



Chelsea Cooper, 2021

Eastern Lake Ontario Dunes Invasive Species Initiative

Final Report: November 2021



Prepared for
The Nature Conservancy
SLELO PRISM



Prepared by
Upstate Environmental Grant Professionals &
Eastern Lake Ontario Dunes Foundation

TABLE OF CONTENTS

Overview	4
Project Need.....	6
Project Team.....	7
Study Area.....	8
Scope.....	9
Methods.....	10
Historic Management Practices (Literature Review).....	11
2021 Field Survey Results and Restoration Recommendations.....	16
El Dorado Beach Preserve.....	17
Black Pond Wildlife Management Area.....	19
Southwick Beach State Park.....	21
Lakeview Wildlife Management Area.....	23
Sandy Island Beach State Park.....	25
Deer Creek Marsh Wildlife Management Area.....	28
Dune Willow Restoration.....	31
Native Plant Restoration.....	36
Native Plant Vendors.....	39
Recommendations.....	43
References.....	44
Appendices.....	50
Acknowledgments.....	84

Acknowledgements

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List of Figures

- Figure 1: Invasive Species Shallow Root System
- Figure 2: Map of the Eastern Lake Ontario Dunes and Wetlands Area
- Figure 3: Map of Site Recommendations El Dorado Beach Preserve
- Figure 4: Map of Site Recommendations for Black Pond WMA
- Figure 5: Map of Site Recommendations for Southwick Beach State Park
- Figure 6: Map of Site Recommendations for Lakeview WMA
- Figure 7: Map of Site Recommendations for Sandy Island Beach State Park
- Figure 8: Map of Site Recommendations for Deer Creek WMA
- Figure 9: Chrysomelid Willow Leaf Beetles
- Figure 10: Eastern Lake Ontario Dune Profile

List of Tables

- Table 1: Significant Rare Plants, Wildlife and Ecological Communities to the Eastern Lake Ontario Dunes and Wetlands Area
- Table 2: Invasive Species Observed at El Dorado Beach Preserve
- Table 3: Site Recommendations for El Dorado Beach Preserve
- Table 4: Site Recommendations for El Dorado Beach Preserve
- Table 5: Invasive Species Observed at Black Pond Wildlife Management Area
- Table 6: Site Recommendations Black Pond Wildlife Management Area
- Table 7: Invasive Species Observed at Southwick Beach State Park
- Table 8: Site Recommendations Southwick Beach State Park
- Table 9: Invasive Species Observed at Lakeview Wildlife Management Area
- Table 10: Site Recommendations Lakeview Wildlife Management Area
- Table 11: Invasive Species Observed at Sandy Island Beach State Park
- Table 12: Site Recommendations Sandy Island Beach State Park
- Table 13: Invasive Species Observed at Deer Creek WMA
- Table 14: The Beachgrass Community
- Table 15: The Poison Ivy, River Grape, and Cottonwood Community
- Table 16: The Red Oak, Red Maple Community
- Table 17: The Alder Thicket Community

Appendices

- Appendix A: SLELO PRISM Tiered Species List
- Appendix B: Eastern Lake Ontario Dunes Terrestrial Invasive Species Initiative Questionnaire
- Appendix C: Invasive Species Survey Permits
- Appendix D: The Flora of the Eastern Shore Dunes of Lake Ontario
- Appendix E: Invasive Species Best Management Practices Resources
- Appendix F: NYSDEC Funding Opportunities to Implement Great Lakes Restoration Actions

Overview

The Eastern Lake Ontario Dunes and Wetlands Area (ELODWA) is a 17-mile (5,800 acres) barrier beach and wetland ecosystem designated as a Natural Heritage Area, Audubon Important Bird Area, Significant Coastal Fish and Wildlife Habitat, National Natural Landmark, and proposed National Marine Sanctuary. The ELODWA includes non-federal wetlands monitored as part of the Great Lakes Coastal Wetland Monitoring Program. There are rare and significant natural communities identified by the NY Natural Heritage Program including Great Lakes Dunes, Sand Beach, and Shallow Emergent Marsh, which supports federal and state protected rare plants and wildlife including Great Lakes piping plover, low sand cherry, dune willow, Indiana bat, long eared bat, common tern, bald eagle, and black tern. Additional priority conservation species that benefit from the invasive species initiative project can be found at: [List of endangered, threatened, and special concern fish and wildlife species of New York State](#).

Threats to the Eastern Lake Ontario barrier beach and wetlands include development (residential, commercial, water quality impairment from runoff, erosion and septic systems, shoreline hardening), recreational overuse (ATV's, trampled vegetation, pressure on wildlife, trash dumping, bon fires, camping, non permitted activities), habitat modification (beach grooming, vegetation removal), high water levels, decreased native plant composition, habitat alteration, reduced function of wetlands, and invasive species. In 2017 and 2019 Lake Ontario observed high water events which led to dune erosion. Many land managers and property owners began fortifying their dunes using hard structures which alter the natural succession of vegetation, accelerated wave action to neighboring properties and impaired habitat for shoreline birds and wildlife species. These manmade and natural disturbances also gave invasive species a vector to spread into newly disturbed areas. Invasive species continue to threaten the dune and wetland system with few habitat benefits and decreased ability to build and stabilize shorelines.

The ELODWA Invasive Species Initiative addresses decreased native plant composition, habitat alteration, and invasive species. The project develops recommendations to restore native dune building plants and identifies key areas for land managers to monitor, manage, and suppress the presence of invasive species. The initiative accomplishes this by working with land managers to identify mapping gaps for priority management species, evaluate current and historical IS treatment methods for efficacy, and identify future priority IS management and native vegetation restoration areas to benefit state and federally listed species of greatest conservation need.

The project focuses on surveying and planning management projects for tiered priority invasive species developed by the NYSDEC and SLELO PRISM which can be found in Appendix A: SLELO PRISM Tiered Species List. The proposed project strengthens existing partnerships, projects, and collaboration through the Eastern Lake Ontario Dune Coalition. Participating agencies can be found at: [Eastern Lake Ontario Dunes Coalition](#). This habitat restoration initiative augments and expands existing conservation plans to maintain and enhance dunes, wetlands, protect threatened and endangered species, restore and protect the barrier beach, improve hydrologic connections, and control invasive species which can be found at:



<u>Conservation Plan</u>	<u>Organization</u>	<u>Conservation Plan</u>	<u>Organization</u>
<u>Black Pond WMA</u>	NYSDEC	<u>North Pond Resiliency</u>	Hart et. al
<u>Champlain Beachgrass</u>	NYNHP	<u>Lakeview WMA</u>	NYSDEC
<u>Deer Creek Marsh WMA</u>	NYSDEC	<u>NYS Inv. Sp. Mgt. Plan</u>	NYSDEC
<u>GLRI Action Plan III</u>	USEPA	<u>Piping Plover Recovery Plan</u>	USFWS
<u>Aquatic Restoration Plan</u>	SLELO PRISM	<u>NYS Forest Action Plan</u>	NYSDEC

The ELO Dunes Invasive Species Initiative also furthers SLELO PRISM’s Strategic Goals including (Williams, 2020):

Goal Number 3: Rapid Response Control and Management

- The ELO Dunes Invasive Species Initiative addresses the monitoring and management of new and existing infestations of terrestrial invasive species within the barrier beach system, and offers recommendations to manage populations of invasive species.

Goal Number 4: Education, Outreach and Citizen Science

- The ELO Dunes Invasive Species Initiative makes recommendations for private homeowner education and outreach, while promoting citizen science opportunities to monitor, report, and participate in invasive species management and restoration projects.

Goal Number 5: Cooperation

- The initiative incorporates inter agency collaboration from stakeholders including NYS Department of Environmental Conservation, The Nature Conservancy, The Natural Heritage Program, NYS Office of Parks, Recreation and Historic Preservation, The Eastern Lake Ontario Dunes Foundation, and additional Eastern Lake Ontario Dune Coalition member organizations and individuals.

Goal Number 6: Information Management

- Invasive species do not observe political boundaries. The initiative provides a historical overview of past and current monitoring and management activities, a synopsis of past and current funded projects to encourage information sharing and collaboration across agency property boundaries. The project recommends implementing information sharing platforms or participating in yearly invasive species management meetings to promote cooperation and information management.

Goal Number 7: Ecological Restoration

- Central to the ELO Dunes Invasive Species Initiative is Ecological Restoration. By prioritizing survey and assessment areas the project focuses on critical habitat for federally and state protected species, recreational corridor vectors that may spread invasive species, and vulnerable areas of shoreline that are impacted by invasive species which may accelerate erosion and alter the succession of native vegetation. The project makes detailed and site-specific management and restoration recommendations. In addition, the project provides best management practices resources, native plant resources, and funding opportunities to promote future collaboration on barrier beach ecological restoration projects.

Project Need

Among the biggest threats to the Eastern Lake Ontario Dunes and Wetlands Area ecosystem are shoreline development, increased erosion, pressure from recreation, algal blooms, and water quality problems, and decreased native plant cover. Each of which is linked to the threat of invasive species. For example, *Phragmites* contributes to decreased functionality of the shoreline to withstand high water, wind, and wave events which result in increased runoff and erosion. *Phragmites* provides few habitat benefits for native wildlife and increased erosion can contribute to water quality impairments.

Figure 1: Invasive Species Shallow Root System



Phragmites (L) has shallow root systems in contrast to Champlain beachgrass which help to anchor sand and prevent shoreline erosion. Photo credits: Unknown (Left), Patricia Shulenburg (Right)

Terrestrial invasive species also out-compete native dune building plants resulting in decreased habitat availability for threatened and endangered plants and wildlife and significant ecological communities. Significant rare plants, wildlife, and communities include:

Table 1: Significant Rare Plants, Wildlife and Ecological Communities to the Eastern Lake Ontario Dunes and Wetlands Area

Common Name	Scientific Name	Comments
Black Tern	<i>Chlidonias niger</i>	A state-endangered species whose range is restricted to less than 15 sites and 150 pairs of breeding pairs.
Bogbean Buckmoth	<i>Hemileuca sp.</i>	One of three known occurrences in NY. All occurrences in Oswego County.
Caspian Tern	<i>Sterna caspia</i>	A species that's only breeding population occurs on Little Galloo Island in eastern Lake Ontario. It is susceptible to death by exposure to Botulism-E toxin.
*Champlain Beachgrass	<i>Ammophila breviligulata</i>	Lake Ontario genetic variant of American beachgrass. One of two known locations for this species in NY.
Common Tern	<i>Sterna hirundo</i>	State designated threatened, vulnerable throughout New York.
Dunes		Largest and most extensive freshwater dunes in NY.
Fawn Brown Dart	<i>Euxoa pleuritica</i>	Vulnerable to disappearing in New York.
Great Lakes Sand Cherry	<i>Prunus pumila var. pumila</i>	State designated endangered, five or fewer populations.
Hairy-necked Tiger	<i>Cicindela hirticollis</i>	Critically imperiled in New York, declining in its limited range.

Beetle		
Houghton's Sedge	<i>Carex houghtoniana</i>	State designated threatened, very restricted range. 10 known populations.
Least Bittern	<i>Ixobrychus exilis</i>	A state-threatened bird whose breeding occurrences are uncommon and whose non-breeding occurrences are critically imperiled.
Noctuid moth	<i>Abagrotis barnesi</i>	The only recorded occurrence of this species in NY.
Ram's Head Lady's Slipper	<i>Cypripedium arietinum</i>	State designated threatened and very vulnerable to disappearing in New York.
Rough Avens	<i>Geum laciniatum</i>	One of three known locations for this species in NY.
Sand Dune Willow	<i>Salix cordata</i>	State threatened. Only known area for this species in NY.
Schweinitz's Flat Sedge	<i>Cyperus schweinitzii</i>	State designated rare, vulnerable in New York. Restricted range and widespread decline.
Silver Maple-Ash Swamps		Excellent examples of this community type. Pristine and high-quality swamps.

Adapted from List of Endangered, Threatened and Special Concern Fish & Wildlife Species of New York State

*Champlain beachgrass is a genetic variant of American beachgrass which is not designated as an endangered or rare plant. However, NYSNHP recommends its continued protection. (Young, 2022.)

Project Team

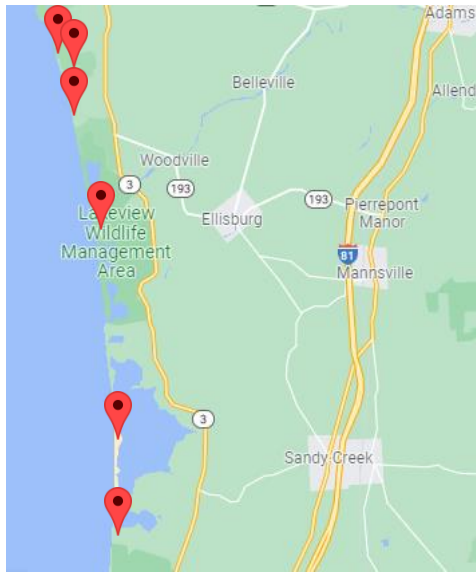
The Eastern Lake Ontario Dunes Foundation was awarded a SLELO PRISM Special Projects grant to create the ELO Dunes and Wetlands Area Invasive Species Initiative. The Dunes Foundation works with individual members and organizations of the [Eastern Lake Ontario Dune Coalition](#) to develop projects to benefit the long term recreational use and resiliency of the dune system. The Dunes Foundation subcontracted Upstate Environmental Grant Professionals, owned by Patricia Shulenburg, to implement the invasive species initiative and provide a project report.

- Patricia Shulenburg, Owner/Ecologist Upstate Environmental Grant Professionals
- Robert Williams, SLELO PRISM Program Director
- Brittney Rogers, SLELO PRISM Aquatic Restoration and Resiliency Coordinator
- Megan Pistolese-Shaw, SLELO PRISM Education and Outreach Coordinator
- NYS Department of Environmental Conservation - Regions 6 and 7 Regional Staff
- NYS Office of Parks, Recreation and Historic Preservation - Central and Finger Lakes Region Staff
- The Nature Conservancy Northern New York Conservation of Lands Staff

STUDY AREA

The Great Lakes Dunes ecosystem is globally rare. Plant communities are dominated by grasses, herbaceous spp., trees and shrubs, of which some are endemic to this ecological community. The Study encompassed six project sites from the Town of Richland, New York in Oswego County, to the Town of Ellisburg, New York in Jefferson County.

Figure 2: Map of the Eastern Lake Ontario Dunes and Wetlands Area



Project Site

- 1. El Dorado Beach**
- 2. Black Pond WMA**
- 3. Southwick Beach**
- 4. Lakeview WMA**
- 5. Sandy Island Beach**
- 6. Deer Creek WMA**

Organization

- The Nature Conservancy
- NYS Department of Environmental Conservation
- NYS Office of Parks, Recreation and Historic Preservation
- NYS Department of Environmental Conservation
- NYS Office of Parks, Recreation and Historic Preservation
- NYS Department of Environmental Conservation

The focus of the study area includes the open beach, foredune, swale, back dune, shrub thicket, and wetland areas which contain populations of rare plant and wildlife species within public lands. In addition, areas with recreational trails and areas of the shore susceptible to erosion were evaluated. The following sites were included in the ELO Dunes Invasive Species Initiative: El Dorado Beach Preserve, Black Pond Wildlife Management Area, Southwick Beach State Park, Lakeview Wildlife Management Area, Sandy Island Beach State Park, and Deer Creek Wildlife Management Area.

Priority survey areas were selected from input from state, and nonprofit land managers. In addition, each site was assessed using the [NYSDEC Nature Explorer](#) for presence of rare plants and wildlife. The invasive species initiative also focused on underreported terrestrial invasive species, and project sites with gaps in reporting.



Project Scope

The Dunes Foundation collaborated with individuals and partners of the Eastern Lake Ontario Dune Coalition to implement the ELODWA Invasive Species Initiative to accomplish the following tasks:

1. Oversee the preparation of an Eastern Lake Ontario Dunes and Wetlands Area (ELODWA) Comprehensive Invasive Species Management Plan.
2. Subcontract a portion of the plan development.
3. Collaborate with multiple partners to include but not limited to New York State Department of Environmental Conservation, The Nature Conservancy, New York State Department of Parks Recreation and Historic Preservation, the ELO Dune Coalition and the NYS Natural Heritage Program on the development and contents of the management plan.
4. Include a section in the management plan that summarizes a literature review of existing management efforts for ELO dune environment for both dunes and adjacent wetlands.
5. Include in the management plan 1) an overview of invasive species present based on in-situ surveys and best management practices to mitigate their impacts, 2) a section on dune restoration measures such as dune willow protection and enhancement and ecological beach restoration measures if deemed desirable.
6. Include number of acres of dunes mapped (including an adjacent 50-foot buffer) for tier invasive species gaps using in-situ surveys and NY iMapInvasives to inform future long-term restoration and monitoring projects and communicate results to land managers.
7. Summarize number of acres of dunes (including an adjacent 50-foot buffer) recommended for long term priority invasive species management.
8. Acknowledge the SLELO PRISM, The Nature Conservancy in any correspondence associated with this project.
9. Prepare a final report (Management Plan) which addresses all project elements.

Desired Outcome: The transparent development of an Eastern Lake Ontario Dunes and Wetlands Area (ELODWA) Comprehensive Invasive Species Management Plan.

The project scope was categorized into the following tasks:

- Literature Review- research and analysis of historic and current invasive species management practices, dune willow restoration, and native plant communities and restoration.
- Pre-fieldwork: obtaining research permits, input from land managers into priority survey areas, cross referencing survey sites with observed rare plant communities through NYSDEC Nature Explorer, assessing underreported species in survey sites utilizing the iMapInvasives invasive species mapping and database platform. (see Appendix C: Invasive Species Survey Permits)

- Fieldwork– surveying invasive and rare plants and wildlife throughout priority sites within the Eastern Lake Ontario dunes ecosystem and when accessible 50 ft into the wetland area.
- Reporting- Authoring a Mid-Season Progress Report and Final Report

Methods

The Eastern Lake Ontario Dunes Invasive Species Initiative utilizes a multi-tiered approach to prioritizing monitoring, management, and restoration recommendations throughout the 17 mile barrier beach system. Monitoring and site evaluation occurred at sites which were underreported for invasive species mapping efforts, sites which had rare or significant plants or wildlife, areas that are used as recreation corridors, and shorelines that experienced loss of sand due to erosion. Stakeholders from each landowner agency and partners from participating organizations within the Eastern Lake Ontario Dune coalition also prioritized survey areas and species to monitor and report.

Pre-Fieldwork Methods: Landowner permissions and research permits were acquired prior to site assessments and field inventory. Each site was assessed using the NYSDEC Nature Explorer search engine for approximate locations of rare plant and wildlife species. Landowner agencies and land manager staff provided input to the project through the Eastern Lake Ontario Terrestrial Invasive Species Questionnaire (Appendix B). The iMapInvasives online platform was consulted to assess underreported species, and prioritize project sites that were missing mapping and monitoring.

Fieldwork Methods: Once input from stakeholders was completed and sites were prioritized, visual surveys commenced. Staff also noted rare plants and wildlife present. Species prioritized in the site surveys included the SLELO PRISM Tiered Species List, as well as non-ranked invasive species. Presence of species were recorded in a field notebook and uploaded into survey area polygons using iMapInvasives and Survey 123. Surveys were completed at prioritized sites and 50 feet into the wetland when conditions were favorable.

Tasks include:

- Obtaining input, permits, and permissions from public land managers for:
 - Identifying priority survey areas
 - Identifying reporting gaps
 - Identifying under reported species
- Cross referencing priority sites using rare plant database utilizing NYSDEC Nature Explorer



- Cross referencing underreported species, and underreported project sites using iMapInvasives
- GIS mapping: iMapInvasives and Survey 123
- Literature review
 - Current and historic invasive species management practices
 - Dune willow restoration
 - Native dune building plants and barrier beach restoration methods

Overview of Invasive Species Management

An overview and historic timeline of invasive species monitoring, management, and treatment projects was created by sourcing publicly available information. This timeline includes invasive species monitoring, management, and treatment efforts focusing on terrestrial invasive species found on the Eastern Lake Ontario Dunes from 2006-2021. The ELO Dunes Invasive Species Initiative created a stakeholder survey and sharing platform for agency land managers to provide historic management documents. Responses are indicated in Appendix B: Eastern Lake Ontario Dunes Terrestrial Invasive Species Initiative Questionnaire.

Publicly Available Sources: SLELO PRISM Field Reports (2012-2020), iMapInvasives (2006-2021), and Great Lakes Restoration Initiative Project Map

Additional project and field reports may be available internally from each land manager organization. It is encouraged for agency internal staff, contractors, and partnering organizations to record monitoring, management, and treatments in universal platforms including iMapInvasives if they have not used this platform in the past. Adding project information to create a comprehensive timeline of management activities and success of treatments can benefit additional landowners and land managers. The project also recommends creating a collaborative platform to share outcomes of invasive species treatments and evaluate management outcomes through online project sharing, or annual project meetings focusing on the dunes.

Black Pond Wildlife Management Area and El Dorado Beach Preserve

2021: Acres Surveyed: 11.2 acres (El Dorado Beach Preserve and 26.8 acres of Black Pond WMA by Upstate Environmental Grant Professionals

Species Observed: spotted knapweed, pale swallowwort, and amur honeysuckle. Phragmites, common buckthorn, purple loosestrife, multiflora rose, and autumn olive

2020 Acres Surveyed: 36 acres by SLELO PRISM



Species Found: common reed grass, yellow iris, common buckthorn, pale swallow-wort, purple loosestrife, common barberry, honeysuckle spp., garlic mustard, great mullein, creeping jenny, eastern helleborine

Treatments: common reed grass was treated at 2 sites (0.04 acres), and pale swallow-wort infestations were treated at 4 sites (8.06 acres) with a selective application of triclopyr based herbicide. [Link to Report](#)

2014 Species Observed: pale swallow-wort

2013 Species Observed: pale swallow-wort

Treatments: 3.6 acres of pale swallow-wort treated with glyphosate. [Link to Report](#)

2012 Treatments: 26 sites treated with a foliar application of glyphosate. Limited secondary spraying also occurred in August. [Link to Report](#)

Dune Willow Monitoring: 729 plants Surveyed. 52 plants with *D. alternata* adults. 149 plants with *D. alternata* larvae [Link to Report](#) [Link to Report](#)

2011 Species Observed: common reed grass, purple loosestrife, hybrid cattail, reed canary grass

Southwick Beach State Park

2021: Acres Surveyed: 24.12 acres by Upstate Environmental Grant Professionals
Species Observed: spotted knapweed, honeysuckle ssp., queen Ann's lace, common buckthorn, purple loosestrife

2012 Species Observed: pale swallowwort, creeping jenny, garlic mustard, common buckthorn

Treatments: one pale swallow-wort plant was found and dug by hand

2008 Species Observed: brown knapweed, Canada bluegrass

2006 Species Observed: purple loosestrife

Lakeview Wildlife Management Area

2021 Acres Surveyed: 45.3 acres by Upstate Environmental Grant Professionals
Species Observed: spotted knapweed, glossy buckthorn, amur honeysuckle, common buckthorn, Phragmites, purple loosestrife, autumn olive, and common barberry

2020 Acres Surveyed: 10.6 acres by SLELO PRISM



Species Observed: common buckthorn, glossy buckthorn, Japanese knotweed, oriental bittersweet, yellow flag iris, purple loosestrife, wild parsnip, bishop's goutweed, climbing nightshade, cut leaved teasel, honeysuckle spp., multiflora rose, stringy stonecrop, tufted vetch.

Treatments: Pale swallow-wort infestations were treated at 1 site (0.4 acres). [Link to Project Report](#)

2015 Species Observed: hybrid cattail, purple loosestrife, glossy buckthorn

2014 - Project Overview: EPA GLRI funded project for coastal wetland habitat restoration at Floodwood Pond with Ducks Unlimited, NYSDEC, SUNY ESF, and The Nature Conservancy. Potholes were excavated to benefit northern pike, black tern, and muskrat. Mounds from excavated material was used to vary the topography and provided substrate for succession of vegetation (Sargis, 2015). [Link to Project Award](#)

Target Invasive Species: purple loosestrife, hybrid cattail, glossy buckthorn

Treatment: glossy buckthorn was managed (method unknown) for 55 acres, and biocontrol (*Galerucella* spp.) released to control purple loosestrife across three wetlands. After two years cattail densities were slightly greater than reference areas along the channel, however excavated mounds showed greater species richness and cattails near the mounds was lower than cattails near the channel (Sargis, 2015).

2014 Species Observed: hybrid cattail, purple loosestrife, reed canary grass

Dune Willow Monitoring: 269 plants Surveyed. 2 plants containing 23 plants with *D. alternata* adults. 149 plants with *D. alternata* larvae every strong positive relationship between the percentage of plants with *D. alternata* larvae and the amount of damage. [Link to Report](#) [Link to Report](#)

2013 Species Observed: glossy buckthorn, pale swallow-wort, flowering rush [Link to Report](#)

Treatments: 0.39 acres of pale swallow-wort treated with foliar application of Glyphosate. [Link to Report](#)

2012 Species Observed: pale swallow-wort, glossy buckthorn,

Treatments: 5 pale swallow-wort sites identified in iMap however one single site revealed a population of plants that was subsequently treated with a foliar application of Glyphosate. [Link to Report](#)

2011 Species Observed: glossy buckthorn

2010 Species Observed: pale swallow-wort



Sandy Island Beach State Park

2021 Acres Surveyed: 13.04 acres by Upstate Environmental Grant Professionals

Species Observed: spotted knapweed, amur honeysuckle, Phragmites, purple loosestrife, Queen Ann's lace, autumn olive, and common buckthorn

2020 - Project Description: EPA GLRI funding awarded to OPRHP to protect and restore a degraded dune on a recently acquired parcel on the barrier beach that separates North Sandy Pond from Lake Ontario. By preventing erosion of barrier dunes, the project will directly protect 46 acres. NYS Parks proposes a project to protect and restore a degraded dune on a recently acquired parcel on the barrier beach that separates North Sandy Pond from Lake Ontario. By preventing erosion of barrier dunes, the project will directly protect 46 acres. [Link to Project Award](#)

2018 Species Observed: common reed grass, purple loosestrife, black locust, pale swallow-wort

2017 Species Observed: common reed grass, spotted knapweed, purple loosestrife, common reed grass, common buckthorn

Treatments: common reed grass mechanical removal (2 sites), spotted knapweed hand pulled (1 site). This project was part of the 2016-2020 GLRI EPA funding.

2015 Species Observed: common reed grass

2014 Species Observed: Purple loosestrife

Dune Willow Monitoring: 412 plants Surveyed. 0 plants containing 4 plants with *D. alternata* adults. 149 plants with *D. alternata* larvae [Link to Report](#) [Link to Report](#)

2013 Species Observed: common reed grass,

2012: Species Observed: glossy buckthorn

2011 Species Observed: common reed grass, glossy buckthorn, purple loosestrife

Deer Creek Marsh Wildlife Management Area

2021 Acres Surveyed: 22.4 acres surveyed by Upstate Environmental Grant Professionals

Species Observed: spotted knapweed, honeysuckle ssp., queen Ann's lace, Phragmites, Japanese barberry, autumn olive, glossy buckthorn, multiflora rose, and common buckthorn, and purple loosestrife.



- 2020 Acres Surveyed:** 23.4 acres surveyed by SLELO PRISM
Species Observed: common buckthorn, glossy buckthorn, pale swallow-wort, Japanese knotweed, amur honeysuckle, black locust, climbing nightshade, dame's rocket, eastern helleborine, garlic mustard, honeysuckle spp., Japanese barberry, multiflora rose, tufted vetch
Treatments: pale swallow-wort was treated at 22 sites (total 9.8 acres) with selective application of triclopyr based herbicide. Pale swallow-wort was not found on the dune, and therefore treatments did not occur on the dune. [Link to Project Report](#)
- 2014 Species Observed:** purple loosestrife
- 2012 Species Observed:** glossy buckthorn
Treatments: hand pulled Japanese stiltgrass on private homeowner property adjacent to Deer Creek Marsh WMA. One cubic yard of pale swallow-wort was manually removed from Rainbow Shores Road in a medium sized patch (approximately 50 plants) occurring near a rock barrier across a former logging access road leading into Deer Creek WMA. [Link to Report](#)
Dune Willow Monitoring: 30 plants Surveyed. 0 plants containing *D. alternata* adults or larvae. [Link to Report](#) [Link to Report](#)
- 2011 Species Observed:** purple loosestrife, common reed grass, Japanese knotweed

Additional Invasive Species Related Projects

- 2021- 2023 Project Description:** US Fish and Wildlife Service awarded Syracuse University funding to investigate limiting factors and restoration opportunities on the Eastern Great Lakes [Link to Project Award](#)
- 2021 - 2023 Project Description:** US Fish and Wildlife Service awarded Syracuse University funding to investigate limiting factors and restoration opportunities on the Eastern Great Lakes to inform adaptive management of piping plover habitat on Eastern Lake Ontario. [Link to Project Award](#)
- 2019 - 2021 Project Description:** US Fish and Wildlife Service awarded funding to SUNY ESF for Great Lakes piping plover recovery planning. Funds under this award are to be used on work aimed at understanding the ecology of the newly established population of Great Lakes piping plovers in eastern Lake Ontario, to coordinate collection of information and restoration planning. [Link to Project Award](#)



2021 Field Survey Results and Restoration Recommendations

The results of the ELODWA Invasive Species Initiative addresses invasive species found within priority survey areas, and recommended management and restoration strategies. 1.5 acres of barrier beach were monitored and assessed throughout 6 project sites. Surveys were prioritized within project sites using input from the stakeholder questionnaire, and stakeholder maps. Areas that were surveyed were also prioritized near designated recreation trails, unmarked social trails, where sensitive species are present, or in areas where foredune is susceptible to shoreline erosion.

The following areas of invasive species were mapped, and data including size, and percent cover of infestation was input using Survey 123 and iMapInvasives 3.0.

Invasive species management and restoration recommendations were assessed using the following resources:

- Invasive Species Best Management Practices Resources (Appendix E) and
- Flore of the Eastern Shore Dunes of Lake Ontario (Appendix D)

El Dorado Beach Preserve

Table 2: Invasive Species Observed at El Dorado Beach Preserve

El Dorado Beach Preserve is a 360-acre dune and wetland area managed by The Nature Conservancy in New York. El Dorado is directly adjacent to Black Pond WMA.

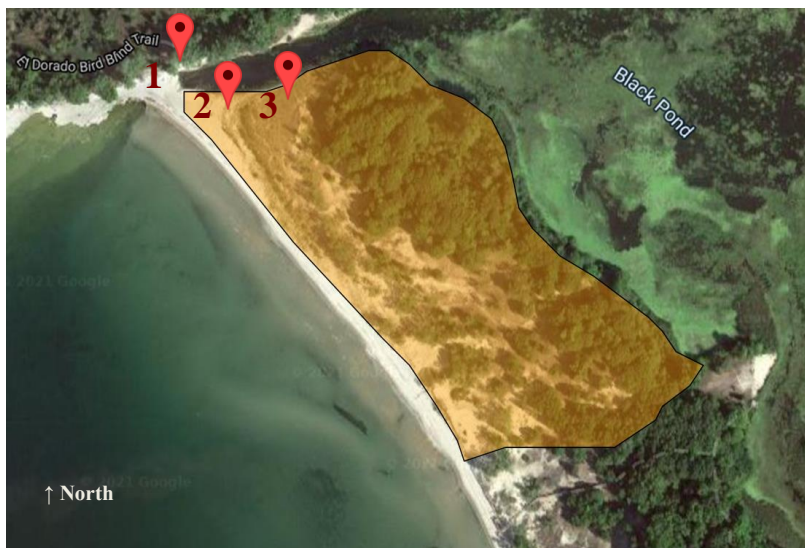
11.2 acres of dune were mapped and surveyed for presence of invasive species using Survey 123, and iMapInvasives 3.0 in October and November 2021.

The most abundant invasive species found on the dune system includes spotted knapweed, pale swallowwort, and Amur honeysuckle. Phragmites and common buckthorn are also present. [2020 SLELO PRISM Survey and Management Field Report](#).

Species	(Common Name, Latin Name)	Present	
Giant Hogweed	<i>(Heracleum mantegazzianum)</i>		
Porcelain Berry	<i>(Ampelopsis glandulosa)</i>		
Common Buckthorn	<i>(Rhamnus cathartica)</i>	X	
Glossy Buckthorn	<i>(Frangula alnus)</i>		
Japanese Knotweed	<i>(Reynoutria japonica)</i>		
Japanese Stiltgrass	<i>(Microstegium vimineum)</i>		
Oriental Bittersweet	<i>(Celastrus orbiculatus)</i>		
Pale swallow-wort	<i>(Vincetoxicum rossicum)</i>	X	
Phragmites	<i>(Phragmites australis)</i>	X	
Tree of Heaven	<i>(Ailanthus altissima)</i>		
Wild Chervil	<i>(Anthriscus sylvestris)</i>		
Yellow Flag Iris	<i>(Iris pseudacorus)</i>		
Purple Loosestrife	<i>(Lythrum salicaria)</i>	X	
Spotted Knapweed	<i>(Centaurea stoebe ssp. micranthos)</i>	X	
Wild Parsnip	<i>(Pastinaca sativa)</i>		
Amur Honeysuckle	<i>(Lonicera maackii)</i>	X	
Autumn Olive	<i>(Elaeagnus umbellata)</i>		
Common Barberry	<i>(Berberis vulgaris)</i>		
Multiflora Rose	<i>(Rosa multiflora)</i>		
Queen Ann’s Lace	<i>(Daucus carota)</i>		
Tier 2	Tier 3	Tier 4	Not Ranked

Ecological Restoration Recommendations

Figure 3: Map of Site Recommendations El Dorado Beach Preserve



Recommendation 1
Description: Open beach adjacent to El Dorado Bird Blind Trail

Recommendation 2
Description: Open beach along channel

Recommendation 3
Description: Swale behind foredune

Project area surveyed



Table 4: Site Recommendations for El Dorado Beach Preserve

Recommendation Area	Site Description	Species	Recommended IS Management	Native Plant Restoration
<p>1</p> <p>43.807417 N -76.231995 W</p> <p>Threats: PSW along recreation trail can spread, Phragmites may increase shore erosion</p>	<p>Open beach adjacent to El Dorado Bird Blind Trail</p>	<p>Pale swallow-wort (1 acre)</p> <p>Phragmites (>0.25 acre, sparse)</p>	<p>Continue chemical management. Consider adjusting level of trichlopyr concentration, or amount of surfactant. Try cutting or mowing in July, and application in August</p> <p>Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr)</p>	<p>None at this time</p> <p>Spread native seed mix to supplement seed bank (beachgrass and (or) wetland community)</p>
<p>2</p> <p>43.806900 N -76.231258 W</p> <p>Threats: Phragmites may increase shore erosion, sensitive species observed may be impacted</p>	<p>Open beach along channel</p>	<p>Phragmites (>0.25 acre, sparse)</p>	<p>Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr)</p>	<p>Spread native seed mix to supplement native seed bank (beachgrass and (or) wetland community). For upland Phragmites patches consider interspersing native beachgrass community shrubs for competition</p>
<p>3</p> <p>43.806913 N -76.230501 W</p> <p>Threats: Honeysuckle may infiltrate foredune, poor foredune stabilization, and may outcompete sensitive native species.</p>	<p>Swale behind foredune</p>	<p>Honeysuckle ssp. (>0.25 acre, large and medium shrubs)</p>	<p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p>	<p>Consider interspersing native red oak, red maple community shrubs for competition</p>



Black Pond Wildlife Management Area

Table 5: Invasive Species Observed at Wildlife Management Area

Black Pond WMA is a 551-acre dune and wetland area managed by The New York State Department of Environmental Conservation. El Dorado is directly adjacent to Black Pond WMA. 48 acres (9%) of the area is comprised of Great Lakes dune (Latremore et. al, 2018).

28.6 acres of dune were mapped and surveyed for presence of invasive species using Survey 123, and iMapInvasives 3.0 in September and October 2021.

The most abundant invasive species found on the dune system includes spotted knapweed, common buckthorn, honeysuckle ssp. Pale swallow-wort is found nearby in adjacent roads and parking areas. Purple loosestrife, multiflora rose, and autumn olive are also present. [2020 SLELO PRISM Survey and Management Field Report](#).

Species (Common Name, Latin Name)	Present		
Giant Hogweed (<i>Heracleum mantegazzianum</i>)			
Porcelain Berry (<i>Ampelopsis glandulosa</i>)			
Common Buckthorn (<i>Rhamnus cathartica</i>)	X		
Glossy Buckthorn (<i>Frangula alnus</i>)			
Japanese Knotweed (<i>Reynoutria japonica</i>)			
Japanese Stiltgrass (<i>Microstegium vimineum</i>)			
Oriental Bittersweet (<i>Celastrus orbiculatus</i>)			
Pale swallow-wort (<i>Vincetoxicum rossicum</i>)	X		
Phragmites (<i>Phragmites australis</i>)	X		
Tree of Heaven (<i>Ailanthus altissima</i>)			
Wild Chervil (<i>Anthriscus sylvestris</i>)			
Yellow Flag Iris (<i>Iris pseudacorus</i>)			
Purple Loosestrife (<i>Lythrum salicaria</i>)	X		
Spotted Knapweed (<i>Centaurea stoebe ssp. micranthos</i>)	X		
Wild Parsnip (<i>Pastinaca sativa</i>)			
Amur Honeysuckle (<i>Lonicera maackii</i>)	X		
Autumn Olive (<i>Elaeagnus umbellata</i>)	X		
Common Barberry (<i>Berberis vulgaris</i>)			
Multiflora Rose (<i>Rosa multiflora</i>)	X		
Queen Ann’s Lace (<i>Daucus carota</i>)			
Tier 2	Tier 3	Tier 4	Not Ranked

Ecological Restoration Recommendations

Figure 4: Map of Site Recommendations for Black Pond WMA

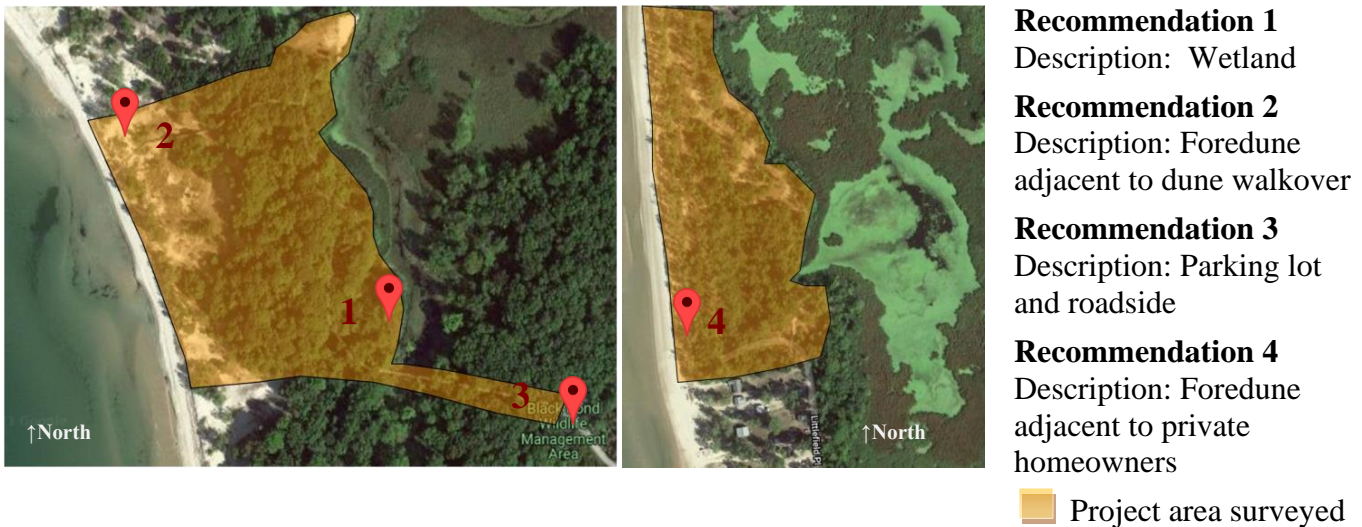


Table 6: Site Recommendations Black Pond Wildlife Management Area

Recommendation Area	Site Description	Species	Recommended IS Management	Native Plant Restoration
<p>1</p> <p>43.802780 N -76.225873 W</p> <p>Threats: Phragmites dense monoculture outcompeting native wetland plants, impacts to wetland connectivity. Plants may spread to other areas of dune.</p>	Wetland	Phragmites (1+ acre, dense)	Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr) to outlying stray plants, foliar spray monoculture dense stands	Spread native wetland seed mix to supplement seed bank.
<p>2</p> <p>43.805994 N -76.228909 W</p> <p>Threats: Poor stabilizer of foredune, encroaching on sensitive species habitats.</p>	Foredune adjacent to dune walkover	Spotted knapweed (>0.25 acre, sparse)	Hand-pull individual plants	Spread beachgrass community native seed mix (common evening primrose, common milkweed, tall wormwood etc.)
<p>3</p> <p>43.793196 N -76.225939 W</p> <p>Threats: PSW along recreation trail can spread.</p>	Parking areas and roadside	Pale swallow-wort	Continue chemical management. Consider adjusting level of trichlopyr concentration, or amount of surfactant. Try cutting or mowing in July, and application in August	None at this time
<p>4</p> <p>43.793196 N -76.225939 W</p> <p>Threats: Invasive shrubs may invade private property boundaries and provide poor stabilization of foredune.</p>	Foredune adjacent to private landowner	Buckthorn, honeysuckle, autumn olive. (>0.25 acre)	Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management	Consider interspersing native red oak, red maple community shrubs for competition



Southwick Beach State Park

Table 7: Invasive Species Observed at Southwick Beach State Park

Southwick Beach State Park is a 464 acre dune and wetland area managed by The New York State Office of Parks, Recreation and Historic Preservation. Southwick Beach is directly adjacent to Lakeview WMA.

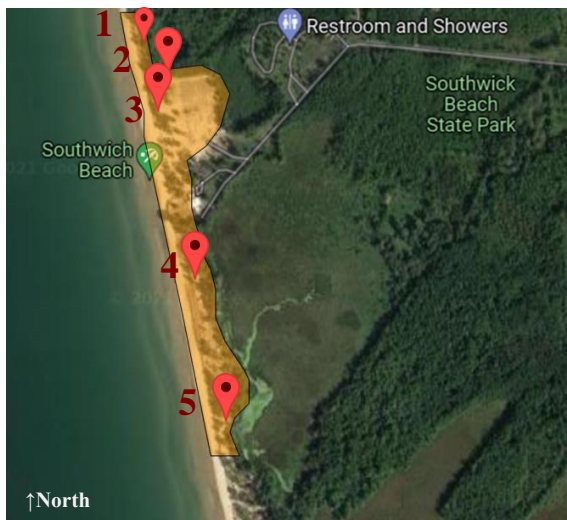
24.12 acres of dune were mapped and surveyed for presence of invasive species using Survey 123, and iMapInvasives 3.0 in October and November 2021.

The most abundant invasive species found on the dune system includes spotted knapweed and amur honeysuckle. Queen Ann’s lace and common buckthorn are also present in lower abundance. Much of the riparian area of the wetland area is inaccessible due to dense shrubs including amur honeysuckle and common buckthorn.

Species (Common Name, Latin Name)	Present
Giant Hogweed (<i>Heracleum mantegazzianum</i>)	
Porcelain Berry (<i>Ampelopsis glandulosa</i>)	
Common Buckthorn (<i>Rhamnus cathartica</i>)	X
Glossy Buckthorn (<i>Frangula alnus</i>)	
Japanese Knotweed (<i>Reynoutria japonica</i>)	
Japanese Stiltgrass (<i>Microstegium vimineum</i>)	
Oriental Bittersweet (<i>Celastrus orbiculatus</i>)	
Pale swallow-wort (<i>Vincetoxicum rossicum</i>)	
Phragmites (<i>Phragmites australis</i>)	
Tree of Heaven (<i>Ailanthus altissima</i>)	
Wild Chervil (<i>Anthriscus sylvestris</i>)	
Yellow Flag Iris (<i>Iris pseudacorus</i>)	
Purple Loosestrife (<i>Lythrum salicaria</i>)	X
Spotted Knapweed (<i>Centaurea stoebe ssp. micranthos</i>)	X
Wild Parsnip (<i>Pastinaca sativa</i>)	
Amur Honeysuckle (<i>Lonicera maackii</i>)	X
Autumn Olive (<i>Elaeagnus umbellata</i>)	
Common Barberry (<i>Berberis vulgaris</i>)	
Multiflora Rose (<i>Rosa multiflora</i>)	
Queen Ann’s Lace (<i>Daucus carota</i>)	X
Tier 2	Tier 3
	Tier 4
	Not Ranked

Ecological Restoration Recommendations

Figure 5: Map of Site Recommendations for Southwick Beach State Park



Recommendation 1

Description: Foredune next to Jefferson Park Boundary

Recommendation 2

Description: Foredune north of Parking lot along fencing

Recommendation 3

Description: Dune walkover

Recommendation 4

Description: Foredune in front of beach campsites

Recommendation 5

Description: Foredune North of Lakeview WMA boundary


 Project area surveyed



Table 8: Site Recommendations Southwick Beach State Park

Recommendation Area	Site Description	Species	Recommended IS Management	Native Plant Restoration
<p>1</p> <p>43.765674 N -76.215805 W</p> <p>Threats: Honeysuckle spp., spotted knapweed, and common buckthorn may outcompete sensitive species and spread to private landowner property.</p>	Foredune next to Jefferson Park Boundary	<p>Amur honeysuckle (>30 medium shrubs, 5 lg shrubs)</p> <p>Spotted knapweed (0.5 acre)</p> <p>Common Buckthorn</p>	<p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p> <p>Hand pull after plants have bolted and when soil is moist</p> <p>Cut stump and basal bark herbicide treatments</p>	<p>Consider interspersing native red oak, red maple community shrubs for competition</p> <p>Spread beachgrass community native seed mix (common evening primrose, common milkweed, tall wormwood etc.)</p>
<p>2</p> <p>43.765755 N -76.215995 W</p> <p>Threats: Honeysuckle ssp. And spotted knapweed provide poor foredune stabilization.</p>	Foredune north of Parking lot along fencing	<p>Amur honeysuckle (>10 medium shrubs)</p> <p>Spotted knapweed (>0.01 acre, dense)</p>	<p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p> <p>Hand pull after plants have bolted and when soil is moist</p>	<p>Consider interspersing beachgrass community shrubs for competition</p> <p>Consider interspersing native red oak, red maple community shrubs for competition</p>
<p>3</p> <p>43.765674 N -76.215805 W</p> <p>Threats: May outcompete native grasses used in restoration project.</p>	Dune walkover	<p>Spotted knapweed</p> <p>Queen Ann’s Lace (>0.25 acres, sparse)</p>	<p>Hand pull after plants have bolted and when soil is moist</p> <p>Hand pull plants and root system before the plant seeds</p>	<p>None, native grasses should be able to outcompete invasive plants when eradicated from the site</p>
<p>4</p> <p>43.755963 N -76.216377 W</p> <p>Threats: Poor foredune stabilization</p>	Foredune in front of beach campsites	<p>Amur honeysuckle (10 medium shrubs)</p> <p>Spotted knapweed</p> <p>Common Buckthorn (5 medium trees)</p>	<p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p> <p>Hand pull after plants have bolted and when soil is moist</p> <p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p>	<p>Consider interspersing beachgrass community and(or) cottonwood community shrubs for competition</p> <p>Spread beachgrass community native seed mix (common evening primrose, common milkweed, tall wormwood etc.)</p>
<p>5</p> <p>43.755963 N -76.216377 W</p> <p>Threats: Poor foredune stabilization, may outcompete sensitive species.</p>	Foredune north of Lakeview WMA	<p>Amur honeysuckle</p>	<p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p>	<p>None, native grasses, and shrubs should be able to outcompete native plants</p>



Lakeview Wildlife Management Area

Table 9: Invasive Species Observed at Lakeview Wildlife Management Area

Lakeview WMA is a 3,444-acre dune and wetland area managed by The New York State Department of Environmental Conservation. Lakeview is directly adjacent to Southwick Beach State Park. 327 acres (9%) of the area is comprised of Great Lakes dune (Mazzocchi et. al, 2018).

45.3 acres of dune were mapped and surveyed for presence of invasive species using Survey 123, and iMapInvasives 3.0 in October and November 2021.

The most abundant invasive species found on the dune system includes spotted knapweed, glossy buckthorn and amur honeysuckle. Common buckthorn, Phragmites, purple loosestrife, autumn olive, and common barberry are also present in lower abundance. [2020 SLELO PRISM Survey and Management Field Report](#).

Species (Common Name, Latin Name)	Present
Giant Hogweed (<i>Heracleum mantegazzianum</i>)	
Porcelain Berry (<i>Ampelopsis glandulosa</i>)	
Common Buckthorn (<i>Rhamnus cathartica</i>)	X
Glossy Buckthorn (<i>Frangula alnus</i>)	X
Japanese Knotweed (<i>Reynoutria japonica</i>)	
Japanese Stiltgrass (<i>Microstegium vimineum</i>)	
Oriental Bittersweet (<i>Celastrus orbiculatus</i>)	
Pale swallow-wort (<i>Vincetoxicum rossicum</i>)	
Phragmites (<i>Phragmites australis</i>)	X
Tree of Heaven (<i>Ailanthus altissima</i>)	
Wild Chervil (<i>Anthriscus sylvestris</i>)	
Yellow Flag Iris (<i>Iris pseudacorus</i>)	
Purple Loosestrife (<i>Lythrum salicaria</i>)	X
Spotted Knapweed (<i>Centaurea stoebe ssp. micranthos</i>)	X
Wild Parsnip (<i>Pastinaca sativa</i>)	
Amur Honeysuckle (<i>Lonicera maackii</i>)	X
Autumn Olive (<i>Elaeagnus umbellata</i>)	X
Common Barberry (<i>Berberis vulgaris</i>)	X
Multiflora Rose (<i>Rosa multiflora</i>)	
Queen Ann's Lace (<i>Daucus carota</i>)	
Tier 2	Tier 3
Tier 4	Not Ranked

Ecological Restoration Recommendations

Figure 6: Map of Site Recommendations for Lakeview WMA



Recommendation 1

Description: Shoreline adjacent to channel

Recommendation 2

Description: Backside of the foredune in the swale

Recommendation 3

Description: Foredune

Recommendation 4

Description: Social trails through swale and backdune areas

Project area surveyed



Table 10: Site Recommendations Lakeview Wildlife Management Area

Recommendation Area	Site Description	Species	Recommended IS Management	Native Plant Restoration
<p>1</p> <p>43.696620 N -76.199146 W</p> <p>Threats: Phragmites is a poor dune stabilizer and may spread into areas that are habitats for sensitive species.</p>	Shoreline adjacent to channel	Phragmites (>0.25 acre, sparse)	Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr)	Spread native wetland seed mix to supplement seed bank.
<p>2</p> <p>43.696624 N -76.200067 W</p> <p>Threats: Honeysuckle ssp. And autumn olive are approaching foredune and habitat for sensitive species.</p>	Backside of the foredune in the swale	Amur honeysuckle (>15 medium shrubs) Autumn Olive (7 tree seedlings)	Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management	Consider interspersing beachgrass community and(or) cottonwood community shrubs for competition
<p>3</p> <p>43.697084 N -76.200414 W</p> <p>Threats: Honeysuckle ssp. And autumn olive are approaching foredune and habitat for sensitive species.</p>	Foredune	Autumn Olive (15 medium trees) Amur honeysuckle (>20 medium shrubs)	Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management	Consider interspersing beachgrass community and(or) cottonwood community shrubs for competition
<p>4</p> <p>43.696620 N -76.199146 W</p> <p>Threats: Honeysuckle ssp. Barberry, and spotted knapweed are located near social trails which can be vectors to spread.</p>	Social trails through swale and backdune areas	Amur honeysuckle Common barberry Spotted knapweed	Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management Hand pull after plants have bolted and when soil is moist. Consider herbicide application for dense stands.	Consider interspersing cottonwood community shrubs ad native seed for competition



Sandy Island Beach State Park

Table 11: Invasive Species Observed at Sandy Island Beach State Park

Sandy Island Beach State Park is a 229-acre dune and wetland area managed by The New York State Office of Parks, Recreation and Historic Preservation.

13.04 acres of dune were mapped and surveyed for presence of invasive species using Survey 123, and iMapInvasives 3.0 in July and November 2021.

The most abundant invasive species found on the dune system includes spotted knapweed, amur honeysuckle, Phragmites, and purple loosestrife. Queen Ann’s lace, autumn olive, and common buckthorn are present in lower abundance.

Species (Common Name, Latin Name)	Present
Giant Hogweed (<i>Heracleum mantegazzianum</i>)	
Porcelain Berry (<i>Ampelopsis glandulosa</i>)	
Common Buckthorn (<i>Rhamnus cathartica</i>)	X
Glossy Buckthorn (<i>Frangula alnus</i>)	
Japanese Knotweed (<i>Reynoutria japonica</i>)	
Japanese Stiltgrass (<i>Microstegium vimineum</i>)	
Oriental Bittersweet (<i>Celastrus orbiculatus</i>)	
Pale swallow-wort (<i>Vincetoxicum rossicum</i>)	
Phragmites (<i>Phragmites australis</i>)	X
Tree of Heaven (<i>Ailanthus altissima</i>)	
Wild Chervil (<i>Anthriscus sylvestris</i>)	
Yellow Flag Iris (<i>Iris pseudacorus</i>)	
Purple Loosestrife (<i>Lythrum salicaria</i>)	X
Spotted Knapweed (<i>Centaurea stoebe ssp. micranthos</i>)	X
Wild Parsnip (<i>Pastinaca sativa</i>)	
Amur Honeysuckle (<i>Lonicera maackii</i>)	X
Autumn Olive (<i>Elaeagnus umbellata</i>)	X
Common Barberry (<i>Berberis vulgaris</i>)	
Multiflora Rose (<i>Rosa multiflora</i>)	
Queen Ann’s Lace (<i>Daucus carota</i>)	X
Tier 2	Tier 3
Tier 4	Not Ranked

Ecological Restoration Recommendations

Figure 7: Map of Site Recommendations for Sandy Island Beach State Park



Recommendation 1

Description: Foredune and open beach north of channel

Recommendation 2

Description: Foredune, open beach, and swale south of the channel

Recommendation 3

Description: Two dune walkovers

Recommendation 4

Description: Boardwalk at main beach

Recommendation 5

Description: 2017 Dune stabilization project


 Project area surveyed



Table 12: Site Recommendations Sandy Island Beach State Park

Recommendation Area	Site Description	Species	Recommended IS Management	Native Plant Restoration
<p>1</p> <p>43.696620 N -76.199146 W</p> <p>Threats: Phragmites, honeysuckle ssp. are poor dune stabilizers and may spread into areas that are habitats for sensitive species. Early detection autumn olive, low abundance spotted knapweed.</p>	<p>Foredune and open beach north of channel</p>	<p>Phragmites (1+ acre)</p> <p>Amur honeysuckle and Autumn olive (0.25 acre)</p> <p>Spotted knapweed (sparse patch)</p>	<p>Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr) to outlying stray plants. Foliar spray dense monoculture if conditions allow</p> <p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p> <p>Hand pull after plants have bolted and when soil is moist</p>	<p>Spread native wetland and (or) beachgrass community seed mix to supplement seed bank.</p> <p>Consider supplementing beachgrass community and(or) cottonwood community shrubs for competition</p>
<p>2</p> <p>43.693261 N -76.194583 W</p> <p>Threats: Phragmites, honeysuckle ssp. are poor dune stabilizers and may spread into areas that are habitats for sensitive species.</p>	<p>Foredune, open beach, and swale south of the channel</p>	<p>Phragmites (1+ acre)</p> <p>Pale swallow-wort (small patch)</p>	<p>Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr) to outlying stray plants. Foliar spray dense monoculture if conditions allow</p> <p>Continue early detection and rapid response. Hand dig taking care to remove root crown and buds</p>	<p>Spread native wetland and (or) beachgrass community seed mix to supplement seed bank.</p> <p>None at this time</p>
<p>3</p> <p>43.656901 N -76.195230 W</p> <p>Threats: Phragmites, and spotted knapweed are spreading into areas that are habitats for sensitive species.</p>	<p>Two dune walkovers</p>	<p>Phragmites (>0.5 acre)</p> <p>Spotted knapweed (sparse patch)</p> <p>Pale swallow-wort (sparse patch)</p>	<p>Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr) to outlying stray plants. Foliar spray dense monoculture if conditions allow</p> <p>Hand pull after plants have bolted and when soil is moist</p> <p>Continue early detection and rapid response. Hand dig taking care to remove root crown and buds</p>	<p>Spread native wetland and (or) beachgrass community seed mix to supplement seed bank.</p> <p>Spread beachgrass community seed mix to supplement seed bank.</p> <p>None at this time</p>
<p>4</p> <p>43. 631395 N -76.195940 W</p> <p>Threats: Spotted knapweed is spreading into an area that is habitat for sensitive species</p>	<p>Boardwalk at main beach</p>	<p>Spotted knapweed (>0.25 sparse patch)</p>	<p>Hand pull after plants have bolted and when soil is moist. Consider herbicide application for dense stands</p>	<p>Spread beachgrass community seed mix to supplement seed bank.</p>



<p>5 43. 629911 N -76.196494 W</p> <p>Threats: Spotted knapweed and Queen Ann's lace are poor dune stabilizers. May outcompete native grasses used in restoration project.</p>	<p>2017 Dune stabilization project (1 acre)</p>	<p>Spotted knapweed Queen Ann's lace</p> <p>(Total area 1 acre)</p>	<p>Hand pull after plants have bolted and when soil is moist</p> <p>Hand pull plants and root system before the plant seeds</p>	<p>Continue planting native beachgrass throughout shoreline stabilization project</p> <p>Spread beachgrass community seed mix to supplement seed bank.</p>
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Deer Creek Marsh Wildlife Management Area

Table 13: Invasive Species Observed at Deer Creek WMA

Deer Creek WMA is a 1,771-acre dune and wetland area managed by The New York State Department of Environmental Conservation. Lakeview is directly adjacent to Southwick Beach State Park. 46 acres (3%) of the area is comprised of Great Lakes dune (Putnam et. al, 2018).

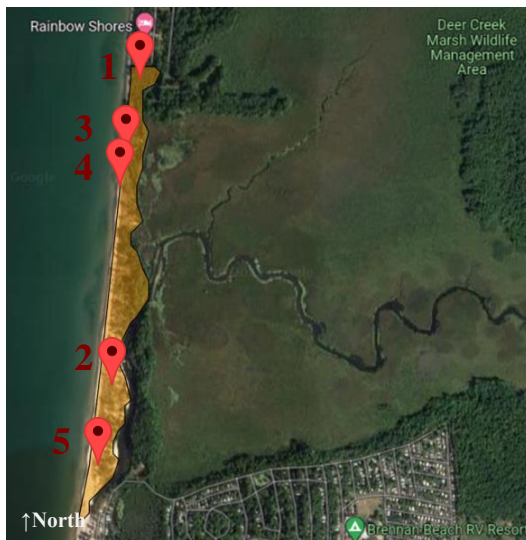
22.24 acres of dune were mapped and surveyed for presence of invasive species using Survey 123, and iMapInvasives 3.0 in October and November 2021.

The most abundant invasive species found on the dune system includes spotted knapweed, glossy buckthorn and amur honeysuckle. Species present in lower abundance include Phragmites, common buckthorn, purple loosestrife, autumn olive, common barberry, multiflora rose, and Queen Ann’s lace. [2020 SLELO PRISM Survey and Management Field Report](#)

Species (Common Name, Latin Name)	Present		
Giant Hogweed (<i>Heracleum mantegazzianum</i>)			
Porcelain Berry (<i>Ampelopsis glandulosa</i>)			
Common Buckthorn (<i>Rhamnus cathartica</i>)	X		
Glossy Buckthorn (<i>Frangula alnus</i>)	X		
Japanese Knotweed (<i>Reynoutria japonica</i>)			
Japanese Stiltgrass (<i>Microstegium vimineum</i>)			
Oriental Bittersweet (<i>Celastrus orbiculatus</i>)			
Pale swallow-wort (<i>Vincetoxicum rossicum</i>)			
Phragmites (<i>Phragmites australis</i>)	X		
Tree of Heaven (<i>Ailanthus altissima</i>)			
Wild Chervil (<i>Anthriscus sylvestris</i>)			
Yellow Flag Iris (<i>Iris pseudacorus</i>)			
Purple Loosestrife (<i>Lythrum salicaria</i>)	X		
Spotted Knapweed (<i>Centaurea stoebe ssp. micranthos</i>)	X		
Wild Parsnip (<i>Pastinaca sativa</i>)			
Amur Honeysuckle (<i>Lonicera maackii</i>)	X		
Autumn Olive (<i>Elaeagnus umbellata</i>)	X		
Common Barberry (<i>Berberis vulgaris</i>)	X		
Multiflora Rose (<i>Rosa multiflora</i>)	X		
Queen Ann’s Lace (<i>Daucus carota</i>)	X		
Tier 2	Tier 3	Tier 4	Not Ranked

Ecological Restoration Recommendations

Figure 8: Map of Site Recommendations for Deer Creek WMA



Recommendation 1

Description: Northernmost area adjacent to private landowner

Recommendation 2

Description: Marked trails and unmarked social trails

Recommendation 3

Description: Northern most walkover

Recommendation 4

Description: Monoculture beachgrass along foredune

Recommendation 5

Description: Deer Creek riparian area meets back dune

Project area surveyed



Table 14: Site Recommendations Deer Creek WMA

Recommendation Area	Site Description	Species	Recommended IS Management	Native Plant Restoration
<p>1</p> <p>43.600601 N -76.198508 W</p> <p>Threats: Honeysuckle, spotted knapweed, and multiflora rose are poor dune stabilizer species and may spread to adjacent properties.</p>	<p>Northernmost area adjacent to private landowner</p>	<p>Amur honeysuckle (30 large and medium plants (0.25 acre))</p> <p>Spotted knapweed (sparse plants)</p> <p>Multiflora rose (sparse plants)</p>	<p>Hand pull or weed wrench small shrubs</p> <p>Hand pull after plants have bolted and when soil is moist</p> <p>Hand pull small bushes</p>	<p>Plant red oak, red maple seed mix to supplement seed bank. Consider planting native shrubs</p>
<p>2</p> <p>43.599537 N -76.198905 W</p> <p>43.598939 N -76.198562 W</p> <p>43.588781 N -76.199609 W</p> <p>43.590550 N -76.198803 W</p> <p>Threats: Honeysuckle spp., spotted knapweed, and buckthorn are linearly scattered on recreational trails and can spread to new areas.</p>	<p>Marked trails and unmarked social trails</p>	<p>Amur honeysuckle</p> <p>Spotted knapweed</p> <p>Common Buckthorn</p>	<p>Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long-term management</p> <p>Hand pull after plants have bolted and when soil is moist. Consider herbicide application in dense monoculture areas.</p> <p>Cut stump and basal bark herbicide treatments with long term management</p>	<p>Spread native beachgrass community seed mix to augment native seed bank</p>
<p>3</p> <p>43.597951 N -76.198918 W</p> <p>Threats: Spotted knapweed and Queen Ann’s lace are poor dune stabilizers and may spread to new areas via recreational trails.</p>	<p>Northern most walkover</p>	<p>Spotted knapweed (Dense 0.25 acre)</p> <p>Queen Ann’s lace (Sparse 0.25 acre)</p>	<p>Hand pull after plants have bolted and when soil is moist. Consider herbicide application in dense monoculture areas</p> <p>Hand pull close to the ground before seed sets in mid to late summer.</p>	<p>Spread native beachgrass community seed mix to augment native seed bank</p>



<p>4 43.596614 -76.199186</p> <p>Threats: Spotted knapweed and amur honeysuckle are poor dune stabilizer species. May outcompete native grasses in restoration project sites.</p>	<p>Monoculture beachgrass along foredune</p>	<p>Amur honeysuckle (Few medium shrubs, >0.25 acre)</p> <p>Spotted knapweed (sparse)</p>	<p>Hand pull or weed wrench small shrubs</p> <p>Hand pull after plants have bolted and when soil is moist. SK plants are sparse in this area</p>	<p>Spread native beachgrass community seed mix to augment native seed bank. Consider interspersing native beachgrass community shrubs.</p>
<p>5 43.587557 -76.199630</p> <p>Threats: Phragmites and spotted knapweed are poor dune stabilizers and outcompete native species.</p>	<p>Deer Creek riparian area meets back dune</p>	<p>Phragmites (Dense patch along channel shoreline >0.25 acre)</p> <p>Spotted knapweed (sparse clumps)</p>	<p>Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr) to outlying stray plants.</p> <p>Hand pull close to the ground before seed sets in mid to late summer</p>	<p>Spread native beachgrass or wetland community seed mix to augment native seed bank.</p>



Sand Dune Willow Restoration

Sand dune willow (*Salix cordata*), also called the heartleaf willow, is a perennial shrub which can grow 3 to 12 ft tall, native to the Great Lakes region found along sand dunes, riverbanks, and lake shorelines. Dune willow is designated as a threatened species in New York State and is considered imperiled and very vulnerable to disappearing throughout its range. There are approximately seven populations existing in its restricted range (NYNHP, 2021.)



Threats to sand dune willow include shoreline erosion, development, recreational pressure, and ATV traffic. Additional threats to dune willow include three leaf defoliating beetle species belonging to the *Chrysomelidae* family; willow leaf beetle (*Altica subplicata*), imported black willow leaf beetle (*Plagioder a versicolor*), and the striped willow leaf beetle (*Disonycha alternata*). Willow beetles feed directly on leaves, decrease plant growth leading to mortality, and alters plant succession on the dunes which can lead to sand erosion. (Bach, 1994). These beetles have numerous native and non-native host plants in addition to sand dune willow which can found along the dunes, wetlands, and riparian areas.

Figure 9: Chrysomelid Willow Leaf Beetles

Willow leaf beetle
(*Altica subplicata*)



Photo credit: Bob Parks

Imported black willow leaf beetle
(*Plagioder a versicolor*)



Photo credit: Natasha Wright

Striped willow leaf beetle
(*Disonycha alternata*)



Photo credit: Mike Quinn

Altica subplicata host plants: Species of *Salix* (*Salicaceae*), including Bebb's willow (*S. bebbiana*), sand dune willow (*S. cordata*), and sandbar willow (*S. exigua*) Laboratory tests found that adults would accept peach leaved willow (*S. amygdaloides*) but preferred sand bar willow (*S. interior*). Late season *A. subplicata* fed on common evening primrose (*Oenothera biennis*) and common silverweed (*Potentilla anserine*) but after the quality of *Salix cordata* had declined dramatically (Clark et. al., 2004).

Plagioder a versicolor host plants: Species of *Salix* (*Salicaceae*), black poplar (*Populus nigra*), cottonwood (*Populus deltoids*), white willow (*Salix alba*), weeping white willow (*S. babylonica*), goat willow (*S. caprea*), pussy willow (*S. discolor*), sand bar willow (*S. interior*),



sandbar willow (*S. exigua*), hybrid crack willow (*S. fragilis*), shining willow (*S. lucida*), and black willow (*S. nigra*). In laboratory experiments, *P. versicolora* has fed on Eurasian white poplar (*Populus alba*), basket willow (*S. purpurea*). *Plagioderia versicolora* has also been reported on primrose ssp. (Clark et. al., 2004).

Disonycha alternata host plants: Species of *Salix* (*Salicaceae*), including Bebb's willow (*S. bebbiana*), sand dune willow (*Salix cordata*), sand bar willow (*S. interior*), sandbar willow (*S. exigua*), prairie willow (*S. humilis*). It has also been found on wild parsnip (*Pastinaca sativa*), and goldenrod species (*Solidago*) (Clark et. al., 2004).

In 2012, SLELO PRISM field crew members surveyed dune willow populations in Black Pond WMA, El Dorado Beach Preserve, Deer Creek Marsh WMA, Lakeview WMA, and Sandy Island Beach State Park for presence of willow leaf beetles and imported black willow leaf beetles. These beetles were not observed. Surveying efforts focused to quantify the effects of dune willow leaf defoliation by the striped willow leaf beetle (SLELO PRISM, 2014).

SLELO PRISM observed 1440 dune willows with 54 of the plants having *D. alternata* adults on them. *A. subplicata* and *P. versicolor* were not observed. There was a moderately strong positive relationship with *D. alternata* adults and the amount of damage to the patches. 176 of the dune willow plants were observed with *D. alternata* larvae. There was a moderately positive relationship between the percentage of plants with *D. alternata* larvae and the amount of damage to the patches (SLELO PRISM, 2012). Several strategies are available to minimize the impacts of willow leaf defoliating beetles including *D. alternata* on protected dune willow populations. SLELO PRISM prioritized management of striped willow leaf beetles at Lakeview WMA where the presence of the beetle and the damage to dune willow was the highest (SLELO PRISM, 2014). Suppression of *D. alternata* beetles may provide benefits to other native plant host species including *Salix* species and goldenrods, and positive impact dune vegetation succession. The following methods are available for willow leaf beetle suppression and control:

Continued Monitoring

An integrated pest management approach is recommended to suppress and control *Chrysomelidae* species herbivory on sand dune willow. Continued monitoring of each leaf beetle species larvae and adults to assess long term impacts on dune willow populations should be performed, especially where high rates of defoliation were observed at Lakeview WMA. In addition to monitoring, chemical, mechanical, and (or) eventually biological controls can be used to manage leaf defoliating beetles.

Mechanical Control

Physically removing *Chrysomelidae* from dune willow host plants where extensive defoliation is observed is another management option. Following removal continue to monitor with an option of erecting enclosures using insect and bird barrier mesh netting. Exclusion of *A. subplicata* from *Salix cordata* for three years using mesh enclosures protected the plants which



were found to be twice as large and wide than dune willows exposed to beetle feeding. (Bach, 1994).

A. subplicata and *D. alternata* both have one generation per year. The total egg-adult cycle is 34 days for *A. subplicata* and 46 days for *D. alternata* (DeSwarte and Balsbaugh, 1973). *D. alternata* uses the sand for oviposition medium and requires prepupa to burrow to stimulate pupation while *A. subplicata* lays its eggs on the undersides of leaves on the host plant (DeSwarte and Balsbaugh, 1973). Physical removal of *A. subplicata* should occur when adults emerge and before egg laying occurs. Physical removal *A. subplicata* larval instars should occur in the late spring or early summer before they burrow into soil and undergo pupation and when adults emerge in the spring from overwintering. Physical removal of *D. alternata* should occur when adults emerge in the spring from overwintering, and before prepupa burrow into the sand. *Plagioderia versicolor* adults overwinter under logs, loose bark, and leaf litter near the host plants and become active during April. They can develop three generations, and a fourth partial generation (Day 2008). Two monitoring and harvesting cycles are recommended due to the biology of the species: one removal treatment for larvae (spring) and one removal treatment for adults (late summer) starting after the first emergence of larvae and ending when the remaining larvae have pupated into adults (SLELO PRISM 2014). Hand harvesting and monitoring should be repeated until desirable levels of suppression are achieved. Consider adding beetle exclosures using mesh netting following harvesting and control.

Chemical Control

Caution is needed when considering chemical control methods. Viceroy butterfly larvae, fall webworm, and additional native moth larvae may also feed on dune willow. Plants should be assessed for presence of non-target species before application. Test applications on single plants should be conducted before performing larger control efforts to monitor adverse impacts (ex. wilting) to dune willows (SLELO PRISM, 2014).

Neem oil is a broad-spectrum pesticide which contains the naturally occurring chemical compound azadirachtin. Azadirachtin acts as a repellent towards insects, including beetles in the *Chrysomelidae* family by disrupting insect growth, and also has anti-feedant and oviposition (egg-laying) deterrent properties (Caldwell et. al., 2013). AzaSol is the only water-soluble product with Azadirachtin. Plants can absorb the pesticide which will remain in the plant system for 2-weeks following treatment. Using other Azadirachtin non water-soluble products applied to the leaves will last only days. AzaSol can be injected into the stems, applied to the soil and be dripped into the roots which decreases impacts to non-target plants (The AzaSol Difference, n.d.).

Additional insecticide products include Entrust, an insecticide containing the active ingredient spinosad. It can be used to control insects including *Chrysomelidae* beetles but has not been tested on *D. alternata* specifically, or the effect it may have on dune willows (SLELO PRISM, 2012). When ingested this can cause feeding cessation but can also kill on contact. It is toxic to aquatic invertebrates and should not be sprayed below the high water line or next to surface water (Entrust, 2011). Novodor, is another product which can cause feeding cessation of



Chrysomelidae species. It contains a toxin produced by the bacteria *Bacillus thuringiensis* subsp. *tenebrionis* which kills insect larvae. It is most effective against first and second instar larvae in the target species (Novodor, 2000, SLELO PRISM, 2012). In addition, Mavrik, Merit, permethrin, pyrethrins, Sevin, and Talstar are all labeled for beetle control (Baker, 2019).

Treatment is not required on plants in which the damage is not noticeable. However, large numbers of imported black willow leaf beetle may warrant control. Pest-controls that are specifically recommended for *Plagioderia versicolor* include: *Bacillus thuringiensis tenebrionis*, carbaryl (Sevin), and spinosad (Conserve). *B.t. tenebrionis* is only effective on the larval stage. (Cloyd, 2000.)

Biological Control

Biological control programs are one of the best and long-term solutions to managing invasive plants and animals. Biological control agents must first be federally approved before being introduced into New York State (Cornell University, 2021). Biocontrol agents are used to control insect species including hemlock woolly adelgid and emerald ash borer. There are several natural predator options to control leaf eater beetles.

Altica subplicata biological control: *Carabidae* beetles of the genus *Lebia* are known to prey on *Altica* larvae and are likely a predator of *A. subplicata* (Pettis, 2005). *Lebia grandis* is used as a predator for lady beetles and Colorado potato beetles (Weber and Riddick, n.d.). New York State's Integrated Pest Management Program at Cornell University lists *Lebia grandis* as a biological control option for North America, although this species is not commercially available.

Disonycha alternata biological control: no information at this time.

Plagioderia versicolor biological control: *Schizonotus rotundivenris* and *Schizonotus latus* parasitize the imported willow leaf beetle. Eggs are eaten by predators, especially the coccinellid *Neoharmonia venusta* (Driesche et. al., 2013).

Sand Dune Willow Genetic Testing

Research by Bach (2008) examined the genetic variability of caged *Salix cordata* plants in response to herbivory from *A. subplicata* under zero, low, and high predation. As expected, plants showed higher growth rates under zero and low herbivore pressure. Higher herbivore treatments led to increased mortality due to drought stress. Genotype significantly influenced growth rates and the susceptibility of plants to drought stress. However, each genotype showed similar growth in response to herbivory, therefore suggesting a lack of genetic variation in tolerance or resistance to herbivory (Bach, 2008). Research also found that shorter plants were more susceptible to mortality from sand burial, and plants with past herbivory were significantly shorter than plants without past herbivory Bach (2001).

Identifying drought resistant and larger *Salix cordata* plants can be beneficial to ecological restoration. If distinct populations can be identified in eastern Lake Ontario, as they



were observed in Michigan, larger and more drought resistant sand dune willows could be used to augment existing dune willow populations. Larger, more drought resistant *Salix cordata* plants could also be used in dune restoration projects as they have a lower mortality due to over threshold sand burial.

Milanowski and Bach (1997) found differences in two populations of *Salix cordata* in the suitability as a larval food source for *A. subplicata*. They found that pupas weighed more and developed faster feeding on sand dune willows located in Pointe Aux Chenes (PAC), Michigan than Grass Bay, Michigan. They measured that PAC sand dune willows had lower trichome density and higher pupal weight. They hypothesized that higher densities in trichomes (fine hair outgrowths) can function as a mechanical barrier to decrease larval consumption rates (Milanowski & Bach 1997). Research can be conducted to identify if there are localized adaptations of *Salix cordata* plants with higher trichome densities that can be used for their tolerance to herbivory for restoration projects. Leaf surface texture has been shown to affect host plant suitability (Kennedy 1986, Stork 1980).

Recommendations

- Continue to monitor dune willow populations for presence and herbivory impacts of *Altica subplicata*, *Plagioderia versicolor*, and *Disonycha alternata* on populations of sand dune willow
- Management options if high impacts to populations of dune willow are observed
 - Manual management: Remove *Chrysomelidae* species and exclude sand dune willow from herbivores using mesh netting.
 - Chemical management: Neem oil, Entrust, Novodor etc.
 - Biocontrol: more research is needed into options for biocontrols for *Altica subplicata*, *Plagioderia versicolor*, and *Disonycha alternata*
 - Dune Willow Research: Genetic testing to find drought resistant populations, or populations with higher trichome densities to augment existing dune willow populations and utilize in restoration projects.

The New York Natural Heritage Program (NYNHP, 2021) recommends additional research into how changes in dune building processes are affecting sand dune willows. Bach (2001) conducted research investigating how long-term insect herbivory, sand accretion, and the interaction of these factors affect patterns of plant succession on sand dunes.

NYNHP also recommends research into plant propagation. Sand dune willow plantings can augment existing vulnerable populations. Research into propagating bare root stock (Carlson, 1938), container stock, or willow stakes would be beneficial for ecological restoration and shoreline stabilization projects.

The implementation of one or more of these management and research options can suppress herbivory of sand dune willow by *Chrysomelidae* species. Dune willow restoration projects can increase the stability of the sand dunes and promote dune native vegetation succession.



Native Plant Restoration

The Eastern Lake Ontario dunes support over 300 vascular plant species (Appendix D). Without these plants to anchor the sand the dunes would be subjected to wind and wave erosion. Vegetation provides invaluable ecosystem services including stabilizing the shoreline. Plant life within the dune system is also highly adapted to lower nutrient concentrations in the substrate, and fluctuating temperature and moisture conditions (Bonanno and White, n.d.).

The Eastern Lake Ontario Dunes and Wetlands Area is comprised of six main zones: A: Beach, B: Foredune, C: Trough or Swale, D: Secondary Dune, E: Backdune and F: Wetland, Pond, or Creek. Woodlands and meadows are found inland of the wetland. Each of these zones may develop one or multiple “community types” classified according to dominant vegetation (Bonanno 1992). The species listed below are not always restricted to a specific community. American beachgrass (*Ammophila breviligulata ssp. champlainensis*) may occur in more than one vegetation community in varying abundance.

Figure 10: Eastern Lake Ontario Dune Profile

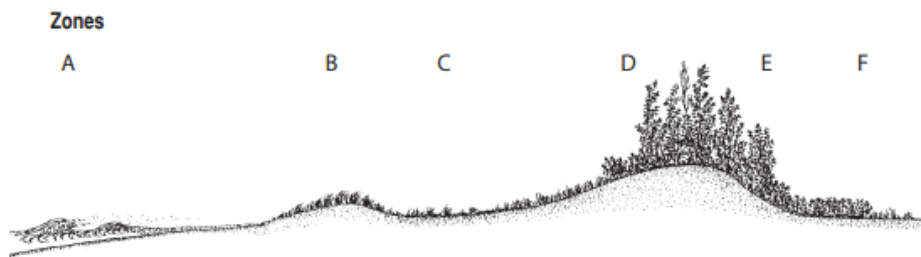


Illustration by Bob McNamara

Vegetation can be grouped into four distinct plant communities classified by dominant vegetation types: the American beachgrass community; the poison ivy-dune grape-cottonwood community; the red oak-red maple forest community; and the alder thicket community. Each community and the dominant native vegetation is discussed below. Each plant species has been verified as native by [The New York Flora Atlas](#), and its plant composition and community descriptions are adapted from [Eastern Lake Ontario Sand Dunes: An Overview of Their Flora](#) by Bonanno & White, 2021.

For a complete list of vascular trees and plants see Appendix D: The Flora of the Eastern Shore Dunes of Lake Ontario (Bonanno et. al, 1998).

Although invasive species are also found in abundance within each community, the following native plants are recommended for vegetation and habitat restoration projects.



Table 14: The Beachgrass Community

Adjacent to the open beach, also found throughout the interior dunes and in disturbed areas is the Champlain beachgrass community. The dominant native vegetation found throughout this community includes: beachgrass, tall wormwood, eastern cottonwood saplings, and dune willow (Bonanno and White, n.d.).

Trees	Shrubs	Vines	Grasses
Balsam poplar <i>Populus balsamifera</i>	Great Lakes sand cherry <i>Prunus pumila</i> var. <i>pumilia</i>	Poison ivy <i>Toxicodendron radicans</i>	American beachgrass <i>Ammophila breviligulata</i>
Eastern cottonwood <i>Populus deltoides</i>	Red osier dogwood <i>Cornus sericea</i>	River grape <i>Vitis riparia</i>	Baltic rush <i>Juncus balticus</i> ssp. <i>littoralis</i>
Hybrid willow <i>Salix petiolaris</i> × <i>S sericea</i> <i>Populus deltoides</i>	Sand dune willow <i>Salix cordata</i>		Canada wild-rye <i>Elymus canadensis</i> var. <i>canadensis</i>
	Silky dogwood <i>Cornus amomum</i> ssp. <i>amomum</i>		
Ferns	Herbaceous		
Field horsetail <i>Equisetum arvense</i>	Beach pea <i>Lathyrus japonicus</i> var. <i>maritimus</i>	Common yarrow <i>Achillea millefolium</i>	Starry Solomon's seal <i>Maianthemum stellatum</i>
Shore horsetail <i>Equisetum x littorale</i>	Beggarticks <i>Bidens vulgata</i>	Lake sea rocket <i>Cakile edentula</i> var. <i>lacustris</i>	Virginia bugleweed <i>Lycopus virginicus</i>
	Common evening primrose <i>Oenothera biennis</i>	Sand (tall) wormwood <i>Artemisia campestris</i> ssp. <i>caudata</i>	
	Common milkweed <i>Asclepias syriaca</i>	Seaside spurge <i>Euphorbia polygonifolia</i>	
	Common silverweed <i>Potentilla anserina</i> ssp. <i>anserina</i>		

Table 15: The Poison Ivy, River Grape, and Cottonwood Community

Found throughout the interior dunes and in disturbed areas is the poison ivy, riverbank grape, and eastern cottonwood community. The dominant native vegetation found throughout this community includes: sparse stands of beachgrass, eastern cottonwood, poison ivy, riverbank grape, choke cherry, Canada goldenrod, and Baltic rush (Bonanno and White, n.d.).

Trees	Shrubs	Vines	Grasses
Balsam poplar <i>Populus balsamifera</i>	American red raspberry <i>Rubus idaeus</i> ssp. <i>strigosus</i>	Poison ivy <i>Toxicodendron radicans</i>	American beachgrass <i>Ammophila breviligulata</i>
Black cherry <i>Prunus serotina</i> var. <i>serotina</i>	Blackberry <i>Rubus allegheniensis</i>	River grape <i>Vitis riparia</i>	Baltic rush <i>Juncus balticus</i> ssp. <i>littoralis</i>
Eastern cottonwood <i>Populus deltoides</i>	Chokecherry <i>Prunus virginiana</i> var. <i>virginiana</i>		Canada wild-rye <i>Elymus canadensis</i> var. <i>canadensis</i>
Pin cherry <i>Prunus pensylvanica</i>	Great Lakes sand cherry <i>Prunus pumila</i> var. <i>pumilia</i>		
Hybrid willow <i>Salix petiolaris</i> × <i>S sericea</i>	Red osier dogwood <i>Cornus sericea</i>		
Northern red oak <i>Quercus rubra</i>	Sand dune willow <i>Salix cordata</i>		



	Shadbush <i>Amelanchier canadensis</i> var. <i>canadensis</i>		
Ferns	Herbaceous		
Field horsetail <i>Equisetum arvense</i> Shore horsetail <i>Equisetum x litorale</i>	Bouncing bet <i>Saponaria officinalis</i> Blue stem goldenrod <i>Solidago caesia</i> var. <i>caesia</i> Blunt leaved sandwort <i>Moehringia lateriflora</i> Canada goldenrod <i>Solidago canadensis</i> var. <i>canadensis</i> Canada mayflower <i>Maianthemum canadense</i>	Common evening primrose <i>Oenothera biennis</i> Common milkweed <i>Asclepias syriaca</i> Common yarrow <i>Achillea millefolium</i> Fleabane daisy <i>Erigeron annuus</i> Gray goldenrod <i>Solidago nemoralis</i> ssp. <i>nemoralis</i>	Lake sea rocket <i>Cakile edentula</i> var. <i>lacustris</i> Sand (tall) wormwood <i>Artemisia campestris</i> ssp. <i>caudata</i> Seaside spurge <i>Euphorbia polygonifolia</i> Starry Solomon's seal <i>Maianthemum stellatum</i> Virginia bugleweed <i>Lycopus virginicus</i>

Table 16: The Red Oak, Red Maple Community

Found throughout high dunes is a forested community which includes the red oak and red maple community. The dominant native vegetation found throughout this community includes: red oak, red maple, American beech, sugar maple, black cherry, striped maple, shadbush, and choke cherry, red raspberry, riverbank grape, goldenrods, and wild sarsaparilla (Bonanno and White, n.d.).

Trees	Shrubs	Vines	Grasses
American beech <i>Fagus grandifolia</i> Black cherry <i>Prunus serotina</i> var. <i>serotina</i> Green ash <i>Fraxinus pennsylvanica</i> Sugar maple <i>Acer saccharum</i> Striped maple <i>Acer pensylvanicum</i> Red maple <i>Acer rubrum</i> Northern red oak <i>Quercus rubra</i>	American red raspberry <i>Rubus idaeus</i> ssp. <i>strigosus</i> Arrowwood <i>Viburnum dentatum</i> var. <i>lucidum</i> Blackberry <i>Rubus allegheniensis</i> Chokecherry <i>Prunus virginiana</i> var. <i>virginiana</i> Nannyberry <i>Viburnum lentago</i> Winterberry <i>Ilex verticillata</i>	Bristly greenbrier <i>Smilax hispida</i> Poison ivy <i>Toxicodendron radicans</i> River grape <i>Vitis riparia</i>	Common hairgrass <i>Avenella flexuosa</i>
Ferns	Herbaceous		



Sensitive fern <i>Onoclea sensibilis</i>	Blue stem goldenrod <i>Solidago caesia</i> var. <i>caesia</i>	Canada mayflower <i>Maianthemum canadense</i>	Starry Solomon's seal <i>Maianthemum stellatum</i>
	Blunt leaved sandwort <i>Moehringia lateriflora</i>	Common yarrow <i>Achillea millefolium</i>	Wild sarsaparilla <i>Aralia nudicaulis</i>
	Canada goldenrod <i>Solidago canadensis</i> var. <i>canadensis</i>	Fringed bindweed <i>Fallopia cilioidis</i>	

Table 17: The Alder Thicket Community

Found in a transition between the dunes and the wetlands is the dense alder shrub community. The dominant native vegetation found throughout this community includes: speckled alder, winterberry, nannyberry, hybrid willows, green ash, dune grape, black cherry, arrowwood, chokecherry, ferns, wetland grasses, and sedges (Bonanno and White, n.d.).

Trees	Shrubs	Vines	Grasses
Black cherry <i>Prunus serotina</i> var. <i>serotina</i>	American red raspberry <i>Rubus idaeus</i> ssp. <i>strigosus</i>	Bristly greenbrier <i>Smilax hispida</i>	Baltic rush <i>Juncus balticus</i> ssp. <i>littoralis</i>
Green ash <i>Fraxinus pennsylvanica</i>	Blackberry <i>Rubus allegheniensis</i>	Poison ivy <i>Toxicodendron radicans</i>	Fowl mannagrass <i>Glyceria striata</i>
Hybrid willow <i>Salix petiolaris</i> × <i>S. sericea</i>	Chokecherry <i>Prunus virginiana</i> var. <i>virginiana</i>	River grape <i>Vitis riparia</i>	
Northern red oak <i>Quercus rubra</i>	Nannyberry <i>Viburnum lentago</i>		
Red maple <i>Acer rubrum</i>	Red osier dogwood <i>Cornus sericea</i>		
	Speckled alder <i>Alnus incana</i> ssp. <i>rugosa</i>		
	Silky dogwood <i>Cornus amomum</i> ssp. <i>amomum</i>		
	Winterberry <i>Ilex verticillata</i>		
Ferns	Herbaceous		
Field horsetail <i>Equisetum arvense</i>	Beggarticks <i>Bidens vulgata</i>	Canada goldenrod <i>Solidago canadensis</i> var. <i>canadensis</i>	Spotted jewelweed <i>Impatiens capensis</i>
Sensitive fern <i>Onoclea sensibilis</i>	Blue flag iris <i>Iris versicolor</i>	Canada mayflower <i>Maianthemum canadense</i>	Sweet scented bedstraw <i>Galium triflorum</i>
	Blue stem goldenrod <i>Solidago caesia</i> var. <i>caesia</i>	Common silverweed <i>Potentilla anserina</i> ssp. <i>anserina</i>	Virginia bugleweed <i>Lycopus virginicus</i>
	Blunt leaved sandwort <i>Moehringia lateriflora</i>		

Native Plant Vendors

Disclaimer of Liability and Endorsement: The following plant nurseries carry the following native dune building plant species. These listings do not constitute endorsement, recommendation, or favoring by the Eastern Lake Ontario Dunes Foundation.



[Saratoga Tree Nursery](#)

Address: NYS Department of Environmental Conservation
Saratoga Tree Nursery
2369 Rt. 50 S
Saratoga Springs, NY 12866-4771
Phone: (518) 587-1120
Email: nysnursery@dec.ny.gov
Species: Sugar maple, red oak, black cherry, arrowwood, redosier dogwood, silky dogwood, nannyberry, winterberry

[Jefferson County Soil and Water District](#)

Address: 25451 State Route 12
Watertown, NY 13601
Phone: (315) 782-305
Email: info@jeffersoncountyswcd.org
Species: Black cherry, red osier dogwood, nannyberry

[Oswego County Soil and Water District](#)

Address: 3105 State Route 3
Fulton, NY 13069
Phone: (315) 592-9663
Email: laura@oswegosoilandwater.com
Species: Black cherry, red oak, sugar maple

[Vans Pines Nursery](#)

Address: 14731 Baldwin Street
West Olive, MI 49460
Phone: (800) 888-7337
Email: info@vanspinesnursery.com
Notes: American beachgrass*, red oak

[Ernst Seed](#)

Address: 8884 Mercer Pike
Meadville, PA 16335
Phone: (800) 873-3321
Email: sales@ernstseed.com
Species: Prepared and custom seed mixes: common yarrow, common milkweed, beggarticks, common evening primrose, blue stem goldenrod, Canada goldenrod, gray goldenrod, rough stemmed goldenrod, fowl mannagrass, Canada wildrye

[Cold Stream Farm](#)

Address: 8585 N. Stephens Rd.
Free Soil, MI 49411
Phone: 231-464-5809
Email: info@coldstreamfarm.net

Species: Native trees and shrubs. American beachgrass*, redosier dogwood, silky dogwood, nannyberry, arrowwood, winterberry, American beech, chokecherry, redosier dogwood, red oak, shadbush, speckled alder, winterberry

[Pinelands Nursery](#)

Address: 323 Island Road
Columbus, NJ 08022
Phone: (609) 291-948
Email: sales@pinelandnursery.com
Species: Native trees, shrubs, plugs, and seed mixes. American beachgrass*, red maple, sugar maple, shadbush, silky dogwood, redosier dogwood, winterberry, black cherry, red oak, arrowwood, common milkweed, common evening primrose, Canada goldenrod, gray goldenrod

[Cardno Native Plant Nursery](#)

Address: 128 Sunset Dr.
Walkerton, IN 46574
Phone: (574) 586-2412
Email: nurserysales@cardno.com
Species: Native trees, shrubs and seed mixes. American beachgrass*, common milkweed, beggarstick, Canada wildrye, sensitive fern, starry false solomon's seal, blue stem goldenrod, rough stemmed goldenrod, red maple, sugar maple, silky dogwood, redosier dogwood, winterberry, eastern cottonwood, black cherry, red oak, arrowwood, nannyberry

[Champlain Valley Native Plant Restoration Nursery](#)

Address: 685 York Street
Poultney, VT, 05764
Phone: (802) 287-6880
Email: Hilary@pmnr.cd.org
Species: Black cherry, chokecherry, red maple, red oak, shadbush, sugar maple, arrowwood, nannyberry, redosier dogwood, silky dogwood, winterberry

[Woody Warehouse](#)

Address: 33339 W. 850
N. Liton, IN 46149
Phone: (866) 766-8376
Email: sales@woodywarehouse.com
Species: Red maple, sugar maple, speckled alder, shadbush, silky dogwood, redosier dogwood, American beech, winterberry, eastern cottonwood, pin cherry, black cherry, chokecherry, sand dune willow, arrowwood, nannyberry

*Nursery lists American beachgrass (*Ammophila breviligulata*) as commercially available. However, this is not a guarantee the vegetation is the native Champlain Beachgrass subspecies (*Ammophila breviligulata* spp. *Champlainensis*) which is the primary dune building species. Genetic testing is required. Vans Pines Nursery has the



closest commercially available genetic match to the local ecotype (Hart & Bonanno, 2021). American beachgrass is also native to New York State although it outcompetes state endangered Champlain beachgrass (NYNHP, 2021).

Restoration and Stabilization Site Considerations

Although some studies suggest some species invasive plants can protect dunes from collision erosion (Charbonneau et al, 2017), it is generally believed that native plants provide more ecological benefits and function to dune systems. Removal of invasive plants from the dunes should be done in a way that does not destabilize the sand. Depending on the special attributes of invasive and native plants at any site recommended for suppression, attention should be given to maintaining root mass beneath the dune segment under management.

Monoculture site considerations: Target management of sites that consist of a monoculture of an invasive plant should be partially planted to a native plant prior to the removal or suppression of the invasive. This can be done by interspersing the native plant among the invasive if spatial conditions allow, allowing the native to acclimate, then gradually removing the invasive thereby creating a no-net-loss of root structure at the site. Working in sections to gradually remove the invasive plant and replace with native species although a slower process can help to minimize shoreline erosion.

Non-monoculture site considerations: Sites targeted for management that contain preexisting composition of native and invasive plants should be thinned by gradually removing the invasive while leaving the native plants to expand into the surrounding areas and thrive (Anthony et al, 2012). This allows for the root mass to remain intact providing continued stabilization to the dune area. To reduce non-target impacts invasive plants are recommended to be removed using the following methods:

Manual Removal: Using hand tools to pull, dig, cut, weed wrench, spade, or operating a root jack or root talon can be effective suppression techniques depending on the invasive plant species.

Mechanical Removal: Weed whacking or mowing (in areas of stabilized backdunes) can be used to achieve suppression before the invasive plant seeds. Any equipment used to manage invasive species should be cleaned of debris (plant fragments, seeds, mud) before it leaves the site to prevent the spread of seeds and rhizomes to other areas.

Chemical Removal: It is a priority to minimize the use of chemical herbicide use within the barrier beach ecosystem. Manual or mechanical removal used in combination with chemical treatment can be highly effective in controlling invasive species (Holloran et. al, 2013). It is recommended to minimize the use of herbicides and target chemical treatments using stem injection, hand-wicking, cut stump, and basal bark applications to reduce airborne and soil drift. Foliar sprays should be avoided due to the sensitive vegetation and windy conditions of Lake Ontario. These methods should be used as an alternative to foliar spray due to the presence of sensitive vegetation and changing wind and weather conditions along eastern Lake Ontario.



Recommendations

In addition to the aforementioned invasive species management and restoration project priorities, the Eastern Lake Ontario Dunes Initiative recommends the following actions to achieve a collaborative and comprehensive approach to invasive species monitoring, management, and dune restoration projects:

1. Work with neighboring private property owners to monitor, assess, and implement invasive species management and ecological restoration projects, and repeat the study with participating private landowners.
2. Conduct private landowner education and outreach especially focusing on Phragmites, pale swallow-wort, and additional high priority species.
3. Seek long-term funding, secure and implement (working with agency landowners) an Eastern Lake Ontario Dunes invasive species and restoration strike team.
4. Develop an equivalent of the [Natural Edge Program](#) hosted by Watersheds Canada to work with land owners and land managers to plant native species in the dunes system and riparian areas.
5. Establish a native plant nursery for native dune building plants including Champlain beachgrass, and protected species including low sand cherry and sand dune willow.
6. Expand genetic testing for American beachgrass populations to identify source populations for future restoration projects.
7. Seek funding, secure, and implement (working with agency landowners) a study to map and manage unmarked social trails to minimize invasive species pathways.
8. Repeat the dunes invasive species initiative to identify wetland restoration projects.
9. Identify sites for demonstration projects, develop educational materials, and conduct public tours and workshops for invasive species management and restoration projects.
10. Establish a platform for online information sharing or in person yearly meetings with land manager staff and interested private landowners to share invasive species projects, success stories, updates, restoration projects, and collaboration opportunities.



References

- Anthony, P., Gilster, M. & Sado, K. (2012). Beachgrass Removal at the Samoa Dunes. Humboldt State University, Arcata, California. 30 p.
- Bach, C. (1994). Effects of a Specialist Herbivore (*Altica subplicata*) on *Salix cordata* and Sand Dune Succession. *Ecological Monographs*, 64(4), 423-445.
- Bach, C. (2001). Long Term Effect of Insect Herbivory on Responses by *Salix Cordata* to Sand Accretion. *Ecological Society of America*. Pages 397-409.
- Bach, C. (2008). Effects of herbivory and genotype on growth and survivorship of Sand-Dune Willow (*Salix cordata*). *Ecological Entomology*. 19. 303 – 309.
- Baker, J. (2019). Imported Willow Leaf Beetle Fact Sheet. North Carolina State Extension. Raleigh, North Carolina. <https://content.ces.ncsu.edu/imported-willow-leaf-beetle>. Accessed on November 8, 2021.
- Biohabitats, Inc. and Camion Associates. 2008. Sandy Creeks Watersheds: Baseline Conditions Report. Prepared for The Nature Conservancy. Available from: <https://tughill.org/wp-content/uploads/2011/10/SandyCreeksBaselineReportFeb2008.pdf>
- Bonanno, S., Racette, J., and Young, S. (n.d.). When Does Your Beachgrass Bloom. Champlain Beachgrass: A Rare Variant of American Beachgrass from NY, VT, and Quebec.
- Bonanno, S., and White, D. (n.d.). Eastern Lake Ontario Sand Dunes: An Overview of Their Flora. <https://seagrant.sunysb.edu/glhabitat/dune/flora.htm>. Accessed on November, 2021.
- Bonanno, S. E., Leopold, D. J., & St. Hilaire, L. R. (1998). Vegetation of a Freshwater Dune Barrier Under High and Low Recreational Uses. *The Journal of the Torrey Botanical Society*, 125(1), 40–50. <https://doi.org/10.2307/2997230>
- Caldwell, B., Sideman, E., Seaman, A., Shelton, A., and Smart, C. (2013). Resource Guide for Organic Insect and Disease Management. New York State Agricultural Experiment Station, Geneva, New York. 210 p.
- Charbonneau, B., Wootton, L., Wnek, J., Langley, A., & Posner, M. (2017). A Species Effect on Storm Erosion: Invasive Sedge Stabilized Dunes More Than Native Grass During Hurricane Sandy. *Journal of Applied Ecology*, 5. 1385-1394.
- Clark, S., LeDoux, D., Seeno, T., Riley, E., Gilbert, A., & Sullivan, J. (2004). Host Plants of Leaf Beetle Species Occurring in the United States and Canada (Coleoptera: Orsodacnidae, Megalopodidae, Chrysomelidae Exclusive of Bruchinae). Special Publication of the Coleopterists Society No. 2. 615 p.



Cloyd, R. (2000). <http://hyg.ipm.illinois.edu/pastpest/200008d.html>. Accessed on November 27, 2021

Cornell (2021) <http://www.nyisri.org/research/biological-control/biocontrol-updates-resources/>. Accessed on November 27, 2021

Day, 2008. *Plagioder a Versicolor*. Center for Invasive Species and Ecosystem Health at the University of Georgia. https://wiki.bugwood.org/Plagioder a_versicolora. Accessed on November 20, 2021.

David, R., and Bonanno, S. (1995). Sandy Pond Beach Management Plan. A Cooperative Partnership Between the NYS Department of Environmental Conservation and The Nature Conservancy.

DeSwarte, D., and Balsbaugh, E. (1973). Biologies of *Altica subplicata* and *Disonycha alternata* (Coleoptera: Chrysomelidae), two flea beetles that feed on sandbar willow. *Annals of the Entomological Society of America*, 66: 1349-1353.

Driesche, R., LaForest, J., Barger on, C., Reardon, R. & Herlihy, M. (2013) *Forest Pest Insects in North America A Photographic Guide*. USDA Forest Service, Morgantown, WV. 722 p.

Eastern Lake Ontario Swallowwort Collaborative. (2021). Control/Management. <https://swallowwortcollaborative.org/about/control-management/>. Accessed on November 29, 2021

Edinger, G., Evans, D., Gebauer, S., Howard, T., Hunt, D., & Olivero, A. (2014). *Ecological Communities of New York State*. Second Edition. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, New York.

Entrust Specimen Label. (2011). <http://www.cdms.net/ldat/ld62B024.pdf> Accessed on November 27, 2021

Great Lakes Phragmites Collaborative. (2017). Phragmites Management. <https://www.greatlakesphragmites.net/management/> Accessed on November 27, 2021.

Great Lakes Restoration Initiative. (2021). Projects Map. <https://www.glri.us/projects>. Accessed on November 20, 2021.

Great Lakes Restoration Interagency Task Force (2019). Great Lakes Restoration Initiative Action Plan III: 2020-2024. <https://www.glri.us/documents#actionplan>. Accessed on November 3, 2021.

Hart, T. and Bonanno, S. Personal Communication, November 21st, 2021.



Hart, T., and Steadman, G. (2017). North Pond Resiliency Study: A Comprehensive Analysis of Shoreline Change and Inlet Dynamics on the Eastern Shore of Lake Ontario. Oswego County Soil and Water Conservation District. <https://seagrant.sunysb.edu/glhabitat/dune/Report-NorthPondResiliencyProject.pdf>. Accessed on October 15, 2021.

Halloran, J., Anderson, H. and Tassie, D. (2013). Clean Equipment Protocol for Industry. Peterborough Stewardship Council and Ontario Invasive Plant Council. Peterborough, ON. 20 p. Latremore, E., Hillegas, E., Canevari, James & Mazzocchi, I. Habitat Management Plan for Black Pond Wildlife Management Area 2019-2028. New York State Dept of Environmental Conservation, Division of Fish and Wildlife Bureau of Wildlife, Albany, New York.

Kennedy, C. (1986). Attachment as a basis for specialization in oak aphids. *Ecological Entomology*. 11:291-300.

LeSage, L. (1995). Revision of the costate species of *Altica* Müller of North America north of Mexico (Coleoptera, Chrysomelidae). *Canadian Entomologist*, 127/3: 295-411.

Lieberman, A. and O'neill, C. (1998). *Vegetation Use in Coastal Ecosystems*. Cornell Cooperative Extension.

L.R. Johnston Associates. 1989. New York's eastern Lake Ontario sand dunes: resources, problems, and management guidelines. New York State Department of State. Albany, NY. 148 p.

Lym, R. (2018). Know Your Knapweeds. North Dakota State University., Fargo, North Dakota. <https://www.ag.ndsu.edu/publications/crops/know-your-knapweeds>.

Lyons-Swift, L. et. Al. (2011). *Sandy Creeks Watershed Inventory and Landscape Analysis*. New York Natural Heritage Program, Albany, New York.

Mazzocchi, I., Latremore, E., Hillegas, R., and Canevari, J. (2018). *Habitat Management Plan for Lakeview Wildlife Management Area 2018 – 2027*. New York State Dept of Environmental Conservation, Division of Fish and Wildlife Bureau of Wildlife, Albany, New York.

Michigan Department of Natural Resources. (2014). *A Guide to the Control and Management of Invasive Phragmites Third Edition*. Michigan Department of Natural Resources, Bay City, Michigan. 46 p.

Michigan Department of Natural Resources. (2012). *Invasive Species Best Control Practices: Glossy Buckthorn*. <https://mnfi.anr.msu.edu/invasive-species/GlossyBuckthornBCP.pdf>. Accessed November 27, 2021.

Midwest Invasive Plant Network. (2021). *Woody Invasives of the Great Lakes Collaborative*. <https://woodyinvasives.org/>. Accessed on November 29, 2021.

Milanowski, D., & Bach, C. (1994). Between-site variation in suitability of *Salix cordata* as a host for *Altica subplicata* (Coleoptera, Chrysomelidae). *Great Lakes Entomologist*, 26: 253-261.

Minnesota Department of Natural Resources. (2021). Queen Ann's Lace. <https://dnr.state.mn.us/invasives/terrestrialplants/herbaceous/queenannslace.html>. Accessed on November 27, 2021.

Mitchell, R. and Tucker, G. (1997) A Revised Checklist of New York State Plants. New York State Museum, Albany New York. 272 p.

New York State Department of Environmental Conservation. 1990. Protected native plants. NYSDEC Division of Lands and Forests, Albany, NY. 18 p.

New York State Department of Environmental Conservation. (2020). New York State Forest Action Plan. New York State Department of Conservation, Albany, New York. 144 p.

New York State Department of Environmental Conservation. (2021). List of Endangered, Threatened, and Special Concern Fish and Wildlife Species of New York State. New York State Department of Environmental Conservation, Albany, New York. 4 p.

New York State Department of Environmental Conservation (n.d.). Funding Opportunities to Implement Great Lakes Restoration Actions. https://www.dec.ny.gov/docs/water_pdf/glfunding.pdf Accessed on November 20, 2021.

Novodor Flowable Concentrate. (2000, November 1). <http://www.entomology.umn.edu/cues/cwlb/insecticides/novodor.pdf>. Accessed on November 27, 2021.

New York Invasive Species Clearinghouse. (2021). New York Invasive Species Information. <http://nyis.info/>. Accessed November 20, 2021.

New York Natural Heritage Program. (2021.) iMapInvasives. <https://www.imapinvasives.org/>. Accessed on October 3, 2021.

New York Natural Heritage Program. (2021). Online Conservation Guide for Great Lakes Dunes. Available from: <https://guides.nynhp.org/great-lakes-dunes/>. Accessed November 25, 2021.

New York Natural Heritage Program. (2021). Online Conservation Guide for *Salix cordata*. Available from: <https://guides.nynhp.org/sand-dune-willow/>. Accessed November 22, 2021

O'Brien and Gere, and Ecologic LLC. (2018). New York State Invasive Species Comprehensive Management Plan. New York State Department of Environmental Conservation and New York State Department of Agriculture and Markets. https://www.dec.ny.gov/docs/lands_forests_pdf/iscmpfinal.pdf. Accessed on November 3, 2021.



Penn State Extension. (2021). Autumn Olive. <https://extension.psu.edu/autumn-olive>. Accessed on November 28, 2021.

Pettis, G. 2005. "Management of insect pests of crapemyrtle (*Lagerstroemia* spp) with special reference to the ecology and biology of *Altica litigata* Fall (Coleoptera: Chrysomelidae). https://getd.libs.uga.edu/pdfs/pettis_gretchen_v_200505_phd.pdf Accessed on November 27, 2021.

Putnam, M., Parton, B., Drake, M., Robedee, A., and Yeatts, T. (2018.) Habitat Management Plan for Deer Creek Marsh Wildlife Management Area 2018 – 2027. New York State Department of Environmental Conservation, Division of Fish and Wildlife Bureau of Wildlife. Albany, New York 48 p.

Rootz LLC. Phase 1: Aquatic and Riparian Invasive Species Inventory and Habitat Assessment. The Nature Conservancy. <https://www.sleloinvasives.org/initiatives/aquaticrestoration/>. Accessed on October 1, 2021.

Sargis. 2015. Restoration of Eastern Lake Ontario Coastal Wetlands and Invasive Species Control. The Nature Conservancy.

Silverstein, M. (1980). Deer Creek Barrier Beach Dune Stabilization Demonstration Project. St. Lawrence Eastern Ontario Commission, Watertown, New York. 53 p.

SLELO PRISM. (2012). SLELO-PRISM Dune Willow Monitoring and Early Detection Surveillance. St. Lawrence Eastern Lake Ontario Partnership for Invasive Species Management, Pulaski, New York. 22p.

SLELO PRISM. (2020). Invasive Species Handbook. Fourth Edition. NYS Department of Environmental Conservation, Albany New York. 72 p. <https://www.sleloinvasives.org/wp-content/uploads/2020/07/SLELO-PRISM-Invasive-Species-Handbook-v2020.pdf>. Accessed on November 29, 2021.

SLELO PRISM (2021). Priority Conservation Area Field Reports. <https://www.sleloinvasives.org/field-reports/>. Accessed on November 23, 2021.

Swift, L., Corser J., Ring, R., Schmid, J., Howard, T., & Spencer, E. (2011). Sandy Creeks Watershed Inventory and Landscape Analysis. A report prepared for the NYS Tug Hill Commission. New York Natural Heritage Program, Albany, New York.

The AzaSol Difference. (n.d.). www.azasol.com/about/theazasol-difference/. Accessed on November 28, 2021.

Uhlig, J. (1981). Vegetative Analysis of Deer Creek Barrier Beach. Saint Lawrence-Eastern Ontario Commission.



United States Department of Agriculture. (2014). Field Guide for Managing Diffuse, Meadow, Spotted, and Squarrose Knapweeds in the Southwest. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410116.pdf. Accessed on November 29, 2021.

United States Department of Agriculture. (n.d.). Plants Profile for *Salix cordata* (heartleaf willow.) <https://plants.usda.gov/home>. Accessed on October 18th, 2021.

United States Fish and Wildlife Service. 2003. Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*). Ft. Snelling, Minnesota. 141 pp.

United States Forest Service (2006). Weed of the Week: Common Barberry. <https://www.invasive.org/weedcd/pdfs/wow/common-barberry.pdf>. Accessed on November 28, 2021.

United States Forest Service. (n.d.). Weed of the Week: Queen Ann's Lace. Available from: <https://www.invasive.org/weedcd/pdfs/wow/queen-annes-lace.pdf>. Accessed on October 1, 2021.

University of Nevada, Reno. (2021). Managing Spotted Knapweed. Available from: <https://extension.unr.edu/publication.aspx?PubID=2390>. Accessed on November 29, 2021.

Webber, D., and Riddick, E. (n.d.). Biological Control: A Guide to Natural Enemies in North America (*Lebia grandis*). Cornell University College of Agriculture and Life Sciences. <https://biocontrol.entomology.cornell.edu/predators/Lebia.php> Accessed on November 27, 2021.

Weldy, T. Werier, D., & Nelson, A. (2021). New York Flora Atlas. USF Water Institute. University of South Florida. New York Flora Association, Albany, New York. <https://newyork.plantatlas.usf.edu/> Accessed on November 2, 2021.

Williams, R. (2019). SLELO PRISM Strategic Plan 2019-2023. St. Lawrence Eastern Lake Ontario Partnership for Invasive Species Management. <https://www.sleloinvasives.org/wp-content/uploads/2020/07/SLELO-STRATEGIC-PLAN-2019-2023-Final-p.pdf>. Accessed on October 19, 2021.

Williams, R. (2020). SLELO PRISM 2020 Annual Report. <https://www.sleloinvasives.org/initiatives/aquaticrestoration/>. Accessed on November 4, 2021.

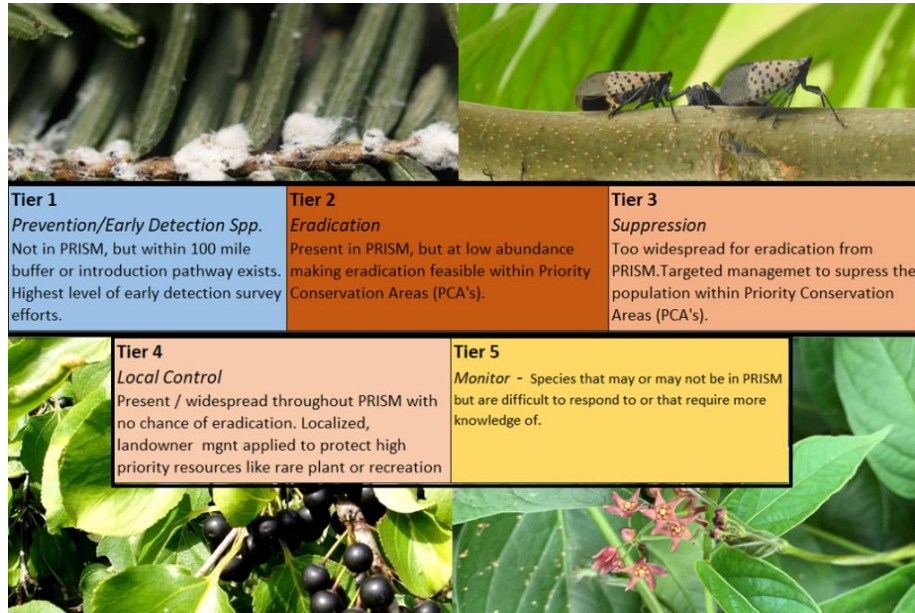
Young, Steve (2021). New York Natural Heritage Program Rare Plant Status Lists. Available from: <http://www.nynhp.org/>. Accessed on January 28, 2022.

Young, Steve. (2022). Personal Communication, January 28, 2022.



Appendix A: SLELO PRISM Tiered Species List

This tiered species list categorizes species by population distribution within the SLELO region and feasible management approaches: prevention, eradication, suppression, localized control, and monitoring (SLELO PRISM, 2021).



Tier 1 - Prevention/Early Detection Species - Not in PRISM, but within 100-mile buffer or introduction pathway exists. Highest level of early detection survey efforts.

- Asian Longhorned Beetle - (*Anoplophora glabripennis*)
- Hemlock Woolly Adelgid - (*Adelges tsugae*)
- Hydrilla - (*Hydrilla verticillata*)
- Kudzu - (*Pueraria montana var. lobata*)
- Mile-A-Minute Vine - (*Persicaria perfoliata*)
- Silver, Big Head and Grass Carp
- Slender False Brome - (*Brachypodium sylvaticum*)
- Spotted Lanternfly - (*Lycorma delicatula*)
- Water Lettuce - (*Pistia stratiotes*)
- Water Hyacinth - (*Piaropus crassipes*)
- Water Soldier - (*Stratiotes aloides*)

Tier 2 – Eradication Species - Present in PRISM, but at low abundance with suitable treatment methods available to make eradication feasible within Priority Conservation Areas (PCA's).

- Asian Clam – (*Corbicula fluminea*)
- Fanwort - (*Cabomba caroliniana*)
- *Giant Hogweed - (*Heracleum mantegazzianum*)
- Bloody Red Shrimp - (*Hemimysis anomala*)

*Porcelain Berry - (*Ampelopsis glandulosa*)
Spiny Water Flea - (*Bythotrephes longimanus*)
Tench - (*Tinca tinca*)

Tier 3 -Suppression Species - Too widespread for eradication from PRISM, but some areas remain unaffected. Targeted management to suppress the population within Priority Conservation Areas (PCA's).

*Black & Pale Swallow-wort - (*Vincetoxicum spp.*)
*Common Buckthorn - (*Rhamnus cathartica*)
*Glossy Buckthorn - (*Frangula alnus*)
*Japanese Knotweed - (*Reynoutria japonica*)
*Japanese Stiltgrass - (*Microstegium vimineum*)
*Oriental Bittersweet – (*Celastrus orbiculatus*)
*Phragmites/Common Reed – (*Phragmites australis*)
Rusty Crayfish - (*Orconectes rusticus*)
Starry Stonewort - (*Nitellopsis obtusa*)
*Tree-of-heaven - (*Ailanthus altissima*)
Water Chestnut - (*Trapa natans*)
*Wild Chervil - (*Anthriscus sylvestris*)
*Yellow Iris - (*Iris pseudacorus*)

Tier 4 - Local Control Species - Present and widespread throughout PRISM with no chance of eradication. Localized (landowner) management applied to protect high priority resources like rare plant or recreation assets.

Curly Leaf Pondweed - (*Potamogeton crispus*)
Emerald Ash Borer - (*Agrilus planipennis*)
Eurasian Water Milfoil - (*Myriophyllum spicatum*)
European Frogbit - (*Hydrocharis morsus-ranae*)
Feral Swine - (*Sus scrofa*)
Leafy Spurge - (*Euphorbia virgata*)
*Purple Loosestrife - (*Lythrum salicaria*)
Round Goby - (*Neogobius melanostomus*)
*Spotted Knapweed – (*Centaurea stoebe ssp. micranthos*)
*Wild Parsnip - (*Pastinaca sativa*)
Zebra/Quagga Mussel - (*Dreissena spp.*)

Tier 5 – Species - Species that may or may not be in PRISM but are difficult to respond to or that require more knowledge of.

Jumping Worms (*Amyntas spp.*)
Tench (*Tinca tinca*)

*Denotes terrestrial invasive plants included in the ELO Dunes Invasive Species Initiative

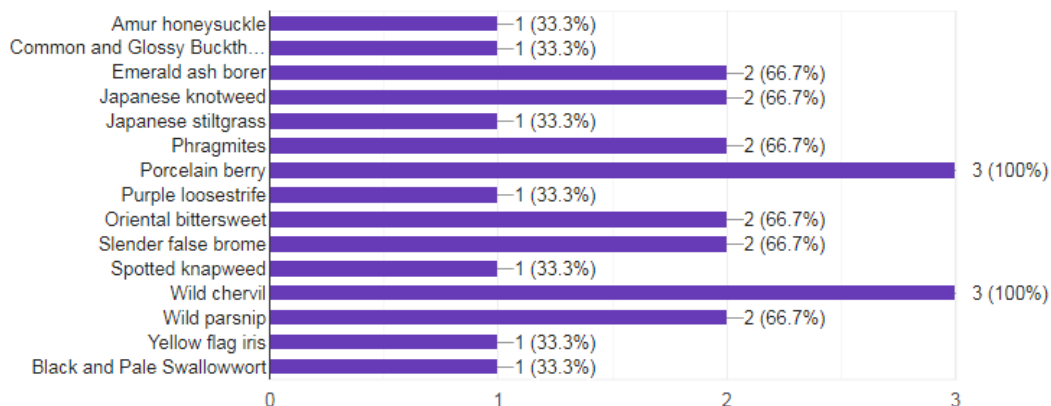


Appendix B: Eastern Lake Ontario Dunes Terrestrial Invasive Species Initiative Questionnaire

1. Responses
 - a. Who has responded: 3
 - b. Waiting for responses: 5
2. Organization or Agency
 - a. NYROPRHP, NYSDEC
3. Does your land have past or current invasive species management practices that you would like evaluated for effectiveness of control?
 - a. 66.7% Yes 0.00% No 33.3% Not Applicable
4. If your answer above is YES. Are you willing to provide invasive species management practices literature and locations so that we may evaluate the effectiveness of control?
 - a. 66.7% Yes 0.00% No 33.3% Not Applicable
5. If you are missing historic IS management records and would like us to contact those agencies that performed the work? If YES, please provide an agency contact list below.
 - a. Not Applicable No
6. Are there priority areas which you would like surveyed to benefit threatened/endangered plants or wildlife. Please upload a map (Ex. Google Map) with approximate location of polygons for areas you would like included in the survey.

*Please note we do not need exact locations of rare plants or wildlife.

 - a. Four Maps Provided: (3) Southwick Beach State Park, (1) Deer Creek Marsh WMA
7. Please check any gaps in terrestrial invasive species mapping (ex. underreported species) that you would like included in the ground surveys.



8. Do you have any areas of land that you plan to create/restore habitat in the future that you would like included in the survey? Please upload a map (Ex. Google Map) with




approximate location of polygons for areas you would like included in the survey.

*Please note we do not need exact locations of rare plants or wildlife.

- a. 2 Maps provided Southwick Beach State Park
9. Do you have any additional questions or comments for the Dunes Foundation?
- a. I'd like a prioritized list of invasive species to control/native species to protect.;
Thank You!!



Appendix C: Invasive Species Survey Permits (NYSOPRHP, NYSDEC, TNC)

 <p>NEW YORK STATE OF OPPORTUNITY</p>	<p>Parks, Recreation and Historic Preservation</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">FOR DEPARTMENT USE ONLY</th> </tr> <tr> <td style="width: 50%;">APPLICATION NO. 2021-MP15-013</td> <td style="width: 50%;">DATE RECEIVED 8/13/2021</td> </tr> <tr> <td>REGION Multiple</td> <td>PERMIT TYPE Pi</td> </tr> </table>	FOR DEPARTMENT USE ONLY		APPLICATION NO. 2021-MP15-013	DATE RECEIVED 8/13/2021	REGION Multiple	PERMIT TYPE Pi
FOR DEPARTMENT USE ONLY								
APPLICATION NO. 2021-MP15-013	DATE RECEIVED 8/13/2021							
REGION Multiple	PERMIT TYPE Pi							
<input checked="" type="checkbox"/> NEW (Complete sections A-D) <input type="checkbox"/> RENEWAL/MODIFICATION (Complete Section A-D where appropriate) <input type="checkbox"/> FINAL and/or INTERIM REPORT (Complete Section E)								
SCIENTIFIC RESEARCH APPLICATION AND PERMIT								
<p><i>Instructions: Please type or print. Attach additional information as necessary. Indicate fields not applicable with N/A. Electronic signatures are acceptable. Send application to the appropriate contact.</i></p>								
Section A - Applicant Information								
<p>1. Principal Investigator (Last, First) Shulenburg, Patricia</p>								
<p>2. Mailing Address 221 Milton Ave Syracuse, NY 13204</p>		<p>Telephone 585-303-5750 Fax Email pshulenburg@gmail.com</p>						
<p>3. Affiliation (Graduate students, include name & phone number of major professor.) Dunes Foundation</p>								
<p>4. Names of Field Assistants 1</p>								
<p>5. Project Title Dunes Foundation Invasive Species Initiative</p>								
Section B - Project Information								
<p>6. Park and Project Location (Include site names with GPS coordinates when applicable and/or attach map.) Sandy Island Beach State Park, Southwick Beach State Park</p>								
<p>7. Research Purpose and Methodologies (Include objectives, design, methods, equipment & materials, and any collection or disposition of specimens as well as proof of other required permits, if any.) Attach research proposal if necessary. On the ground surveys for invasive species impacting dune willow and piping plover habitat areas to be included in developing a comprehensive invasive species management initiative plan for the eastern Lake Ontario dunes.</p>								
Section C - Time Frame								
<p>8. Time Frame (start and end dates, including project scoping and clean up) 9/1-11/1/2021</p>								
Section D - Project Relationships								
<p>9. Project's Relationship to Other Research Projects (Note whether related projects are in or near State Parks.) n/a</p>								
Section E - Final Report								
<p>10. Project Report (Provide a copy of the final research report when it becomes available. Submittal of interim reports is encouraged.)</p> <p>Anticipated date of Final Report: _____</p> <p>Attached report(s) and provide comments as deemed necessary: _____</p>								



SCIENTIFIC RESEARCH PERMIT

Standard Conditions and Restrictions:

It is the intention of the NYS OPRHP to further scientific research within the areas administered by it, and to cooperate with authorized workers to the fullest extent compatible with its charge to protect all species of flora and fauna and all soil and geologic material in a natural state insofar as possible.

1. Except for the resources indicated in the permit, the taking or disturbing of resources (including cultural or archaeological materials) is specifically prohibited.
2. Research shall be used for scientific or interpretive purposes only, be dedicated to the public benefit, and not be used for commercial purposes.
3. All research should be done in an inconspicuous manner away from roads, trails and developed areas unless specified in the permit, and shall not cause significant damage to the environment. In some cases, the researchers and state parks may agree to location that enhances environmental education opportunities while meeting research and park management goals. Because of the scarcity and/or importance of some resources, the OPRHP may designate other restrictions necessary for the preservation of the area.
4. All field equipment (traps, measuring devices, etc) left in the field must be labeled with the Principal Investigator's name, date of installation, and the OPRHP permit number.
5. A permit from the NYS DEC and USFWS is required for certain types of work. This may include, but is not limited to, work on listed species and the collection and possession of wildlife. State and federal permits must be in hand prior to initiating work and be available for inspection on site.
6. Any research that leads to the discovery of new rare species or ecological communities requires the submission of a Natural Heritage Reporting Form to the New York Natural Heritage Program.
7. The permittee shall submit a summary of information gathered to the contact for the Region where the investigations took place within a year of the research end date (as identified on this permit). The OPRHP further requires that the researcher(s) provide copies of or otherwise make available to the OPRHP any material published as a result of this permit.
8. Researcher(s) or their representatives are to contact the appropriate Facility Manager before beginning, and to present a copy of this permit together with evidence of additional research licenses and permits, if required.
9. Researcher(s) will discuss with the Facility Manager the type and extent of work to be performed. The Facility Manager will describe any rules and regulations that may apply to the work.
10. If research is not conducted in accordance with this permit and/or to the satisfaction of the OPRHP, this permit will be immediately revoked.
11. The permittee shall promptly report any and all unusual incidents directly to the Facility Manager or Park Police. Unusual incidents include, but are not limited to, damage to Park property, accidents, personal injuries, and emergencies involving medical personnel.
12. Permittee shall defend, indemnify and hold harmless the People of the State of New York, the Executive Department, the New York State Office of Parks, Recreation and Historic Preservation and its commissioners, officers, agents and employees from and against damages for injury to or death of persons and for damage to or destruction of property of State Parks or others occurring during Permittee's use of said Premises and caused by the acts, omissions, neglect or misconduct of Permittee or any of its employees, agents, contractors, licensees or guests in the conduct of Permittee's operations under this permit. The Permittee assumes all risk of loss of the Permittee's property or that of its agents, employees, contractors and guests. Permittee's liability is not limited to the insurance coverage provided.

Special Conditions:

I have read the Conditions and Restrictions above and agree to those terms.

Patricia Shulenburg APPLICANT'S SIGNATURE	<small>Digitally signed by Patricia Shulenburg Date: 2021.08.12 09:33:49 -0400</small>	Patricia Shulenburg APPLICANT'S NAME (Print or type)	8/12/2021 DATE
Lynn Bogan APPROVAL SIGNATURE	<small>Digitally signed by Lynn Bogan Date: 2021.09.08 16:10:45 -0400</small>	Lynn Bogan OPRHP PERMIT ADMINISTRATOR	9/8/21 DATE

APPLICANT MUST CARRY THIS PERMIT AT ALL TIMES WHILE IN PARK OR HISTORIC SITE.

PERMIT VALID FROM 9/8/21 TO 12/1/2021

Entrance fees/admission to the park or site will be waived only in accordance to the research identified on this permit; specifically to those individuals identified on this permit and within the time period described on this permit.

Copies to: Permit contact. (Distribute both approved and denied permits.) Version 10/25/2019





TEMPORARY REVOCABLE PERMIT

SHORT-TERM PERMIT FOR INDIVIDUALS AND/OR GROUP EVENTS ON DEC-MANAGED PUBLIC LANDS AND CONSERVATION EASEMENTS

The NYS Department of Environmental Conservation grants permission to the Permittee to use the specified State lands for the described purposes in accordance with all the attached Terms & Conditions. TRPs will only remain valid if all necessary permits and/or insurance are obtained and kept current by the Permittee.

Permittee Name: Patricia Shulenburg Organization: Dunes Foundation

Street Address: 221 Milton Ave.

City: Syracuse State: NY Zip Code: 13204

Email: pshulenburg@gmail.com Phone: 585-303-5750

State Land Unit Name(s): Lakeview WMA, Deer Creek WMA and Black Pond WMA

Facility, Trail or Road Name(s):

Description of Use:

The Dunes Foundation, along with Resource Environmental Solutions, will be surveying for invasive species impacting dune willow and low sand cherry among other protected species and develop guidelines for management. The project team is surveying the dunes and will not be conducting surveys in the wetlands, grasslands or forested areas. The purpose of the project is to develop a comprehensive invasive species initiative for the eastern Lake Ontario dunes. Two staff from RES (Ben Zimmerman + one staff) will be accessing the dune by foot. See special conditions. p.2.

Maximum Attendees Permitted: Start Date: End Date:

Primary DEC Contact: Phone: DEC Office:

Application Fee:

Insurance Certificate:

Map:

REGIONAL REVIEW TRP#

DATE ISSUED TO APPLICANT: TYPE:

RECOMMEND: SPECIAL TERMS & CONDITIONS:

REGIONAL MANAGER SIGNATURE: Digitally signed by Andrew J. MacDuff
Date: 2021.08.20 10:08:15 -0400 DATE:

REGIONAL DIRECTOR SIGNATURE: DATE:

CENTRAL OFFICE REVIEW *NON-ROUTINE & FOREST PRESERVE RESEARCH PERMITS ONLY

RECOMMEND: SIGNATURE: DATE:

STATE MUSEUM REVIEW * IF APPLICABLE

RECOMMEND: SIGNATURE: DATE:

OFFICE OF PARKS, RECREATION AND HISTORIC PRESERVATION REVIEW * IF APPLICABLE

RECOMMEND: SIGNATURE: DATE:



TEMPORARY REVOCABLE PERMIT

STANDARD TERMS & CONDITIONS

1. Permittee hereby agrees to indemnify and save harmless the Department and the State of New York from and against all losses from claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought or recovered against it by reason of the Permittee's use of the State land facilities which are the subject of this permit.
2. Permittee shall comply with all applicable Federal and State rules and regulations and shall obtain and keep current any additionally required Federal, State or local permits for the full duration of the permitted activity.
3. This permit shall at all times be subject to the approval of the Department and may be suspended or revoked at any time.
4. If public liability insurance is required by the Department, the Permittee must keep in force such insurance for the full duration of the permit.
5. Permittee shall notify the primary DEC contact person at least 48 hours prior to commencing permit use and upon completion of use.
6. Any activity authorized under this permit shall not interfere with normal administration of the area by the Department.
7. No trees or other vegetation shall be cut, disturbed or removed unless specifically authorized by the Department.
8. Permittee shall be responsible for any damages or disturbances that occur to natural resources, public facilities, boundaries or survey markers resulting from the permitted activity.
9. Permittee is responsible for removing all litter and debris from the State Land facility covered by this permit within 24 hours of completion of the authorized activity.
10. Upon completion of the activity, Permittee shall meet with the primary DEC contact person to inspect the area and to ensure that the Permittee has complied with all terms and conditions.



TRP # 62118

Insert TRP Activity Type
SPECIAL TERMS & CONDITIONS

In addition to the aforementioned Standard Terms & Conditions, this permit is subject to the following Special Terms & Conditions. Failure of the Permittee to comply with any Terms and Conditions will void this permit.

Access to Black Pond will begin no sooner than September 7, 2021 due to the gate being locked.



INSTRUCTIONS FOR SUBMITTING A PROPOSAL TO DO RESEARCH ON NATURE CONSERVANCY PRESERVES

Central and Western New York Chapter
The Nature Conservancy

The Nature Conservancy promotes the use of its preserves for scientific research and study. Researchers are encouraged to investigate the challenging problems related to the maintenance or enhancement of important plant and animal populations and natural communities protected by the preserves.

Scientific research that does not require the removal of natural material is preferred. Some research requires the collection of specimens for further analysis, study, and recording. Under certain circumstances, limited collecting on The Nature Conservancy preserves is permitted. Collections of specimens from preserves shall be used for scientific or educational purposes only, shall be dedicated to public benefit, and shall not be used for commercial profit.

Anyone wishing to conduct research or collect specimens on a Conservancy preserve in Central and Western New York must submit a research proposal to the Chapter office. Proposals must be submitted at least one month prior to the planned starting date of the research. No research can be conducted until a research proposal has been approved in writing. (**Note: If you have already crafted a proposal for this work for funding agencies, you may submit that in lieu of our format. Please be sure to tailor the methods sections to our preserve/s and concerns, and trim the proposal, when feasible, to a maximum of 5-8 pages, not including literature cited. Please also provide a 1-page cover letter addressing how the research relates to TNC's mission, why the work will benefit the landscape and/or TNC, a concise statement of expected outcomes, and a plan for how you will share the data with us.**)

Data collected and a final report summarizing the results of the research must be submitted to The Nature Conservancy.

1. All proposals require completion of a cover sheet (page 1 of attachment) and should include a 2-6-page narrative following the outline provided (page 2 of attachment).
2. Requests for permission to collect materials should include a completed and signed collecting permit.
3. Proposals can be emailed to mlevine@tnc.org and broat@tnc.org or mailed to:

The Nature Conservancy
274 North Goodman Street
Suite B261
Rochester, NY 14607



- (1) **Objectives:** The specific need or the management problem addressed by this research should be described. What are the elements (species or communities) this research focuses on? State specific proposed accomplishments for this study.
- (2) **Background:** State the significant points already known concerning the problem or need. Related efforts currently underway should be discussed, as well as how the proposed research complements other efforts.
- (3) **Value/Benefits:** How will this research aid in the management of the target element(s)? How will the information collected benefit The Nature Conservancy and further the preservation of natural diversity? What is the practical application of the research?
- (4) **Methods:**
- Procedures and methods: Discuss the research design identifying variables to be measured, and sampling and data collection procedures. Fully explain the plan of action.
 - Timetable:
 - Collecting: Description of any collecting to be undertaken (include the "Application for Permission to Collect" form).
 - Anticipated impact: Discuss anticipated impact of research on both the specific subjects of the study and the surrounding preserve.
- (5) **Biological Monitoring Considerations:** Discuss how continuity and consistency will be maintained throughout the process. How will it be determined how long this monitoring will last? Assuming the monitoring does record change, how will the change be analyzed? Who will analyze it?
- (6) **Products and Reports:** Define the final report or product of the study. Include a schedule for submission of progress and final reports to The Nature Conservancy. The Nature Conservancy should be acknowledged in any publications resulting from the research.
- (7) **Literature Cited:**
- (8) **Resume of Principal Investigator:**

(Continued)

Tasks to be accomplished (by the Dunes Foundation).

- Oversee the preparation of an Eastern Lake Ontario Dunes and Wetlands Area (ELODWA) Comprehensive Invasive Species Management Plan.
- Subcontract a portion of the plan development to Resource Environmental Solutions Formerly Applied Ecological Services Inc.
- Collaborate with multiple partners to include but not limited to New York State Department of Environmental Conservation, The Nature Conservancy, New York State Department of Parks Recreation and Historic Preservation, the ELO Dune Coalition and the NYS Natural Heritage Program on the development and contents of the management plan.
- Include a section in the management plan that summarizes a literature review of existing management efforts for ELO dune environment for both dunes and adjacent wetlands.
- Include in the management plan 1) an overview of invasive species present based on in-situ surveys and best management practices to mitigate their impacts, 2) a section on dune restoration measures such as dune willow protection and enhancement and ecological beach restoration measures if deemed desirable.

Updated 02.11.2021 Page 8 of 8

- Include number of acres of dunes mapped (including an adjacent 50-foot buffer) for tier invasive species gaps using in-situ surveys and NY IMapInvasives to inform future long-term restoration and monitoring projects and communicate results to land managers.
- Summarize number of acres of dunes (including an adjacent 50-foot buffer) recommended for long-term priority invasive species management.
- Acknowledge the SLELO PRISM, The Nature Conservancy in any correspondence associated with this project.
- Prepare a final report (Management Plan) which addresses all project elements.
 - Desired Outcomes:
 - The transparent development of an Eastern Lake Ontario Dunes and Wetlands Area (ELODWA) Comprehensive Invasive Species Management Plan.



Appendix D: The Flora of the Eastern Shore Dunes of Lake Ontario

A comprehensive list of the Flora of the Eastern Shore Dunes of Lake Ontario is sourced from:

Bonanno, S. E., Leopold, D. J., & St. Hilaire, L. R. (1998). Vegetation of a Freshwater Dune Barrier Under High and Low Recreational Uses. *The Journal of the Torrey Botanical Society*, 125(1), 40–50.
<https://doi.org/10.2307/2997230>

This plant guide may be beneficial for conducting vegetation surveys, identifying native and sensitive plant species, and creating custom plant and seed mixes for ecological restoration projects.

What follows this page is the flora scanned from Sandra Bonanno's M.S. thesis,
the title of which is scanned below.

**Vegetation of a Lake Ontario Dune Barrier,
Oswego and Jefferson Counties, NY,
under High and Low Recreation Pressure**

by

Sandra E. Bonanno

A thesis

submitted in partial fulfillment
of the requirements for the
Master of Science Degree

State University of New York
College of Environmental Science and Forestry
Syracuse, New York

December 1992

The Flora of the Eastern Shore Dunes of Lake Ontario

Native species appear in bold type. Information provided for each species includes relative abundance as well as location by zone and site: DC, Deer Creek WMA; ED, El Dorado Beach Preserve; L, Lakeview WMA. See text for definition of abundances and zones.

Pteridophytes

Lycopodiaceae

Lycopodium lucidulum Michx. - Rare, forest, ED.

Equisetaceae

Equisetum arvense L. - Common throughout, DC, ED, L.

Equisetum hyemale L. - Occasional, swales; rare, secondary dunes, DC, L.

Equisetum variegatum Schleich. ex Weber & Mohr - Occasional, swales, flats, DC, ED, L.

Equisetum x litorale Kuhl. ex Rupr. - Occasional, swales, flats, L.

Ophioglossaceae

Botrychium dissectum Spreng. f. *obliquum*¹ - Rare, swale, L.

Osmundaceae

Osmunda regalis L. - Rare, moist swale, L.

Polypodiaceae

Polypodium virginianum L. - Rare, forest, L.

Aspleniaceae

Athyrium asplenoides (Michx.) Desv. - Occasional, flats, ED, L.

Dryopteris carthusiana (Vill.) Fuchs - Occasional, secondary dunes, forest, flats, DC, ED, L.

Dryopteris cristata (L.) Gray - Rare, flats, L.

Dryopteris marginalis (L.) Gray - Occasional, dune forest, ED, L.

Onoclea sensibilis L. - Common, flats, DC, ED, L.

Thelypteris noveboracensis (L.) Nieuwl. - Rare, flats, ED.

Thelypteris palustris Schott - Rare, flats, ED, L.

Gymnosperms

Taxaceae

Taxus canadensis Marsh. - Occasional, forest, flats, ED, L.

¹ Determined by Dr. W.H. Wagner

Pinaceae

Pinus strobus L. - Occasional, swales, secondary dunes, forest, flats, DC, L.

Pinus sylvestris L. - Rare, swales, ED, L.

Cupressaceae

Juniperus communis L. - Occasional, swales, secondary dunes, flats, DC, ED, L.

Juniperus virginiana L. - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Thuja occidentalis L. - Common, secondary dunes, forest, flats, ED.

Angiosperms

Ranunculaceae

Actaea pachypoda Ell. - Occasional, forest, flats, DC, ED, L.

Actaea spicata L. ssp. *rubra* (Ait.) Hulten - Common, forest, flats, DC, ED, L.

Anemone canadensis L. - Occasional, swales, forest, flats, DC, ED.

Anemone virginiana Gray - Rare, flats, ED.

Aquilegia canadensis L. - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Clematis virginiana L. - Occasional, secondary dunes, forest, flats, DC, ED, L.

Hepatica nobilis Mill. - Rare, forest, L.

Ranunculus abortivus L. - Occasional, forest, flats, L.

Thalictrum pubescens Pursh - Occasional, swales, secondary dunes, forest, flats, DC, ED,
L.

Berberidaceae

Berberis thunbergii DC. - Rare, forest, flats, ED.

Caulophyllum thalictroides (L.) Michx. - Rare, forest, ED.

Podophyllum peltatum L. - Rare, flats, L.

Papaveraceae

Sanguinaria canadensis L. - Rare, forest, ED.

Ulmaceae

Celtis occidentalis L. - Rare, forest, flats, DC.

Ulmus americana L. - Occasional, secondary dunes, flats, DC, ED, L.

Urticaceae

Boehmeria cylindrica (L.) Sw. - Rare, flats, ED, L.

Pilea fontana (Lunell) Rydb. - Rare, flats, ED, L.

Pilea pumila (L.) Gray - Rare, flats, ED, L.

Urtica dioica L. ssp. *gracilis* (Ait.) Selander - Occasional, forest, flats, ED, L.

Myricaceae

Myrica gale L. - Occasional, swales, flats, DC, ED, L.

Fagaceae

Fagus grandifolia Ehrh. - Rare, forest, ED; common, forest, L.

Quercus rubra L. var. *borealis* (Michx. f.) Farw. - Common, swales, secondary dunes, flats; abundant, forest, DC, ED, L.

Quercus velutina Lam. - Rare, swale, DC.

Betulaceae

Alnus incana (L.) Moench ssp. *rugosa* (DuRoi) Clausen - Abundant, flats; occasional, swales, secondary dunes, DC, ED, L.

Betula alleghaniensis Britt. - Rare, flats, L.

Betula papyrifera Marsh. - Occasional, swales, secondary dunes, forest, flats, ED, L.

Betula populifolia Marsh. - Rare, swales, flats, L.

Carpinus caroliniana Walt. - Rare, flats, L.

Ostrya virginiana (Mill.) Koch - Rare, flats, L.

Caryophyllaceae

Dianthus armeria L. - Rare, swale, DC, ED.

Minuartia michauxii (Fenzl) Farw. - Rare, swale, ED.

Moehringia lateriflora (L.) Fenzl - Common, swales, secondary dunes, forest, flats, DC, ED, L.

Saponaria officinalis L. - Abundant, swales, secondary dunes; occasional, forest, flats, DC, ED, L.

Silene latifolia Poir. - Rare, swales, secondary dunes, DC.

Silene vulgaris (Moench) Garcke - Occasional, swales, secondary dunes, DC, ED, L.

Stellaria graminea L. - Rare, swales, secondary dunes, DC, L.

Polygonaceae

Polygonum cilinode Michx. - Occasional, secondary dunes, forest, flats, DC, ED, L.

Polygonum convolvulus L. - Rare, forest, flats, ED, L.

Polygonum lapathifolium L. - Rare, beach, L.

Polygonum punctatum Ell. - Rare, flats, L.

Polygonum sagittatum L. - Rare, flats, L.

Rumex acetocella L. - Common, swales, secondary dunes, forest, DC, ED, L.

Clusiaceae

Hypericum perforatum L. - Occasional, swales, secondary dunes, flats, DC, ED, L.

Hypericum punctatum Lam. - Rare, flats, DC, L.

Tiliaceae

Tilia americana L. - Occasional, secondary dunes, forest, flats, DC, ED.

Violaceae

Viola arvensis Murr. - Rare, swales, L.

Cucurbitaceae

Echinocystis lobata (Michx.) Torr. & Gray - Rare, beach, ED.

Salicaceae

Populus alba L. - Rare, swale, L.

Populus balsamifera L. - Occasional, beach, foredune, swale, flats, DC.

Populus deltoides Bartr. ex Marsh. - Abundant, beach, foredunes, swales, secondary dunes; occasional, forest, flats, DC, ED, L.

Populus grandidentata Michx. - Rare, forest, ED.

Populus nigra L. - Occasional, foredune, swale, secondary dunes, flats, DC; rare, swale, L.

Populus tremuloides Michx. - Rare, swale, ED.

Salix alba L. - Rare, flats, DC; swale, L.

Salix amygdaloides Anderss. - Occasional, foredunes, swales, flats, DC, ED, L.

Salix bebbiana Sarg. - Rare, flats, ED.

Salix cordata Michx. - Common, beach, foredunes, swales, secondary dunes, flats, DC, ED, L.

Salix discolor Muhl. - Rare, swale, flats, ED, L.

Salix exigua Nutt. - Occasional, beach, swale, flats, DC, ED, L.

Salix fragilis L. - Rare, swale, flats, L.

Salix humilis Marsh. - Rare, swale, L.

Salix lucida Muhl. - Rare, foredunes, secondary dunes, flats, ED, L.

Salix nigra L. - Rare, swale, flats, ED, L.

Salix purpurea L. - Occasional, foredunes, swales, flats, DC, ED, L.

Salix rigida Muhl. - Rare, swale, secondary dune, flats, DC, L.

Salix x rubens Schrank - Common, beach, foredunes, swales, secondary dunes, flats, DC, ED, L.

Brassicaceae

Alyssum alyssoides (L.) L. - Rare, swale, ED.

Berteroa incana (L.) DC. - Rare, swales, secondary dunes, DC, L.

Cakile edentula (Bigel.) Hook. ssp. *lacustris* (Fern.) Hultén - Rare, beach, DC, ED, L.

Cardamine pratensis L. - Rare, flats, ED.

Ericaceae

Vaccinium corymbosum L. - Rare, forest, flats, ED.

Pyrolaceae

Pyrola elliptica Nutt. - Rare, swale, flats, L.

Primulaceae

Lysimachia ciliata L. - Occasional, flats, DC, ED, L.

Lysimachia nummularia L. - Rare, flats, L.

Lysimachia quadrifolia L. - Rare, flats, L.

Lysimachia terrestris (L.) BSP. - Occasional, swales, flats, L.

Trientalis borealis Raf. - Occasional, forest, flats, ED, L.

Grossulariaceae

Ribes americanum Mill. - Occasional, flats, ED, L.

Ribes cynos-bati L. - Rare, forest, L.

Ribes rubrum L. - Occasional, forest, flats, ED, L.

Crassulaceae

Sedum acre L. - Rare, swales, ED, L.

Rosaceae

Amelanchier spp. - Occasional, secondary dunes, forest; rare, swale, flats, DC, ED, L.

Crataegus sp. - Rare, secondary dune, L.

Fragaria virginiana Mill. - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Geum canadense Jacq. - Occasional, swale, forest, flats, DC, ED, L.

Geum virginianum L. - Rare, flats, ED.

Potentilla anserina L. ssp. *anserina* - Occasional, beach, foredunes, swales, flats, DC, ED, L.

- Potentilla argentea* L. - Rare, swale, ED.
- Potentilla norvegica* L. - Rare, swale, secondary dune, DC.
- Potentilla palustris* (L.) Scop. - Rare, flats, DC.
- Prunus pensylvanica* L.f. - Occasional, swales, secondary dunes, flats, DC; rare, secondary dune, L.
- Prunus pumila* L. var. *pumila* - Rare, swale, DC; common, foredunes, swales, secondary dunes, ED.
- Prunus serotina* Ehrh. - Common, swales, secondary dunes, forest, flats, DC, ED, L.
- Prunus virginiana* L. - Abundant, swales, secondary dunes, forest, flats, DC, ED, L.
- Rosa blanda* Ait. - Occasional, flats, DC; common, secondary dunes, forest, flats, ED.
- Rosa palustris* Marsh. - Rare, forest, flats, ED.
- Rubus allegheniensis* Porter ex Bailey - Occasional, swales, forest, flats, DC, ED, L.
- Rubus flagellaris* Willd. - Occasional, swales, secondary dunes, DC, L.
- Rubus idaeus* L. - Abundant, swales, secondary dunes, forest, flats, DC, ED, L.
- Rubus occidentalis* L. - Rare, secondary dune, ED.
- Rubus odoratus* L. - Occasional, swale, flats, DC.
- Rubus pubescens* Raf. - Abundant, forest, flats, ED; rare, swale, forest, flats, L.
- Spiraea alba* DuRoi - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Fabaceae

- Amorpha fruticosa* L. - Rare, swales, DC, L.
- Apios americana* Medic. - Occasional, swales, flats, ED, L.
- Lathyrus japonicus* Willd. var. *glaber* (Ser.) Fern. - Occasional, foredunes, swales, secondary dunes, DC, ED, L.
- Lathyrus palustris* L. - Occasional, beach, swales, flats, ED, L.
- Lotus corniculata* L. - Rare, swales, DC, L.
- Medicago sativa* L. - Rare, flats, L.
- Melilotus alba* Desr. ex Lam. - Rare, swale, L.
- Robinia pseudo-acacia* L. - Rare, swale, DC.
- Trifolium aureum* Pollich - Rare, swales, DC, L.
- Trifolium dubium* Sibth. - Rare, swale, DC.

Trifolium pratense L. - Rare, swale, DC.

Trifolium repens L. - Rare, swales, flats, DC, L.

Vicia cracca L. - Rare, swales, DC, L.

Eleagnaceae

Eleagnus umbellata Thunb. - Rare, swale, L.

Lythraceae

Lythrum salicaria L. - Occasional, beach, swales, flats, DC, ED, L.

Onagraceae

Circaea lutetiana L. - Occasional, forest, flats, DC, ED, L.

Epilobium coloratum Biehl. - Rare, flats, L.

Oenothera biennis L. - Occasional, foredunes, swales, secondary dunes, flats, DC, ED, L.

Cornaceae

Cornus amomum Mill. - Occasional, beach, foredunes, swales, flats, DC, ED, L.

Cornus sericea L. - Common, swales, secondary dunes, forest, flats, DC, ED, L.

Celastraceae

Celastrus scandens L. - Occasional, secondary dunes, forest, DC, L.

Aquifoliaceae

Ilex verticillata (L.) Gray - Occasional, forest, flats, DC, ED, L.

Euphorbiaceae

Chamaesyce polygonifolia (L.) Small - Occasional, beach, foredunes, swales, secondary dunes, flats, DC, ED, L.

Euphorbia esula L. - Rare, swale, ED.

Rhamnaceae

Rhamnus cathartica L. - Occasional, swales, secondary dunes, flats, DC, ED, L.

Rhamnus frangula L. - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Vitaceae

Parthenocissus quinquefolia (L.) Planch. ex DC - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Vitis riparia Michx. - Abundant, swales, secondary dunes, forest, flats, DC, ED, L.

Aceraceae

Acer negundo L. - Occasional, throughout, ED, L.

Acer nigrum Michx. f. - Rare, forest, ED, L.

Acer pensylvanicum L. - Occasional, secondary dunes, forest, ED, L.

Acer rubrum L. - Abundant, beach, swales, secondary dunes, forest, flats, ED, L.

Acer saccharinum L. - Rare, foredunes, ED, L.

Acer saccharum Marsh. - Rare, swale, secondary dunes, flats, DC, ED, L; common, forest, DC, L.

Anacardiaceae

Rhus typhina L. - Occasional, swales, secondary dunes, forest, flats, DC; rare, flats, L.

Oxalidaceae

Toxicodendron radicans L. - Abundant all roadside sites (not secondary)

Oxalis stricta L. - Rare, forest, ED.

Geraniaceae

Geranium robertianum L. - Rare, forest, ED.

Balsaminaceae

Impatiens capensis Meerb. - Occasional, beach, forest, flats, ED, L.

Araliaceae

Aralia nudicaulis L. - Abundant, secondary dunes, forest, flats, ED, L.

Apiaceae

Daucus carota L. - Occasional, swales, secondary dunes, DC, L.

Sium suave Walt. - Rare, flats, DC, ED, L.

Apocynaceae

Apocynum cannabinum L. var. *hypericifolium* Gray - Rare, swale, DC.

Asclepiadaceae

Asclepias syriaca L. - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Solanaceae

Physalis heterophylla Nees - Rare, flats, DC.

Solanum dulcamara L. - Occasional, beach, swales, secondary dunes, forest, flats, DC, ED, L.

Convolvulaceae

Calystegia sepium (L.) R.Br. - Rare, beach, L.

Boraginaceae

Echium vulgare L. - Occasional, beach, swales, DC, ED.

Myosotis laxa Lehm - Rare, flats, DC.

Verbenaceae

Phryma leptostachya L. - Occasional, forest, flats, DC, ED, L.

Lamiaceae

Clinopodium vulgare L. - Rare, flats, DC.

Collinsonia canadensis L. - Rare, forest, ED.

Hedeoma pulegioides (L.) Pers. - Rare, swale, secondary dune, ED.

Lycopus americanus Muhl. ex Bart. - Occasional, beach, flats, DC, ED, L.

Lycopus uniflorus Michx. - Rare, flats, DC, ED.

Lycopus virginicus L. - Occasional, beach, swale, flats, ED, L.

Mentha arvensis L. ssp. *haplocaylx* Briq. - Rare, swale, L.

Mentha spicata L. - Rare, beach, flats, DC, ED.

Scutellaria galericulata L. - Occasional, beach, swales, flats, DC, ED, L.

Scutellaria lateriflora L. - Rare, beach, flats, ED, L.

Stachys hyssopifolia Michx. - Rare, flats, L.

Stachys nuttallii Shuttlw. ex Benth. - Rare, beach, L.

Stachys tenuifolia Willd. - Rare, forest, flats, ED, L.

Teucrium canadense L. var. *virginicum* (L.) Eat. - Rare, swale, flats, L.

Plantaginaceae

Plantago lanceolata L. - Rare, swale, secondary dune, DC, L.

Plantago major L. - Rare, flats, L.

Oleaceae

Fraxinus americana L. - Occasional, swale, forest, DC; rare, foredune, secondary dune, L.

Fraxinus nigra Marsh. - Rare, forest, flats, ED.

Fraxinus pennsylvanica Marsh. - Occasional, swales, secondary dunes, forest; common, flats, DC, ED, L.

Scrophulariaceae

Agalinis paupercula (Gray) Britt. var. *paupercula* - Occasional, swales, flats, L.

Chelone glabra L. - Rare, flats, L.

Linaria vulgaris Mill. - Rare, swale, flats, DC, ED.

Scrophularia lanceolata Pursh - Rare, flats, DC.

Verbascum thapsus L. - Occasional, swales, secondary dunes, flats, DC, ED, L.

Veronica serpyllifolia L. - Rare, swales, flats, DC, L.

Orobanchaceae

Epifagus virginiana (L.) Bartr. - Rare, forest, L.

Rubiaceae

Cephalanthus occidentalis L. - Occasional, flats, DC, ED, L.

Galium aparine L. - Occasional, swales, secondary dunes, forest, flats, DC, L.

Galium asprellum Michx. - Occasional, forest, flats, DC, L.

Galium mollugo L. - Occasional, swale, forest, DC, L.

Galium trifidum L. - Occasional, beach, swales, flats, DC, ED, L.

Galium triflorum Michx. - Common, forest, flats, ED; rare, flats, L.

Mitchella repens L. - Rare, flats, L.

Caprifoliaceae

Diervilla lonicera Mill. - Rare, swale, secondary dune, forest, DC.

Lonicera morrowii Gray - Common, swales, secondary dunes, forest; rare, flats, DC, ED, L.

Lonicera tatarica L. - Occasional, swales, secondary dunes, forest, DC, ED, L.

Lonicera oblongifolia (Goldie) Hook. - Occasional, forest, flats, DC, ED, L.

Sambucus canadensis L. - Occasional, flats, DC, L.

Sambucus racemosa L. ssp. *pubens* (Michx.) House - Rare, forest, flats, L.

Viburnum acerifolium L. - Rare, forest, ED.

Viburnum lentago L. - Common, flats, rare, secondary dunes, forest, DC, ED, L.

Viburnum recognitum Fern. - Common, flats; occasional, swales, secondary dunes, forest, DC, ED, L.

Viburnum trilobum Marsh. - Rare, flats, ED, L.

Asteraceae

Achillea millefolium L. - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Ambrosia artemisiifolia L. - Rare, beach, foredunes, swales, DC, ED.

Anaphalis margaritacea (L.) Benth. & Hook. f. ex Clarke - Rare, swale, L.

Artemisia campestris L. ssp. *caudata* (Michx.) Hall & Clem. - Common, beach, foredunes, swales, secondary dunes; occasional, flats, DC, ED, L.

Aster lanceolatus Willd. - Occasional, swales, flats, DC, L.

- Aster macrophyllus* L. - Rare, forest, flats, ED.
- Aster nova-angliae* L. - Rare, swale, L.
- Aster pilosus* Willd. - Rare, swale, L.
- Bidens cernua* L. - Rare, flats, L.
- Bidens frondosa* L. - Occasional, beach, flats, DC, ED, L.
- Centaurea maculosa* Lam. - Common, swales, secondary dunes; rare, flats, DC, ED, L.
- Cirsium vulgare* (Savi) Tenore - Rare, forest, ED.
- Conyza canadensis* (L.) Cronq. - Occasional, beach, swales, secondary dunes, flats, DC, ED, L.
- Erigeron annuus* (L.) Pers. - Rare, flats, DC.
- Erigeron philadelphicus* L. - Occasional, swales, secondary dunes, flats, DC, ED, L.
- Erigeron strigosus* Muhl. ex Willd. - Rare, swale, secondary dune, DC, L.
- Eupatorium maculatum* L. - Rare, beach, flats, DC, ED.
- Eupatorium perfoliatum* L. - Occasional, beach, flats, DC, ED, L.
- Euthamia graminifolia* (L.) Nutt. ex Cass. - Rare, beach, swale, flats, DC, ED, L.
- Galinsoga ciliata* (Raf.) Blake - Rare, beach, L.
- Gnaphalium obtusifolium* L. - Rare, swale, L.
- Helenium autumnale* L. var. *autumnale* - Rare, flats, DC.
- Hieracium lachenalii* Gmel. - Rare, swale, L.
- Lactuca canadensis* L. - Rare, swale, flats, DC.
- Leucanthemum vulgare* Lam. - Rare, swale, DC.
- Solidago caesia* L. - Common, forest, flats; Occasional, swales, secondary dunes, DC, ED, L.
- Solidago canadensis* L. - Occasional, swales, secondary dunes, flats, DC, ED, L.
- Solidago gigantea* Ait. - Common, swales, secondary dunes, forest, flats, DC, ED, L.
- Solidago nemoralis* Ait. - Common, swales, secondary dunes, DC, ED, L.
- Solidago rugosa* Mill. ssp. *rugosa* - Common, forest, flats, DC, ED, L.
- Taraxacum officinale* Weber ex Wiggers - Occasional, swales, secondary dunes, DC, ED, L.
- Tragopogon pratensis* L. - Rare, swale, secondary dune, DC, ED.
- Tussilago farfara* L. - Rare, flats, ED.

Xanthium strumarium L. var. *canadense* (Mill.) Torr. & Gray - Occasional, beach, foredunes, DC, ED, L.

Alismataceae

Sagittaria latifolia Willd. - Rare, beach, DC.

Araceae

Peltandra virginica (L.) Schott & Endl. - Rare, flats, ED.

Juncaceae

Juncus balticus Willd. var. *littoralis* Engelm. - Common, swales; occasional, beach, foredunes, secondary dunes, flats, DC, ED, L.

Juncus inflexus L. - Rare, beach, ED.

Juncus tenuis Willd. - Rare, swale, DC.

Cyperaceae

Carex aurea Nutt. - Rare, swale, L.

Carex blanda Dewey - Rare, forest, L.

Carex comosa Boott - Rare, beach, flats, DC.

Carex lacustris Willd. - Rare, flats, ED, L.

Carex lanuginosa Michx. - Occasional, swales, forest, flats; rare, secondary dune, DC, ED, L.

Carex lasiocarpa Ehrh. - Rare, swale, secondary dune, L.

Carex laxiflora Lam. - Rare, secondary dune, L.

Carex muhlenbergii Schkuhr ex Willd. - Rare, swale, DC.

Carex ormostachya Wieg. - Rare, forest, L.

Carex sprengei Dewey ex Spreng. - Rare, forest, flats, L.

Carex stipata Muhl. ex Willd. - Occasional, flats, L.

Carex stricta L. - Rare, flats, L.

Cyperus filiculmis Vahl var. *macilentus* Fern. - Occasional, swales, secondary dunes, DC, L.

Dulichium arundinaceum (L.) Britt. - Rare, flats, L.

Scirpus cyperinus (L.) Kunth. - Rare, flats, L.

Scirpus tabermontanii Gmel. - Occasional, beach, foredunes, flats, DC, ED, L.

Poaceae

- Agropyron repens* (L.) Beauv. - Occasional, swales, DC, ED, L.
- Agrostis perennans* (Walt.) Tuckerm. - Rare, flats, DC.
- Agrostis stolonifera* L. var. *palustris* (Huds.) Farw. - Occasional, beach, swales, secondary dunes, ED, L.
- Ammophila breviligulata* Fern. - Abundant, beach, foredunes, swales, secondary dunes; occasional, flats, DC, ED, L.
- Anthoxanthum odoratum* Biehl. - Occasional, swales; rare, secondary dunes, DC, L.
- Bromus altissimus* Pursh - Rare, secondary dune, L.
- Bromus inermis* Leyss. - Occasional, swales, DC, L.
- Bromus tectorum* L. - Occasional, swales, secondary dunes, DC, L.
- Calamagrostis canadensis* (Michx.) Beauv. - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.
- Dactylis glomerata* L. - Occasional, swales, secondary dunes, forest, flats, DC, L.
- Deschampsia flexuosa* (L.) Trin. - Rare, swale, secondary dune, forest, L.
- Echinocloa crus-galli* (L.) Beauv. ssp. *crus-galli* - Rare, beach, DC.
- Elymus canadensis* L. - Common, swales, secondary dunes, forest, flats, DC, ED, L.
- Elymus hystrix* L. var. *hystrix* - Rare, secondary dune, L.
- Festuca obtusa* Biehl. - Occasional, forest, flats, DC, ED, L.
- Festuca ovina* L. - Common, swales, secondary dunes, forest, DC, ED, L.
- Glyceria canadensis* (Michx.) Trin. - Rare, flats, L.
- Glyceria striata* (Lam.) Hitchc. - Occasional, flats, L.
- Leersia oryzoides* L. - Rare, flats, DC, ED.
- Panicum acuminatum* Sw. (*sensu lato*) - Rare, swales, DC, ED, L.
- Panicum virgatum* L. - Occasional, swales, ED, L.
- Phalaris arundinacea* L. - Common, flats; occasional, beach, swales, secondary dunes, forest, DC, ED, L.
- Phleum pratense* L. - Occasional, swales, secondary dunes, forest, DC, ED.
- Phragmites australis* (Cav.) Trin. ex Steud. - Occasional, beach, foredune, swale, flats, ED, L.
- Poa compressa* L. - Abundant, swales, secondary dunes; occasional, forest, flats, DC, ED, L.

Poa palustris L. - Rare, swale, secondary dune, flats, DC, ED, L.

Poa pratensis L. - Occasional, swale, secondary dunes, forest, flats, DC, ED, L.

Sporobolus cryptandrus (Torr.) Gray - Common, swales, secondary dunes; rare, flats, DC, ED, L.

Typhaceae

Typha angustifolia L. - Rare, flats, ED, L.

Liliaceae

Clintonia borealis (Ait.) Raf. - Common, forest, flats, ED; rare, flats, L.

Maianthemum canadense Desf. - Common, secondary dunes, forest, flats, DC, ED, L.

Polygonatum pubescens (Willd.) Pursh - Occasional, forest, flats, DC, ED, L.

Smilacina racemosa (L.) Desf. - Occasional, forest, flats, DC, ED, L.

Smilacina stellata (L.) Desf. - Abundant, swales, secondary dunes, forest, flats, DC, ED, L.

Trillium erectum L. - Rare, forest, flats, DC, ED, L.

Trillium grandiflorum (Michx.) Salisb. - Rare, forest, flats, DC, ED, L.

Iridaceae

Iris pseudoacorus L. - Rare, swale, flats, DC, L.

Iris versicolor L. - Occasional, swales, forest, flats, DC, ED, L.

Sisyrinchium montanum Greene - Rare, flats, DC.

Smilacaceae

Smilax herbacea L. - Occasional, flats, DC, ED, L.

Smilax hispida Muhl. ex Torr. - Common, secondary dunes, forest, flats, DC, ED, L.

Orchidaceae

Coeloglossum viride (L.) Hartm. - Rare, swale, L.

Epipactis helleborine (L.) Crantz - Occasional, swales, secondary dunes, forest, flats, DC, ED, L.

Spiranthes cernua (L.) Rich. - Rare, swale, flats, DC, L.

Appendix E: Invasive Species Best Management Practices Resources

Amur Honeysuckle

Midwest Invasive Plant Network. (2021). Woody Invasives of the Great Lakes Collaborative: Amur Honeysuckle. <https://woodyinvasives.org/woody-invasive-species/amur-honeysuckle/>

SLELO PRISM. (2020). Invasive Species Handbook. Fourth Edition. NYS Department of Environmental Conservation, Albany New York. 72 p. <https://www.sleloinvasives.org/wp-content/uploads/2020/07/SLELO-PRISM-Invasive-Species-Handbook-v2020.pdf>

Autumn Olive

Midwest Invasive Plant Network. (2021). Woody Invasives of the Great Lakes Collaborative: Autumn Olive. <https://woodyinvasives.org/woody-invasive-species/autumn-olive/>

Penn State Extension. (2021). Autumn Olive. <https://extension.psu.edu/autumn-olive>

Common Barberry

Midwest Invasive Plant Network. (2021). Woody Invasives of the Great Lakes Collaborative: Glossy Buckthorn. <https://woodyinvasives.org/woody-invasive-species/common-barberry/>

U.S. Forest Service (2006). Weed of the Week: Common Barberry. <https://www.invasive.org/weedcd/pdfs/wow/common-barberry.pdf>

Common Buckthorn

Midwest Invasive Plant Network. (2021). Woody Invasives of the Great Lakes Collaborative: Common Buckthorn. <https://woodyinvasives.org/woody-invasive-species/common-buckthorn/>

New York Invasive Species Clearinghouse. (2021). Common Buckthorn. http://nyis.info/invasive_species/commonbuckthorn/

SLELO PRISM. (2020). Invasive Species Handbook. Fourth Edition. NYS Department of Environmental Conservation, Albany New York. 72 p. <https://www.sleloinvasives.org/wp-content/uploads/2020/07/SLELO-PRISM-Invasive-Species-Handbook-v2020.pdf>

Glossy Buckthorn

Michigan Department of Natural Resources. (2012). Invasive Species Best Control Practices: Glossy Buckthorn. <https://mnfi.anr.msu.edu/invasive-species/GlossyBuckthornBCP.pdf>

Midwest Invasive Plant Network. (2021). Woody Invasives of the Great Lakes Collaborative: Glossy Buckthorn. <https://woodyinvasives.org/woody-invasive-species/glossy-buckthorn/>



Multiflora Rose

Midwest Invasive Plant Network. (2021). Woody Invasives of the Great Lakes Collaborative: Amur Honeysuckle. <https://woodyinvasives.org/woody-invasive-species/multiflora-rose/>

New York Invasive Species Clearinghouse. (2021). Purple Loosestrife. http://nyis.info/invasive_species/multiflora-rose/

Pale Swallow-wort

Eastern Lake Ontario Swallowwort Collaborative. (2021). Control/Management. <https://swallowwortcollaborative.org/about/control-management/>

New York Invasive Species Clearinghouse. (2021). Swallow-wort, Black and Pale. http://nyis.info/invasive_species/swallow-wort/#Prevention%20and%20Control

SLELO PRISM. (2020). Invasive Species Handbook. Fourth Edition. NYS Department of Environmental Conservation, Albany New York. 72 p. <https://www.sleloinvasives.org/wp-content/uploads/2020/07/SLELO-PRISM-Invasive-Species-Handbook-v2020.pdf>

Phragmites

Great Lakes Phragmites Collaborative. (2017). Phragmites Management. <https://www.greatlakesphragmites.net/management/>

SLELO PRISM. (2020). Invasive Species Handbook. Fourth Edition. NYS Department of Environmental Conservation, Albany New York. 72 p. <https://www.sleloinvasives.org/wp-content/uploads/2020/07/SLELO-PRISM-Invasive-Species-Handbook-v2020.pdf>

Purple Loosestrife

New York Invasive Species Clearinghouse. (2021). Purple Loosestrife. http://nyis.info/invasive_species/commonbuckthorn/

Queen Ann's Lace

Minnesota Department of Natural Resources. (2021). Queen Ann's Lace. <https://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/queenannslace.html>

Spotted Knapweed

United States Department of Agriculture. (2014). Field Guide for Managing Diffuse, Meadow, Spotted, and Squarrose Knapweeds in the Southwest. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410116.pdf

University of Nevada, Reno. (2021). Managing Spotted Knapweed. <https://extension.unr.edu/publication.aspx?PubID=2390>



Appendix F: NYSDEC Funding Opportunities to Implement Great Lakes Restoration Actions

Funding Opportunities to Implement Great Lakes Restoration Actions

Consider referencing NY's [Great Lakes Action Agenda](#) goals and/or the federal [GLRI Action Plan III](#) in your applications.

Opportunity Title	Source	Focus Areas
GREAT LAKES PROGRAMS		
Great Lakes Restoration Initiative	Environmental Protection Agency (EPA)	Funding and initiatives for toxic substances, areas of concern, invasive species, nearshore health, non-point source pollution, habitat/wildlife protection and restoration, education/partnerships and climate change adaptation.
Great Lakes Fish and Wildlife Restoration Act Grants	US Fish and Wildlife Service (FWS)	Restoration, research and regional projects to support conservation, restoration and management of fish and wildlife resources and their habitats in the Great Lakes basin. (Consult with Betsy Trometer, Lower Great Lakes USFWS)
GLRI Cooperative Weed Management Areas	USDA Forest Service	Detect, prevent, eradicate, and/or control invasive plant species to promote resiliency, watershed stability, and biological diversity on Federal, State, or private land.
NY's Great Lakes Basin Small Grants	NY Sea Grant, NYS Department of Environmental Conservation (DEC)	Support stakeholder-driven efforts to restore and revitalize the state's Great Lakes region and demonstrate successful application of ecosystem-based management (EBM).
Great Lakes Research Consortium Small Grants	Great Lakes Research Consortium (GLRC), DEC	Funding cooperative approaches to researching and protecting the environmental quality of the Great Lakes.
Sustain Our Great Lakes	National Fish & Wildlife Foundation (NFWF)	Restoring and Enhancing Stream and Riparian Habitat, restoring and enhancing Coastal Wetland Habitat, Expanding Green Stormwater Infrastructure in Great Lakes Communities, and Maintaining and Enhancing Benefits of Habitat Restoration through Invasive Species Control.
NOAA Great Lakes Habitat Restoration Regional Partnership Program Grants	National Oceanic and Atmospheric Administration (NOAA)	Planning and/or on-the-ground restoration activities to restore degraded Great Lakes coastal habitat and native riverine/lacustrine species



Department of Environmental Conservation



NOAA Great Lakes Region Bay Watershed Education and Training (BWET) Grants	NOAA	Supports existing environmental education programs, fosters the growth of new programs, and encourages development of partnerships among environmental education programs within watershed systems.
GLRI Northeastern Area State and Private Forestry Grants	US Department of Agriculture (USDA) Forest Service	Tree planting, green infrastructure, and forest health improvement in the Great Lakes Basin.
Northeast Area State and Private Forestry Landscape Scale Restoration Grants	USDA Forest Service	Encourages collaborative, science-based restoration of priority forest landscapes, leveraging public and private resources, and supporting priorities identified in NY's Forest Action Plan .
Great Lakes Protection Fund	Great Lakes Protection Fund	Supporting innovative, results oriented projects that have basinwide impact and foster sustainable water resource management.
FEDERAL GRANT PROGRAMS		
Agricultural Conservation Easement Program	USDA	Wetland reserve and agricultural land easements.
Environmental Quality and Incentives Program (EQIP)	USDA	Financial and technical assistance to address agriculture-related natural resource concerns.
Five Star and Urban Waters Restoration Grant Program	NFWF	Supports diverse local partnerships focused on improving water quality, watersheds and the species and habitats they support.
North American Wetlands Conservation Act – Small Grants and Standard grants	US Fish and Wildlife Service (FWS)	Long-term protection, restoration, and/or enhancement of wetlands and associated upland habitats for wetlands-associated migratory birds. Public-private partnerships to implement projects (1:1 match).
National Fish Passage Program	USFWS	Restore aquatic organism passage at man-made barriers including dams and culverts; Priorities: freshwater mussels, brook trout, lake sturgeon, Atlantic salmon, American eel. Contact USFWS's Lower Great Lakes Fish & Wildlife Conservation office (Betsy_Trometer@fws.gov)
EPA Environmental Education Grants	USEPA	Supports environmental education projects that promote environmental awareness and stewardship.



Department of
Environmental
Conservation



NYS GRANT PROGRAMS		
New York State Conservation Partnership Program	NYSDEC	Eligible for land trusts, to strengthen land conservation and public outreach programs, build community partnerships and implement best business practices.
NYS Department of Agriculture and Markets Source Water Buffer Program	NYS DAM	Purchase of conservation easements on agricultural lands that support protection of public drinking water supplies and implementation of riparian buffer systems, in partnerships with land trusts and/or municipalities.
DEC Trees for Tribs School Seedling Program	NYSDEC	Provides schools with free trees to plant on school property.
DEC Urban and Community Forestry Grants	NYSDEC	Assists communities in the development of comprehensive projects to create healthy urban and community forests while enhancing the quality of life for urban residents.
Clean Energy Communities Program	NYSERDA	Provides tools, resources and technical assistance, and supports clean energy projects for local governments.
Community Resiliency Training Program	NYS DAM	Community and Municipality-based Training Events to increase resiliency to future flooding and outbreaks of harmful algal blooms in high-risk waterbodies.
NYS Invasive Species Grant Program	NYSDEC	Aquatic invasive species spread prevention; terrestrial and aquatic invasive species rapid response and control; terrestrial and aquatic invasive research; and lake management plans
Water Quality Improvement Project (WQIP) Grants	NYSDEC	Nonagricultural Nonpoint Source Abatement and Control including green infrastructure, nature-based shoreline stabilization and riparian restoration; Municipal Wastewater Treatment; Land Acquisition Projects for Source Water Protection; Aquatic Habitat Restoration; Salt Storage; Municipal Separate Storm Sewer Systems.
Non-Agricultural Nonpoint Source Planning Grant	NYSDEC	Funds planning reports for nonpoint source water quality improvement projects.
Green Innovation Grant Program (GIGP)	NYS EFC	'Green' stormwater infrastructure design and technologies.
Local Waterfront Revitalization Program	DOS	Community and watershed planning and implementation grants funding watershed management, redevelopment, community resiliency, revitalization, and tourism development projects.



Department of
Environmental
Conservation



Climate Resilient Farming Program	DAM, NYS Soil & Water Cons Committee	Projects to mitigate the impact of agriculture on climate change and to enhance on-farm adaptation and resiliency (e.g. soil health, waste storage cover and flare systems, water management)
Integrated Solutions Construction Grant Program	NYS EFC	Projects that incorporate green infrastructure into Clean Water State Revolving Fund projects to remove stormwater from combined, sanitary, or storm sewers.
Agricultural Nonpoint Source Abatement and Control Program	NYS Soil & Water Cons Committee	Funds support nonpoint source abatement and control projects that plan (AEM Tier III) or implement (AEM Tier IV) Ag BMPs on farms. Soil & Water Conservation Districts are eligible to apply.
NYS Water Infrastructure Improvement Act (WIIA) Grant program	NYS EFC	Assistance for municipalities to fund water quality infrastructure. Grants are available for drinking water and clean water projects to improve water quality and/or protect public health.
Climate Smart Communities (CSC) Grant Program	NYSDEC	Climate adaptation and mitigation projects related to flood risk reduction, extreme event preparation, reduction of vehicle miles, waste, etc. and certification projects that advance land use, planning, and assessment actions aligned with CSC certification.
EPF Grant Program for Parks, Preservation and Heritage	OPRHP	Acquisition, planning, development and improvement of parks, historic properties, and heritage areas.
Parks and Trails NY Stewardship Grants Program	Parks & Trails NY, OPRHP	Projects and capacity to support stewardship of public lands.
OTHER FUNDING OPPORTUNITIES		
Water Finance Clearinghouse (web portal)	EPA	Contains two searchable databases: 1) available funding sources for water infrastructure and 2) contains resources, such as reports, weblinks, webinars etc.

Subscribe to DEC's [NY Great Lakes News, Funding and Events Listserv](#) to receive updates on grant funding availability. To request a pdf copy of this document or to seek additional information on a grant program, please contact greatlakes@dec.ny.gov.



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“The true meaning of life is to plant trees,
under whose shade you do not expect to sit.”
-Nelson Henderson

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Black Pond WMA, Photo credit: Patricia Shulenburg

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