

Examples of Case Studies for Invasive Species Action

Michigan's Great Lakes Islands



Submitted to:

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MNFI Report Number 2019-19

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Top Left: Brandon Shroeder, Michigan Sea Grant, and students monitor phragmites on Charity Island – Photo: Tracy D’Augustino

Center: Michigan Technological University biologists test a native fungus for controlling Eurasian Water Milfoil with UAV- Les Cheneaux Watershed Council website.

Top Right: Map showing invasive species locations on High Island – Photo: MNFI

Bottom: “Go Beyond Beauty” program logo, Northwest Michigan Invasive Species Network.

Higman, P.J., H.D. Enander, D.A. Hyde, P.J Badra and K.M. Korroch. 2019. Examples of Case Studies for Invasive Species Action: Michigan’s Great Lakes Islands. Report to the USFWS Great Lakes Coastal Program. MNFI Report No, 2019-19.

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Introduction

During our study to gather baseline data on Michigan's Great Lakes Islands to inform invasive species planning and action, we came across many exemplary, interesting, or otherwise useful examples of efforts taken to address invasive species. Some of these activities have occurred on Michigan's islands, others from oceanic islands and still others from relevant work on the mainland. We provide summaries of some of these efforts below. Unfortunately, these are not the stories that often make the front-page news. But these are extraordinary efforts to stay ahead of the invasion curve in the places that are least invaded, including some of our most treasured islands. Front page headlines should read: *Thousands of Acres of Michigan's Coastal Zone Protected from Invasion Due to the Dedicated Efforts of Michiganders!* Thanks to the vision of and leadership of our funders, policy-makers, planners, managers, practitioners and volunteers, this return on our investment cannot be underestimated. Now is the time to expand these efforts to all of Michigan's Great Lakes islands.

Great Lakes Island Case Studies

Early Detection and Control of invasive Phragmites on Beaver Island, Grand Traverse Bay, Emmet County and Michigan's Upper Peninsula

Beaver Island

In 2012, MNFI received a call from DNR Forest Resources Division asking if we could provide access to the element occurrence data for Beaver Islands shoreline. They explained that they were working with a local island leader, Pam Grassmick, who was spearheading a campaign to remove invasive phragmites from Beaver Island. We established a data sharing agreement and provided these element occurrence data along with guidance for treatment techniques and timing that would avoid impacts to the species. Systematic surveys were conducted to map phragmites and occurrences of vulnerable species throughout the entire shoreline of the island, contractors were hired and several years later the phragmites population on Beaver Island had been reduced to less than ¼ of its original extent. Proof of early detection success was born! This effort continues today with expanded partnerships and phragmites remains on the losing side.

Grand Traverse Bay

Soon after the success story on Beaver Island, a National Fish and Wildlife Foundation Grant was funded to conduct a similar effort in Grand Traverse Bay. coordinated by The Watershed Center. This project resulted in the survey, documentation and treatment of phragmites along Grand Traverse Bay shoreline as well as on public and private lands within Grand Traverse County. It resulted in a 78% reduction in phragmites since the program inception in 2009. It was a monumental effort that incorporated a great deal of coordination of resources and communication among various partners in the region which included mapping infestations along the entire shoreline, obtaining the necessary permits, providing maps to contractors and staff for treatment, education of road commissions and adoption of township ordinances for treatment along the shoreline. Education and partnerships proved to be key ingredients in this success story.

Emmet County

Soon thereafter, another grant was obtained through the USFWS Great Lakes Coastal Program to conduct comprehensive surveys of phragmites along the entire Great Lakes coastline in Emmet County. Similar results were achieved there with the help of Tip of the Mitt Watershed Center and a county-wide ordinance was adopted.

Michigan's Upper Peninsula

Following on the heels of the dedicated efforts noted above, yet another successful EDR program was initiated in the Upper Peninsula. The UP RC&D secured a GLRI grant to initiate systematic mapping of phragmites throughout the entire Upper Peninsula. This tedious, yet extraordinary effort, has reduced phragmites invasions significantly and protected dozens of Michigan's endemics species occurrences along the coastal zone.

Comprehensive Invasive Species Surveys on Beaver Island

After the success of invasive phragmites surveys control on Beaver Island, and as the paradigm of EDR began to take root throughout Michigan, the island has expanded its survey effort to include species that have demonstrated serious impacts elsewhere in Michigan. These include:

Autumn olive (<i>Elaeagnus umbellata</i>)	Lombardy poplar (<i>Populus nigra</i> var. <i>italica</i>)
Baby's breath (<i>Gypsophila paniculata</i>)	Marsh thistle (<i>Cirsium palustre</i>)
Black locust (<i>Robinia pseudo-acacia</i>)	Multiflora rose (<i>Rosa multiflora</i>)
Black swallow-wort (<i>Vincetoxicum nigra</i>)	Narrow-leaved cat-tail (<i>Typha angustifolia</i>)
Bladder campion (<i>Silene vulgaris</i>)	Non-native phragmites (<i>Phragmites australis</i>)
Blue lyme grass (<i>Leymus arenarius</i>)	Oriental bittersweet (<i>Celastrus orbiculatus</i>)
Bush honeysuckle (<i>Lonicera</i> spp.)*	Pale swallow-wort (<i>Vincetoxicum rossicum</i>)
Crown vetch (<i>Securigera varia</i>)	Purple loosestrife (<i>Lythrum salicaria</i>)
Dalmatian toadflax (<i>Linaria dalmatica</i>)	Reed canary grass (<i>Phalaris arundinacea</i>)
False baby's-breath (<i>Galium mullugo</i>)	Scots pine (<i>Pinus Sylvestris</i>)
Garlic mustard (<i>Alliaria petiolata</i>)	Spotted knapweed (<i>Centaurea stoebe</i>)
Glossy buckthorn (<i>Frangula alnus</i>)	St. John's-wort (<i>Hypericum perforatum</i>)
Japanese barberry (<i>Berberis thunbergii</i>)	Sweet woodruff (<i>Galium odoratum</i>)
Japanese hedge parsley (<i>Torilis japonica</i>)	White sweet-clover (<i>Melilotus alba</i>)
Japanese knotweed (<i>Fallopia cuspidatum</i>)	Wild parsnip (<i>Pastinaca sativa</i>)
Kudzu (<i>Pueraria lobata</i>)	

*(*L. tatarica*, *L. morrowii*), (*L. x bella*), (*L. japonica*), (*L. avium*)

The initial efforts showcased the then newly developed Midwest Invasive Species Information Network (MISIN) mapping protocols and they continue to be used today. Treatments were prioritized based on available resources, identified natural areas, and size of occurrence and recommendation for future treatments were provided by GEI Consulting Engineers and Scientists (GEI Consultants of MI. 2017). They used and recommend the EGLE (DEQ) Phragmites Treatment/Management Prioritization Tool (EGLE 2014)) as a means for quantitatively scoring infestations of all the species documented. They acknowledged that this should be considered as a flexible tool and localized, management needs could take precedence in certain situations. Notably, they highlighted the critical importance of prioritizing sites with

threatened, endangered species or otherwise vulnerable species and using treatment techniques and timing that avoid impacts to these species.

To our knowledge, this is the most comprehensive invasive species survey conducted on Michigan's Great Lakes islands to date and serves as an excellent example for others to emulate. We encourage the expansion these surveys to include aquatic species as well.

Big Charity Island Phragmites Control and Federally Endangered Pitcher's Thistle (*Cirsium pitcheri*). (On-going; <https://ijc.org/en/students-helping-restore-threatened-plant-saginaw-bay>)

Shiawassee National Wildlife Refuge, Huron Pines, Michigan Sea Grant and Michigan State University (MSU) Extension have partnered in a unique project to remove invasive *Phragmites* from the shoreline of Big Charity Island, where it threatens coastal habitat and a nearby population of state and Federally threatened Pitcher's thistle. Students from Au Gres-Sims school district have been taking a boat to the island to monitor the Pitchers' thistle and recently received permission from the USFWS to harvest the seed. The seed will be transported back to the school where students will grow them and return the plugs back to the Island and possibly re-establish extirpated populations in protected areas along the Au Gres coastal zone.

Controlling spotted knapweed (*Centaurea stoebe*) on High Island

MNFI collaborated with the Little Traverse Bay Band of Ottawa Indians to conduct natural feature and invasive species on High Island between 2009-2013 (Higman et al. 2012). Among the findings was the almost complete lack of spotted knapweed on the high-quality open dune system along the western shoreline which harbors a population of state threatened fascicled broomrape (*Orobanche fasciculata*), a thriving population of federally and state threatened pitcher's thistle (*Cirsium pitcheri*), and Lake Huron locust (*Trimerotropis huroniana*). There is also an occurrence record for dune cutworm (*Euxoa aurulenta*) that could still persist there. There are few remaining dunes in Michigan where spotted knapweed has not already become established. The knapweed is well established on the east side of High Island and there is a massive infestation on the sand spit at the northeast corner of the Island. Some knapweed is starting to creep around the Great Lakes barrens on the north side of the island towards the west side dunes. This presents a rare opportunity to initiate early detection and response surveillance on the island to catch any plants that are near the dunes and to reduce and contain source populations on the east and northern side of the island. The urgency and potential for success is high. The LTTB bands of Odawa Indians secured a grant from the USFWS to undertake this work.

Northern Lake Michigan Island Collaborative

The Northern Lake Michigan Island Collaborative was initiated by the DNR-Wildlife Division in 2015, to bring relevant and interested stakeholders together to engage in a "*Collaborative Governance Approach to State Land Management for the Beaver Island Archipelago*". The Collaborative seeks to build trust, consider and discuss all island values, including ecological, recreational, cultural, and economic assets, in order to sustain the integrity of them all. The collaborative is flourishing, and land use opportunities and conflicts are being identified and

resolved within a collaborative and spatial framework that interweaves ecological, cultural and socio-economic considerations. The work of the collaborative illustrates how the overlay of island-asset data layers can assist constructive dialogue and enable more informed decision-making. We hope the *Island Database* can contribute further to the Collaborative's on-going planning efforts.

Great Lakes Islands Alliance (GLIA)

A volunteer network of Great Lake island Communities emerged in 2017 with inspiration from an existing network of Coastal Maine islands. The inaugural group, including the Michigan Office of the Great Lakes (EGLE, formerly DEQ), Northland College of Wisconsin, Island Institute, Wisconsin Coastal Management Program and other partners, convened a summit, hosted by Beaver Island. A second gathering was convened in 2018 on Madeline Island of the Apostle Islands Archipelago of Northern Wisconsin, attracting community members from 13 different islands. The Alliance was formed to bring together interested partners, including island leaders, residents and advocates throughout and beyond the international Great Lakes region to help chart a vision, mission and goals (Northland College 2019). The GLIA describes itself as those who “*share the experience of living and working in these geographically isolated places. The GLIA will be driven 'for islands, by islands'*”. Their vision and mission are presented below.

Vision

Our vision is to support our individual islands for current and future generations, honoring their distinct cultures and character, while growing the collective impact of the inter-island network.

Mission Statement

The mission of the GLIA is to encourage relationship building, foster information exchange, and leverage resources to address shared challenges and embrace opportunities to benefit islands.

This novel Alliance has great promise for sustaining leadership that effectively intertwines the ecological, cultural, and socio-economic assets of islands, enabling the best decisions possible for managing the threat of invasive species.

Go Beyond Beauty

This program created by the Northwest Michigan Invasive Species Network (2019) provides positive recognition to garden professionals and others who exemplify business and landscaping practices that benefit and protect natural areas. The program offers support to garden professionals and concerned citizens who have committed to not sell or use high-threat invasive plants; provides science-based information and helps businesses gain new customers through free publicity and outreach. Participants also receive additional recognition for further steps they may choose to take, such as selling native plants, participating in Buy Back and Trade Up programs, or organizing community workshops. This model is applicable to other regions in Michigan and their advice and assistance is frequently requested. Their web site provides “How-To” guidance.

Great Lakes Commission GLDIATR Initiative

In an effort to address a major pathway for the introduction of aquatic invasive species, the Great Lakes Commission mounted a strategy to develop innovative software that identifies points of sale of these undesirable invasive species. Using natural language processing and machine intelligence, this tool scours and sorts thousands of pages across the internet. This novel strategy has been highly effective as noted on the GLDIATR web site (Great Lakes Commission, 2019).

“In the first 30 days of full-scale testing alone, GLDIATR scanned over 300,000 web pages and identified 200 websites with invasive species for sale, including 56 restricted species. In response, the GLC contacted website owners with information about invasive species regulations and best practices and observed changes to stock and/or shipping restrictions in 27 cases.”

Great Lakes Sea Lamprey Control Program

The U.S. Fish and Wildlife Service (USFWS), acting as an agent through the Great Lakes Fishery Commission, implemented a massive chemical control effort in the 1950's and by the early 1960's sea lamprey populations had been reduced to a fraction of what they were before control began. This effort paved the way for recovery of self-sustaining populations of native lake trout in portions of the Upper Great Lakes and has successfully reduced impacts to valued sport fisheries over the past 50 years. “Of the more than 180 non-native species in the Great Lakes basin, sea lampreys are the only invader that is controlled basin-wide and is the only example in the world of a successful aquatic vertebrate pest control program at an ecosystem scale” (Great Lakes Fisheries Commission 2019).

Eurasian Watermilfoil Control in the Les Cheneaux Islands

The Les Cheneaux Watershed Council has been working to control the Eurasian Watermilfoil (EWM) plants in Cedarville Bay as well as to identify, map and remove other invaders such as phragmites, narrow-leaf cattail and purple loosestrife. They have reduced the presence of EWM by the introduction of *E. lecontei*, a weevil that has been studied as a potential biocontrol agent as well as the use of a mycoherbicide, *Mycocleptodiscus terrestris*, as a commercial competitor to chemical herbicides. The results of these trials have been encouraging (Smith et al. 2018).

National and International Case Studies

Lessons Learned from Oceanic Island Invasive Species Eradication Efforts

Clout and Veitch (2002) assembled the proceedings of the International Conference on Eradication of Island Invasives in “Turning the tide: the eradication of invasive species”. The contributors to this conference as well as other researchers from a growing body of work have shared lessons learned and common denominators of successful eradication efforts for a variety of invasive species including mammals, insects, birds and plants. Success rates for mammal eradications range from 80-90% although animal welfare and ethical issues need to be grappled with and acceptable to stakeholders and communities. Two thirds of attempts (50) to eradicate insects on islands were successful, primarily through the use of chemicals, sterile insect technique or biological control agents. There has been an 83% success rate in the eradication of 8

species of birds in 23 attempts on 21 islands. Plant eradications have lagged behind animal eradications as persistent seed banks are a challenge and the “treadmill effect” is often encountered as another nonnative plant becomes dominant after treatment of another plant. Failures in eradication and maintenance management on islands are often due to an insufficient long-term commitment of resources. Understanding the complex interactions among species is also very important to consider (Zavaleta et al. 2001).

Mack and Lonsdale, (2002), Buddenhagen and Tye (2015), Chadderton (2011) and Pennimean et al. (2011) identify common characteristics and steps of successful control/eradication programs including:

- Understand the invasive species biology, particularly dispersal and home-range characteristics.
- Assess the invasiveness of candidate species.
- Have the ability to access and target all individuals in a population.
- Possess the means to detect target species at low densities.
- Determine feasibility of eradication of each candidate based on biological factors, distribution and costs and draw up a management plan.
- Have support from local communities and key decision-makers and cooperative landowners.
- Invasives are detected early – The decision to destroy all invasive species is swift.
- Ensure the detection and destruction of outlier, nascent isolated populations.
- Periodically re-evaluate feasibility: if judged still feasible with available or attainable resources continue the project (abandonment is an option at any stage).
- Ensure that reinvasion is prevented.
- Repeated surveys are needed to reduce non-indigenous species below levels of detection.
 - Eradication efforts should last 10 years or more.
 - Maintain persistent efforts by trained crews.
- Maintain clear lines of authority and an ability to compel action
- Possess adequate resources for the life of the project (sufficient duration to detect and remove propagules).
- Focus on creating a *zone sanitaire*, rather than single species removals, and establish desired native vegetation.

Effective Use of Tools and Sharing of Data are Needed to Assist Planning Efforts.

The Nature Conservancy created an Invasive Plant Management Decision Analysis Tool to help TNC and other partner agencies and organizations determine whether a plant management project is likely to be successful. They identified four possible outcomes of this tool including: 1) Proceed with control strategy implementation (high probability of success), 2) Stop - secure sustainable funding source, 3) Stop - control not feasible and/or not warranted or 4) Peer-review required- feasibility and/or conservation value is uncertain. Effective planning for island restoration in the U.S. is limited by island specific data available on native and invasive species and the interoperability of existing datasets to make data uniformly comparable. Prioritization tools and a roadmap for action are also needed for project planning and implementation. The Global Island Database (GID) was implemented to provide an updated list of attempted

eradications and tools to support more effective decision-making. Working together on island restoration programs can leverage synergies. Partnering across organizational structures is highly effective strategy for mainstreaming invasive species eradication. The tool has been recently incorporated on i-MapInvasives which is a platform for sharing information for strategic management of invasive species (The Nature Conservancy 2019).

Community Led Conservation Initiative by the Ponoma Island Charitable Trust

One example of a successful community-led conservation initiative was implemented by the Ponoma Island Charitable Trust on the largest inland island in New Zealand (Shaw, Whitehead and Shaw, 2011). This effort eradicated all introduced mammal pest species from the island including stoats, possums, red deer, ship rats and mice that had major impact on the island's biodiversity, especially native birds. The trust developed plans for pest management, quarantine and communications and conducted a social impact assessment. They worked with the local community, especially boat clubs, water taxi operators and individual boat owners to encourage them to make quarantine checks before they visit the island. Prominent signs were installed at key landing sites to remind boat owners of their responsibilities in helping the Trust keep the island free of pests.

Case Studies Reveal Several Key Factor to Consider

Case studies that were reviewed pointed out several other factors that are worth bearing in mind including the trophic considerations in eradicating multiple pests and exploiting synergies among pest management projects which might improve the quality of the efforts (Morrison, 2011). In addition, biological invasions and alien species removals can be viewed as large scale experiments of trophic chain manipulations and can inform conservation biology and fundamental ecology (Courchamp et al. 2011). Finally, biodiversity benefits obtained from pest eradication depends on the biodiversity context around the island as well as the pest context (e.g. suite of pests) on the island (Overton, J., IUCN, 2011).

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