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

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Overview

The Eastern Lake Ontario Dunes and Wetlands Area (ELODWA) is designated as a NYS Department of State Coastal Fish and Wildlife Habitat, Audubon New York Important Bird Area, and National Natural Landmark. Spanning Oswego and Jefferson Counties, from the Town of Richland to the Town of Ellisburg, this 17 mile freshwater barrier beach provides habitat for state and federally threatened and endangered species, abundant recreational opportunities, and invaluable ecosystem services to the people, wildlife, and wetlands that depend on the ecosystem.

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 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 invasive species 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:

Conservation Plan	Organization	Conservation Plan	Organization
Black Pond WMA	NYSDEC	North Pond Resiliency	Hart et. al
Champlain Beachgrass	NYNHP	Lakeview WMA	NYSDEC
Deer Creek Marsh WMA	NYSDEC	NYS Inv. Sp. Mgt. Plan	NYSDEC
GLRI Action Plan III	USEPA	Piping Plover Recovery Plan	USFWS
Aquatic Restoration Plan	SLELO PRISM	NYS Forest Action Plan	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, outcompete native plants, and the shallow roots provide increased runoff contributing to shoreline erosion and water quality impairment.

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
American Knotweed	*Polygonum buxiforme*	State designated endangered.
Black Tern	*Chlidonias niger*	A state-endangered species whose range is restricted to less than 15 sites and 150 pairs of breeding pairs.
Bogbean Buckmoth	*Hemileuca sp.*	One of three known occurrences in NY. All occurrences in Oswego County.
Caspian Tern	*Sterna caspia*	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	*Ammophila breviligulata spp. champlainesis*	State designated endangered. One of two known locations for this species in NY.
Common Tern	*Sterna hirundo*	State designated threatened, vulnerable throughout New York.
Cream-colored Avens	*Geum virginianum*	State designated threatened, vulnerable from disappearing in New York due to limited range.
Dunes		Largest and most extensive freshwater dunes in NY.
Fawn Brown Dart	*Euxoa pleuritica*	Vulnerable to disappearing in New York.
Great Lakes Sand Cherry	*Prunus pumila var. pumila*	State designated endangered, five or fewer populations.
Hairy-necked Tiger Beetle	*Cicindela hirticollis*	Critically imperiled in New York, declining in its limited range.
Houghton's Sedge	*Carex houghtoniana*	State designated threatened, very restricted range. 10 known populations.
Least Bittern	*Ixobrychus exilis*	A state-threatened bird whose breeding occurrences are uncommon and whose non-breeding occurrences are critically imperiled.
Noctuid moth	*Abagrotis barnesi*	The only recorded occurrence of this species in NY.
Ram's Head Lady's Slipper	*Cypripedium arietinum*	State designated threatened and very vulnerable to disappearing in New York.
Rough Avens	*Geum laciniatum*	One of three known locations for this species in NY.
Sand Dune Willow	*Salix cordata*	State threatened. Only known area for this species in NY.
Schweinitz's Flat Sedge	*Cyperus schweinitzii*	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.
Wafer Ash	*Ptelea trifoliata ssp.*	State designated endangered, critically imperiled in New York and very restricted range.

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

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

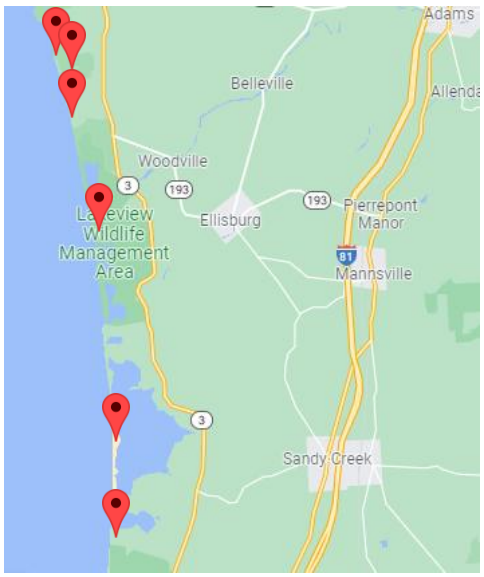
system. The Dunes Foundation subcontracted Upstate Environmental Grant Professionals, owned by Patricia Shulenburg, to implement the invasive species initiative and provide a project report.

- Patricia Shulenburg, Owner/Ecologist Upstate Environmental Grant Professionals
- Rob 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 seven 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	Organization
1. El Dorado Beach	The Nature Conservancy
2. Black Pond WMA	NYS Department of Environmental Conservation
3. Southwick Beach	NYS Office of Parks, Recreation and Historic Preservation
4. Lakeview WMA	NYS Department of Environmental Conservation
6. Sandy Island Beach	NYS Office of Parks, Recreation and Historic Preservation
7. Deer Creek WMA	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 Collation 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 on sites which were underreported for invasive species mapping efforts, sites which had rare or significant plants or wildlife, areas that were used as recreation corridors, and shorelines that experiences 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 asses 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 sourcing publically 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.

Publically 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 all agency internal staff, contractors, and partnering organizations to record monitoring, management, and treatments in universal platforms including iMapInvasives if they haven't used this platform in the past. Adding project information to create a comprehensive timeline of management activities and success of treatments can benefit each agency and private landowners. It is also recommended to create collaborative platform to share outcomes of invasive species treatments and evaluate management outcomes through an online platform, or yearly 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 - 2010 **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* ssp.) 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 canarygrass

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 - 2016 **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 - **Project Description:** US Fish and Wildlife Service awarded funding to SUNY ESF for

2021 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 7 project sites. Surveys were prioritized within project sites using input from the stakeholder questionnaire, 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

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.

Table 2: Invasive Species Observed at El Dorado Beach Preserve

Species (Common Name, Latin Name)	Present
Giant Hogweed (*Heracleum mantegazzianum*)	
Porcelain Berry (*Ampelopsis brevipedunculata*)	
Common Buckthorn (*Rhamnus cathartica*)	X
Glossy Buckthorn (*Rhamnus frangula*)	
Japanese Knotweed (*Reynoutria japonica*)	
Japanese Stiltgrass (*Microstegium vimineum*)	
Oriental Bittersweet (*Celastrus orbiculatus*)	
Pale swallow-wort (*Vincetoxicum rossicum*)	X
Phragmites (*Phragmites australis*)	X
Tree of Heaven (*Ailanthus altissima*)	
Wild Chervil (*Anthriscus sylvestris*)	
Yellow Flag Iris (*Iris pseudacorus*)	
Purple Loosestrife (*Lythrum salicaria*)	X
Spotted Knapweed (*Centaurea stoebe*)	X
Wild Parsnip (*Pastinaca sativa*)	
Amur Honeysuckle (*Lonicera maackii*)	X
Autumn Olive (*Elaeagnus umbellate*)	
Common Barberry (*Berberis vulgaris*)	
Multiflora Rose (*Rosa multiflora*)	
Queen Ann's Lace (*Daucus carota*)	
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
1 43.807417 N -76.231995 W Threats: PSW along recreation trail can spread, Phragmites may increase shore erosion	Open beach adjacent to El Dorado Bird Blind Trail	Pale swallow-wort (1 acre) Phragmites (>0.25 acre, sparse)	Continue chemical management. Consider adjusting level of trichlopyr concentration, or amount of surfactant. Try cutting or mowing in July, and application in August Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr)	None at this time Spread native seed mix to supplement seed bank (beachgrass and (or) wetland community)
2 43.806900 N -76.231258 W Threats: Phragmites may increase shore erosion, sensitive species observed may be impacted	Open beach along channel	Phragmites (>0.25 acre, sparse)	Cut-stem herbicide application using glyphosate (not as long lasting in soil as imazapyr)	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
3 43.806913 N -76.230501 W Threats: Honeysuckle may infiltrate foredune, poor foredune stabilization, and may outcompete sensitive native species.	Swale behind foredune	Honeysuckle ssp. (>0.25 acre, large and 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 native red oak, red maple community shrubs for competition

Black Pond 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.

Table 5: Invasive Species Observed at Wildlife Management Area

Species (Common Name, Latin Name)	Present
Giant Hogweed (*Heracleum mantegazzianum*)	
Porcelain Berry (*Ampelopsis brevipedunculata)*	
Common Buckthorn *(Rhamnus cathartica)*	X
Glossy Buckthorn (*Rhamnus frangula)*	
Japanese Knotweed (*Reynoutria japonica)*	
Japanese Stiltgrass (*Microstegium vimineum)*	
Oriental Bittersweet *(Celastrus orbiculatus)*	
Pale swallow-wort (*Vincetoxicum rossicum*)	X
Phragmites *(Phragmites australis)*	X
Tree of Heaven *(Ailanthus altissima)*	
Wild Chervil *(Anthriscus sylvestris)*	
Yellow Flag Iris *(Iris pseudacorus)*	
Purple Loosestrife *(Lythrum salicaria)*	X
Spotted Knapweed *(Centaurea stoebe)*	X
Wild Parsnip *(Pastinaca sativa)*	
Amur Honeysuckle *(Lonicera maackii)*	X
Autumn Olive (*Elaeagnus umbellate)*	X
Common Barberry (*Berberis vulgaris)*	
Multiflora Rose *(Rosa multiflora)*	X
Queen Ann's Lace *(Daucus carota)*	

Tier 2	Tier 3	Tier 4	Not Ranked

Ecological Restoration Recommendations

Figure 4: Map of Site Recommendations for Black Pond WMA

Recommendation 1
Description: Wetland

Recommendation 2
Description: Foredune adjacent to dune walkover

Recommendation 3
Description: Parking lot and roadside

Recommendation 4
Description: Foredune adjacent to private homeowners

Project area surveyed

Table 6: Site Recommendations Black Pond Wildlife Management Area

Recommendation Area	Site Description	Species	Recommended IS Management	Native Plant Restoration
1 43.802780 N -76.225873 W Threats: Phragmites dense monoculture outcompeting native wetland plants, impacts to wetland connectivity. Plants may spread to other areas of dune.	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.
2 43.805994 N -76.228909 W Threats: Poor stabilizer of foredune, encroaching on sensitive species habitats.	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.)
3 43.793196 N -76.225939 W Threats: PSW along recreation trail can spread.	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
4 43.793196 N -76.225939 W Threats: Invasive shrubs may invade private property boundaries and provide poor stabilization of foredune.	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

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.

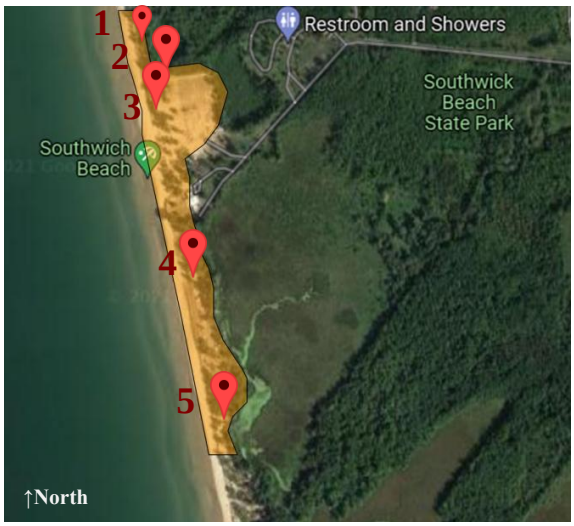
Table 7: Invasive Species Observed at Southwick Beach State Park

Species (Common Name, Latin Name)	Present
Giant Hogweed (*Heracleum mantegazzianum*)	
Porcelain Berry (*Ampelopsis brevipedunculata)*	
Common Buckthorn *(Rhamnus cathartica)*	X
Glossy Buckthorn (*Rhamnus frangula)*	
Japanese Knotweed (*Reynoutria japonica)*	
Japanese Stiltgrass (*Microstegium vimineum)*	
Oriental Bittersweet *(Celastrus orbiculatus)*	
Pale swallow-wort (*Vincetoxicum rossicum*)	
Phragmites *(Phragmites australis)*	
Tree of Heaven *(Ailanthus altissima)*	
Wild Chervil *(Anthriscus sylvestris)*	
Yellow Flag Iris *(Iris pseudacorus)*	
Purple Loosestrife *(Lythrum salicaria)*	X
Spotted Knapweed *(Centaurea stoebe)*	X
Wild Parsnip *(Pastinaca sativa)*	
Amur Honeysuckle *(Lonicera maackii)*	X
Autumn Olive (*Elaeagnus umbellate)*	
Common Barberry (*Berberis vulgaris)*	
Multiflora Rose *(Rosa multiflora)*	
Queen Ann's Lace *(Daucus carota)*	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
1 43.765674 N -76.215805 W Threats: Honeysuckle spp., spotted knapweed, and common buckthorn may outcompete sensitive species and spread to private landowner property.	Foredune next to Jefferson Park Boundary	Amur honeysuckle (>30 medium shrubs, 5 lg shrubs) Spotted knapweed (0.5 acre) Common Buckthorn	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 Cut stump and basal bark herbicide treatments	Consider interspersing native red oak, red maple community shrubs for competition Spread beachgrass community native seed mix (common evening primrose, common milkweed, tall wormwood etc.)
2 43.765755 N -76.215995 W Threats: Honeysuckle ssp. And spotted knapweed provide poor foredune stabilization.	Foredune north of Parking lot along fencing	Amur honeysuckle (>10 medium shrubs) Spotted knapweed (>0.01 acre, dense)	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 interspersing beachgrass community shrubs for competition Consider interspersing native red oak, red maple community shrubs for competition
3 43.765674 N -76.215805 W Threats: May outcompete native grasses used in restoration project.	Dune walkover	Spotted knapweed Queen Ann's Lace (>0.25 acres, sparse)	Hand pull after plants have bolted and when soil is moist Hand pull plants and root system before the plant seeds	None, native grasses should be able to outcompete invasive plants when eradicated from the site
4 43.755963 N -76.216377 W Threats: Poor foredune stabilization	Foredune in front of beach campsites	Amur honeysuckle (10 medium shrubs) Spotted knapweed Common Buckthorn (5 medium trees)	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 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 Spread beachgrass community native seed mix (common evening primrose, common milkweed, tall wormwood etc.)
5 43.755963 N -76.216377 W Threats: Poor foredune stabilization, may outcompete sensitive species.	Foredune north of Lakeview WMA	Amur honeysuckle	Hand pull or weed wrench small shrubs, larger bushes may require cut stump and basal bark herbicide treatments and long term management	None, native grasses and shrubs should be able to outcompete native plants

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.

Table 9: Invasive Species Observed at Lakeview Wildlife Management Area

Species (Common Name, Latin Name)	Present
Giant Hogweed (*Heracleum mantegazzianum*)	
Porcelain Berry (*Ampelopsis brevipedunculata)*	
Common Buckthorn *(Rhamnus cathartica)*	X
Glossy Buckthorn (*Rhamnus frangula)*	X
Japanese Knotweed (*Reynoutria japonica)*	
Japanese Stiltgrass (*Microstegium vimineum)*	
Oriental Bittersweet *(Celastrus orbiculatus)*	
Pale swallow-wort (*Vincetoxicum rossicum*)	
Phragmites *(Phragmites australis)*	X
Tree of Heaven *(Ailanthus altissima)*	
Wild Chervil *(Anthriscus sylvestris)*	
Yellow Flag Iris *(Iris pseudacorus)*	
Purple Loosestrife *(Lythrum salicaria)*	X
Spotted Knapweed *(Centaurea stoebe)*	X
Wild Parsnip *(Pastinaca sativa)*	
Amur Honeysuckle *(Lonicera maackii)*	X
Autumn Olive (*Elaeagnus umbellate)*	X
Common Barberry (*Berberis vulgaris)*	X
Multiflora Rose *(Rosa multiflora)*	
Queen Ann's Lace *(Daucus carota)*	
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
1 43.696620 N -76.199146 W Threats: Phragmites is a poor dune stabilizer and may spread into areas that are habitats for sensitive species.	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.
2 43.696624 N -76.200067 W Threats: Honeysuckle ssp. And autumn olive are approaching fordune and habitat for sensitive species.	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
3 43.697084 N -76.200414 W Threats: Honeysuckle ssp. And autumn olive are approaching fordune and habitat for sensitive species.	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
4 43.696620 N -76.199146 W Threats: Honeysuckle ssp. Barberry, and spotted knapweed are located near social trails which can be vectors to spread.	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

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.

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

Species (Common Name, Latin Name)	Present
Giant Hogweed (*Heracleum mantegazzianum*)	
Porcelain Berry (*Ampelopsis brevipedunculata)*	
Common Buckthorn *(Rhamnus cathartica)*	X
Glossy Buckthorn (*Rhamnus frangula)*	
Japanese Knotweed (*Reynoutria japonica)*	
Japanese Stiltgrass (*Microstegium vimineum)*	
Oriental Bittersweet *(Celastrus orbiculatus)*	
Pale swallow-wort (*Vincetoxicum rossicum*)	
Phragmites *(Phragmites australis)*	X
Tree of Heaven *(Ailanthus altissima)*	
Wild Chervil *(Anthriscus sylvestris)*	
Yellow Flag Iris *(Iris pseudacorus)*	
Purple Loosestrife *(Lythrum salicaria)*	X
Spotted Knapweed *(Centaurea stoebe)*	X
Wild Parsnip *(Pastinaca sativa)*	
Amur Honeysuckle *(Lonicera maackii)*	X
Autumn Olive (*Elaeagnus umbellate)*	X
Common Barberry (*Berberis vulgaris)*	
Multiflora Rose *(Rosa multiflora)*	
Queen Ann's Lace *(Daucus carota)*	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
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
1 43.696620 N -76.199146 W 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.	Foredune and open beach north of channel	Phragmites (1+ acre) Amur honeysuckle and Autumn olive (0.25 acre) Spotted knapweed (sparse patch)	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 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	Spread native wetland and (or) beachgrass community seed mix to supplement seed bank. Consider supplementing beachgrass community and(or) cottonwood community shrubs for competition
2 43.693261 N -76.194583 W Threats: Phragmites, honeysuckle ssp. are poor dune stabilizers and may spread into areas that are habitats for sensitive species.	Foredune, open beach, and swale south of the channel	Phragmites (1+ acre) Pale swallow-wort (small patch)	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 Continue early detection and rapid response. Hand dig taking care to remove root crown and buds	Spread native wetland and (or) beachgrass community seed mix to supplement seed bank. None at this time
3 43.656901 N -76.195230 W Threats: Phragmites, and spotted knapweed are spreading into areas that are habitats for sensitive species.	Two dune walkovers	Phragmites (>0.5 acre) Spotted knapweed (sparse patch) Pale swallow-wort(sparse patch)	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 Hand pull after plants have bolted and when soil is moist Continue early detection and rapid response. Hand dig taking care to remove root crown and buds	Spread native wetland and (or) beachgrass community seed mix to supplement seed bank. Spread beachgrass community seed mix to supplement seed bank. None at this time
4 43. 631395 N -76.195940 W Threats: Spotted knapweed is spreading into an area that is habitat for sensitive species	Boardwalk at main beach	Spotted knapweed (>0.25 sparse patch)	Hand pull after plants have bolted and when soil is moist. Consider herbicide application for dense stands	Spread beachgrass community seed mix to supplement seed bank.

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

Deer Creek Marsh Wildlife Management Area

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.

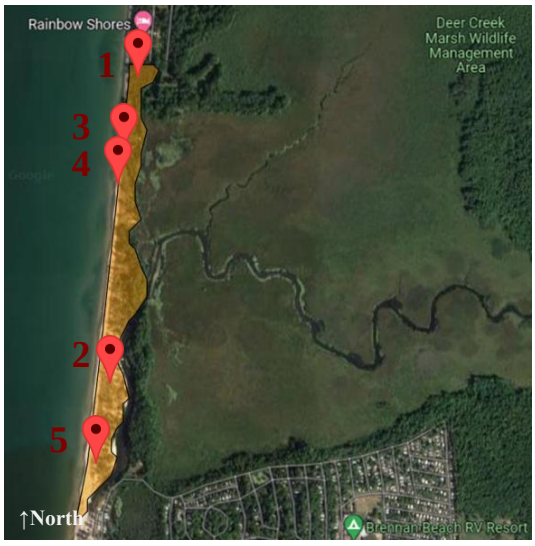
The most abundant invasive species found on the dune system includes spotted knapweed, glossy buckthorn and amur honeysuckle. Species present in lower abundance include Phragmites, common buckthorn, purple loosestrife, autumn olive, common barberry, multiflora rose, and Queen Ann's lace. [2020 SLELO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

Table 13: Invasive Species Observed at Deer Creek WMA

Species (Common Name, Latin Name)	Present
Giant Hogweed (*Heracleum mantegazzianum*)	
Porcelain Berry (*Ampelopsis brevipedunculata*)	
Common Buckthorn (*Rhamnus cathartica*)	X
Glossy Buckthorn (*Rhamnus frangula*)	X
Japanese Knotweed (*Reynoutria japonica*)	
Japanese Stiltgrass (*Microstegium vimineum*)	
Oriental Bittersweet (*Celastrus orbiculatus*)	
Pale swallow-wort (*Vincetoxicum rossicum*)	
Phragmites (*Phragmites australis*)	X
Tree of Heaven (*Ailanthus altissima*)	
Wild Chervil (*Anthriscus sylvestris*)	
Yellow Flag Iris (*Iris pseudacorus*)	
Purple Loosestrife (*Lythrum salicaria*)	X
Spotted Knapweed (*Centaurea stoebe*)	X
Wild Parsnip (*Pastinaca sativa*)	
Amur Honeysuckle (*Lonicera maackii*)	X
Autumn Olive (*Elaeagnus umbellate*)	X
Common Barberry (*Berberis vulgaris*)	X
Multiflora Rose (*Rosa multiflora*)	X
Queen Ann's Lace (*Daucus carota*)	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
1 43.600601 N -76.198508 W Threats: Honeysuckle, spotted knapweed, and multiflora rose are poor dune stabilizer species and may spread to adjacent properties.	Northernmost area adjacent to private landowner	Amur honeysuckle (30 large and medium plants (0.25 acre) Spotted knapweed (sparse plants) Multiflora rose (sparse plants)	Hand pull or weed wrench small shrubs Hand pull after plants have bolted and when soil is moist Hand pull small bushes	Plant red oak, red maple seed mix to supplement seed bank. Consider planting native shrubs
2 43.599537 N -76.198905 W 43.598939 N -76.198562 W 43.588781 N -76.199609 W 43.590550 N -76.198803 W Threats: Honeysuckle ssp., spotted knapweed, and buckthorn are linearly scattered on recreational trails and can spread to new areas.	Marked trails and unmarked social trails	Amur honeysuckle Spotted knapweed Common Buckthorn	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 in dense monoculture areas. Cut stump and basal bark herbicide treatments with long term management	Spread native beachgrass community seed mix to augment native seed bank
3 43.597951 N -76.198918 W Threats: Spotted knapweed and Queen Ann's lace are poor dune stabilizers and may spread to new areas via recreational trails.	Northern most walkover	Spotted knapweed (Dense 0.25 acre) Queen Ann's lace (Sparse 0.25 acre)	Hand pull after plants have bolted and when soil is moist. Consider herbicide application in dense monoculture areas Hand pull close to the ground before seed sets in mid to late summer.	Spread native beachgrass community seed mix to augment native seed bank

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

Sand Dune Willow Restoration


Sabrina Dreythaler, 2014

Sand dune willow (*Salix cordata*), also called the heartleaf willow, is a perennial shrub which can grow 3 to 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 *(Plagiodera 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 *(Plagiodera 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).

Plagiodera 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*). *Plagiodera 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. alternate* 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 *Chrysomelidaes* 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 preformed, especially where high rates of defoliation was observed at Lakeview WMA. In addition to monitoring, chemical, mechanical, and (or) eventually biological controls can be used to manage leaf defoliating beetles.

Manual/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 exclosures 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. alternate* (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. *Plagiodera 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 repellant towards insects, including beetles in the *Chrysomelidae* family by disrupting insect growth, and also has anti-feedant and oviposition (egglaying) 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 *Plagiodera 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). Bioncontrol agents are used to control insect species including hemlock wooly 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.

Plagiodera 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 trichrome density and higher pupal weight. They hypothesized that higher densities in trichomes (fine hair outgrowths) can act 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, Plagiodera 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 exclose 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, Plagiodera versicolor,* and *Disonycha alternate*
    - 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

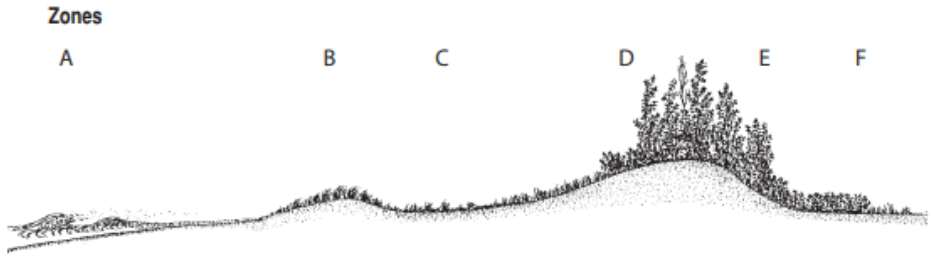


Illustration by Bob McNamara

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

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

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

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

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

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 *Prunus serotina* var. *serotina* Green ash *Fraxinus pennsylvanica* Hybrid willow *Salix petiolaris* × *S sericea* Northern red oak *Quercus rubra* Red maple *Acer rubrum*	American red raspberry *Rubus idaeus* ssp. *strigosus* Blackberry *Rubus allegheniensis* Chokecherry *Prunus virginiana* var. *virginiana* Nannyberry *Viburnum lentago* Red osier dogwood *Cornus sericea* Speckled alder *Alnus incana* ssp. *rugosa* Silky dogwood *Cornus amomum ssp Amomum* Winterberry *Ilex verticillata*	Bristly greenbrier *Smilax hispida* Poison ivy *Toxicodendron radicans* River grape *Vitis riparia*	Baltic rush *Juncus balticus* ssp. *littoralis* Fowl mannagrass *Glyceria striata*

Ferns	Herbaceous		
Field horsetail *Equisetum arvense* Sensitive fern *Onoclea sensibilis*	Beggarticks *Bidens vulgate* Blue flag iris *Iris versicolor* Blue stem goldenrod *Solidago caesia* . var. *caesia* Blunt leaved sandwort *Moehringia lateriflora*	Canada goldenrod *Solidago canadensis* var. *Canadensis* Canada mayflower *Maianthemum canadense* Common silverweed *Potentilla anserina* . *ssp. anserina*	Spotted jewelweed *Impatiens capensis* Sweet scented bedstraw *Galium triflorum* Virginia bugleweed *Lycopus virginicus*

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@pmnrcd.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 very 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 adjacent landowners: 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 on planting native species 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 genetics testing 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 spreading pathways Map social trails and work to minimize invasive species spread.

8. Repeat the 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 manger staff and interested private landowners to share invasive species projects and success stories, updates, restoration projects, and collaboration opportunities

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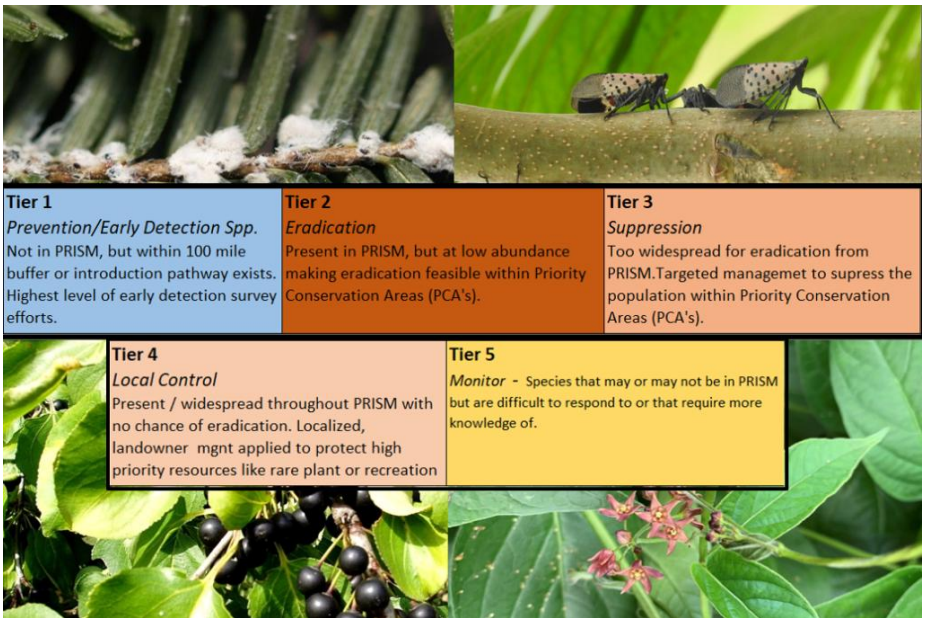
Appendix A: SLELO PRISM Tiered Species List

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 - (Eichhornia 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 (*Amynthas 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

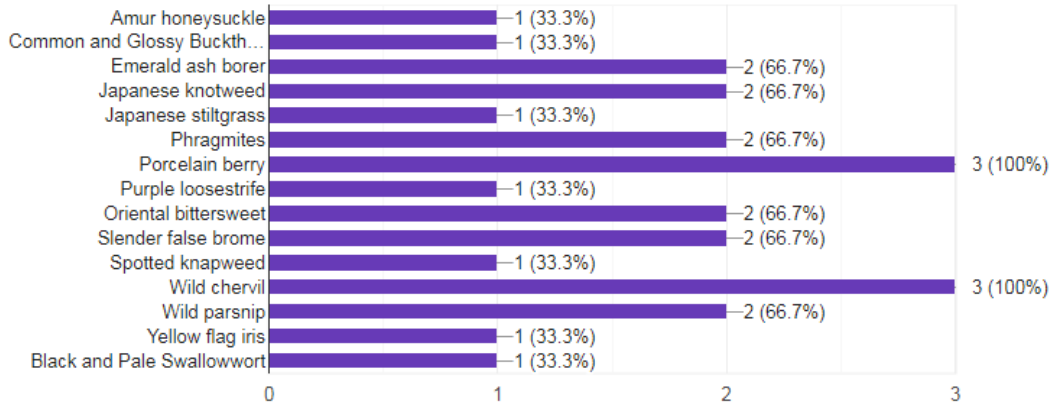
3. Does your land have past or current invasive species management practices that you would like evaluated for effectiveness of control?
    a. 66.7% Yes 0.00% No 33.3% Not Applicable

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)

NEW YORK STATE OF OPPORTUNITY. **Parks, Recreation and Historic Preservation**

FOR DEPARTMENT USE ONLY	
APPLICATION NO.	DATE RECEIVED
2021-MP15-013	8/13/2021
REGION	PERMIT TYPE
Multiple	Pi

- [x] **NEW** (Complete sections A-D)
- [ ] **RENEWAL/MODIFICATION** (Complete Section A-D where appropriate)
- [ ] **FINAL and/or INTERIM REPORT** (Complete Section E)

SCIENTIFIC RESEARCH APPLICATION AND PERMIT

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.

Section A - Applicant Information

1. Principal Investigator (*Last, First*)

Shulenburg, Patricia

2. Mailing Address 221 Milton Ave
Syracuse, NY 13204

Telephone 585-303-5750
Fax
Email pshulenburg@gmail.com

3. Affiliation (*Graduate students, include name & phone number of major professor.*)

Dunes Foundation

4. Names of Field Assistants

1

5. Project Title

Dunes Foundation Invasive Species Initiative

Section B – Project Information

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

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.

Section C – Time Frame

8. Time Frame (*start and end dates, including project scoping and clean up*)

9/1-11/1/2021

Section D – Project Relationships

9. Project's Relationship to Other Research Projects (*Note whether related projects are in or near State Parks.*)

n/a

Section E – Final Report

10. **Project Report** (*Provide a copy of the final research report when it becomes available. Submittal of interim reports is encouraged.*)

Anticipated date of Final Report:

Attached report(s) and provide comments as deemed necessary:

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 Digitally signed by Patricia Shulenburg Date: 2021.08.12 09:33:48 -04'00'	Patricia Shulenburg	8/12/2021
APPLICANT'S SIGNATURE	APPLICANT'S NAME (Print or type)	DATE
Lynn Bogan Digitally signed by Lynn Bogan Date: 2021.09.08 16:10:45 -04'00'	Lynn Bogan	9/8/21
APPROVAL SIGNATURE	OPRHP PERMIT ADMINISTRATOR	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

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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: 2 **Start Date:** 09/01/21 **End Date:** 11/01/21

Primary DEC Contact: Andrew MacDuff **Phone:** (315) 785-2254 **DEC Office:** Watertown

Application Fee: EXEMPT

Insurance Certificate: YES

Map: NO

REGIONAL REVIEW **TRP#** 62118

DATE ISSUED TO APPLICANT: 08/20/21 **TYPE:** RESEARCH

RECOMMEND: APPROVED **SPECIAL TERMS & CONDITIONS:** YES

REGIONAL MANAGER SIGNATURE: Andrew J. MacDuff Digitally signed by Andrew J. MacDuff Date: 2021.08.20 10:08:15 -04'00' **DATE:** 08/20/21

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:

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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.

ment

(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:

a) Procedures and methods: Discuss the research design identifying variables to be measured, and sampling and data collection procedures. Fully explain the plan of action.
b) Timetable:
c) Collecting: Description of any collecting to be undertaken (include the "Application for Permission to Collect" form).
d) 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).
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 to Resource Environmental Solutions Formerly Applied Ecological Services Inc.
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.

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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 Outcomes:

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

Appendix D. Reference for separate document titled;

"Vegetation of a Lake Ontario Dune Barrier, Oswego and Jefferson Counties, NY, under High and Low Recreation Pressure". 1992 Thesis. Sandra E. Bonanno. State University of New York College of Environmental Science and Forestry. Syracuse, New York.

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). Ivasive 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 Stated 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

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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.

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	NYSDAM	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	NYSDAM	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.

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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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Deer Creek WMA, Photo credit: Patricia Shulenburg

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