighboring community to public view from within the park. At HLSP, there is also construction underway that will affect the timing of our management efforts. For the prioritization of areas, see Appendix H.

We will prioritize species such as invasive vines (which can kill trees and overtop fences) and also those species that can become particularly problematic and difficult to remove if permitted to spread. Although there are some canopy trees in the park which are classified as invasive species, we do not plan on removing such large trees since they contribute significantly to the habitat structure and aesthetic value of the park. For the prioritization of species, see Appendix E.

# Invasive Species Management and Native Species Enhancement Plan

This section lays out in detail the goals, objectives, and actions required for invasive species management. Many actions are already in progress at Hempstead Lake State Park, and in these cases, relevant data and a status update (as of the date of publication) are provided. As invasive species control is already an ongoing process at the site, each goal section also contains a summary of the current work being done and plans for future control work. Future directions are also outlined.

## Goal 1 – Inventory and Map Invasive Species

### Objective 1 – Gather Knowledge on Invasive Plant Species

***Action 1a. Define List of Invasive Species and Their Invasiveness Rankings***

The New York Invasive Species Council (ISC) has developed a standardized list of known invasive species in New York and their statewide invasiveness rankings (ISC 2010). The Nature Conservancy in New York and the Brooklyn Botanic Garden developed the ranking system, designed to assess the invasive nature of non-native plant species, in 2008. The ISC, in consultation with the Invasive Species Advisory Committee, adopted the plant ranking system for use statewide in 2009 which can now be found on the New York Invasive Species

Information website (http://nyis.info/). State Parks will consider any species listed as an invasive species if present at or threatening the park. The ranks of each species observed in HLSP can be found (along with the preferred control methods) in Appendix F.

***Action 1b. Train Staff and Volunteers.***

Formal training on the identification and control of invasive species will be given to new staff and volunteers. Staff will pursue new information regarding best practices in invasive species control and seek expert advice whenever necessary. Invasive species factsheets on identification and control have been developed and will continue to be developed and updated as new control techniques become available.

A field guide on invasive plants is an essential tool in becoming knowledgeable on invasive plant species. Two valuable publications are "Plant Invaders of Mid Atlantic Natural Areas", published by the National Park Service (NPS) and U.S Fish and Wildlife Service (USFWS), and the "Invasive Plants Field Guide and Reference Guide: An Ecological Perspective of Plant Invaders of Forests and Wetlands" published by the United States Department of Agriculture (USDA) Forest Service. Using these guides will assist in becoming familiar with the species within the Park. Survey reports prepared by the NY Natural Heritage Program, other documents prepared by local groups and the NY Flora Atlas are other important resources that can be used in becoming familiar with invasive species.

## Objective 2 – Collect and Store Data on Invasive Species and Their Locations

Knowledge of invasive species occurrence and density is essential in creating successful management strategies. A standardized inventory and mapping method has been developed and a protocol can be found in Appendix A. The collection of complete inventory data will be an ongoing process. As of August 2017, sufficient data on the presence and abundance of invasive species have been collected for focused management efforts to begin.

***Action 2a. Plan Survey***

The area to be surveyed must be delineated before fieldwork begins. At HLSP, we started with a trail map of the park and divided the survey area into sections based on clear landmarks.

***Action 2b. Collect Occurrence and Abundance Data***

We surveyed the areas we had defined, and refined area boundaries based on invasive species presence and composition. We used a GPS to collect information in the field. In early surveys, the presence of invasive species was recorded along with incidental notes; in later surveys, abundance was recorded as approximate percent cover of the section. It will be important to re-survey after treatments to determine effectiveness and provide a new baseline. Field notes will be entered into MS Excel.

## Objective 3 – Create Maps Linked to Survey Data

***Action 3a. Create Inventory Maps from Occurrence and Abundance Data***

*Informal surveys* - The iMapInvasives cell phone app will be used by trained staff and volunteers to update and report infestations. Other useful tools for recording invasive species occurrences digitally include the cell phone app Survey123 and GPS Tracks.

*Formal surveys* – In the first year, the survey areas sketched on the paper map were transcribed into ArcGIS by tracing polygons on an aerial image. The polygons are labeled with codes that correspond to a table of species presence/absence and abundance. Points collected with GPS units were also uploaded into ArcGIS. In future seasons, we can re-survey the same areas by referring to the GIS map. The first-year data will serve as a baseline record of infestations (before any removal efforts have taken place). Data collected in subsequent years will inform the effectiveness of treatments, and in so doing will be essential to the adaptive management approach.

### Current Status: Invasive Species Inventory

In 2017, surveys were conducted along the trails of the park. The first surveys were done in the winter (December 2016-January 2017). This proved valuable in that some of the evergreen invasive species (e.g., Japanese honeysuckle) are more evident when the deciduous leaves are off. Surveys continued in April through August. The surveys in July and August included records of percent cover of species by section. The surveys were conducted by the Long Island Regional Biologist, Stewardship Specialist, and interns.

The maps of HLSP divided into survey sections and the corresponding table of data are available in Appendices B and C.

## Goal 2 –Prioritize Invasive Species for Control and Set Targets

In this step, we will use the inventory data to create a ranking based on species' prevalence in the park (infestation size: major, EDRR, or special), significance of impact (invasiveness ranking), and the conservation goals of the park. This park-specific prioritization of species allows us to tailor our control efforts most effectively.

### Objective 1 – Prioritize species and sections to be controlled

***Action 1a. Categorize species by their prevalence in the park and invasiveness rankings***

The species were prioritized primarily using the decision tree in Appendix D. Species were considered major concerns if either: a) the total cover (sum of percent cover in all sections in which the species appears) is >50%, or b) the frequency (total number of sections in which it appears) is >14. These cutoffs are somewhat arbitrary and designed to facilitate management at HLSP. Species with lower cover or frequency were considered "EDRR" (early detection and rapid response).

***Action 1b. Prioritize based on other concerns***

There were a few species that deserve special consideration. Garlic mustard occurs in 21 sections, but has very low percent cover- it offers good potential for volunteer projects but is not a major management concern. White mulberry is also frequent (16 sections), but occurs as single individuals and is not very invasive, so it is not a major problem. Norway maple is widespread throughout the park and a major canopy component, but its plentitude means that removing the species would drastically compromise the structure and function of the vegetative community.

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Common reed occurs as a few stems in one area on South Pond, and also in a large dense area at the north end of Hempstead Lake; for this species, the two populations are addressed separately.

Quantity aside, we increased the priority of some species based on the invasiveness ranking and the ways in which the species interferes with the conservation goals of the park. Finally, a few species were elevated in priority because their particular infestation would be easy to control if addressed right away. All of the species prioritizations can be found in Appendix D.

***Action 1c. Prioritize sections for control***

At Hempstead Lake State Park, there is a need to approach invasive species management by working in sections. There is major construction underway at the park, and this will affect the timing of our control efforts (Appendix H). However, EDRR species should be addressed right away, and they are located in many sections (see species by section in Appendix C, and species priorities in Appendix D).

### Objective 2 – Set targets for percent cover of invasive species

The invasive species occur in varying quantities in the park, and with different impacts on our conservation goals. As such, there are a few different target levels for the species in the park. The timeline for reaching these targets is spelled out in Appendix G.

The first target level is to remove the plants from trees: this applies to invasive vines that threaten the survival or flourishing of trees (e.g., Oriental bittersweet), which are an important structural and aesthetic element of the park.

Another target is to remove stems <2” in diameter at breast height (DBH). This target applies to trees with an important canopy presence (e.g., Norway maple), meaning that their total removal would dramatically alter the park in a lasting way. However, by removing the saplings and small trees and replacing them with native species, we can invest in a native-dominated future of the park without severely deprecating the present value of the park.

For species growing along the ground (as shrubs, vines, or forbs), there are targets for reduction of cover: 60% of current cover, 30% of current cover, and reduce to negligible. Complete eradication is difficult in most cases, but it is possible to reduce infestations to a level that a minimal level of effort each year is required to maintain their near-absence. Some of the infestations at Hempstead Lake are so severe that reduced cover and prevention of spread would be a success. In such cases, it is appropriate to begin on the perimeter of the infestation and work toward the heart of it.

### Current Status: Ranking and Prioritization

*Appendices reflect the current status. As priorities and targets change, update the Appendices appropriately.*

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## Goal 3 – Control and Remove Invasive Species

### Objective 1 – Research and choose methods of control

Knowledge of appropriate control methods is key. OPRHP has been developing fact sheets on some of the priority invasive species that occur in New York State Parks. These contain information about both the biology as well as current control methods of each species. Staff will use these fact sheets (and those compiled by other organizations) during exploration into different options available for control. National Park Service fact sheets for numerous invasive plants found in New York State are available at http://www.nps.gov/plants/alien/fact.htm. The USDA Forest Service Fire Effects Information System (https://www.feis-crs.org/feis/) is also an invaluable resource for information about the most effective control methods. Other organizations that may provide insight include New York Invasive Species Research Institute, LIISMA, Cornell Cooperative Extension, New York Flora Atlas, and NY Natural Heritage Program.

Several different methods (or combination of methods) may be employed for invasive control including manual, mechanical, cultural, and chemical. The determination of which species to be controlled in a given year will be based on the prioritizations in Goal 2, availability of resources, and on-the-ground logistics for that year.

Manual removals will be prioritized and used whenever feasible, based on availability of staff, biology of the plant, and scale of infestation. Chemical removals will be limited to infestations of plants that are not feasible for manual control based on a) their growth form (e.g., rhizomatous or able to sprout from root fragments) or b) their distribution or density. The size of an infestation that requires chemical control will differ between species. There may also be times when chemical control is necessary to reduce ground disturbance, such as within archaeologically sensitive areas. Biological control methods will be employed to provide long-term control when approved by the state and the regional biologist.

### Objective 2 – Assess feasibility

Each year, the Implementation Panel will assess the project needs and the availability of funding, resources, and personnel to enact the plan on a continuing basis. The methods of control will be affected by these factors. If using manual or mechanical controls, consult the NYS OPRHP Strike Team leaders (statewide and regional) to obtain estimates of person-hours required for the quantity of the species to be removed. The species and the size of the plant will affect removal logistics. In addition, the status of other improvements in the park will affect the timing of invasive control efforts.

### Objective 3 – Develop timetables

Invasive species removal schedules will be dependent upon outdoor conditions for various methods, soil conditions, and species phenology. Therefore, dates and times of removals will vary year to year. Manual and mechanical removals will take place throughout the site for a

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variety of species, and when appropriate, large volunteer groups will be put to use. An invasive removal log (Appendix I) will be filed for manual and mechanical removals, to later be added to iMapInvasives. Controls efforts are contingent on funding, available staff, and timing.

Timetables for implementation were developed accounting for time needed for all parts of the process, including: plan revisions and SEQR approvals, yearly logistical plans, pollinator habitat and native grass installations, manual invasive removals, chemical invasive controls, replacement of removed plants with native plants, and evaluation and communication of project success. The promotion of stewardship goal will be an ongoing effort, conducted throughout the year over several years.

### Objective 4 – Obtain approvals for planned removals

OPRHP has adopted a pesticide policy, limiting use of pesticides at NY State Parks. In the case of invasive controls, "pesticides may be used to control invasive plant or animal species, including forest pests and pathogens, that pose a significant threat to important natural or recreational resources and that cannot be controlled through non-chemical means" (OPRHP 2009). Any proposed use for treatment of invasive species in New York State Parks must be approved by the Department of ESP (518.391.3953 or 518.474.0409). Chemical treatments must be performed by a NYSDEC Certified Pesticide Applicator.

Any addenda to this Invasive Species Management Plan must be put through a SEQR checklist (Appendix N) to determine potential need for further review. This process will include annual checks of Cultural Resource Information System and DEC's Environmental Resource Mapper based on the target project area for the year. Further discussion of this process is included in the Environmental Review Section at the end of this Plan.

### Objective 5 – Removals and/or controls

#### *Action 4a. Logistics and preparation*

Each year will require an assessment of available resources (equipment, materials, personnel, funding) and on-the-ground conditions. This should happen at the end of the field season to prepare for the coming year. This process will help readjust priorities and methods, and determine the best way forward. Questions to address (adapted from NYC Parks 2014) include:

- What is the existing vegetation? (Refer to the previous year's surveys)
- Are our targets for this year practical?
- What specific removals in what areas are we taking on?
    - What is the timing for each?
    - Are manual removals acceptable and effective, or will chemical controls be needed? If the latter, who can do the application?

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***Action 4b. Manual removals (first year) and/or chemical removals (subsequent years)***
Performing removals and controls with a focus on safety is imperative. All removals, manual or otherwise, will be done in accordance with best practices per each species, and in such a way as to limit unnecessary impacts. Removals will be completed by staff, volunteer groups, and/or hired contractors. Any removal actions should be done within the context of this plan and work to achieve the goals outlined in this document.

When working with large volunteer groups, an inventory of tools and other items must be taken before and after the removal is performed. Staff needs to check that all items are returned. It is always a good idea to include some education, interpretation, and recreation for volunteers after a hard day's work.

Although manual and mechanical removals are often preferable, for some species these methods are either ineffective or can intensify infestations. In such cases, the use of pesticides is recommended (see preferred control methods, Appendix F) or, if that is not a viable option, taking no action may be the most prudent. These decisions should be made case-by-case, considering SEQR regulations, the NYS OPRHP pesticide policy, on-the-ground conditions, and availability of appropriately licensed pesticide applicators.

### Current status: Removals and Controls
As of the first writing of this plan, management of invasive species in the park has been conducted, but without a formal and comprehensive strategy. Park staff have cut Oriental bittersweet and other vines, removed Japanese knotweed, and cleared the upstream face of the Hempstead Lake dam. Also, the Invasive Species Strike Teams have done some work there. These efforts are summarized in the Introduction.

### Objective 6 – Report on the results of efforts in iMap
Manual removal data will be collected in the field via an Invasive Species Log (Appendix I) in and then uploaded to iMapInvasives. Chemical treatment areas will be mapped using GPS and uploaded to iMapInvasives. Maps will be created of treatment areas using GIS as necessary. Monthly photos at standard reference points will capture a majority of large scale changes following the invasive species removals over the course of the year, and before and after photos will be taken regularly.

## Goal 4 – Native Species Enhancements
The goal of controlling invasive species is to restore, enhance, and/or protect native natural communities. Invasive species control and subsequent restoration of natural communities will preserve biological diversity, enhance community resilience and watershed integrity, and restore important chemical, biological and physical characteristics to the ecosystem. In the case of Hempstead Lake State Park, the suburban and fragmented nature of the landscape is not conducive to a traditional restoration (in the sense of returning to a historic condition), but rather an enhancement (improving ecological function, and trading invasive species for native ones). Complete removal of all invasive species at HLSP is not in alignment with our goals: it would decrease aesthetic value of the park to have such a dramatic change, and it would removal visual

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barriers with the surrounding neighborhood. As such, there will be remnant IS populations. Installing native species adjacent to remnant infestations should be carefully considered, as there may be conflicts with competition from, and continuing management of, the invasive species.

At HLSP there are two goals of enhancement plantings: 1) to replace invasive species singly or in small patched as they are removed, and 2) to install herbaceous native habitats over large areas on the dams (where woody plants are being removed). The herbaceous native habitats will include an area planted with forbs that are beneficial for pollinators (on the dam south of Hempstead Lake), and an area with native grasses (the dams on Hempstead Lake and South Pond).

## Objective 1 – Overall plan for native species enhancement

This plan recommends species to be used for enhancement purposes. The enhancement design for particular spaces in the park requires a high level of logistical detail; herein, we describe what issues need to be addressed before any enhancement action should be taken. Figure 1 outlines the restoration process beginning with assessing the infestation and determining the feasibility of success, then moving through the control and restoration process and all while incorporating monitoring to inform management.

### *Action 1a. Plan site preparation*

Lay out the area to be planted, answering the following questions (adapted from NYC Parks 2014):

- What type of planting is to be done: a one-for-one replacement of a removed invader? What about pollinator habitat, or grassland?
- What is the total area to be planted?
- What is the soil type (texture, pH, organic matter, etc.) and moisture availability?
- What are the light conditions?
- Which areas will be planted with seeds and which with plugs?

On-the-ground preparation of the site, after the removal of woody species and invasive species, will require a thorough plan. Consulting the Long Island Regional Horticulturalist for the details of this plan is highly recommended.

A possible procedure might include: clearing the ground with a backhoe, adding soil, smoothing with hand rakes, tilling, removing rocks, and leveling. Planting may occur in late fall or early spring. It may be necessary to plant in the fall of year 1, rather than in spring, to optimize the likelihood of success and provide adequate time for planning and acquisition of materials (Victor Azzaretto, personal communication).

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***Action 1b. Plan maintenance***

Required maintenance includes ongoing removal of weeds (including invasive exotic species), with a strong preference for manual methods to reduce risk of damaging the pollinator species. In the months immediately following planting, a regular and heavy watering regime will be necessary. Also, as damage occurs (from storms or other disturbances), areas will need to be re-seeded or re-planted. We recommend not mowing May through July to prevent disturbing ground-nesting birds. The personnel requirements for maintenance will vary based on the weed seed bank of the site and other factors, but may require attention from several times a week to daily particularly during the early months after planting.

***Action 1c. Develop timetables and targets***

Native species installation schedules will be dependent on on-the-ground conditions (e.g., weather, construction, invasive species removals) and species factors (e.g., phenology). Installation dates will vary from year to year. Where possible, we will use volunteer groups for planting efforts (for recruitment techniques, see Goal 6).

Plants should be fully established by 2 years after planting (NRCS 2011). In order to stabilize the dam, our objective is to attain >80% cover of native species by the end of year 2. In the pollinator area, we aim for >50% cover of native wildlife-friendly plants.

### Objective 2 – Choose native species to be used in general enhancements

The removal of invasive species throughout the park and of woody plants from the dam will disturb the soil. Disturbed soils present an opportunity for re-invasion, and post-removal invasions can often be more problematic than the original invasion. There are three general strategies to restoring native plant communities:

1. Allow for natural re-growth of native vegetation
2. Fully restore control areas immediately after removal
3. Enhance control area(s) in stages (involves multiple removals/plantings)

At HLSP, there is an abundance of invasive species in the park and in the surrounding landscape: thus, allowing natural reseeding would not be effective. Due to the practical needs of the site, a staged enhancement would be the best option, though in some cases replanting immediately after removal would be effective.

Successful enhancement planting will fend off future invasions, and completing this important step is integral to the success of invasive species management. Planting plans will necessarily be different in each situation and so will be developed per each site. Follow-up monitoring and removal of invasive regeneration within removal/control areas are important for allowing the restoration efforts to take hold and will be discussed in the next Goal 5.

For replacement plantings (where invaders have been removed anywhere in the park), we provide a list of general enhancement species. The goal is to fill the gaps left by removal to

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prevent recolonization of invasive species, and to increase biodiversity and aesthetics throughout the park.

For pollinator habitat, we provide a list of wildlife-friendly species. Our goals for the pollinator habitat are to stabilize the dams with the roots of herbaceous species native to Long Island, while at the same time encouraging pollinators, increasing biodiversity, improving ecosystem function, and adding aesthetic value to the park. Much of the existing vegetation will need to be removed, including invasive plants to the extent possible (outlined elsewhere in this plan) and all woody vegetation. There are no rare plants documented on the dams.

***Action 2a. Choose species for general enhancement***

To replace invasive species as they are removed, we will use a diverse mix of species that are appropriate to the soil type and hydrology and are native to Nassau County. According to the OPRHP Native Plants in State Parks and Historic Sites Policy a native plant is defined as, "any plant species that has evolved and naturally occurs in New York State" (OPRHP 2015). The policy cites the New York Flora Atlas (http://newyork.plantatlas.usf.edu/) as the authority for determining if a plant species is native to New York State. Native species used in enhancement must be native to Nassau County, and should meet more than one of the following criteria. The species should be:

- Already onsite - Surveys done by NYNHP (unpublished data) provide information about the existing native species onsite (Appendix J);
- Characteristic of communities found in the park - Surveys from NYNHP have described these communities (Figure 2);
- Recommended for use in restoration plantings broadly speaking, from one of the following (or other reputable) sources:
    - Brooklyn Botanic Garden's "Native Alternatives to Invasive Plants" book (Burrell 2011, which provides information on native habitat and range, aesthetic value, and growing tips)
    - NYC Park's "Native Species Planting Guide for New York City and Vicinity" guide (NYC Parks 2011, which suggests species appropriate to the NYC region that are commercially available, resilient to transplanting, provide wildlife value, and are well-adapted to local soil/climate).

By reviewing the species recommended in these various ways and looking for overlap, we have compiled a general list of native species to use in enhancement or replacement in the park (Appendix K).

***Action 2b. Choose species for pollinator habitat***

In the case of the pollinator habitat, we have limited the recommended species list to those which have known pollinator or wildlife value (NYC Parks 2017). The list of recommended species can be found in Appendix L. In the pollinator area, in addition to using species that are region- and site-appropriate, the species will provide a series of bloom times throughout the growing season to optimize availability of food and habitat to pollinators.

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***Action 2c. Source Native Species to be Used in Enhancement***

The OPRHP Native Plants in State Parks and Historic Sites Policy defines locally sourced (local ecotype) plants and seed as, "being derived from plants that occur within the state, ideally from the same ecoregion in which they are to be planted" (OPRHP 2010). Local ecotype plants should be used whenever possible. Local ecotype plants will exhibit a phenology that is in sync with the surrounding ecosystem, therefore maintaining important food web interactions. Plant species that are native to a site, but grown from stock that originated from a different ecoregion, may contain genetic material that could alter local genetic pools and slight physical adaptations. For seeds and plants with local, Long Island genotypes, try Ernst Seeds (https://www.ernstseed.com/) or the Long Island Native Plant Initiative (http://www.linpi.org/). Communicating with the providers of seed and/or plants early in the process is highly recommended to ensure that seeds/plants of adequate quantity will be available on the desired planting date.

### Objective 3 – Native Planting Enactment

***Action 3a. Assess feasibility and allocate resources***

With a general plan in place and species selected, we will assess feasibility. This will involve determining the cost of materials and labor for installation (plants/seeds and site preparation; including rental of equipment, labor, mulch if using) and maintenance (replacement plants/seeds, watering equipment, etc.). These costs may affect the degree to which the plan can be enacted year to year. Additionally, any concerns with timing should be double-checked at this point.

***Action 3b. Obtain approvals***

Each season's enhancement plan will be reviewed as discussed in the Environmental Review section below.

***Action 3c. Planting***

All site preparation, planting, and maintenance will take place during the growing season except as otherwise required by species phenology.

***Action 3d. Reporting***

This plan will be updated at the end of each growing season to reflect what species have been planted in which areas. If possible, a more complete report celebrating successes with photos and details should be produced and shared with the public.

### Current status: Restoration of Native Species

As of December 2017, on-the-ground restoration has not begun.

## Goal 5 – Maintain Native Ecological Systems

Maintaining native ecological systems will be achieved by preventing re-introductions of invasive species in areas where removal/control has taken place, and stopping new invasions of invasive species as they occur through an Early Detection and Rapid Response program.

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### Objective 1 – Monitor control locations post-removal

After removal/control is performed, further monitoring is needed in order to reassess actions performed and to determine what control methods and restoration practices may need to be adapted. Surveys should continue to take place after restoration planting and data can be used to show progress and monitor the success of plantings. Any regeneration of invasive plants should be treated according to the best practice method outlined in the restoration plan.

### Objective 2 – Monitor invasive free zones

To promote a successful rapid response program, it is important to identify species that pose a high risk to the region in general and to be prepared to act quickly if an invasive free or prevention zone is invaded. Early detection species and areas take precedence over any other removal projects. Monitoring efforts will be recorded using the form in Appendix M.

Rapid response includes immediate data collection and planning of eradication and control. All of the steps outlined in this management plan will begin immediately including making additions to the Removal Schedule for the current field season whenever possible. Early detection and rapid response is the best management practice for overall invasive species prevention and eradication.

As experimental and landscape scale control progresses, protection areas and prevention zones will be designated, monitored and maintained as weed free to the greatest extent possible. Special attention will be paid to early detection and rapid response.

### Current Status: Maintaining Native Ecological Systems

As of December 2017, on-the-ground restoration has not begun.

## Goal 6 – Promote Stewardship

### Objective 1 – Institute training programs

Volunteer stewards, will be used during all steps of management. Volunteers are well suited to time- and labor-intensive objectives. To make the most of volunteer efforts, training programs have been developed so that the volunteers, partners, and staff have a basic background on invasive species, native plantings, and safety protocols. Interns with skills in problem solving and public outreach will be trained similarly to volunteers, with a project-specific focus. Training will take place before removals or plantings, and the training staff will be delegated by the Implementation Panel. Training programs that have been created for other parks will be used whenever possible.

#### *Action 1a. Develop Training Programs*

All stewards (volunteers, interns, and other personnel) will be trained on identification, control, and safety. The completion of each goal of the plan requires both a basic training and more advanced training program. NYS OPRHP will offer and deliver various types of training. The basic, individual training program is for volunteers who are there for one or infrequent days to

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perform one aspect of invasive management, such as removal and control or restoration planting. This type of training program will include:

1. Welcome and Introduction (if a group)
2. Overview of the overall goal (invasive species removal or native species planting, as appropriate)
3. Safety lecture
4. Plan of the day (i.e., conduct and order of activities)
5. Question and Answer Session

Advanced training programs are for volunteers with a higher level of commitment. These trainings focus on particular interests of the volunteers (in alignment with one or more goals of the plan) and will be more detailed.

In addition to training outside groups and the public, it is necessary to have staff training. This will occur in spring or early summer and will be specific to the roles staff can play in enacting this plan. Field-based staff will receive training on species identification and data collection. This is an excellent way to gather data and initiate early detection and rapid response. It should be noted that the field staff at a park can be the most valuable resource a coordinator has for constant monitoring of the park.

Annual training events will be designed to introduce stewards to the project goals. These events will provide coordinated, timely training to long-term volunteers and interns, and will cover invasive species topics, outreach, native plant identification, fauna identification, and OPRHP professional conduct and safety. Outside experts will be brought in to the extent possible to lend new perspectives, increase staff knowledge, and create further contacts for stewards.

***Action 1b. Perform Outreach***

There are a variety of ways to get the word out about the need for volunteers. Contacting local schools and colleges may help, as many students have requirements for community service hours. Other potential groups to reach out to include: Boy and Girl Scout Troops, the Student Conservation Association, Long Island Botanical Society, the New York Flora Association, and the Long Island Invasive Species Management Area (LIISMA). Media for outreach include local newspapers, online event calendars (such as LongIsland.com), environmental publications/ newsletters, Facebook and other social media, and fliers in HLSP and other parks.

***Action 1c. Train Volunteers/Partners/Staff***

Volunteer training will occur as often as possible and on a variety of days and times throughout the field season. The staff assigned to training, the Implementation Panel, and other stakeholders will collaborate to develop a training schedule, and an annual plan for outreach.

## Objective 2 – Educate

Staff will seek out education programs (separate from training programs) annually with an emphasis on the threats invasive species pose to native biodiversity, economics, aesthetics, and

human health. Workshops provided by LIISMA and the Cornell Cooperative Extension In-Service's Invasive Species Track are ideal for expanding knowledge and training beyond what is available within OPRHP.

### *Action 2a. Research and Design Education Programs*

Educational program development has, for the most part, been done by others. There are several K-12 programs available for free over the internet. An example of a primary school curriculum, from California State University Monterey Bay and Bureau of Land Management, is located on the web at: http://watershed.csumb.edu/ron/roncor/cor/index.htm. Programs such as this can be used in part, whole, or tailored to meet specific educator needs. The basic training program is well suited as an educational tool for general public programs delivered at nature centers and other venues and events such as Earth Day or Invasive Species Awareness Weeks.

### *Action 2b. Coordinate School-Based Programs*

Education will include coordinating with school based-programs. Classroom and field activities will include actual removals wherever possible. Traveling offsite to deliver education programs outside of the growing season will be encouraged. Classroom presentations and collaborations that include a field work or project component will be prioritized with an effort to create annual programming relationships. Possible campuses to collaborate with include: Molloy College, Nassau Community College, Hofstra University, SUNY Old Westbury, SUNY Farmingdale, SUNY Stonybrook, and others.

### *Action 2c. Develop Public Information Campaign*

Information about invasive species should be included in park kiosk panels, brochures, flyers, and newsletters to raise the overall level of awareness and promote participation and stewardship. The distribution of information on early detection is especially important, since this minimizes time and effort is needed to control and eradicate. When a citizen locates a new infestation, it will be suggested that images rather than voucher specimens be taken of the suspect invasive, as often species are misidentified and the possibility that a rare species is mistakenly collected needs to be avoided.

## Objective 3 – Develop working partnerships

Acting locally in partnerships is especially valuable and ad hoc groups involved in environmental issues will be sought out or created. Environmental commissions, university environmental science and natural resource departments, and watershed organizations are other such groups will be sought to collaborate with in invasive species management.

### *Action 3a. Assist with Community and Private Landowner Actions*

Disseminating information to surrounding private landowners and encouraging them to restore native species on their land is essential to the success of any invasive control program over the long term. Private lands are the largest segment of the state with invasive species to manage. Educating the private land owner in public forums and cooperative demonstration projects is a step toward statewide early detection, rapid response, and eradication of existing invasive species.

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### Objective 4 – Research and Experimentation

Often volunteers, partners, and academic institutions will have interest and skill in the natural sciences. These valuable persons and organizations can aid in development and augmentation of best management practices and help carry out experimentation. Qualitative and quantitative data analysis can lead to better understanding and new methods of control and eradication. The measurement of failure and success of management practices over time aids in achieving the best cost-benefit ratio in invasive species management. Partnerships will be developed with groups such as the aforementioned universities to perform research within the site.

#### *Action 4a. Conduct Research on Best Management Practices*

OPRHP is open to testing new and innovative control strategies that adhere to the resource management guidelines established for the statewide park system. Whether conducted by park staff or by outside researchers, this type of research will help determine the efficacy and feasibility of new control strategies.

### Current Status: Promotion of Stewardship

While environmental education programs are often done at the park, and there are often programs raising awareness of invasive species in the region, a greater and more focused effort can be made in accordance with the above suggestions.

# Environmental Review

In its actions, State Parks is required to comply with the regulations implementing SEQR (NYCRR Part 617). Thus, a full Environmental Assessment Form (EAF) has been prepared for the PARK Plan. (See *Appendix X*, *Invasive Species Management Plan Environmental Assessment Form*). Overall invasive species control is an action which will have a positive effect on ecological communities and the natural environment of the Site. Therefore, State Parks has determined that the PARK Plan will not have a significant adverse effect on the environment and that an Environmental Impact Statement is not required for this plan. In accordance with SEQR regulations, the agency has prepared a Negative Declaration. The EAF and Plan take into account that certain future control/removal and/or restoration actions may have some impact on the environment, such as ground disturbance and herbicide application. In such cases, further environmental assessment and review may need to be required.

Each year, the Implementation Panel will review the annual project schedule and accompanying project information to determine whether potential environmental impacts have been addressed within this plan and environmental assessment and whether additional consultation with the State Historic Preservation Office (SHPO) and/or review under SEQR needs to occur. This additional review process will assure that individual projects that may cause environmental impacts will receive a hard look. A SEQR checklist will be completed for each of the projects on an annual basis. The SEQR checklist (Appendix N) will look specifically at the need for permits, historic preservation review and potential impacts on rare, threatened or endangered plants and animals or significant ecological communities for specific projects. The SEQR checklist will also

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document whether the project is consistent with the IS Management Plan and Environmental Assessment or whether additional environmental review is needed.

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# Appendix A. Invasive Species Mapping and Inventory Method

This method was devised to suit the needs of Hempstead Lake State Park – a relatively small park (900 acres) in which virtually all areas are accessible by trails.

1. Determine general areas to be mapped.
    a. Determine areas of the park to focus on (based on priorities for the park) and divide those areas into manageable sections with assigned alphabetical signifiers.
    b. Convey the boundaries of the map areas on a paper map, taking into account that the boundaries of the sections may change based on field conditions.
2. Walk or drive trails through the map areas, looking for invasive species.
    a. Areas should be based on predetermined map, but at changes in invasive density, define the end of a section.
    b. At points of interest (e.g., a particularly large patch of mugwort, a single privet individual), take a GPS point and a photo. Write the name of the GPS point and the time of the photo in the data sheet.
    c. Take notes describing each map area.
    d. With a separate line for each species, record percent cover (over entire map area) and make any relevant notes about the species.
        i. Where practical, a count of individuals or estimate of patch size should be recorded.
        ii. In many cases the percent cover will be <1%, since the sections are large and patches of some species are small.
        iii. Where species are growing over one another, each species' percent cover should be considered as a separate layer. It is theoretically possible, though unlikely, to have >100% cover of invasive species in an area.
        iv. NOTE: Since areas are of varying areas and percent cover values are approximate, these percent cover values are relative and not absolute. They may be used to determine which species are major concerns and which are smaller, more manageable infestations. Ultimately the data may be used for setting control targets.
    e. For an example of how to set up and fill in an inventory data table, see **Appendix C: Invasive Species Inventory Table**

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3. Digitize data
    a. In ArcGIS (or similar program), trace polygons of map areas onto orthophotos such that they correspond to the field map. While creating these polygons, include a column in which to enter the Map Area letter. Label the sections with the map area letter (in ArcGIS: Layer Properties > Labels tab > tick “Label features in this layer” and choose the correct Label Field). The labels will allow reference to the inventory table.
    b. The survey section polygons can be overlaid onto a layer showing the community types observed by NYNHP in the park (Park Stewardship staff will have access to these layers). The combination of the survey section and the community type will inform appropriate native species to replace any removed in the implementation of this plan.

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# Appendix B. Invasive Species Inventory Maps

These maps show the survey sections. The table that follows shows what species were found in each section.

Map produced by NYS OPRHP, December 2017. Invasive plant cover data for each Invasive Species Section are available in the corresponding table in this document.

Figure B1: Map of survey areas in the north end of the park.

Figure B2. Map of survey areas in the central part of the park.

Figure B3. Map of survey areas in the south end of the park.

# Appendix C. Invasive Species Inventory Table

Table C1. For each section that is marked on the map, the species present in that section and their respective percent cover is indicated.

| Map area | Species (common) | Species (Latin) | Origin | Sum of Percent Cover (<1% = 0.5%) |
|---|---|---|---|---|
| A | Asiatic dayflower | *Commelina communis* | non-native | 0.50% |
| | Brier | *Smilax sp.* | problematic native | 0.50% |
| | Chinese wisteria | *Wisteria sinensis* | non-native | 0.50% |
| | English ivy | *Hedera helix* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese angelica tree | *Aralia elata* | non-native | 0.50% |
| | Japanese holly | *Ilex crenata* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 15.00% |
| | Morrow's honeysuckle | *Lonicera morrowii* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 0.50% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 30.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 20.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 0.50% |
| | Purple loosestrife | *Lythrum salicaria* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| B | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese angelica tree | *Aralia elata* | non-native | 5.00% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 30.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 7.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 3.00% |
| | White mulberry | *Morus alba* | non-native | 4.00% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 10.00% |
| C | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Mugwort | *Artemisia vulgaris* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| D | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | NA |

Draft

| | | | | |
|---|---|---|---|---|
| **E** | Cypress spurge | *Euphorbia cyparissias* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 1.00% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 10.00% |
| | Morrow's honeysuckle | *Lonicera morrowii* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 30.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 15.00% |
| **F** | English ivy | *Hedera helix* | non-native | 40.00% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 2.00% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 20.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 5.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 20.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 10.00% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **G** | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| **H** | Brier | *Smilax sp.* | problematic native | 20.00% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese angelica tree | *Aralia elata* | non-native | 7.00% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 10.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 30.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 5.00% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| **I** | Aralia sp. (unknown) | *Aralia sp. (unknown)* | non-native | 0.50% |
| | Bamboo | *Phyllostachys aurea* | non-native | 0.50% |
| | Bittersweet nightshade | *Solanum dulcamara* | non-native | 0.50% |
| | Brier | *Smilax sp.* | problematic native | 11.00% |
| | Burning bush | *Euonymus alatus* | non-native | 0.50% |
| | Common reed | *Phragmites australis* | non-native | 0.50% |
| | English ivy | *Hedera helix* | non-native | 12.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Glossy buckthorn | *Frangula alnus* | non-native | 0.50% |
| | Japanese barberry | *Berberis thunbergii* | non-native | 0.50% |
| | Japanese holly | *Ilex crenata* | non-native | 0.50% |

Draft

| | | | | |
|---|---|---|---|---|
| | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 4.50% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 2.00% |
| | Privet | *Ligustrum sp.* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **J** | Brier | *Smilax sp.* | problematic native | 15.00% |
| | Common mullein | *Verbascum thapsus* | non-native | 0.50% |
| | Cypress spurge | *Euphorbia cyparissias* | non-native | 0.50% |
| | English ivy | *Hedera helix* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Grape | *Vitis sp.* | problematic native | 20.00% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 3.00% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 15.00% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 10.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 3.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 8.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **K** | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |
| | Brier | *Smilax sp.* | problematic native | 7.00% |
| | English ivy | *Hedera helix* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Grape | *Vitis sp.* | problematic native | 5.00% |
| | Japanese angelica tree | *Aralia elata* | non-native | 1.00% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 7.00% |
| | Norway maple | *Acer platanoides* | non-native | 2.00% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 10.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 6.00% |

Draft

| | | | | |
|---|---|---|---|---|
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 5.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **M** | Asiatic dayflower | *Commelina communis* | non-native | 1.00% |
| | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |
| | Brier | *Smilax sp.* | problematic native | 0.50% |
| | Burning bush | *Euonymus alatus* | non-native | 0.50% |
| | Common mullein | *Verbascum thapsus* | non-native | 0.50% |
| | English ivy | *Hedera helix* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese angelica tree | *Aralia elata* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 20.00% |
| | Morrow's honeysuckle | *Lonicera morrowii* | non-native | 1.00% |
| | Multiflora rose | *Rosa multiflora* | non-native | 2.00% |
| | Norway maple | *Acer platanoides* | non-native | 30.00% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 40.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 7.50% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 40.00% |
| | Privet | *Ligustrum sp.* | non-native | 0.50% |
| | Rose of Sharon | *Hibiscus syriacus* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **M1** | Asiatic dayflower | *Commelina communis* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Multiflora rose | *Rosa multiflora* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **O** | Asiatic dayflower | *Commelina communis* | non-native | 0.50% |
| | Black locust | *Robinia pseudoacacia* | non-native | 5.00% |
| | Brier | *Smilax sp.* | problematic native | 1.00% |
| | Bull thistle | *Cirsium vulgare* | non-native | 0.50% |
| | Common mullein | *Verbascum thapsus* | non-native | 0.50% |
| | Common reed | *Phragmites australis* | non-native | NA |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Glossy buckthorn | *Frangula alnus* | non-native | 0.50% |
| | Japanese angelica tree | *Aralia elata* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 1.00% |

Draft

| | | | | |
|---|---|---|---|---|
| | Japanese knotweed | *Fallopia japonica* | non-native | 0.50% |
| | Japanese maple | *Acer palmatum* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 5.00% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 30.00% |
| | Purple loosestrife | *Lythrum salicaria* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **O1** | Bittersweet nightshade | *Solanum dulcamara* | non-native | 0.50% |
| | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |
| | Brier | *Smilax sp.* | problematic native | 5.00% |
| | Butter and Eggs | *Linaria vulgaris* | non-native | 0.50% |
| | Common mullein | *Verbascum thapsus* | non-native | 0.50% |
| | Common reed | *Phragmites australis* | non-native | 20.00% |
| | Grape | *Vitis sp.* | problematic native | 5.00% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 15.00% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 30.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 25.00% |
| | Privet | *Ligustrum sp.* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| **P** | Autumn olive | *Elaeagnus umbellata* | non-native | 0.50% |
| | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |
| | Butter and Eggs | *Linaria vulgaris* | non-native | 3.00% |
| | Common mullein | *Verbascum thapsus* | non-native | 0.50% |
| | Common reed | *Phragmites australis* | non-native | 15.00% |
| | English ivy | *Hedera helix* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Grape | *Vitis sp.* | problematic native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 1.00% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 27.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 5.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | NA |

Draft

| | | | | |
|---|---|---|---|---|
| | Privet | *Ligustrum sp.* | non-native | 0.50% |
| | Purple loosestrife | *Lythrum salicaria* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| **PA1** | Common reed | *Phragmites australis* | non-native | 95.00% |
| **PA2** | Common reed | *Phragmites australis* | non-native | 95.00% |
| **Q** | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |
| | Chinese wisteria | *Wisteria sinensis* | non-native | 0.50% |
| | English ivy | *Hedera helix* | non-native | 2.00% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese angelica tree | *Aralia elata* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Japanese knotweed | *Fallopia japonica* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 1.00% |
| | Norway maple | *Acer platanoides* | non-native | 5.00% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 30.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 3.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 7.00% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| **R** | English ivy | *Hedera helix* | non-native | NA |
| | Japanese angelica tree | *Aralia elata* | non-native | NA |
| | Japanese knotweed | *Fallopia japonica* | non-native | NA |
| **S** | Bittersweet nightshade | *Solanum dulcamara* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese angelica tree | *Aralia elata* | non-native | 0.50% |
| | Japanese holly | *Ilex crenata* | non-native | 0.50% |
| | Japanese knotweed | *Fallopia japonica* | non-native | 10.00% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 10.00% |
| | Norway maple | *Acer platanoides* | non-native | 2.00% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 10.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 0.50% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 5.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **T** | Bull thistle | *Cirsium vulgare* | non-native | 0.50% |
| | Burning bush | *Euonymus alatus* | non-native | 0.50% |
| | Glossy buckthorn | *Frangula alnus* | non-native | 0.50% |

Draft

| | | | | |
|---|---|---|---|---|
| | Grape | *Vitis sp.* | problematic native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 0.50% |
| | Japanese knotweed | *Fallopia japonica* | non-native | 0.50% |
| | Japanese maple | *Acer palmatum* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 15.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| **U** | Bittersweet nightshade | *Solanum dulcamara* | non-native | 0.50% |
| | Black locust | *Robinia pseudoacacia* | non-native | 2.00% |
| | Brier | *Smilax sp.* | problematic native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 2.00% |
| | Japanese barberry | *Berberis thunbergii* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 10.00% |
| | Japanese knotweed | *Fallopia japonica* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 20.00% |
| | Multiflora rose | *Rosa multiflora* | non-native | 15.00% |
| | Norway maple | *Acer platanoides* | non-native | 2.00% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 25.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 0.50% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 1.00% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| **V** | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |
| | Brier | *Smilax sp.* | problematic native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Multiflora rose | *Rosa multiflora* | non-native | 2.00% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 10.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 1.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 2.00% |
| | Wineberry | *Rubus phoenicolasius* | non-native | NA |
| **W** | Brier | *Smilax sp.* | problematic native | 0.50% |
| | Common reed | *Phragmites australis* | non-native | 0.50% |

Draft

| | | | | |
|---|---|---|---|---|
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 0.50% |
| **X** | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |
| | English ivy | *Hedera helix* | non-native | NA |
| | Garlic mustard | *Alliaria petiolata* | non-native | 2.00% |
| | Japanese angelica tree | *Aralia elata* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Japanese knotweed | *Fallopia japonica* | non-native | 40.00% |
| | Mugwort | *Artemisia vulgaris* | non-native | 2.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 4.00% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 5.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 7.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **Y** | Parrotfeather | *Myriophyllum aquaticum* | non-native | 0.50% |
| **AA** | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| **BB** | Garlic mustard | *Alliaria petiolata* | non-native | NA |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | NA |
| | Multiflora rose | *Rosa multiflora* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| | tent caterpillars | *Malacosoma sp* | problematic native | NA |
| **CC** | English ivy | *Hedera helix* | non-native | NA |
| | Garlic mustard | *Alliaria petiolata* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| **DD** | Garlic mustard | *Alliaria petiolata* | non-native | NA |
| | Japanese barberry | *Berberis thunbergii* | non-native | NA |
| | Japanese knotweed | *Fallopia japonica* | non-native | NA |
| | Mugwort | *Artemisia vulgaris* | non-native | NA |
| | Multiflora rose | *Rosa multiflora* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| | Tartarian honeysuckle | *Lonicera tatarica* | non-native | NA |
| **EE** | English ivy | *Hedera helix* | non-native | NA |
| | Japanese knotweed | *Fallopia japonica* | non-native | NA |
| | Multiflora rose | *Rosa multiflora* | non-native | NA |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | NA |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | NA |
| **AAA** | Autumn olive | *Elaeagnus umbellata* | non-native | 0.50% |
| | Black locust | *Robinia pseudoacacia* | non-native | 0.50% |

Draft

| | | | | |
|---|---|---|---|---|
| | Bull thistle | *Cirsium vulgare* | non-native | 0.50% |
| | English ivy | *Hedera helix* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 0.50% |
| | Mugwort | *Artemisia vulgaris* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 0.50% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 50.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 10.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 6.00% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 2.00% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |
| **BBB** | Black locust | *Robinia pseudoacacia* | non-native | 2.00% |
| | Common mullein | *Verbascum thapsus* | non-native | 0.50% |
| | Japanese honeysuckle | *Lonicera japonica* | non-native | 2.00% |
| | Mugwort | *Artemisia vulgaris* | non-native | 2.00% |
| | Multiflora rose | *Rosa multiflora* | non-native | 5.00% |
| | Norway maple | *Acer platanoides* | non-native | 0.50% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 35.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 0.50% |
| | Tree-of-heaven | *Ailanthus altissima* | non-native | 0.50% |
| | White mulberry | *Morus alba* | non-native | 0.50% |
| **CCC** | Bittersweet nightshade | *Solanum dulcamara* | non-native | 0.50% |
| | Garlic mustard | *Alliaria petiolata* | non-native | 0.50% |
| | Japanese barberry | *Berberis thunbergii* | non-native | 0.50% |
| | Multiflora rose | *Rosa multiflora* | non-native | 2.00% |
| | Oriental bittersweet | *Celastrus orbiculatus* | non-native | 30.00% |
| | Poison ivy | *Toxicodendron radicans* | problematic native | 20.00% |
| | Porcelain berry | *Ampelopsis brevipedunculata* | non-native | 30.00% |
| | Wineberry | *Rubus phoenicolasius* | non-native | 0.50% |

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# Appendix D. Prioritization of Species for Control

The following flowchart summarizes the method of prioritization for the species observed in Hempstead Lake State Park.

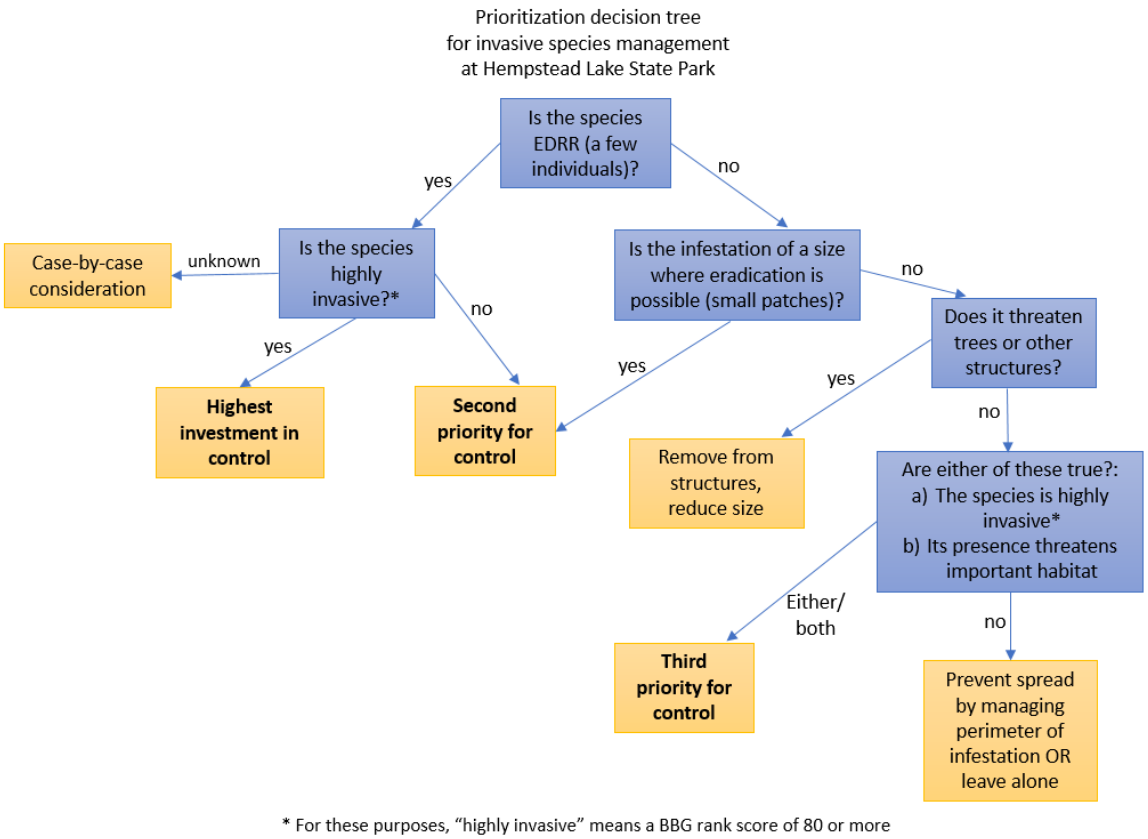


**Table D1. A list of observed species and their priorities.**

Comments:

Data for this table are incomplete. Where information is missing, cells are grey. I have reached out to the authors of the ranking to acquire more information.

Species are sorted by priority and reason for priority. Note that common reed (*Phragmites australis*) is listed twice because the priorities for the two different areas (the large patch and the EDRR patch).

Rel Max Score is the Relative Maximum Score from the Invasiveness Assessment Scores and Ranks for 183 Nonnative Plant Species in NYS, assessed by the Brooklyn Botanic Garden and Funded by The Nature Conservancy. The maximum score for any species is 100%. Rankings consider ecological impact, biological and dispersal characteristics, distribution, and difficulty of control.

Priority # is based on the decision tree above (exception: cells with a "^" have been moved up in priority for the reason stated). It may be necessary to further split the top priorities to increase feasibility.

Origin indicates whether species is native or not. Native species are included for control only if they pose a threat to trees or other structures (i.e. vines)
Concern indicates generally if there is a lot of a species (measured either by cover or by count) or only a little (EDRR)

| Species (common) | Species (Latin) | origin | Rel Max Score | priority # | Reason for priority # | Concern |
|---|---|---|---|---|---|---|
| **Oriental bittersweet** | *Celastrus orbiculatus* | **exotic** | 86.67 | 1 | can shade out trees | **cover and count (major)** |
| **Japanese honeysuckle** | *Lonicera japonica* | **exotic** | 83.51 | 1 | can shade out trees | **cover and count (major)** |
| **Porcelain berry** | *Ampelopsis brevipedunculata* | **exotic** | 71.26 | 1 | can shade out trees | **cover and count (major)** |
| **English ivy** | *Hedera helix* | **exotic** | 66 | 1 | can shade out trees | **cover (major)** |
| **Chinese wisteria** | *Wisteria sinensis* | **exotic** | 56.7 | 1 | can shade out trees | **EDRR** |
| **Grape** | *Vitis sp.* | **native** | NA | 1 | can shade out trees | **EDRR** |
| **Brier** | *Smilax sp.* | **native** | NA | 1 | can shade out trees | **cover (major)** |
| **Poison ivy** | *Toxicodendron radicans* | **native** | NA | 1 | can shade out trees | **cover and count (major)** |
| **Autumn olive** | *Elaeagnus umbellata* | **exotic** | 94 | 1 | highly invasive EDRR | **EDRR** |
| **Common reed *** | *Phragmites australis* | **exotic** | 92 | 1 | highly invasive EDRR | **EDRR** |
| **Japanese barberry** | *Berberis thunbergii* | **exotic** | 91 | 1 | highly invasive EDRR | **EDRR** |
| **Purple loosestrife** | *Lythrum salicaria* | **exotic** | 91 | 1 | highly invasive EDRR | **EDRR** |
| **Wineberry** | *Rubus phoenicolasius* | **exotic** | 85.56 | 1 | highly invasive EDRR | **EDRR** |
| **Morrow's honeysuckle** | *Lonicera morrowii* | **exotic** | 85.54 | 1 | highly invasive EDRR | **EDRR** |
| **Burning bush** | *Euonymus alatus* | **exotic** | 81.25 | 1 | highly invasive EDRR | **EDRR** |
| **Japanese angelica tree** | *Aralia elata* | **exotic** | 80.46 | 1 | highly invasive EDRR | **EDRR** |
| **Cypress spurge** | *Euphorbia cyparissias* | **exotic** | 75.32 | 1 | ^ input from regional invasive species managers | **EDRR** |
| **Tartarian honeysuckle** | *Lonicera tatarica* | **exotic** | NA | 1 | ^ little effort is needed | **EDRR** |
| **Privet** | *Ligustrum sp.* | **exotic** | 76.67 | 1 | ^ little effort is needed | **EDRR** |
| **Glossy buckthorn** | *Frangula alnus* | **exotic** | 72.73 | 1 | ^ little effort is needed | **EDRR** |
| **Bamboo** | *Phyllostachys aurea* | **exotic** | 71.43 | 1 | ^ little effort is needed | **EDRR** |

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|---|---|---|---|---|---|---|
| **Parrotfeather** | *Myriophyllum aquaticum* | **exotic** | 76.67 | 2 | | **EDRR** |
| **Japanese knotweed** | *Fallopia japonica* | **exotic** | 97.94 | 3 | | **cover (major)** |
| **Common reed *** | *Phragmites australis* | **exotic** | 92 | 3 | | **Large area, not quantified** |
| **Multiflora rose** | *Rosa multiflora* | **exotic** | 89 | 3 | | **cover and count (major)** |
| **Mugwort** | *Artemisia vulgaris* | **exotic** | 79.31 | 4 | | **count (major)** |
| **Garlic mustard** | *Alliaria petiolata* | **exotic** | 84 | * | easy to control but unlikely to be problematic; could be managed by volunteers | **count (major)** |
| **Norway maple** | *Acer platanoides* | **exotic** | 82 | * | major canopy component | **count (major)** |
| **Black locust** | *Robinia pseudoacacia* | **exotic** | 81.11 | * | major canopy component | **EDRR** |
| **Tree-of-heaven** | *Ailanthus altissima* | **exotic** | 68 | * | major canopy component | **count (major)** |
| **Rose of Sharon** | *Hibiscus syriacus* | **exotic** | NA | ? | not enough information | **EDRR** |
| **Bull thistle** | *Cirsium vulgare* | **exotic** | NA | ? | not enough information | **EDRR** |
| **Asiatic dayflower** | *Commelina communis* | **exotic** | NA | ? | not enough information | **EDRR** |
| **Common mullein** | *Verbascum thapsus* | **exotic** | NA | ? | not enough information | **EDRR** |
| **Butter and Eggs** | *Linaria vulgaris* | **exotic** | NA | ? | not enough information | **EDRR** |
| **White mulberry** | *Morus alba* | **exotic** | 68.87 | x | low invasibility | **count (major)** |
| **Bittersweet nightshade** | *Solanum dulcamara* | **exotic** | 50.52 | x | low invasibility | **EDRR** |
| **Japanese maple** | *Acer palmatum* | **exotic** | 50 | x | low invasibility | **EDRR** |
| **Japanese holly** | *Ilex crenata* | **exotic** | 46.67 | x | low invasibility | **EDRR** |

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# Appendix E. Targets for Control and Needs for Native Replacement

**Table E1. Targets for invasive species removal and needs for restoration.**

Comments:

Expect stump or root sprouts for all plants (if only manual/mechanical removal methods are used). Some continued maintenance should be expected for all.

Priorities are the same as above, but species are sorted alphabetically by common name.

Removal targets are for the first 2-5 years; timeline may need to be adjusted by urgency.

Restoration needs indicates the amount of plants that will be required (details on particular species to use coming soon). The remaining columns indicate what type of ecosystem benefits the species have; replacement plantings should have comparable value wherever possible.

| **Species name and priority** | | | | **Removal targets** | | | | | **Restoration needs** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species (common)** | **Species (Latin)** | **priority #** | **origin** | **off trees** | **remove stems < 2" in ;** | **60% of current cover** | **30% of current cover** | **reduce to negligible** | **Amount of plants** | **wildlife/bird food** | **wildlife/bird cover** | **pollinator food** | **Nutrient cycling** |
| **Asiatic dayflower** | *Commelina communis* | ? | **exotic** | | | | | **x** | TBD | | | | |
| **Autumn olive** | *Elaeagnus umbellata* | 1 | **exotic** | | | | | **x** | single shrubs | yes | yes | | yes |
| **Bamboo** | *Phyllostachys aurea* | 1 | **exotic** | | | | | **x** | native wetland plant | | | | |
| **Bittersweet nightshade** | *Solanum dulcamara* | x | **exotic** | | | | | **x** | NA | yes | yes | yes | |
| **Black locust** | *Robinia pseudoacacia* | * | **exotic** | | **x** | | | | native trees | | | yes | yes |
| **Brier** | *Smilax sp.* | 1 | **native** | **x** | | | | | no | | yes | | |
| **Bull thistle** | *Cirsium vulgare* | ? | **exotic** | | | | | **x** | TBD | | | yes | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Burning bush** | *Euonymus alatus* | 1 | **exotic** | | | | | **x** | single shrubs | yes | | | |
| **Butter and Eggs** | *Linaria vulgaris* | ? | **exotic** | | | | **x** | | TBD | | | | |
| **Chinese wisteria** | *Wisteria sinensis* | 1 | **exotic** | | | | | **x** | no | | | | |
| **Common mullein** | *Verbascum thapsus* | ? | **exotic** | | | | | **x** | TBD | | | | |
| **Common reed** | *Phragmites australis* | 3 | **exotic** | | | **x** | | **x** | native wetland plant | | yes | | Yes? |
| **Cypress spurge** | *Euphorbia cyparissias* | 1 | **exotic** | | | | | **x** | native ground cover | | | yes | |
| **English ivy** | *Hedera helix* | 1 | **exotic** | **x** | | | | | no | yes | | | |
| **Garlic mustard** | *Alliaria petiolata* | * | **exotic** | | | | | **x** | native ground cover | | | | |
| **Glossy buckthorn** | *Frangula alnus* | 1 | **exotic** | | | | | **x** | single shrubs | yes | | poor | |
| **Grape** | *Vitis sp.* | 1 | **native** | **x** | | | | | no | yes | yes | | |
| **Japanese angelica tree** | *Aralia elata* | 1 | **exotic** | | | | | **x** | native trees | yes | | yes | |
| **Japanese barberry** | *Berberis thunbergii* | 1 | **exotic** | | | | | **x** | single shrubs | poor | | | |
| **Japanese holly** | *Ilex crenata* | x | **exotic** | | | | | **x** | NA | yes | | | |
| **Japanese honeysuckle** | *Lonicera japonica* | 1 | **exotic** | **x** | | | **x** | **x** | no | yes | | yes | |
| **Japanese knotweed** | *Fallopia japonica* | 3 | **exotic** | | | **x** | | **x** | Appropriate? | | | | |
| **Japanese maple** | *Acer palmatum* | x | **exotic** | | | | | **x** | NA | | | | |
| **Morrow's honeysuckle** | *Lonicera morrowii* | 1 | **exotic** | | | | | **x** | single shrubs | yes | yes | | |
| **Mugwort** | *Artemisia vulgaris* | 4 | **exotic** | | | **x** | | | Appropriate? | | | | |
| **Multiflora rose** | *Rosa multiflora* | 3 | **exotic** | | | **x** | | | Appropriate? | yes | yes | | |
| **Norway maple** | *Acer platanoides* | * | **exotic** | | **x** | | | | native trees | | | | |
| **Oriental bittersweet** | *Celastrus orbiculatus* | 1 | **exotic** | **x** | | | **x** | **x** | no | ? | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parrotfeather** | *Myriophyllum aquaticum* | 2 | **exotic** | | | | | **x** | no | | | | |
| **Poison ivy** | *Toxicodendron radicans* | 1 | **native** | **x** | | | | | no | yes | | | |
| **Porcelain berry** | *Ampelopsis brevipedunculata* | 1 | **exotic** | **x** | | | | | no | yes | | | |
| **Privet** | *Ligustrum sp.* | 1 | **exotic** | | | | | **x** | single shrubs | yes | | | |
| **Purple loosestrife** | *Lythrum salicaria* | 1 | **exotic** | | | | | **x** | native wetland plant | | yes | yes | |
| **Rose of Sharon** | *Hibiscus syriacus* | ? | **exotic** | | | | | **x** | TBD | | | yes | |
| **Tartarian honeysuckle** | *Lonicera tatarica* | 1 | **exotic** | | | | | **x** | single shrubs | ? | yes | | |
| **Tree-of-heaven** | *Ailanthus altissima* | * | **exotic** | | | | | **x** | native trees | | | yes | |
| **White mulberry** | *Morus alba* | x | **exotic** | | | | | **x** | NA | yes | yes | | |
| **Wineberry** | *Rubus phoenicolasius* | 1 | **exotic** | | | | | **x** | single shrubs | yes | yes | | |

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# Appendix F. Table of Preferred Control Methods

**Table F1. Recommended control approaches.** Species listed here were observed by OPRHP staff from December 2016 to August 2017. Recommended approaches are numbered in each cell by priority (where adequate information is available), which is determined by *effectiveness* and *appropriateness to the Hempstead Lake situation*. Treatment season is noted where appropriate. Prescribed burning was not considered here. DEC regulations for wetland disturbance and NYS OPRHP policy regarding herbicide use must be considered. Treatments should be followed up with monitoring and repeated treatments as needed for at least 5 years. For herbicide treatments, assume that dilution is in water unless otherwise specified. Check label to determine if a surfactant is needed.

| Species | Reason | Priority | Manual/Mechanical | Mowing | Foliar herbicide | Cut stump herbicide | Basal bark herbicide |
|---|---|---|---|---|---|---|---|
| Oriental bittersweet (CEOR7) | shades trees | 1 | **3** - cut *repeatedly* or cut and pull out roots (small infestations) | No - Do not mow unless weekly | **2** – on lower portions after cutting. Triclopyr 2%. Oct-Nov, > 65$^{o}$ F | **1** – Glyphosate 25% (> 40$^{o}$ F) or triclopyr 25% (>60$^{o}$ F) | n/a |
| Japanese honeysuckle (LOJA) | shades trees | 1 | n/a | No - Probably not good here. Could theoretically mow 2x / year with herbicide. | **2** –Glyphosate 2.5% or triclopyr 2%. In fall. | **1** –Glyphosate 25% or triclopyr 25%. Ground cannot be frozen. | n/a |
| Porcelain berry (AMBR7) | shades trees | 1 | **3 –** Pull up by hand before fruiting to prevent spread of seeds, or cut aboveground vines to prevent flowering. Cut and pull from trees to allow the trees to recover. Repeat as needed. | **5 –** Repeated mowing may reduce vigor | **4** – The herbicides triclopyr (e.g., Garlon 3a, Garlon 4) and glyphosate (Roundup, Rodeo) have been used with varying success | **1 –** Cut to the ground and treat stumps with herbicide to gain initial control. Follow up with a dense planting of fast-growing trees to shade it out. | **2 –** Use triclopyr formulated for use with penetrating oil |

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| English ivy (HEHE) | shades trees | 1 | **1** – where density is low: manual pull. Winter is good. | n/a | **1** – where ivy is dense: triclopyr (2-5%) or glyphosate (2-3%) when 3-5 new leaves appear (in spring or after cutting). Must be above freezing. | n/a | **2** – Be careful not to apply the herbicide to the host tree. Triclopyr 20% in oil. > 50o F for several days. |
| Chinese Wisteria (WISI) | shades trees | 1 | **2** – cut every 2 weeks spring-autumn (prevents seeds, strangulation). Can dig entire plant. | n/a | **3** – Glyphosate after cut-stump to control sprouts | **1** – Glyphosate or triclopyr 2 inches above ground level. Spring and summer when wisteria is actively growing. | n/a |
| Grape (VITIS) | shades trees | 1 | **1** – Severing the vines one to two feet about the ground, esp. under a forest canopy. Will die in three years, if under heavy shade. | n/a | Dicamba, Fosamine herbicide works as a foliar spray [more info needed] | 2,4-D [more info needed] | Dicamba, 2,4-D [more info needed] |
| Brier (SMILA2) | shades trees | 1 | **3** – Dig rhizomes (if only a few small plants) | n/a | **2** – Spray the foliage with a solution of 8.8% triclopyr. | **1** – Cut, then foliar spray resprouts when ½ to 1 ft tall. 10% solution of glyphosate. OR Triclopyr sprayed/ brushed onto freshly cut stumps. | n/a |

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| Poison Ivy (TORA2) | shades trees | 1 | **3** – Careful digging out may work if all stems and roots removed. Do not hand-pull. | **4** – Poison ivy will not tolerate repeated tillage, cutting or mowing. Useful for infestations in fields and other non-woodland habitats. | **2** – Glyphosate, 41%, spray at full leaf growth on a warm, sunny day. | **1** – Cut vines to 2 to 3ft above soil surface. Spray cut stems with 41% Glyphosate or use Triclopyr (will need to be repeated). Spray at full leaf growth on a warm, sunny day. | n/a |
| Autumn Olive (ELUM) | EDRR | 1 | **4** – Hand pull young seedlings and sprouts, esp. from moist soil. | **5** – Mowing alone is not effective, must be used with herbicide treatments. Mowing alone will result in vigorous resprouts. | **1** – Dicamba (4lbs/gal) in late June and 2,4-D effectively control autumn-olive during growing season. | **2** – Direct application of at least 41% glyphosate to cut stumps, particularly late in the growing season (July-September). | **3** – For larger plants, triclopyr or 2,4-D. Use a thin line around the entire circumference of the stem 6-12 inches above the ground. |
| *Phragmites* (PHAUA7) | *EDRR/major* | 1 | No. digging/ hand-pulling/ disking is difficult and costly, "scalps" marsh | No. Not recommended unless in combination w/ herbicides and at proper time of year | **1** –Foliar spray or wipe/wick. Imazapyr (1.5%, Jun-Sep) is better than glyphosate (1.5%, Aug-Sep). Cut 2 weeks later. | **2** – Sometimes called "injection" | n/a ("wicking" is similar, see foliar application) |

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| Japanese Barberry (BETH) | EDRR | 1 | **4** – Pick mattock or honeysuckle popper for large shrubs, (remove all the roots). Hand pull small seedlings. Roots left in ground will resprout. | **5** – Repeated mowing or cutting controls, but does not eradicate it. | **2** –2% solution of glyphosate and water. Apply late in the growing season, or early in the season to minimize non-target impacts. | **1** – Horizontally cut the stem near the ground. Apply a 20-25% solution of glyphosate or triclopyr and water to the stump being sure to cover the outer, top 20% of the cut stem. (August to October) | **3** – Effective throughout the year (if snow does not prevent spraying to the ground level). Apply a mix of 25% triclopyr and 75% horticultural oil to the basal parts of the shrub, up to 12-15 inches from the ground. |
| Purple loosestrife (LYSA2) | EDRR | 1 | **3** – Hand-removal (small populations and isolated stems). Must remove the entire rootstock. | Mowing is not recommended for Purple Loosestrife because it can further spread by distributing plant stems that can sprout vegetatively. | **2** –Rodeo 1-2%, August, in full flower. 2,4-D applied in late May to early June. Best to spray no more than 25-50% of plants foliage. | **1** – Glyphosate, 20-30% solution, cut off all stems at about 6 inches and then paint or drip onto the cut surface. Late August. | n/a |
| Wineberry (RUPH) | EDRR | 1 | **1** –uproot | n/a | **3** – glyphosate (5%) or triclopyr | **2** –Glyphosate or triclopyr | n/a |
| Bush honeysuckle (LOXX) | EDRR | 1 | **1** – weed wrench, or cut 2x/year for 3-5 years. | n/a | **3** – glyphosate (2%) | **2** – glyphosate (20% in oil) or triclopyr (12.5% in oil) | n/a |

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| Burning Bush (EUAL13) | EDRR | 1 | **3** – Hand removal of small seedlings, pick mattock or weed wrench of larger specimens. Dispose of pulled plants properly, will re-root if left in contact with moist soil. | n/a | **1** – Glyphosate, early summer. | **2** – Glyphosate | n/a |
| Japanese Angelica Tree (AREL8) | EDRR | 1 | n/a | n/a | **1** – glyphosate | **1** – triclopyr ester | n/a |
| Cypress Spurge (EUCY2) | regional recom-mendation | 1 | **2** – Frequent and repeated hand-pulling (e.g., monthly hand-pulling for a year). | Mowing often spreads seed and increases density. | **1** – Many herbicides, such as glyphosate. Repeat applications may be necessary to reduce densities. Surfactant is necessary due to waxy cuticles of leaves. | n/a | n/a |
| Privet (LIXX) | little effort | 1 | **1** – weed wrench. | n/a | **3** – glyphosate (3-5%). Ideally Nov-Jan when above freezing. | **2** – glyphosate (25%) or triclopyr. Anytime but spring. | **4** – triclopyr (20% in oil). Fall. |

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| Glossy Buckthorn (FRAL4) | little effort | 1 | **4** – Even when done repeatedly, pulling or cutting glossy buckthorn rarely provides substantial control. Small saplings can be hand pulled, large trees can be dugout or weed wrenched. Must cut or pull plants at least twice a year for a period of three to five years. | Mowing does not control glossy buckthorn. | **2** – 2% solutions of glyphosate and water, late in the growing season. Do not cut down treated plants for at least a full growing season. | **3** – Horizontally cut the stem near the ground (not at ground level) – this allows another cut and application if there is sprouting. Immediately after cutting, apply 20-25% solution of glyphosate or triclopyr and water, being sure to cover the outer, top 20% of the cut stem. (August to October) | **1** – Apply a mixture of 25% triclopyr and 75% horticultural oil to the basal parts of the shrub to a height of 12-15 inches from the ground. Can be done year-round as long as there is no snow cover. |
| Bamboo (PHAU8) | little effort | 1 | **1** – Cut close to the ground. Cutting multiple times (throughout the growing season, for several years) may kill plants by exhausting rhizome nutrient stores. | **2** – Mowing repeatedly repeated multiple times per year may exhaust nutrient stores. | **2** – Glyphosate (5% solution). Thoroughly wet all leaves. Imazapyr (1% solution) may be more effective than glyphosate. Cut canes first, then apply herbicides to newly expanded leaves. | **2** – 25% solution of glyphosate mixed in water can be applied to freshly cut stumps. | n/a |
| Parrotfeather (MYAQ2) | EDRR | 2 | n/a | n/a | **1** – 2,4-D, triclopyr, diquat, carfentrazone, imazapyr, and imazamox. | n/a | n/a |

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|---|---|---|---|---|---|---|---|
| Japanese knotweed (POCU6) | major | 3 | **2** – cut 2x/mo from Apr-Aug then 1x /mo until 1st frost | n/a | **1** – foliar application 2x or cut then foliar. Glyphosate (3-5%), or triclopyr (3-5%), or imazapyr. 1st treatment in May-June, follow up 6 weeks+ later. | n/a | n/a |
| Multiflora rose (ROMU) | major | 3 | **2** – cut or mow 3-6x/year for 2-4 years | **4** – mow 3-6x/year for 2-4 years | **3** – Glyphosate 10-20% or triclopyr 50%. Dormant season or Jul-Sep. | **1** - Pathfinder II (triclopyr-based Ready to Use). Jan-fall. | n/a |
| Mugwort (ARVU) | major | 4 | n/a | **2** –cut 2-3x /year for 3 years | **1** – spray 2 years in a row | n/a | n/a |
| Garlic mustard (ALPE4) | special | * | **1** – Dig up roots: spring – fall. Cut flowering plants: spring, early summer. | n/a | **2** –Glyphosate (1-2%) | n/a | n/a |
| Norway Maple (ACPL) | special | * | **1** – Hand pulling small seedlings, digging up larger saplings, and girdling or felling large trees in Spring. | **4** – Large areas can be easily controlled by mowing. | **3** – Glufosinate-ammonium (11.3%), Glyphosate (41%), on seedlings, young trees | **3** – Glyphosate, or triclopyr (8%) | **2** – Apply triclopyr in horticultural oil to the bark, a foot from the base of the trunk (trees up to 4 inches diameter). June-September. |
| Black Locust (ROPS) | special | * | Not recommended due to sprouting. Small seedlings can be hand pulled. | n/a | **3** – Triclopyr and glyphosate. Foliar sprays are effective when the leaves are fully expanded. | **2** – Cut down and apply undiluted triclopyr into the freshly cut surfaces of the stump. | **1** – Best herbicide method. Not as effective on larger trees (girdle then apply around scar for large trees). Mid |

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| | | | | | | | July to December. |
| Tree-of-heaven (AIAL) | special | * | **4** – seedlings only; best when soil is moist. | n/a | **1** – Glyphosate (2%, Jun-Sep), triclopyr (1.5-2%, Jun-Sep), Imazapyr (1-5%, summer-early fall) | **2** – Triclopyr (20% in oil), triclopyr (100%), or triclopyr or imazapyr (33-50%) depending on specific methods. Growing season. | **3** – Triclopyr (20% in oil), or triclopyr (15%) with imazapyr (5%) in oil, or triclopyr ready-to-use mix. Feb-Apr or June-Sep. |
| Asiatic Dayflower (COCO3) | more info needed | ? | **2** – Hand pull small plants, removing all stem fragments. | n/a | **1** – Sulfentrazone + Cloransulam-methyl, Sulfentrazone, Cloransulam-methyl, Glyphosate + Lactofen or Flumioxazin | n/a | n/a |
| Bull Thistle (CIVU) | more info needed | ? | **2** – Cut right below soil surface, severing the root. Hand pulling. | **3** – Not effective alone, must be done multiple times throughout the growing season. | **1** – 2,4-D, aminocyclopyrachlor, aminopyralid, clopyralid, dicamba, picloram, triclopyr, chlorsulfuron, imazapyr, metsulfuron | n/a | n/a |

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|---|---|---|---|---|---|---|---|
| Butter and Eggs (LIVU2) | more info needed | ? | **1** – Repeated hand pulling of seedlings, multiple times per year and for multiple years. | Mowing will stop seed production but will not kill plants. | **2** – Picloram (0.5-1%/late flower), Dicamba (3-5%/late flower), Chlorsulfuron, Amniocyclopyrachlor + chlorsulfuron (fall), Imazapic (0.25-1.5%/fall) | n/a | n/a |
| Common Mullein (VETH) | more info needed | ? | **2** – Hand pull, plants severed through the root crown below the basal leaves do not sprout, avoid soil disturbance. (April to May) | n/a | **1** – Grazon P+D, Cimarro, and a three-way-mix of Cimarron with Glean and RangeStar, all in a crop oil to penetrate the thick wooly coat. (May) | n/a | n/a |
| Rose of Sharon (HISY) | more info needed | ? | **3** – Remove entire plants by digging up root system. | n/a | **2** – Glyphosate | **1** – Glyphosate | n/a |
| White Mulberry (MOAL) | not a priority | x | **4** – Seedlings hand pulled, girdling larger trees | n/a | **2** – 2% Glyphosate | **1** – Cut stems, spray with 25% glyphosate, during growing season. | **3** – 20% Triclopyr mixed in oil |
| Bittersweet Nightshade (SODU) | not a priority | x | **2** – May be pulled or dug up, usually best for young plants | n/a | **1** – Glyphosate or triclopyr | n/a | n/a |
| Japanese Maple (ACPA2) | not a priority | x | **1** – Hand pull small seedlings, dig up large saplings, cut down large trees | n/a | n/a | n/a | n/a |
| Japanese Holly (ILCR2) | not a priority | x | **1** – Hand pull small seedlings. | n/a | n/a | n/a | n/a |

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# Appendix G. General Timetable for Removals

**Table G1.** A general reference for the project seasonality.

| | | 1 | 2 | 3 | 4 | 5 | 6 | 8 |
|---|---|---|---|---|---|---|---|---|
| | | Plan adaptations and SEQR approval as needed | Logistics and preparation | Pollinator gardens and native grass restoration on dams | Manual removals of invasive species | Replacement plantings of native species | Evaluate and communicate successes | Chemical controls of invasive species |
| Year 1 | Jan | | | | | | | |
| | Feb | | | | | | | |
| | March | | | | | | | |
| | April | | | | | | | |
| | May | | | 100% | See control recommend-ations for species-specific timing | | | |
| | June | | | | | | | |
| | July | | | | | | | |
| | Aug | | | | | | | |
| | Sept | | | | | | | |
| | Oct | | | | | | | |
| | Nov | | | | | | | |
| | Dec | | | | | | | |
| Year 2 | Jan | | | | | | | |
| | Feb | | | | | | | |
| | March | | | | | | | See control recommend-ations for species-specific timing |
| | April | | | | See control recommend-ations for species-specific timing | | | |
| | May | | | replace and fill in native plantings as needed | | | | |

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|---|---|---|---|---|---|---|---|---|
| | June | | | | | | | |
| | July | | | | | | | |
| | Aug | | | | | | | |
| | Sept | | | | | | | |
| | Oct | | | | | | | |
| | Nov | | | | | | | |
| | Dec | | | | | | | |
| | **end of year goals** | | | | **50% of targets** | **invasive shrubs replaced, exposed soil replanted with native pollinator plants** | | **33% of targets** |
| | | <<Seasonal timing repeats each year>> | | | | | | |
| Year 3 | **end of year goals** | | | | **75% of targets** | **successful establishment (90% survival)** | | **50% of targets** |
| Year 4 | **end of year goals** | | | | **90% of targets** | **successful establishment (90% survival)** | | **75% of targets** |
| Year 5 | **end of year goals** | | | | **100% of targets** | **successful establishment (90% survival)** | | **100% of targets** |
| Year 10 | **end of year goals** | | | | **maintenance** | **successful establishment (90% survival)** | | **maintenance** |

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# Appendix H. Prioritization of Park Sections for Treatment

**Table H1**. Areas to address each year (may vary with construction schedule). Refer to map in Appendix B for section locations.

| Invasive section | Map section | Earliest year to begin work | Notes |
|---|---|---|---|
| EE | Central | 1 | Can start right away, but use caution to maintain visual boundary |
| M1 | Central | 1 | No construction in this area, can start right away |
| O1 | Central | 1 | No construction in this area, can start right away |
| P | Central | 1 | No construction in this area, can start right away |
| O | Central, North | 1 | No construction in this area, can start right away |
| E | South | 1 | No construction in this area, can start right away |
| F | South | 1 | No construction in this area, can start right away |
| G | South | 1 | No construction in this area, can start right away |
| Y | South | 1 | No construction in this area, can start right away |
| C | South | 1 | To be pollinator habitat |
| D | South | 1 | To be pollinator habitat |
| B | South | 1 | May be pollinator habitat |
| M | South, Central | 1 | No construction in this area, can start right away |
| PA1 | Central | 2 | Must use chemicals, need approvals |
| PA2 | Central | 2 | Must use chemicals, need approvals |
| AAA | North | 2 | Wait until north pond work is complete |
| BBB | North | 2 | Wait until north pond work is complete |
| V | North | 2 | Wait until north pond work is complete |
| W | North | 2 | Wait until north pond work is complete |
| J | Central | 3 | Wait until trail enhancement is complete |
| K | Central | 3 | Wait until trail enhancement is complete |
| AA | North | 3 | Wait until trail enhancement is complete |
| BB | North | 3 | Wait until trail enhancement is complete |
| CC | North | 3 | Wait until trail enhancement is complete |
| DD | North | 3 | Wait until trail enhancement is complete |
| Q | North | 3 | Wait until trail enhancement is complete |
| R | North | 3 | Wait until trail enhancement is complete |
| S | North | 3 | Wait until trail enhancement is complete |
| T | North | 3 | Wait until trail enhancement is complete |
| U | North | 3 | Wait until trail enhancement is complete |
| X | North | 3 | Wait until trail enhancement is complete |

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|---|---|---|---|
| A | South | 3 | Wait until trail enhancement is complete |
| CCC | South | 3 | Wait until trail enhancement is complete |
| H | South | 3 | Wait until trail enhancement is complete |
| I | South | 3 | Wait until trail enhancement is complete |

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# Appendix I. Removal Log

To be used by staff involved in species removal, as it occurs. These data can be compiled in a spreadsheet.

| **Invasive Species Removal Log** | |
|---|---|
| **Date:** | **Removal Lead:** |
| **Location:** | **# of Participants:** |
| **Species Removed:** | **Time Spent Working:** |
| **Phenology:** | **Number of Individuals Removed:** |
| **Density/Occurance:** | **Area of Removal:** |
| **Removal Method:** | |
| **Comments:** | |
| **GPS Coordinates:** | |
| **GPS File Name:** | |
| **Photo File Name:** | |
| **Previously Reported: Y / N** | **Uploaded to iMap: Y / N** |

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# Appendix J. Native Species Onsite

The New York Natural Heritage Program conducted partial surveys of the native vegetation in the park (unpublished data from NYNHP: Olivero 2001, Young 2004). The data are summarized below, with indications of the origin of the species (native, introduced, or both; USDA Plants), the life form, and the area(s) of the park in which the species was found.

| Scientific name | Common name | Origin | Life form | Coastal plain pond shore | East shoreline | West shoreline north of fishing access trail | West shoreline south of fishing access trail | Western Shoreline |
|---|---|---|---|---|---|---|---|---|
| *Agalinis purpurea* | purple false foxglove | Native | Herbs | | | X | | |
| *Betula populifolia* | gray birch | Native | Tree | X | | | | |
| *Bidens tripartita* | threelobe beggarticks | Native | Herbs | | | X | | X |
| *Bulbostylis capillaris* | densetuft hairsedge | Native | Graminoid | | X | | | X |
| *Comptonia peregrina* | sweet fern | Native | Shrubs | | X | | | |
| *Conyza canadensis* | Canadian horseweed | Native | Herbs | | | | X | X |
| *Cyperus sp.* | flatsedge | Both | Graminoid | | | X | | |
| *Cyperus dentatus* | toothed flatsedge | Native | Graminoid | | | X | | |
| *Cyperus filicinus* | fern flatsedge | Native | Graminoid | X | | | | X |
| *Cyperus grayi* | Gray's flatsedge | Native | Graminoid | | | X | | |
| *Diodia teres* | poorjoe | Native | Herbs | | X | | | |
| *Drosera intermedia* | spoonleaf sundew | Native | Herbs | X | | | | |
| *Eleocharis palustris* | common spikerush | Native | Graminoid | | | | | X |
| *Erechtites hieraciifolius* | American burnweed | Native | Herbs | | | X | | |
| *Eriocaulon aquaticum* | sevenangle pipewort | Native | Herbs | X | | | | |
| *Eupatorium hyssopifolium* | hyssopleaf thoroughwort | Native | Herbs | X | | | | |
| *Eupatorium perfoliatum* | common boneset | Native | Herbs | X | | | | |

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|---|---|---|---|---|---|---|---|---|
| *Eupatorium serotinum* | lateflowering thoroughwort | Native | Herbs | | X | | | X |
| *Euphorbia cyparissias* | cypress spurge | Introduced | Herbs | | X | | | |
| *Euthamia caroliniana* | slender goldentop | Native | Herbs | X | | | | X |
| *Fimbristylis sp.* | fimbry | Native | Graminoid | X | | | | |
| *Gratiola aurea* | golden hedgehyssop | Native | Herbs | X | | X | | X |
| *Helianthemum canadense* | longbranch frostweed | Native | Herbs | | X | | | |
| *Hypericum canadense* | lesser Canadian St. Johnswort | Native | Herbs | X | | | | |
| *Hypericum mutilum* | dwarf St. Johnswort | Native | Herbs | X | | | | |
| *Juncus acuminatus* | tapertip rush | Native | Graminoid | X | | | | X |
| *Juncus articulatus* | jointleaf rush | Native | Graminoid | X | | | | |
| *Juncus brachycarpus* | whiteroot rush | Native | Graminoid | | | | X | |
| *Juncus debilis* | weak rush | Native | Graminoid | | | | X | X |
| *Juncus dichotomus* | forked rush | Native | Graminoid | | | | X | X |
| *Juncus effusus* | common rush | Native | Graminoid | X | | | | |
| *Juncus pelocarpus* | brownfruit rush | Native | Graminoid | | | X | | X |
| *Juncus tenuis* | poverty rush | Native | Graminoid | X | | | | |
| *Lechea villosa* | hairy pinweed | Native | Herbs | | | | X | |
| *Lespedeza violacea* | violet lespedeza | Native | Herbs | | X | | | |
| *Lindernia dubia* | yellowseed false pimpernel | Native | Herbs | X | | | | |
| *Ludwigia alternifolia* | seedbox | Native | Herbs | X | | | | |
| *Ludwigia sphaerocarpa* | globefruit primrose-willow | Native | Herbs | | X | | | |
| *Lycopus americanus* | American water horehound | Native | Herbs | X | | | X | |
| *Lythrum salicaria* | purple loosestrife | Introduced | Herbs | X | | | | |
| *Myriophyllum sp.* | watermilfoil | Both | Aquatic herb | X | | | | |
| *Oenothera biennis* | common evening primrose | Native | Herbs | | | | X | |
| *Panicum virgatum* | switchgrass | Native | Graminoid | | | | | X |
| *Phragmites australis* | common reed | Introduced | Graminoid | X | | | | |
| *Pityopsis falcata* | sickleleaf silkgrass | Native | Herbs | | X | | | |
| *Polygonella articulata* | coastal jointweed | Native | Herbs | | X | | | |
| *Polygonum hydropiperoides* | swamp smartweed | Native | Herbs | | | | | X |

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|---|---|---|---|---|---|---|---|---|
| *Polygonum punctatum* | dotted smartweed | Native | Herbs | | | X | | X |
| *Populus deltoides* | eastern cottonwood | Native | Tree | X | | | | |
| *Potamogeton sp.* | pondweed | Both | Aquatic herb | | X | | | |
| *Pseudognaphalium obtusifolium* | rabbit-tobacco | Both | Herbs | | | X | | |
| *Rhamnus frangula* | glossy buckthorn | Introduced | Shrubs | X | | | | |
| *Rhexia virginica* | handsome Harry | Native | Herbs | X | | | | |
| *Rhynchospora alba* | white beaksedge | Native | Herbs | X | | | | |
| *Salix sp.* | willow | Both | Shrubs | | | | | X |
| *Salix exigua* | narrowleaf willow | Introduced | Shrubs | X | | | | |
| *Schoenoplectus tabernaemontani* | softstem bulrush | Native | Graminoid | X | | | | |
| *Scirpus pungens var. pungens* | common threesquare | Native | Graminoid | X | | | | |
| *Scleria sp.* | nutrush | Both | Graminoid | X | | | | |
| *Trichostema dichotomum* | forked bluecurls | Native | Herbs | | X | | | |
| *Utricularia subulata* | zigzag bladderwort | Native | Herbs | X | | | | |
| *Xyris difformis* | bog yelloweyed grass | Native | Herbs | X | | | | |

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# Appendix K. General List of Native Species to Use in Enhancement Efforts

There are two proposed lists of native species to use in this project: this list of general enhancement species, and a list tailored to the needs of the pollinator garden (See Appendix L).

As we remove invasive species, they can be replaced by species from the following list. All of the species on this list are native to Nassau County. The species lists are culled from multiple sources, and all of the species on the preferred list (below) are recommended by at least two sources. This is not meant to be a comprehensive list of all of the species that would be appropriate for our purposes.

[1] The species on the "BBG" list come from Burrell 2011.
[2] The species on the "onsite" list come from surveys conducted by the New York Natural Heritage Program (Appendix J).
[3] The species on the "community" list are characteristic of the community types found at Hempstead Lake (NYNHP 2015)
[4] The species on the "NYC" list come from NYC Parks. This guide is divided into sections by simplified community types (used here are "oak forests," "shrublands," and "*Phragmites* marsh"), but should be conducive to transplanting and commercially available in the area.
[5] Wildlife value type is based on information found in the USDA Forest Service Fire Effects Information System (FEIS; https://www.feis-crs.org/feis/). Abbreviations indicate how wildlife use the species, and are as follows: C = cover, N = nesting material, F = food, U = unspecified, [] = species is not reviewed in the FEIS.
[6] Wildlife type is based on information found in the FEIS. Abbreviations indicate what sort of wildlife use the plant species, and are as follows: B = variety of birds, SB = songbirds, GB = gamebirds, WB = waterfowl, SM = small mammals, LM = large mammals, U = unspecified, [] = species is not reviewed in the FEIS.
[7] "Pollinators" show which pollinators benefit from the plant species. Sources consulted include the FEIS and Pollinator-Friendly Plants for the Northeast United States (NRCS n.d.).
[8] The columns under the heading "Communities at HLSP where species is suitable" show which species are characteristic of the community types that have been identified at HLSP. The species that do not have a tick mark in the Community column were not characteristic of any of the communities (grey). Note that the "Reservoir/ artificial impoundment" community does not have any characteristic species that would be suitable for habitat enhancement.

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| Species | | | Source | | | | Ecological value | | | Communites at HLSP where species is suitable[8] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Latin name** | **Common name** | **Life form** | **BBG[1]** | **Onsite[2]** | **Community[3]** | **NYC[4]** | **Wild-life value type[5]** | **Wild-life type[6]** | **Pollinators[7]** | Coastal oak-heath forest | Coastal oak-hickory forest | Coastal plain pond shore | Cred maple-blackgum swamp | Red maple-hardwood swamp | Reservoir/ artificial impoundment | Shallow emergent marsh | Shrub swamp | Successional old field | Successional shrubland | Successional southern hardwood forest |
| *Acer rubrum* | red maple | tree | X | | X | X | F | LM, SM | [] | | | | X | X | | | X | | | X |
| *Aronia melanocarpa* | black chokeberry | shrub | X | | | X | U | U | U | | | | | | | | | | | |
| *Asclepias incarnata* | swamp milkweed | forb | X | | X | | poison | [] | B, L | | | | | | | X | | | | |
| *Betula populifolia* | grey birch | tree | | X | X | X | F | SM, SB, GB, LM | [] | | | | | | | | | | | X |
| *Carex pensylvanica* | Pennsylvania sedge | graminoid | | | X | X | C, N | WB, GB | [] | X | X | | | | | | | | | |
| *Carpinus caroliniana* | American hornbeam | tree | X | | X | | F | GB, SB, WB, SM, LM | [] | | | | | X | | | | | | |
| *Ceanothus americanus* | New Jersey tea | shrub | X | | | X | F | LM | B, L, H | | | | | | | | | | | |
| *Clethra alnifolia* | sweet pepperbush | shrub | X | | X | | F | LM | L | | | | X | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cornus florida* | Flowering dogwood | tree | | | X | X | F | SB, GB, SM, LM | [] | | X | | | | | | | | | |
| *Cornus racemosa* | red-panicled dogwood | shrub | | | X | X | F, C | LM, GB, SM | [] | | | | | | | | X | X | X | |
| *Cornus sericea* | red osier dogwood | shrub | X | | X | | F, C | SM, LM, B | U | | | | | | | | X | | | |
| *Eupatorium perfoliatum* | boneset | forb | | X | X | X | [] | [] | B | | | | | | | X | | | | |
| *Euthamia caroliniana* | narrow-leaved goldenrod | forb | | X | X | | [] | [] | [] | | | X | | | | | | | | |
| *Fraxinus americana* | White ash | tree | | | X | X | F, C | WB, SB, SM, LM, SM | [] | | | | | | | | | | | X |
| *Gaylussacia baccata* | black huckleberry | shrub | | | X | X | F, C | GB, SB, SM, LM | L, U | X | X | | | | | | | | | |
| *Gratiola aurea* | gratiola | forb | | X | X | | [] | [] | [] | | | X | | | | | | | | |
| *Hamamelis virginiana* | witch hazel | tree | X | | | X | F | GB, LM, SM | [] | | | | | | | | | | | |
| *Helianthemum canadense* | frostweed | forb | | X | X | | [] | [] | [] | X | | | | | | | | | | |
| *Hypericum canadense* | Canadian St. John's-wort | forb | | X | X | | [] | [] | [] | | | X | | | | | | | | |
| *Ilex verticillata* | winterberry | shrub | X | | X | | F | B, LM, SM | [] | | | | | X | | | | | | |
| *Juncus effusus* | Soft rush | graminoid | | X | | X | [] | [] | [] | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Juniperus virginiana* | Red cedar | tree | | | X | X | F | B, SM, LM | [] | | | | | | | | | X | X | X |
| *Lindera benzoin* | spicebush | shrub | X | | X | | [] | [] | U | | | | | X | | | X | | | |
| *Ludwigia sphaerocarpa* | ludwigia | forb | | X | X | | [] | [] | [] | | | X | | | | | | | | |
| *Nyssa sylvatica* | blackgum | tree | X | | X | | F | B, LM | B | | | | X | X | | | | | | |
| *Oenothera biennis* | common evening primrose | forb | | X | X | X | [] | [] | [] | | | | | | | | | X | | |
| *Panicum virgatum* | switchgrass | graminoid | | X | | X | F, C | LM, WB, GB, SB, SM | [] | | | | | | | | | | | |
| *Parthenocissus quinquefolia* | Virginia creeper | vine | X | | X | | F | SB, LM, SM | [] | | | | X | | | | | | | |
| *Pinus strobus* | eastern white pine | tree | | | X | X | F, C | SB, SM, LM | [] | | | | | X | | | | | | |
| *Polygonatum biflorum* | Solomon's seal | forb | | | X | X | [] | [] | [] | | X | | | | | | | | | |
| *Quercus alba* | white oak | tree | | | X | X | F, C | LM, SM, SB, GB, WB | [] | X | X | | | | | | | | | |
| *Quercus velutina* | black oak | tree | | | X | X | F, C | SM, LM, GB | [] | X | X | | | | | | | | | |
| *Rhexia virginica* | Virginia meadow-beauty | forb | | X | X | | [] | [] | [] | | | X | | | | | | | | |
| *Sassafras albidum* | common sassafras | tree | | | X | X | F | LM, SM, SB, GB | [] | X | | | | | | | | | | X |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Schizachyrium scoparium* | little bluestem | graminoid | | | X | X | F, C | GB, SB | [] | | | | | | | | | X | | |
| *Schoenoplectus tabernaemontani* | softstem bulrush | graminoid | | X | X | | F, C | WB | [] | | | | | | | X | | | | |
| *Vaccinium angustifolium* | lowbush blueberry | shrub | | | X | X | F | LM, B | B, U | X | X | | | | | | | | | |
| *Vaccinium corymbosum* | highbush blueberry | shrub | X | | X | | F | B, LM, SM | U | | X | | X | X | | | X | | | |
| *Viburnum acerifolium* | mapleleaf viburnum | shrub | | | X | X | F | LM, SM, GB, SB | [] | | X | | | | | | | | | |
| *Viburnum nudum var. cassinoides* | withe-rod / wild raisin | shrub | X | | X | | [] | [] | B | | | | | X | | | X | | | |
| *Viburnum prunifolium* | blackhaw viburnum | shrub | X | | | X | [] | [] | U | | | | | | | | | | | |

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# Appendix L. Pollinator habitat and native grassland planning considerations

*Much of this text is present in the main body, but is repeated here for easy reference.*

Preparation of the site, after the removal of woody species and invasive species, will require a thorough plan. Consulting the Long Island Regional Horticulturalist for the details of this plan is highly recommended. A possible procedure might include: clearing the ground with a backhoe, adding soil, smoothing with hand rakes, tilling, removing rocks, and leveling. Planting may occur in late fall or early spring. It may be necessary to plant in the fall of year 1, rather than in spring, to optimize the likelihood of success and provide adequate time for planning and acquisition of materials.

Required maintenance includes ongoing removal of weeds (including invasive exotic species), with a strong preference for manual methods to reduce risk of damaging the pollinator species. In the months immediately following planting, a regular and heavy watering regime will be necessary. Also, as damage occurs (from storms or other disturbances), areas will need to be re-seeded or re-planted. We recommend not mowing May through July to prevent disturbing ground-nesting birds. The personnel requirements for maintenance will vary based on the weed seed bank of the site and other factors, but may require attention from several times a week to daily particularly during the early months after planting.

Plants should be fully established by 2 years after planting (NRCS 2011). In order to stabilize the dam, our objective is to attain >80% cover of native species by the end of year 2, with >50% cover of native wildlife-friendly plants (see list below) in the pollinator area. We will use a diverse mix of species that are appropriate to the soil type and hydrology, are native to Nassau County, and provide a series of bloom times throughout the growing season to optimize availability of food and habitat to pollinators.

The success of the pollinator habitat and native grass plantings is contingent on many factors, all of which should be addressed before initiating this aspect of the project:

- Detailed description of the area to be planted, including which areas should be intentionally pollinator-friendly and which should be committed to native grasses;
- Testing of soils to determine type (texture, pH, organic matter, etc.) and moisture availability;
- Determining the specific list (see suggestions below) of species to use in the plantings, and the ratio of seeded to planted areas;
- Choosing and communicating with the seed/plant provider; and
- Allocating personnel and resources for site preparation, planting, and maintenance.

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**Table M1. Pollinator habitat recommended species**

Note: Use local genotypes to the extent possible. Seeds or plants with local genotypes may be sought from the Long Island Native Plant Initiative (http://www.linpi.org/), Ernst Seeds (https://www.ernstseed.com/), or other local nurseries with this specialty.

All of the following species are recommended for use in pollinator or bird-friendly gardens by NYC Parks (2017). The wildlife value is shown by the last four columns. In addition, if the species are recommended elsewhere in this plan (See APPENDIX K), that is indicated in the table below. The "Old field" column indicates whether a species is characteristic of successional old fields (Edinger et al. 2014).

| Latin name | Common name | # of recommendations | Recommended by this plan | Old field | Bees | Birds | Butterflies and Moths | Hummingbirds |
|---|---|---|---|---|---|---|---|---|
| *Aquilegia canadensis* | Wild columbine | 3 | | | X | | X | X |
| *Aralia nudicaulis* | Wild sarsaparilla | 1 | | | X | | | |
| *Asclepias incarnata* | Swamp milkweed | 3 | X | | X | | X | |
| *Asclepias syriaca* | Common milkweed | 2 | | | X | | X | |
| *Asclepias tuberosa* | Butterfly milkweed | 1 | | | | | X | |
| *Chamaecrista fasciculata* | Golden cassia | 1 | | | X | | | |
| *Chelone glabra* | Turtlehead | 1 | | | | | X | |
| *Desmodium canadense* | Canadian tick trefoil | 2 | | | | | X | X |
| *Desmodium paniculatum* | Beggar tick trefoil | 2 | | | | | X | X |
| *Eupatorium aromaticum* | Small white snakeroot | 1 | | | | | X | |
| *Eupatorium hyssopifolium* | Hyssopleaf thoroughwort | 2 | | | X | | X | |
| *Eupatorium perfoliatum* | Common boneset | 3 | X | | X | | X | |
| *Eupatorium rugosum* | White snakeroot | 1 | | | X | | | |
| *Eurybia divaricata* | White wood aster | 1 | | | X | | | |
| *Geranium maculatum* | Wild geranium | 1 | | | X | | | |
| *Helianthus angustifolius* | Narrow-leaved sunflower | 1 | | | | X | | |
| *Helianthus decapetalus* | Thin-leaf sunflower | 2 | | | X | X | | |
| *Helianthus divaricatus* | woodland sunflower | 2 | | | X | X | | |
| *Hibiscus moscheutos* | Marsh mallow | 1 | | | | | | X |
| *Lespedeza capitata* | Bush clover | 1 | | | X | | | |
| *Lobelia cardinalis* | Cardinal-flower | 3 | | | | X | X | X |
| *Lobelia siphilitica* | Indian tobacco | 2 | | | | X | | X |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Monarda didyma* | Oswego tea | 1 | | | | | | X |
| *Monarda fistulosa* | Wild bergamot | 4 | | | X | X | X | X |
| *Oenothera biennis* | Common evening primrose | 5 | X | X | X | X | X | |
| *Panicum virgatum* | Switchgrass | 1 | | | | X | | |
| *Pycnanthemum tenuifolium* | Mountainmint | 1 | | | X | | | |
| *Pycnanthemum virginianum* | Virginia mountainmint | 1 | | | X | | | |
| *Solidago caesia* | Blue stem goldenrod | 1 | | | X | | | |
| *Solidago juncea* | Early goldenrod | 1 | | | X | | | |
| *Solidago nemoralis* | Gray goldenrod | 1 | | | X | | | |
| *Solidago speciosa* | Showy goldenrod | 1 | | | | | X | |
| *Symphyotrichum lavae* | Smooth blue aster | 1 | | | X | | | |
| *Symphyotrichum novae-angliae* | New England aster | 1 | | | X | | X | |
| *Verbena hastata* | Blue vervain | 1 | | | X | | | |
| *Vernonia noveboracensis* | Ironweed | 1 | | | | | X | |

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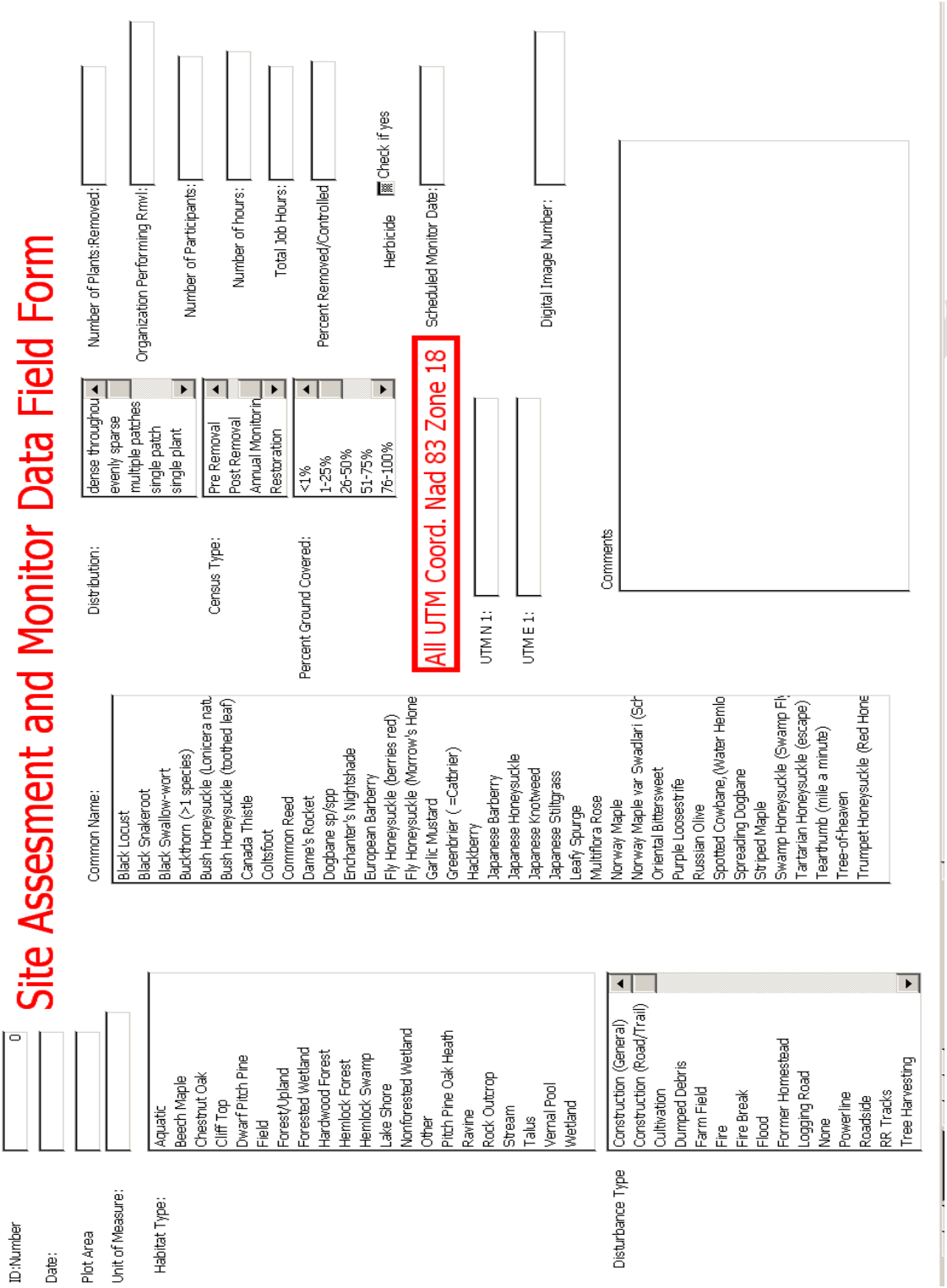
# Appendix M. Form for Monitoring and Site Assessment



# Appendix N. SEQR Review Checklist

***NYS OPRHP***

***State Environmental Quality Review Checklist and Classification Form***

**Region:** Click here to enter text. **Park or Site:** Click here to enter text.

**Project Title/Action:** Click here to enter text.

**Project Review Information:**

Are any State or Federal Permits Required? Yes☐ No ☐

(list permits)

Have CRIS and DHP Intra-agency Protocol Been Checked?

☐No Historic and/or Archeological Resources

☐ Resources identified; consultation completed

Has DEC's Environmental Resource Mapper (ERM) Been Checked?

☐N/A (Project located inside a building)

☐No resources identified in ERM; no consultation required

☐Resources identified in ERM

☐ NHP GIS Database Checked

☐ Consultation completed

**Other information relevant to environmental review and documentation:**

**SEQR is not required or has been complied with as follows:**

**1.** ☐ Project is included in an OPRHP Master Plan/FEIS and no further supplemental environmental review is required:

Master Plan Date and Title:

**OR**

**2.** ☐ Project is a Type II action not subject to SEQR.

Applicable section(s) in Part 617.5(c):

**OR**

**3.** Project is an ☐ Unlisted OR ☐ Type I action and will be transferred to EMB.

**Signature** _____

**Title:** **Date:** Click here to enter text.

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***Instructions***

*This form should be completed and placed in the file for every project undertaken by State Parks. Examples of projects are those under the agency's capital program (e.g. NY Works), special permits, actions that require physical disturbance (e.g. new trails, structures, roads) or result in new uses or applications for funding or a combination of these activities.*

*Enter the Name of the Region and Park and the title of the project.*

***Project Review information****: The checklist listed in this section should be completed for every project. Even Type II projects that are not subject to further review under SEQR may still have some potential impact on the environment.*

*The list asks if the project requires* ***permits*** *from agencies such as DEC or the Corps of Engineers, particularly if the work is in or near water resources. In addition, the Regions are responsible for compliance with the Division for Historic Preservation's Intra-Agency Protocol for the Application of Section 14.09 of the NYS Parks, Recreation and Historic Preservation Law to assure that the project will not impact historic or archeological resources. Applications to federal agencies require compliance with Section 106 of the National Historic Preservation Act.*

***Environmental Resource Mapper (ERM)*** *should be checked: The ERM is a mapping tool found on DEC's website that includes map-based information on wetlands, rare, threatened or endangered plants and animals, and significant natural communities. Reviewers should locate the project site on the ERM at: http://www.dec.ny.gov/animals/38801.html and determine if there are any significant resources in the project area. If the project is in a wetland or within the check zone for a wetland, contact DEC to determine if a permit is required. If any rare species or significant communities are identified, consult the NHP database for more information and consult EMB.*

*Determine the* ***SEQR Classification*** *of the project using the annotated Type I and Type II list. If the project is* ***Type II*** *– enter the* ***number*** *from the Type II list: Part 617.5(c)****1-36****.*

*If there is a recently adopted* ***Master Plan*** *for the park, determine if the project was specifically listed or described within the Plan, Environmental Impact Statement (EIS) and Findings Statement. Determine if the project is consistent with what was discussed in the Master Plan – For example is it in the same location and is it the same size? Also check that it is not listed in the "Supplemental Review" section of the EIS as a project that requires additional environmental review. If it is consistent and does not require further review, enter the name of the Master Plan and the date it was adopted. If the project is not consistent with the Master Plan/FEIS or if you are unsure if it is adequately addressed contact EMB.*

***Unlisted or Type I actions****: For these projects, the Region will prepare Part 1 of the Full or Short Environmental Assessment Form on DEC's website and Parts 2 and 3 will be completed by EMB. Once SEQR review has been completed, EMB will forward copies to the Region.*

***Signature:*** *Regional Directors or their designees may be required to sign SEQR documents and have been delegated the authority to sign off on this SEQR compliance for OPRHP projects.*

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