



## **Invasive Species Program 2016**

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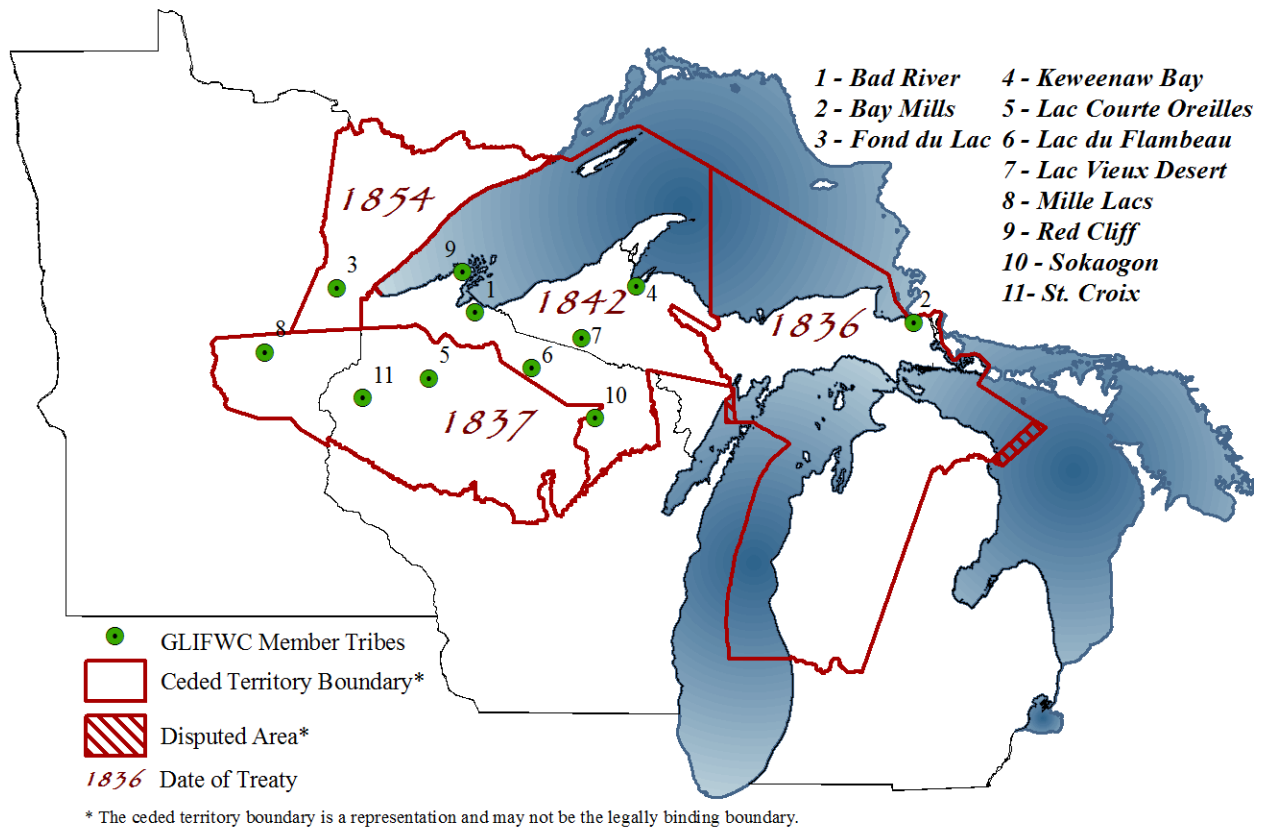
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## EXECUTIVE SUMMARY

The Great Lakes Indian Fish and Wildlife Commission (GLIFWC) is an organization exercising delegated authority from 11 federally recognized Ojibwe tribes in Minnesota, Wisconsin, and Michigan (Figure 1). These tribes retain hunting, fishing, and gathering rights in the territories ceded to the United States through various treaties. The degradation of native ecosystems by invasive species poses a serious threat to the continued exercise of these rights and the traditional lifeways they sustain.



**Figure 1.** Location of GLIFWC member tribes and ceded territories.

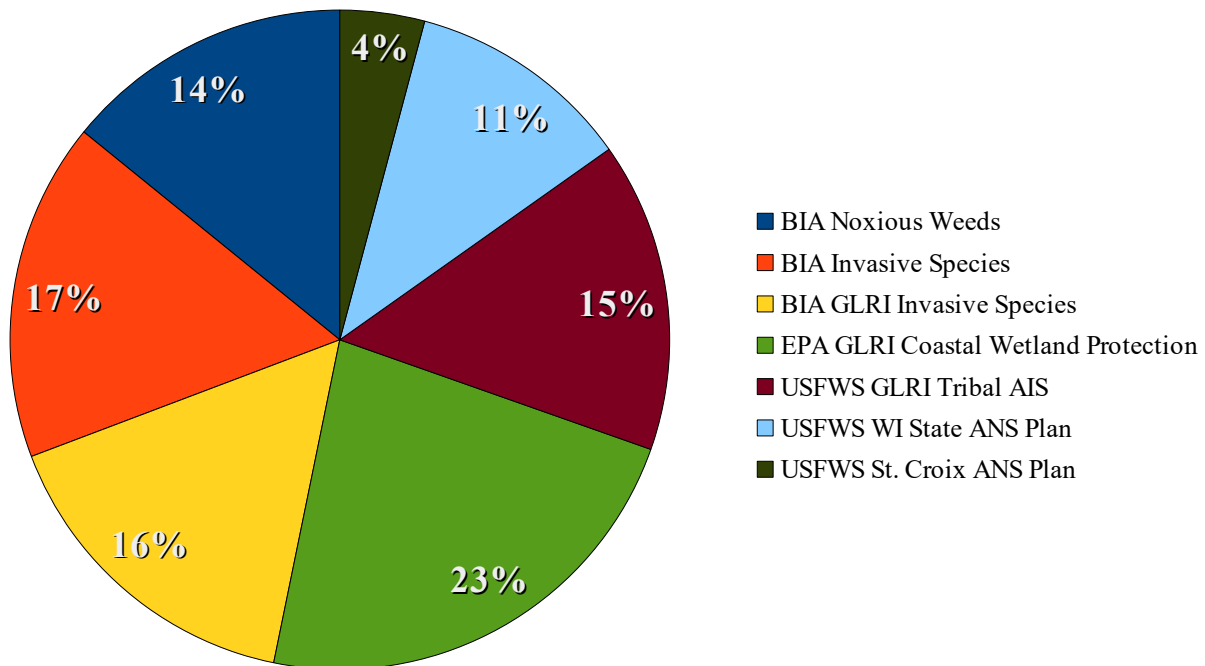
This report summarizes the activities undertaken by GLIFWC staff during 2016 to address the spread of invasive species in the ceded territories. GLIFWC’s invasive species program consists of 1) prevention, 2) early detection rapid response, 3) control and management, 4) research, and 5) coordination of these activities with cooperating tribes, government agencies and groups to maximize the efficient use of limited resources.

## ACKNOWLEDGMENTS

The Great Lakes Indian Fish and Wildlife Commission acknowledges the following for their financial support of GLIFWC's invasive species program. The BIA continues to provide the foundation for developing new partnerships and leveraging additional resources for invasive species management (Figure 2). The activities summarized in this report were funded by:

- Bureau of Indian Affairs (BIA)
  - Noxious Weed Program
  - Invasive Species Program
  - Great Lakes Restoration Initiative (GLRI) Tribal Invasive Species
  
- U.S. Environmental Protection Agency (EPA)
  - GLRI Coastal Wetlands Planning Protection and Restoration
  
- U.S. Fish and Wildlife Service (USFWS)
  - Great Lakes Restoration Initiative (GLRI) Tribal AIS
  - Wisconsin State ANS Plan
  - St. Croix Interstate ANS Plan

**Figure 2.** Funding sources for GLIFWC's Invasive Species Program in 2016.



## PREVENTION

### Introduction

The most effective approach to combat the spread of invasive species is to prevent their initial establishment. Because the vast majority of invasive species introductions can be attributed to human activities, effective prevention efforts depend on an informed public. A variety of education, outreach, and training materials are needed to alert a diverse public to the threats posed by invasive species and the actions required to prevent their spread.

### Program Overview

A suite of educational materials have been compiled and/or developed to reach a broad range of audiences. These materials include ID cards, brochures, stickers, presentations, and videos. GLIFWC distributes educational material with the help of cooperating state and federal agencies throughout the ceded territories. Additional outreach is provided via GLIFWC's invasive species web site ([glifwc.org](http://glifwc.org)) and quarterly newsletter – *Mazina'igan* ([glifwc.org/mazinaigan](http://glifwc.org/mazinaigan)).

### Accomplishments

#### *Mazina'igan* Articles

GLIFWC's newsletter (circulation = 18,500) features articles on invasive species. Topics covered in 2016 included:

- “The emerald ash borer is on the move, Ash-killing beetle continues its relentless march” by Steve Garske – Spring/Summer 2016
- “Clean your boat! Before leaving & before launching inspect everything” image showing points on boat and trailer to inspect for aquatic invasive species by D. Unglaube – Spring/Summer 2016
- “Biologists recruiting alligator gar in carp control effort” by CO Rasmussen - Fall 2016
- “On the hunt for aquatic invasive species” by CO Rasmussen - Fall 2016
- “Dense and ever-thirsty phragmites targeted by GLIFWC, tribes; Invasive plant escaping sewage treatment plants” by Miles Falck
- “Turtle Island's forests at risk: invasive insect continues to spread across Ceded Territory” by Steve Garske.

Events, Presentations and Other Outreach Activities

Activities in 2016 included:

- Pocket size cards were distributed with permits during spring spearing & netting season to educate tribal harvesters on steps to prevent the spread of AIS, including how to clean equipment and specific tribal AIS regulations (Spring 2016).
- Fish measuring stickers with AIS prevention and tribal regulation information were distributed at tribal registration stations and GLIFWC events.
- Assisted with invasive species education and garlic mustard hand pulling event with Hurley middle school students (43) along the Montreal River in Hurley, WI (May 12, 2016).
- Assisted with invasive species education and garlic mustard hand pulling event with Washburn high school students (6) along the Lake Superior shoreline in Washburn, WI (May 13, 2016).
- Organized and held “Herbicide Use Training and Invasive Plant ID Workshop”, Ashland, WI (May 23, 2016). Eleven attendants from 7 agencies including GLIFWC and Red Cliff Natural Resources Department staff.
- Provided summer and fall phragmites identification training to Bad River Natural Resources interns and GLIFWC’s manoomin interns (June 29 and September 27, 2016).
- Purchased and assembled a garlic mustard and invasive species outdoor educational sign with boot brush to prevent the spread along the North Country Trail along the Bad River in the Mellen area (September 2016). Due to severe flooding in 2016, the sign will be installed in 2017.
- Presented information on GLIFWC’s invasive species program at the Upper Midwest Invasive Species Conference, LaCrosse, WI (October 17, 2016).

[glifwc.org](http://glifwc.org)

GLIFWC’s web site features species abstracts for many of the regions’ invasive plants, photos that can be downloaded for educational purposes, GLIFWC reports, and links to interactive maps and other Internet resources on invasive species.

## **EARLY DETECTION RAPID RESPONSE (EDRR)**

Eradicating or containing invasive species is more feasible and cost effective when populations are at a pioneer stage of infestation. GLIFWC staff have conducted annual invasive species surveys since 1995 and have documented over 10,000 occurrences for several hundred species of invasive organisms throughout the ceded territories. This information provides a baseline to determine if newly detected occurrences are early detections, and whether rapid response efforts are warranted. Early detections by GLIFWC staff have led to successful rapid response control efforts for curly-leaf pondweed, Eurasian water-milfoil, garlic mustard, knotweed, phragmites, purple loosestrife, and teasel.

### AQUATIC INVASIVE SPECIES

#### **Introduction**

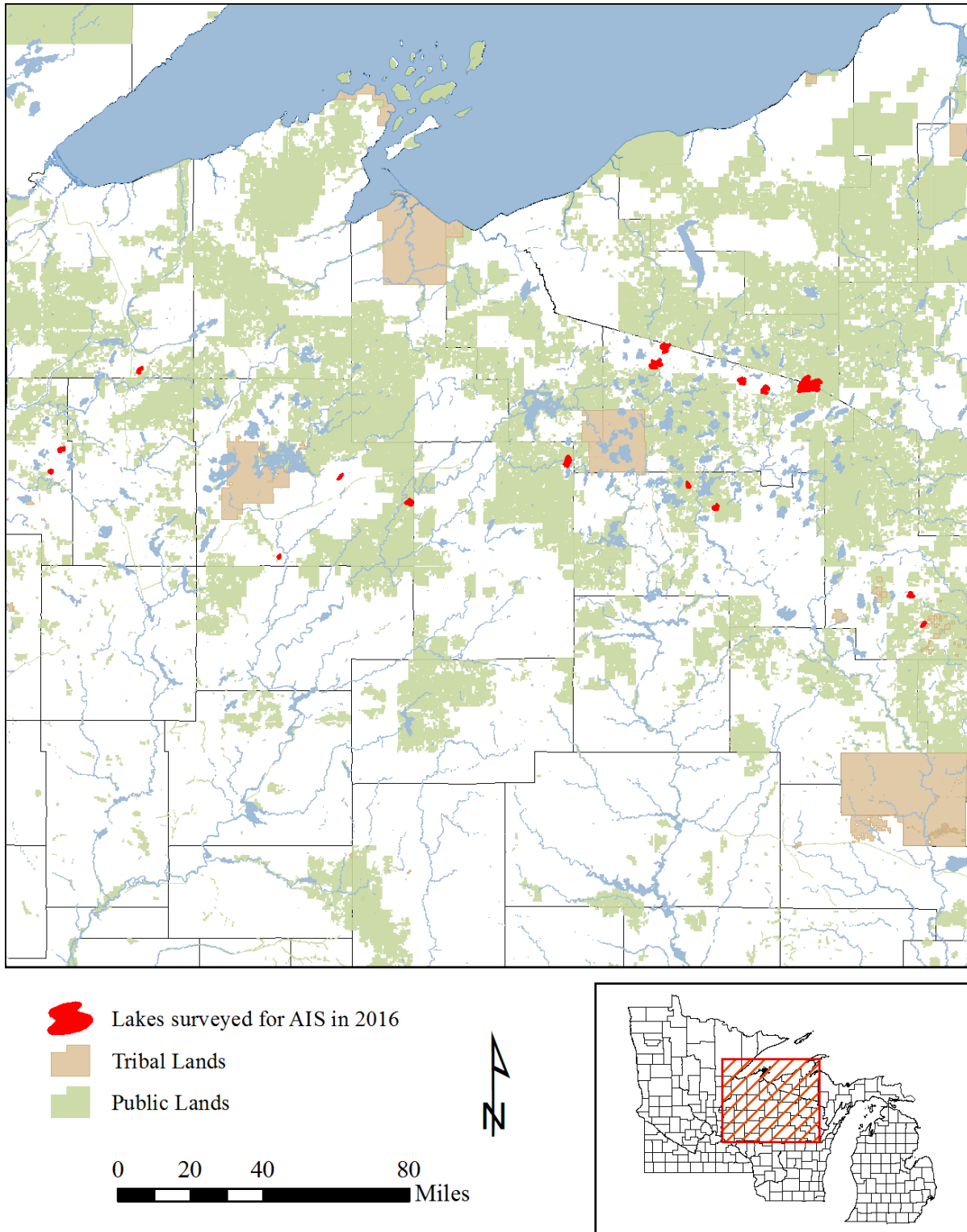
Since the early 1800s, 185 species of fish, plants, invertebrates, algae and pathogens have been introduced into riparian and aquatic habitats of the Great Lakes basin (USGS 2012). Many of these organisms have since invaded inland lakes and rivers in the ceded territory, and others are poised to do so. The most destructive of these invasives have caused major environmental and economic impacts (Pimentel *et al.* 2005).

GLIFWC staff surveyed select ceded territory waters in 2016 to 1) assess and document the scope of the problem, 2) detect small populations of the most ecologically disruptive invasive species before they become large, environmentally damaging populations, and 3) prioritize education and management efforts.

#### **Methods**

In 2016, GLIFWC staff surveyed 16 waterbodies for aquatic invasive species (AIS) in northern Wisconsin and Michigan (Figure 3, Table 1). Lakes surveyed for AIS were chosen in coordination with management partners including tribal, state, county and other local partners. Surveys targeted lakes important to the tribes for *ogaa* (walleye) and *manoomin* (wild rice) harvest, as well as high-risk lakes with high visitation rates or lakes in close proximity to infested waters.

Lakes surveyed for AIS were visited once during the season and were surveyed for all invasive plants and animals. Qualitative surveys for invasive species were conducted on each lake by observing the littoral zone from the water's surface. The survey was conducted by slowly driving a boat back and forth between the shoreline and the outer edge of the littoral zone. Surveys focused on submergent, emergent, and shoreline plants. These areas were also inspected for invasive animals or evidence of their presence. Surveys attempted to cover as much of the shoreline (including island shorelines) as possible.



**Figure 3.** Lakes surveyed in 2016 for aquatic invasive species detection and management.



**Table 1.** Lakes surveyed for aquatic invasive species in 2016.

State	County	Waterbody	WBIC	Acres	Survey Type	Dates Surveyed	Number of Samples	
							Veliger	Waterflea
WI	Burnett	Gaslyn	2677700	164	All AIS taxa	6/29	1	1
		Rooney <sup>a</sup>	2493100	322	All AIS taxa	6/29		1
	Douglas	Red <sup>a</sup>	2492100	258	All AIS taxa	6/30, 7/5		1
		Forest	Trump <sup>a</sup>	479300	172	All AIS taxa	7/6	
	Langlade	Sawyer	198100	149	All AIS taxa	7/6	2	1
	Oneida	Muskellunge <sup>a</sup>	1595600	284	All AIS taxa	8/16		1
		Sweeny <sup>a</sup>	1589600	187	All AIS taxa	8/16		1
	Price	Round <sup>a</sup>	2267800	726	All AIS taxa	8/15		1
	Sawyer	Barber	2382300	238	All AIS taxa	7/12	1	1
		Evergreen <sup>a</sup>	2277600	200	All AIS taxa	7/7, 7/11		1
		Mason <sup>a</sup>	2277200	190	All AIS taxa	7/7, 7/11		1
		Windfall <sup>a</sup>	2046500	102	All AIS taxa	7/18		1
		Vilas	Big Portage <sup>a</sup>	1629500	638	All AIS taxa	8/23	
		Crab <sup>a</sup>	2953500	949	All AIS taxa	8/17,8/22-8/23		1
		Oxbow <sup>a</sup>	2954800	511	All AIS taxa	8/24		1
		Lac Vieux Desert <sup>b</sup>	1631900	4300	Eurasian water-milfoil, Curly pondweed	6/21–6/23		
Total							4	15

Boat landings were the highest priority area for AIS surveys. All public and some private boat landings were surveyed. Shorelines, shallow water areas, pier supports, floating fragments, rocks, and beach debris in the vicinity of the landings were inspected for invasive plants and animals. Rake tosses and D-net pulls were conducted at the main boat landing for five minutes. The material retrieved by each throw and pull was placed in a bin and inspected for invasive plants and animals.

The most ecologically disruptive aquatic invasive species with limited abundance and distribution in the ceded territories were classified as “priority species” (Table 2). Discrete patches of vegetation and locations where invertebrates were detected were considered “sites”. Species with low abundance where rapid response control efforts were deemed feasible were classified as “pioneer” populations and were recorded at each site they were detected within a waterbody. Aquatic invasive species that can not be easily quantified such as invertebrates or crustaceans, species that were abundant and widespread within the waterbody, and terrestrial invasive plants were classified as “present” and only their initial occurrence within a waterbody was documented.

If a “priority” invasive plant species was found on a lake where it was previously undocumented, a specimen was collected and notes on habitat and location were taken. Collections were sent to the Robert W. Freckmann Herbarium at the University of Wisconsin – Stevens Point. Observations of *manoomin* and native populations of phragmites (*Phragmites australis* ssp.

*americanus*) were also documented. Native phragmites location data were added to GLIFWC's database and shared with management partners.

Locations were mapped using mobile data collection. KoBo Toolbox, a set of free open-source tools, was used to create custom data entry forms. Attribute data for each site was entered in the field using a mobile phone with sliding screens, drop down menus and built in constraints in a GIS file capable format. Data were automatically synced or uploaded online from the mobile phone once the mobile phone entered network service or a wireless network.

Plankton nets were used to sample for zebra and quagga mussel veligers. Vertical plankton tows were used to sample for zebra and quagga mussel veligers following Wisconsin DNR protocol (WDNR 2010). Veliger tows were only conducted on lakes that were suitable or borderline suitable to sustain a zebra or quagga mussel population. Lakes that do not have high enough calcium concentrations to sustain a zebra mussel population were not sampled for veligers. Lake suitability information was obtained from the University of Wisconsin Center for Limnology's online "smart prevention" tool. Specific conductance was measured in the deepest basin of each lake at a depth of one meter using a YSI Model 30 meter to determine the current suitability of each lake. Lakes with a specific conductance reading of equal to or greater than 99uS are considered borderline or suitable and were sampled.

For large lakes, three veliger samples were collected from each lake. On small or shallow lakes, only one or two samples were collected. Where feasible, at least one sample was collected near the main boat landing. The remaining samples were collected from the deepest basin, high visitation areas, other bays or basins, or the downwind side of the lake. Immediately after collection, veliger samples were condensed, transferred to sample bottles, labeled, and preserved with 190 proof ethyl alcohol, at a ratio of four parts alcohol to one part plankton sample.

Ekman dredge samples were used to sample for spiny and fishhook water fleas following the protocol of Walsh and Vander Zanden (2016). Sediment samples were collected at the deepest location of each lake. At the sampling point, the Ekman dredge was lowered to within one meter of the lake bottom. The Ekman was then dropped the remaining distance and the messenger sent down to set the dredge. The sample then was condensed, transferred to a plastic bag, labeled, and then kept cold until personnel were able to freeze the sample.

**Table 2.** "Priority" species surveyed for in 2016.

Scientific Name	Common Name
<b><u>Invertebrates</u></b>	
<i>Bithynia tentaculata</i>	Faucet snail
<i>Bythotrephes longimanus</i>	Spiny water flea
<i>Cercopagis pengoi</i>	Fishhook water flea
<i>Corbicula fluminea</i>	Asian clam
<i>Dreissena bugensis</i>	Quagga mussel
<i>Dreissena polymorpha</i>	Zebra mussel
<i>Potamopyrgus antipodarum</i>	New Zealand mudsnail
<i>Procambarus clarkii</i>	Red swamp crayfish
<b><u>Plants</u></b>	
<i>Butomus umbellatus</i>	Flowering rush
<i>Cabomba caroliniana</i>	Fanwort
<i>Callitriche stagnalis</i>	Pond water-starwort
<i>Crassula helmsii</i>	Australian swamp stonecrop
<i>Egeria densa</i>	Brazillian waterweed
<i>Eichhornia crassipes</i>	Water hyacinth
<i>Glyceria maxima</i>	Tall manna grass
<i>Heracleum mantegazzianum</i>	Giant hogweed
<i>Humulus japonicus</i>	Japanese hop
<i>Hydrilla verticillata</i>	Hydrilla
<i>Hydrocharis morsus-ranae</i>	European frog-bit
<i>Microstegium vimineum</i>	Japanese stilt grass
<i>Myriophyllum aquaticum</i>	Parrot feather
<i>Myriophyllum spicatum</i>	Eurasian water-milfoil
<i>Najas minor</i>	Slender-leaved naiad
<i>Nymphoides pelata</i>	Yellow floating heart
<i>Phragmites australis</i> ssp. <i>australis</i>	Non-native phragmites
<i>Pistia stratiotes</i>	Water lettuce
<i>Polygonum cuspidatum</i> , <i>P.sachalinense</i> , <i>P.X bohemica</i>	Japanese, giant and Bohemian knotweed
<i>Potamogeton crispus</i>	Curly pondweed
<i>Trapa natans</i>	Water chestnut

Veliger samples were sent to the WDNR Services Operations in Madison, Wisconsin for analysis. Water flea samples were examined by GLIFWC staff. Water flea samples were analyzed under a dissecting microscope by identifying spine fragments for presence or absence

of water fleas.

All equipment was cleaned between lake samples. The boat, trailer, and equipment were thoroughly disinfected after each survey was completed. Plant fragments and other debris were removed by hand or brush at the landing and the drain plug was removed in an area where the water would not run into the lake.

After leaving the lake, the washing location was chosen to ensure that the disinfection solution and rinse water would not run into storm water drains or other areas that might contaminate surface waters. The boat, trailer, and all equipment that came into contact with the water (including plankton nets and cups, Ekman dredge, collection nets, ropes, weights, anchor, and paddles) were sprayed with a 500 ppm bleach solution. After the appropriate contact time (10 minutes), the boat, trailer, and all equipment were thoroughly rinsed. The boat motor was flushed with tap water by using a flushing attachment (flush muff) for two minutes. Veliger sampling equipment was disinfected with the bleach solution, rinsed, and soaked in vinegar for 20 minutes. The vinegar solution was used to dissolve any veliger remains, thus ensuring there were no false positives in subsequent samples. Lakes with known infestations of easily spread invasives (i.e. water fleas, zebra mussels) were surveyed at the end of each week as an extra precaution to minimize the risk of spreading them.

## Results

A total of 96 invasive species sites comprising 24 taxa were documented in 2016. “Priority” species accounted for 37 of the sites (39%, Table 3). A total of 112 locations of Eurasian water-milfoil or curly pondweed were documented in the spring survey of Lac Vieux Desert. Four zebra mussel veliger and 15 water flea plankton samples were collected during 2016. No zebra or quagga mussel veligers or spiny or fishhook water fleas were detected in any of the samples. Two new plant records were vouchered and sent to the UW-Stevens Point Freckmann Herbarium. One new *manoomin* waterbody was detected. Native phragmites (*Phragmites australis* subsp. *americanus*) was documented on seven of the lakes surveyed. Table 3 provides a summary of invasive species detections for each lake.

## Discussion

Early detection of invasive species before they become large, environmentally damaging populations makes eradication more likely and reduces the amount of effort required for effective control. Three lakes with small, pioneer infestations of “priority” species were detected by GLIFWC staff (Table 3).

Eurasian water-milfoil was detected on Red Lake at low levels. Occurrence data for this site were shared with management partners and follow up surveys and planning of future management efforts were initiated by the local lake association. After fall follow-up surveys

were conducted by a private contractor, more Eurasian water-milfoil than originally observed was documented. The local lake association will continue to manage the population.

Two lakes with non-native phragmites were documented. Staff documented 29 small populations of non-native phragmites scattered around the lake shoreline on Sawyer Lake in Langlade County. Occurrence data was shared with Wisconsin DNR for follow up treatment in 2017. One isolated patch of a variegated form on non-native phragmites was documented on Round Lake in Sawyer County. GLIFWC's invasive species control crew chemically treated the population in September. Gaslyn Lake in Burnett County was listed by WDNR as having occurrences of non-native phragmites along the shoreline. Staff confirmed there is only the native subspecies of phragmites present along the shoreline.

Four lakes had pioneer infestations of lower priority or present/absent species along the shoreline. Data was shared with management partners to determine if follow up management efforts are warranted.

**Table 3.** Summary of aquatic invasive species detected in 2016.

State	County	Waterbody	Species															
			<i>Bellamy chinensis</i>	<i>Cirsium palustre</i>	<i>Iris pseudacorus</i>	<i>Lonicera spp.</i>	<i>Lythrum salicaria</i>	<i>Myosotis scorpioides</i>	<i>Myriophyllum spicatum</i>	<i>Orconectes rusticus</i>	<i>Phragmites australis</i> subsp. <i>australis</i>	<i>Populus alba</i>	<i>Robinia pseudoacacia</i>	<i>Typha</i> spp.	<i>Valeriana officinalis</i>	<i>Viviparus georgianus</i>	Total invasive taxa detected	Native <i>Phragmites</i> ( <i>Phragmites australis</i> subsp. <i>americanus</i> )
WI	Bumett	Gaslyn	X								N						1	X
	Bumett	Rooney	X									X <sup>b</sup>	X <sup>b</sup>				3	
	Douglas	Red							P <sup>a,b,c</sup>								1	
	Forest	Trump						X	X						X <sup>b</sup>		3	
	Langlade	Sawyer			P <sup>b</sup>	X		X	X	P <sup>b</sup>	X <sup>b</sup>		X <sup>b</sup>	P <sup>b</sup>	X		9	
	Oneida	Muskellunge	X	X									X <sup>b</sup>				3	X
	Oneida	Sweeny	X			X							X <sup>b</sup>				3	
	Price	Round	X	P <sup>b</sup>	X	X				P <sup>c</sup>							5	
	Sawyer	Barber				X <sup>b</sup>							X <sup>b</sup>				2	
	Sawyer	Evergreen	X <sup>b</sup>				X <sup>b</sup>						X <sup>b</sup>				3	
	Sawyer	Mason															0	X
	Sawyer	Windfall	X <sup>b</sup>			X <sup>b</sup>						X <sup>b</sup>					3	X
	Vilas	Big Portage		X						X			X <sup>b</sup>				3	X
	Vilas	Crab			P <sup>b</sup>		X <sup>b</sup>		X				X				4	X
	Vilas	Oxbow					X <sup>b</sup>								X		2	X
		Total	7	1	4	3	3	4	2	4	2	1	2	8	1	3	7	

X = Present

N = Previously documented along shoreline, but determined to only have the native subspecies present.

P = Pioneer population

<sup>a</sup> Priority species

<sup>b</sup> Previously undocumented

<sup>c</sup> Voucher sent to UW-Stevens Point Freckmann herbarium

## PHRAGMITES

### **Introduction**

*Phragmites australis* ssp. *australis* is a clonal wetland grass. Both a native (ssp. *americanus*) and a non-native (ssp. *australis*) subspecies of phragmites are present in North America. *Phragmites australis* ssp. *australis* is extremely invasive, growing in moist habitats and waters up to 1 meter deep as well as floating mats in deeper water. Phragmites can grow to heights of 6 meters, and densities of 200 stems per square meter. Phragmites can quickly establish dense clonal stands.

Phragmites spreads primarily by underground roots and overland runners, which can grow up to 16 feet per year. Long distance dispersal occurs via floating root fragments and wind-borne or floating seeds. Phragmites out-competes native wetland vegetation forming dense monotypic stands. Phragmites also alters hydrology and fire frequency and intensity.

Non-native phragmites poses a serious environmental risk to the freshwater estuaries of Lake Superior and inland *manoomin* (wild rice) waters. Phragmites is already common along the Lake Michigan shoreline, however it is not common in the Wisconsin and Michigan portion of the Lake Superior watershed. Considering the current limited distribution and abundance of phragmites in the Lake Superior watershed and the potential loss of coastal estuaries and nearshore open waters, phragmites is a high priority for control efforts before it spreads further and becomes too widespread to manage effectively.

Several small populations of phragmites were detected and treated in 2013 along the western shoreline of Chequamegon Bay near wastewater treatment plants (WWTPs) in Red Cliff, Bayfield, and Washburn, WI. The use of non-native phragmites in WWTPs to dewater sewage sludge (reed bed technology) is permitted by Wisconsin DNR, or EPA for tribal applications. It was initially thought that phragmites spread primarily by floating roots and rhizomes, and that it's seeds were not viable. However, recent studies suggest that seed viability is directly related to soil nutrients (Kettenring 2013). Continued surveillance and follow-up treatments will be required until these seed sources are removed. GLIFWC is actively engaged with all three communities and the permitting agencies to develop alternative species or facilities to remove these phragmites seed sources from the landscape.

Surveys conducted in 2014 detected 70 occurrences of non-native phragmites at a pioneer stage within the St. Louis River Estuary along the border of Minnesota and Wisconsin. Response planning was initiated in the fall of 2014, with initial treatment on the Wisconsin side occurring in 2015.

Additional surveillance was conducted in 2016 to continue assessment of the current distribution and abundance of phragmites in Lake Superior estuaries in Wisconsin and Minnesota, and to verify reports from prior years that lack identification to the subspecies level.

## Methods

Surveys: GLIFWC staff monitored all known sites in the Chequamegon Bay and the Wisconsin side of the St. Louis River for effectiveness of prior management efforts. In addition, staff surveyed coastal wetlands, roadsides, and areas near documented non-native phragmites. Coastal wetlands were surveyed by motor boat, canoe, roadside rights-of-way, or foot. Areas were surveyed by driving or walking slowly, surveying both sides of the road, river, or wetland shoreline.

Control: Prior treated sites along the Chequamegon Bay and the Wisconsin side of the St. Louis River estuary were treated where necessary. GLIFWC crews applied imazapyr (Habitat® or Polaris®) herbicide with back-pack sprayers or hand swiping.

All native and non-native phragmites locations were recorded wherever they were encountered. Attribute data for each site was entered in the field using a mobile phone application to document the locations of phragmites sites and control efforts. Data collected for each site included location, an estimate of the number of plants, acreage class, type of herbicide used, and an estimate of the amount of herbicide applied.

## Results

Fifty-eight prior documented non-native phragmites sites were monitored for effectiveness of management efforts. Eight Lake Superior coastal wetlands, totaling over 1,699 acres, and two industrial sites on the Minnesota side of the St. Louis River were surveyed. Over 550 miles of roadsides, trails, beaches, and shorelines were surveyed in 2016 for phragmites (Figure 4). A total of three new non-native phragmites occurrences and 39 native phragmites occurrences were detected (Figure 4). Thirty-three monitored sites and three newly detected sites received follow-up treatment in 2016 (Figure 4). Figures 5 and 6 illustrate the abundance of phragmites at each site treated and the amount of herbicide used at each site from 2013-2016.

Two phragmites reports were ground-truthed. One report was the non-native subspecies and one report was the native subspecies of phragmites. Staff also assisted Red Cliff Natural Resources Department collect 38 native and non-native phragmites samples within the Lake Superior watershed for genetic analysis to assist in determining spread from WWTPs.

GLIFWC staff continued to work cooperatively to manage non-native phragmites along the St. Louis River Estuary. Staff helped initiate and facilitate Wisconsin DNR control efforts on the Wisconsin side of the St. Louis River in 2015. GLIFWC staff were also instrumental in the creation of a new partnership with the Minnesota DNR, 1854 Treaty Authority, Fond du Lac Band, and St. Louis River Alliance to plan and conduct phragmites control efforts on the Minnesota side of the St. Louis River Estuary. GLIFWC staff are members of the technical

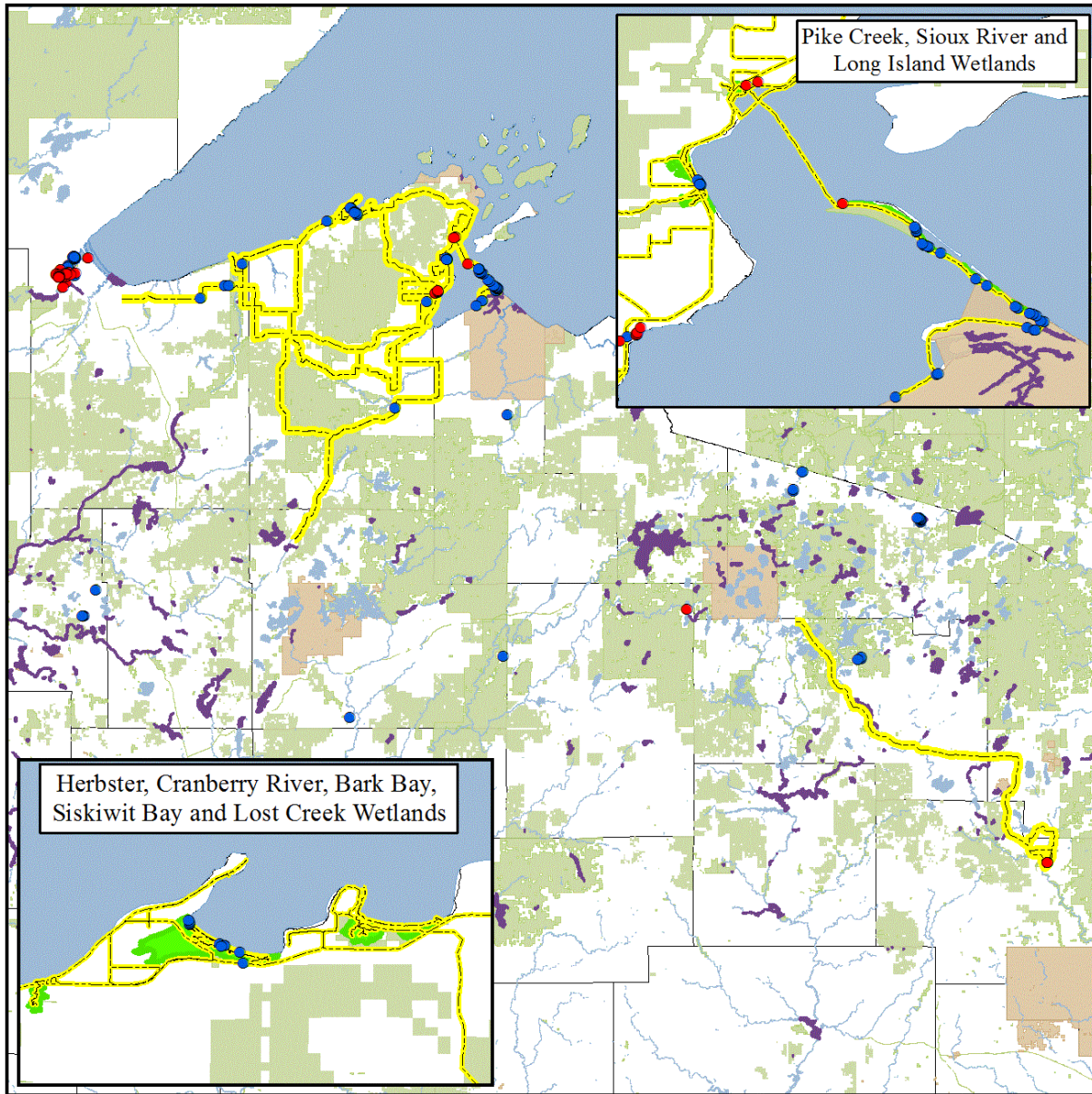


advisory team overseeing the planning and management activities. Treatment on the Minnesota side of the estuary was planned to begin in 2016 but due to permitting issues will be postponed until 2017. All phragmites occurrences that have been verified as either native or non-native were published online to coordinate appropriate responses ([data.glifwc.org/phragmites](http://data.glifwc.org/phragmites)) among management partners.

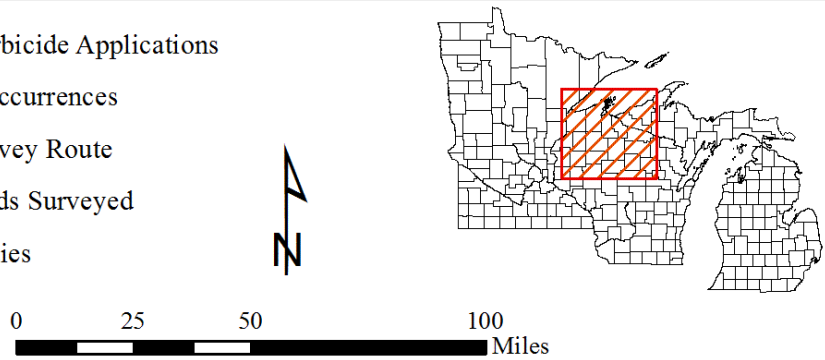
## **Discussion**

One of the newly detected sites in Chequamegon Bay in 2016 was found on the western tip of Long Island. This is the first site detected along the east side of Chequamegon Bay and confirms the threat posed to WWTPs along its western shore to the Kakagon Sloughs. Small pioneer populations of non-native phragmites appearing in Kakagon Sloughs will be challenging to detect because of the abundant native phragmites that grows there. GLIFWC staff provided a mid summer and fall training for Bad River Natural Resources staff to identify the native and non-native phragmites during the different stages of its life cycle.

In addition, Red Cliff Band's engineering contractor completed an alternatives analysis last summer. The alternative analysis recommended converting each treatment plant to use native phragmites instead of the non-native subspecies. Until a new technology is employed to dewater sewage sludge at these WWTPs, annual survey and control efforts will be required to insure that non-native phragmites does not become established within the coastal wetlands of Chequamegon Bay.



- 2016 Phragmites Herbicide Applications
- Native Phragmites Occurrences
- 2016 Phragmites Survey Route
- 2016 Coastal Wetlands Surveyed
- Manoomin Waterbodies
- Tribal Lands
- Public Lands



**Figure 4.** Distribution of *Phragmites* surveys and control efforts in 2016.

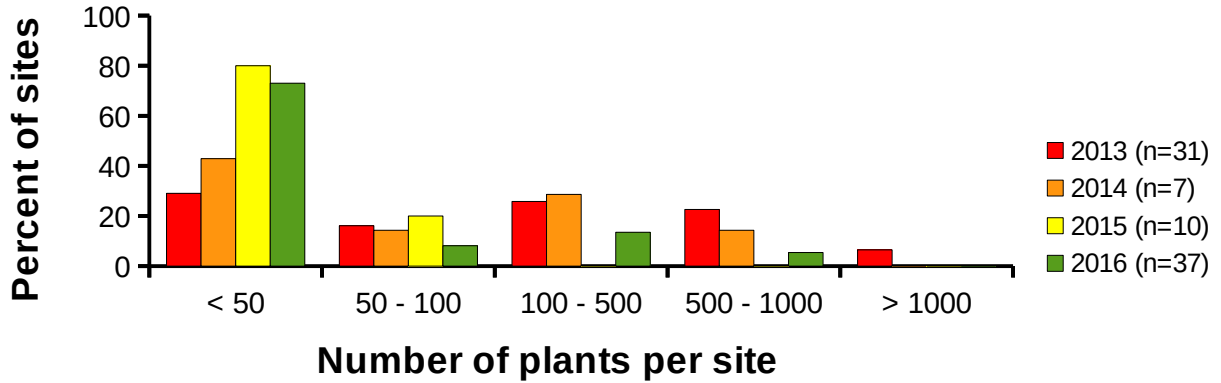


Figure 5. Abundance of non-native phragmites at sites treated in 2013-2016.

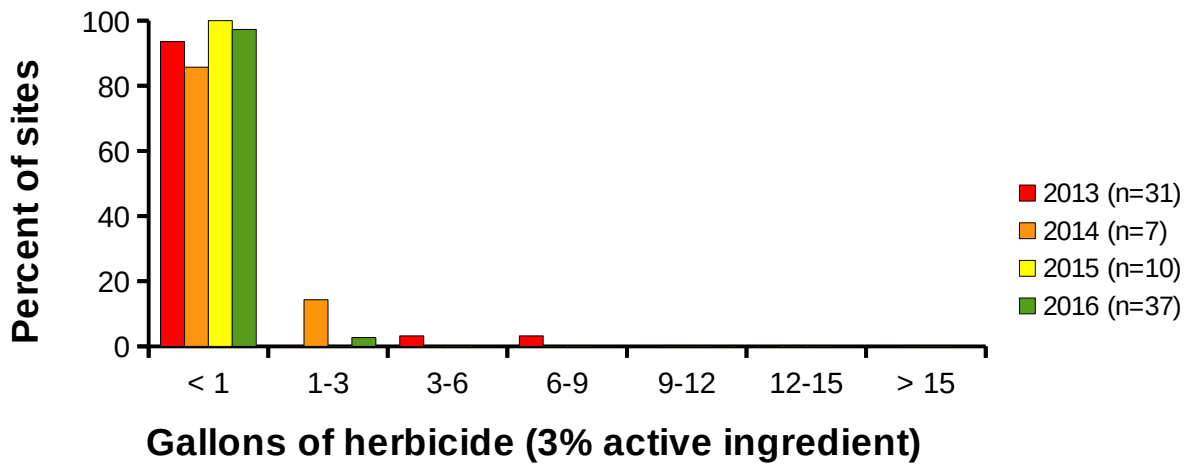


Figure 6. Amount of herbicide mix applied to non-native phragmites sites treated in 2013-2016.

## TEASEL

### **Introduction**

Common and cut-leaved teasel (*Dipsacus fullonum* L. and *D. laciniatus*) are closely related, monocarpic perennials introduced to North America and the Ceded Territory. Common teasel is native to Europe, temperate Asia, and northern Africa, while cut-leaved teasel is native to Europe and temperate Asia (Gucker 2009). Common teasel was introduced to North America as early as the 1700s, while cut-leaved teasel was established in the eastern US before 1900. Common teasel is now widely established across the continental United States. Cut-leaved teasel is primarily established in the northeastern and Midwestern US (sources in Gucker 2009). Although both species are only sparingly established in the Ceded Territory, they are locally common in southern Wisconsin and southern lower Michigan (Wisflora 2017, Voss and Reznicek 2017).

Immature teasel plants typically spend their first one to three years as rosettes. After developing a deep taproot and reaching a critical mass, they bolt, flower, produce seeds, and die. Flowering plants are very spiny and may reach more than 7 ft tall (sources in Gucker 2009). Each plant may produce over 3,000 seeds. The seeds float and are readily spread by water. Teasels produce a fairly short-lived seed bank, with very few seeds surviving beyond 5 years in the soil. Teasel often spreads rapidly along roadsides, presumably aided by mowing equipment and snow plows (Stolp and Cochran 2006, Gucker 2009).

Dry teasel stalks and seedheads persist well into the winter. These seedheads are frequently used in dry-flower arrangements and other decorations. Dispersal from dried seedheads has likely initiated the establishment of numerous new populations (sources in Gucker 2009). Teasel tends to be common in and around cemeteries, presumably originating from floral arrangements left there.

Both teasel species readily invade sunny, disturbed habitats including roadsides, dumps, seeps, ditches, fencelines, and fields. Both tolerate dry to fairly wet soils. Prairie, savanna and sedge meadow communities are the natural communities most at risk (Annen 2007). Prairie and savanna communities are some of the most endangered habitats on the continent.

Common and cut-leaved teasel are listed as “prohibited” under Minnesota’s Noxious Weed Law (MN Statutes 18.75-18.91). It is illegal to transport or sell teasel without a permit in Minnesota, and landowners must make a good-faith attempt to control or eradicate it on their property. Both species are also listed as “restricted” invasive species under Wisconsin’s invasive species rule (Wis. Adm. Code chapter NR 40). This means they can be possessed and cultivated in Wisconsin, but cannot be knowingly transported, transferred to another party, or introduced to a new site without a permit.

## Methods

*Surveys:* Locations of reported teasel sites were acquired from GLIFWC staff and Northwoods Cooperative Weed Management Area (NCWMA) cooperating agencies. Sites were confirmed by GLIFWC staff and areas around the vicinity were surveyed focusing on common vectors and pathways for spread (roadsides, trails, utility corridors, etc). Individual sites were flagged with a site number to assist with management efforts.

*Control:* GLIFWC crews controlled populations by manual or chemical treatment or a combination of both, depending on site size and landowner's preference. Manual treatment was conducted by cutting the taproot below the soil surface using a sharp spade. Application of metsulfuron methyl (Escort®) herbicide was used for chemically treating sites. After initial treatment, sites were monitored to determine if a second treatment was warranted.

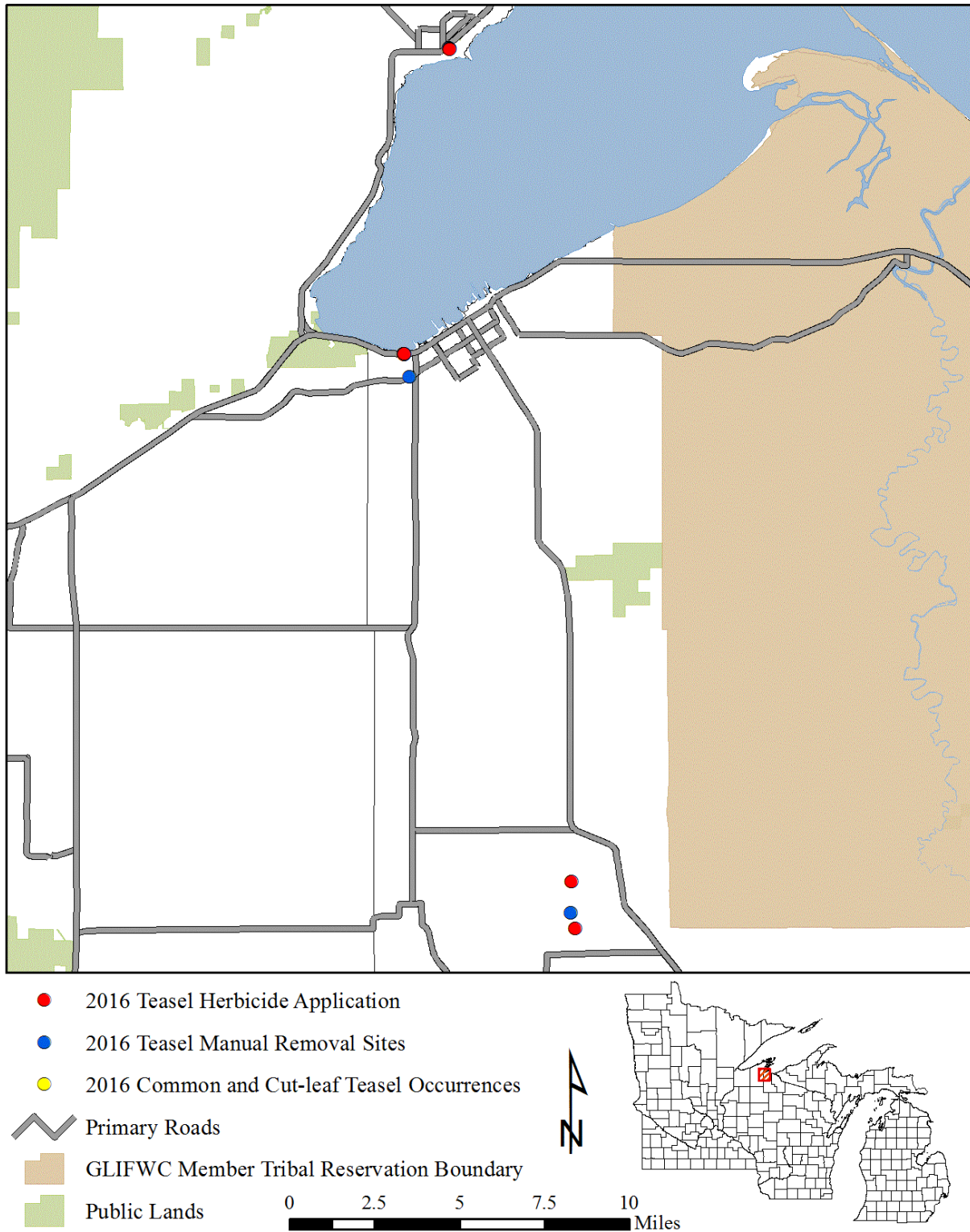
Attribute data for each site was entered in the field using a mobile phone application to document the locations of teasel sites and control efforts. Data collected for each site included location, an estimate of the number of plants, acreage class, type of control used (chemical or manual), and an estimate of the amount of control applied.

## Results

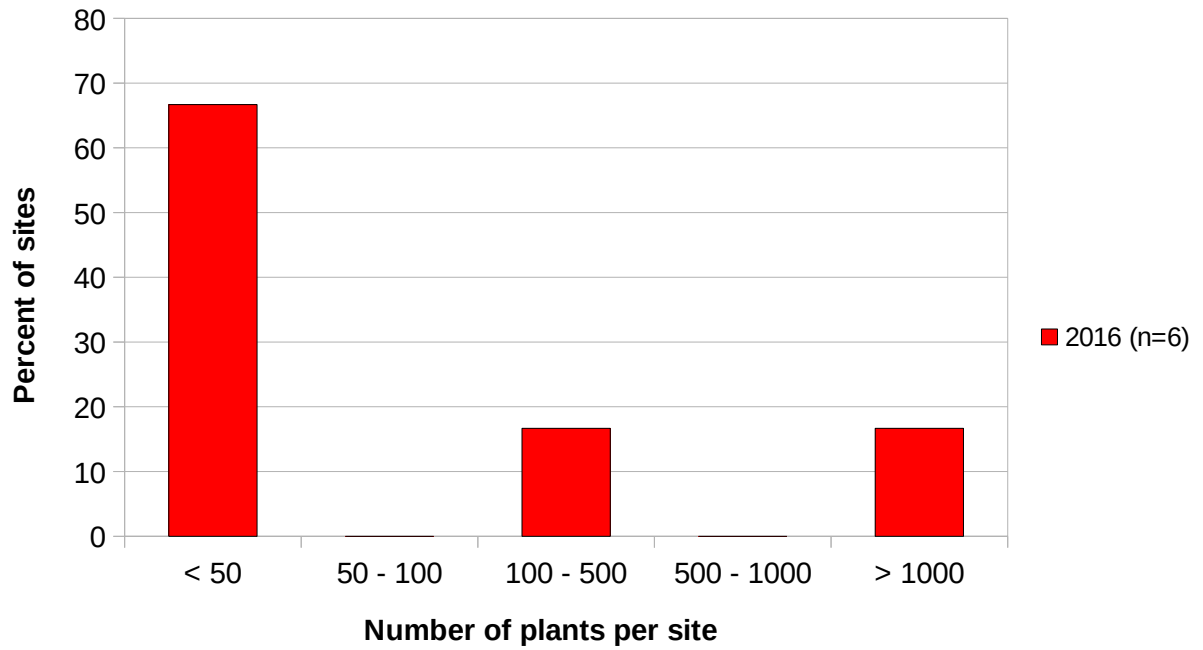
In 2016, six common or cut-leaf teasel occurrence sites were detected and treated. Four, small sites were manually treated, one site was treated with herbicides and one was initially manually treated with follow-up chemical treatment. Figure 7 illustrates the distribution of detected occurrences and control efforts in 2016. Figures 8 illustrate the abundance of teasel at each site treated.

## Discussion

With only six known locations in northern Wisconsin, and ease of control due to teasel's lifecycle, this species is a high priority for eradication before it becomes too widespread, environmentally damaging and reduces the chance for effective control. This species is a priority species for the NCWMA. One additional location was detected by partners during the 2016 season near the northern portion of the Bayfield peninsula. Cooperating agencies were quick to respond and to manually treat the site.



**Figure 7.** Distribution of common and cut-leaf teasel occurrences and control efforts in 2016.



**Figure 8.** Abundance of common or cut-leaf teasel at sites treated in 2016.

## WILD PARSNIP

### **Introduction**

Wild parsnip (*Pastinaca sativa* L.) is native to Eurasia. It is the wild ancestor of the cultivated garden parsnip, and wild and cultivated strains can freely cross. It was introduced into North America at Jamestown, Virginia in 1609 (Berenbaum et al. 1984). It has probably been established in eastern North America for more than two centuries, reaching Michigan by 1838 (Voss and Reznicek 2017) and Wisconsin by 1894 (Wisflora 2017). Wild parsnip is now found across the US and adjacent Canada, except for the extreme southeastern US. It is locally common across the upper Great Lakes region.

Wild parsnip is a taprooted biennial or monocarpic perennial, growing for two or more years before it bolts, flowers, and dies. Immature plants form a rosette. Flowering plants are typically around 3 ft tall, though may reach 5 ft tall. Like other members of the parsley family, wild parsnip produces flat-topped flower clusters called umbels. The golden-yellow flower clusters may reach 4-8 inches across. Plants typically bolt in June and flower in July. The seeds are about 1/4 inch long, flat, elliptic, and slightly winged. Unless dislodged, the seeds tend to remain attached to the dead stalk well into autumn.

Wild parsnip does well along moist to dry roadsides, old fields, clearings, power line corridors, and other sunny, disturbed areas. It also invades open streambanks and cut-over woods. Mowing and snow-plowing likely facilitate its spread along roadsides.

Like some other members of the parsley family, wild parsnip produces chemicals that cause photodermatitis, characterized by blistering and discoloration of the skin when exposed to sunlight (Berenbaum et al. 1984). Photodermatitis can be severe, especially in susceptible individuals.

Wild parsnip is abundant at a number of sites in northern Wisconsin and the western Upper Peninsula (S. Garske, pers. obs.). It is a high priority for control for GLIFWC and the NCWMA and partners.

### **Methods**

Surveys: GLIFWC staff surveyed roadsides, utility corridors and areas near prior wild parsnip reports. Locations of previously reported sites were acquired from prior GLIFWC surveys, Bad River Natural Resources Department, Ashland and Iron County Land and Water Conservation Departments (LWCD) and other cooperating agencies. Rights-of-way were surveyed by walking or driving slowly along roadside or path, surveying both sides of corridor. Individual sites were flagged with a site number to assist with management efforts. If populations were spreading



along a distance of a road or trail, start and end points were flagged.

After monitoring was completed, occurrence data and site maps were shared with partners including Bad River Natural Resources Department, Ashland, Bayfield, and Iron County Land and Water Conservation Departments and the City of Ashland to coordinate follow-up management efforts.

*Control:* GLIFWC crews applied metsulfuron methyl (Escort®) herbicide to wild parsnip rosettes in the spring and fall. Spring treatments targeted all age class plants and fall treatments focused on rosettes that did not bolt in 2016.

Attribute data for each site was entered in the field using a mobile phone application to document the locations of wild parsnip sites and control efforts. Data collected for each site included location, an estimate of the number of plants, acreage class, type of control used (chemical or manual), and an estimate of the amount of control applied.

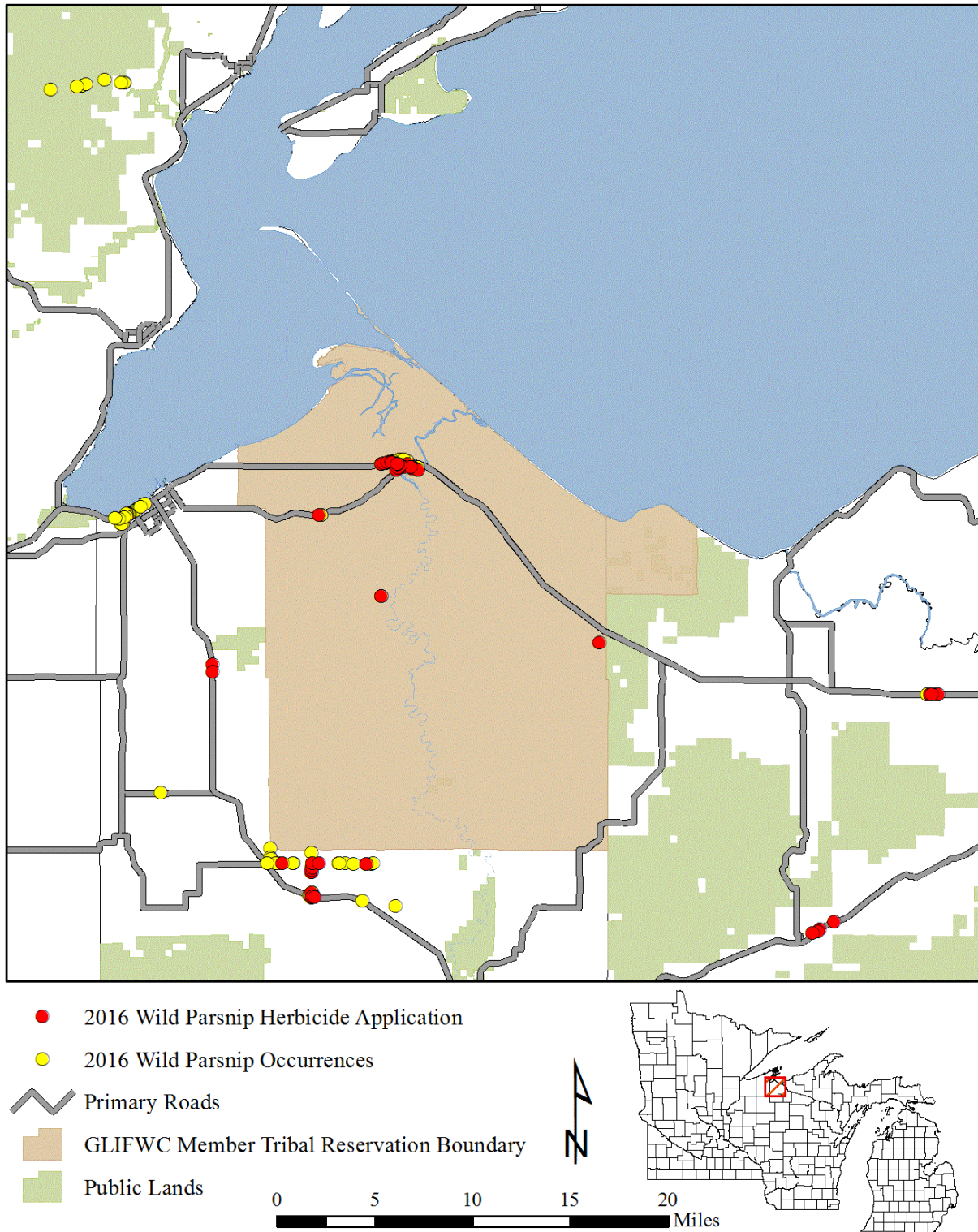
## **Results**

A total of 109 wild parsnip occurrences were detected. In 2016, 54 of those sites received follow-up treatment by GLIFWC staff (Figure 4). Fifty-three sites were treated with herbicide and one was manually pulled. Figure 9 illustrates the distribution of detected occurrences and control efforts in 2016. Figures 10 and 11 illustrate the abundance of wild parsnip at each site treated and the amount of herbicide used at each site in 2016.

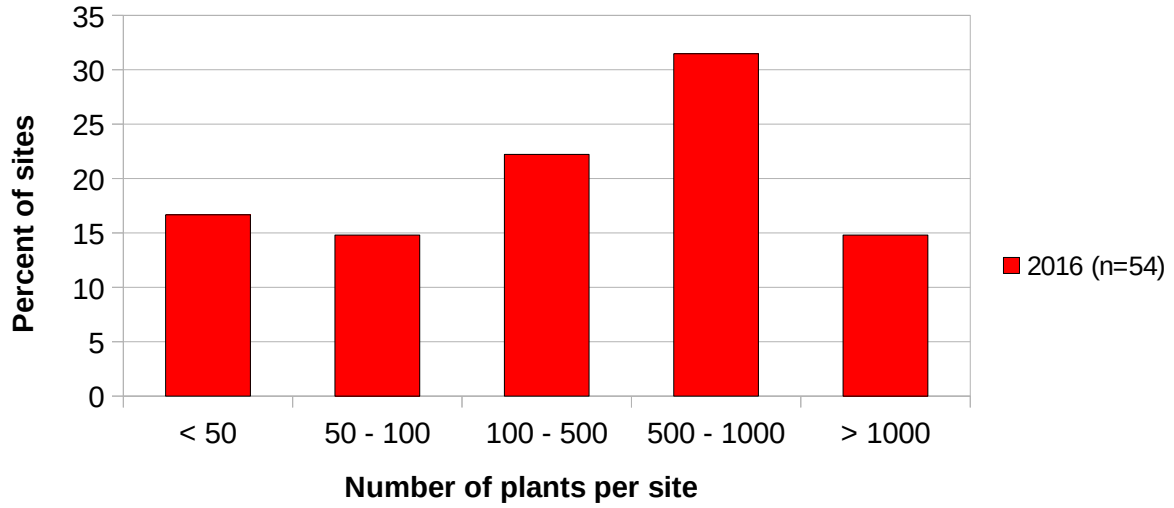
## **Discussion**

While GLIFWC lead the survey efforts for wild parsnip, follow-up treatment was conducted in cooperation with multiple partners. The city of Ashland and Ashland County LWCD lead treatment efforts for the sites in the City of Ashland. Iron County LWCD organized cooperative treatment days to treat the sites near the town of Upson. Of the 54 sites that GLIFWC treated, 32 of those sites were treated in cooperation with Bad River Natural Resources staff on the Bad River reservation. GLIFWC crews treated 15 sites in Ashland County near the town of Marengo. Due to severe flooding, which caused washouts, erosion and limited access to sites after flood waters receded, the remaining sites were not treated. Follow up monitoring is planned for 2017 to determine the impacts of the flood on wild parsnip distribution.

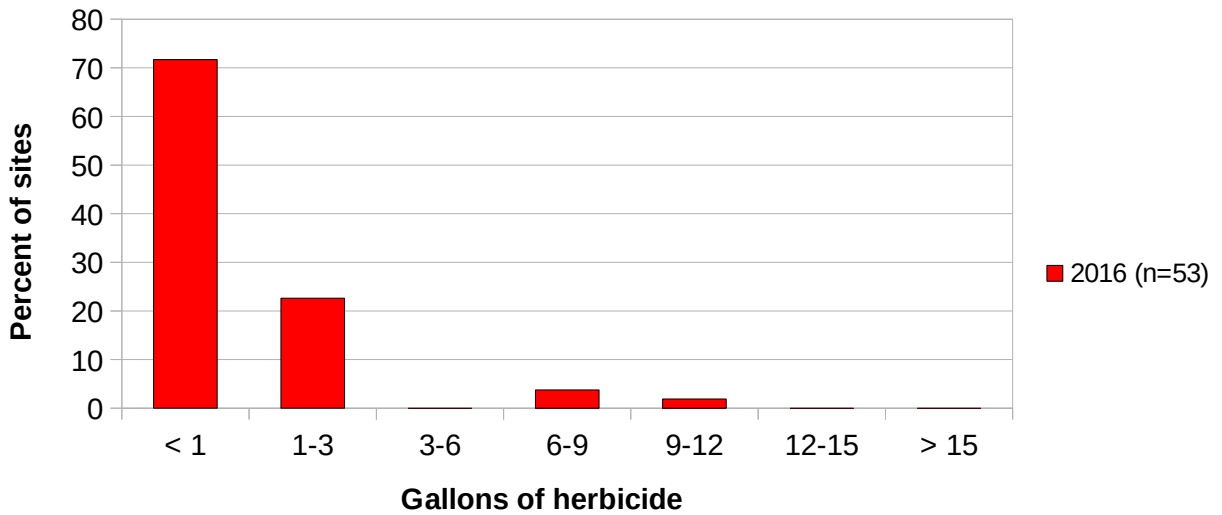
Additional populations were documented later in the season in Bayfield County. Plans for 2017 include monitoring these sites and including in treatment efforts.



**Figure 9.** Distribution of wild parsnip and control efforts by GLIFWC in 2016.



**Figure 10.** Abundance of wild parsnip at sites treated by GLIFWC in 2016.



**Figure 11.** Amount of herbicide mix applied to wild parsnip sites treated by GLIFWC in 2013-2016.

## CONTROL AND MANAGEMENT

When invasive species become established, the most effective action may be to prevent their spread or minimize their impacts through control measures. Integrated pest management (IPM) uses the most effective method or combination of methods while taking into consideration the cumulative environmental impacts. Methods may include manual, chemical and biological control.

### GARLIC MUSTARD

#### **Introduction**

Garlic mustard [*Alliaria petiolata* (Bieb.) Cavara & Grande] is a shade-tolerant, highly invasive forest herb native to Europe. All parts of the plant smell like garlic. It was likely introduced to North America by early European colonists, as a medicinal and salad plant. First recorded outside cultivation on Long Island, New York in 1868 (Nuzzo 1993), it is now widely established and locally abundant in the eastern and midwestern US and in adjacent Canada, and occurs in scattered locations in western North America as well (USDA-FHTET 2014).

Garlic mustard is a strict biennial. In cold temperate climates including the ceded territory, most seed lays dormant for about 20 months, germinating in early spring of the second year (Cavers et al. 1979). A small percentage of seeds may remain dormant for up to 5 years and possibly longer.

Garlic mustard plants spend their first year as rosettes, with each plant developing a slim white taproot that often forms a shallow "S" shape just below the base of the shoot. Rosettes bolt and flower in the spring of their second year, producing stalks up to 3 ft or more tall. Clusters of small, white, 4-petaled flowers are produced from mid-May through June, with seed pods ripening in June and early July. It is not unusual to see plants 2 inches tall flowering and producing seed (S. Garske, pers. obs.).

Although tolerant of sunny habitats, garlic mustard grows best in light to moderate shade, and is quite capable of growing and reproducing in deep shade. It prefers moist, well-drained soil, but tolerates a wide variety of soil conditions from wet clay to well-drained sandy soil (Cavers et al. 1979). Like most mustard family (Brassicaceae) members it is intolerant of very acid soils (Grime et al. 1988). It does well on seasonally inundated habitats such as floodplains. Common habitats include moist to wet riverbanks, floodplains, woodland edges, and interior woods.

Garlic mustard plants are green all their lives. The rosettes resume growth within days after snow melt, when most native forest plants are still dormant. Thus the two-week period just after snow melt is an excellent time to look for new patches, and to treat existing patches with herbicide.

Scattered small to moderate-sized populations of garlic mustard probably grow undetected across

much of the ceded territory. GLIFWC invasive plant surveys in northern Wisconsin in the mid- to late 2000s revealed at least two dozen small patches growing in flowerbeds, in yards and adjacent woods, in campsites (usually at the back of the site, where people unload their equipment), and along back roads. Dozens of small sites have also been found in the Ottawa National Forest (ONF) and the western UP (Ian Shackelford, ONF botanist, pers. comm., S. Garske, pers. obs.). Eradication is possible at many of these sites, given landowner cooperation and a sustained effort over a period of years.

Large garlic mustard populations are apparently still rare in northern Wisconsin and the UP. Known infestations include one around the former WDNR fish hatchery ponds on the northwest side of Presque Isle in Vilas County, Wisconsin, and another along the Montreal River, which forms the border of Wisconsin and the UP of Michigan. A third occurs along the Bad River floodplain from upstream of Mellen to just downstream of Mellen, near the southern border of Copper Falls State Park. The Presque Isle population was treated by volunteers for a number of years, until the town began funding a professional weed control specialist. Garlic mustard numbers there have been reduced to a small fraction of what they once were, but the population has not been completely eradicated. The Montreal River population is being controlled by a coalition that includes GLIFWC, the Wisconsin DNR and volunteers, with the Ottawa National Forest leading the effort.

The Bad River population may be the most extensive population known in northern Wisconsin. Since its discovery in 2007, a broad spectrum of groups and individuals including the Wisconsin DNR, GLIFWC, the NCWMA, Bad River Head Start students, school groups from Ashland and Mellen, and local volunteers have battled this infestation. The infestation has been controlled with manual pulling of second-year plants in spring, follow up by spring herbicide treatment and then fall herbicide treatment of remaining rosettes. This effort has reduced the numbers of plants in the treatment area to a small fraction of the original number, and turned dense carpets of garlic mustard into scattered plants amid a diversity of mostly native vegetation. Unfortunately the area infested by garlic mustard appears to be roughly the same (S. Garske, pers. obs.). Even more disappointingly, a systematic survey for garlic mustard by GLIFWC and the US Forest Service in 2016 revealed extensive infestations for several miles upstream of the treatment area.

In favorable habitats garlic mustard is a transformative species, forming nearly monotypic carpets that largely displace the native plant community, eliminate the food and habitat for native insects and other invertebrates, and alter the habitat for birds and mammals that depend on native ecosystems for survival (Nuzzo 1993). Ongoing research into possible biological control organisms has resulted in the identification of four weevil species (Coleoptera: Curculionidae) that show promise of being both host-specific and effective in controlling garlic mustard (USDA-FHTET 2014).

## **Methods**

Surveys: GLIFWC and other partnering agencies monitored known sites in northern Wisconsin prior to management efforts. GLIFWC staff surveyed the known sites in the city of Ashland and sites along the Bad River floodplain in the city of Mellen. Areas around known sites were surveyed to ensure the full distribution was known. Pathways for spread were surveyed including trails, utility corridors, roads, floodplains, etc. Individual sites were flagged with two flags each with the same site number to assist with management efforts.

Attribute data for each site was entered in the field using a mobile phone application to document the locations of garlic mustard sites. Data collected for each site included location, an estimate of the number of plants and acreage class. GLIFWC shared distribution data with management partners and cooperators for coordinated follow up management.

Control: Sites were manually controlled in the spring by hand pulling second year plants. By targeting second year plants, it reduces seed production at the site. Follow up fall treatment was conducted by applying triclopyr (Garlon 4®) herbicide with back-pack sprayers, targeting first year rosettes after the native plants were dormant.

After sites were manually or chemically controlled, the site flagging that was placed during surveys was removed and the site number documented.

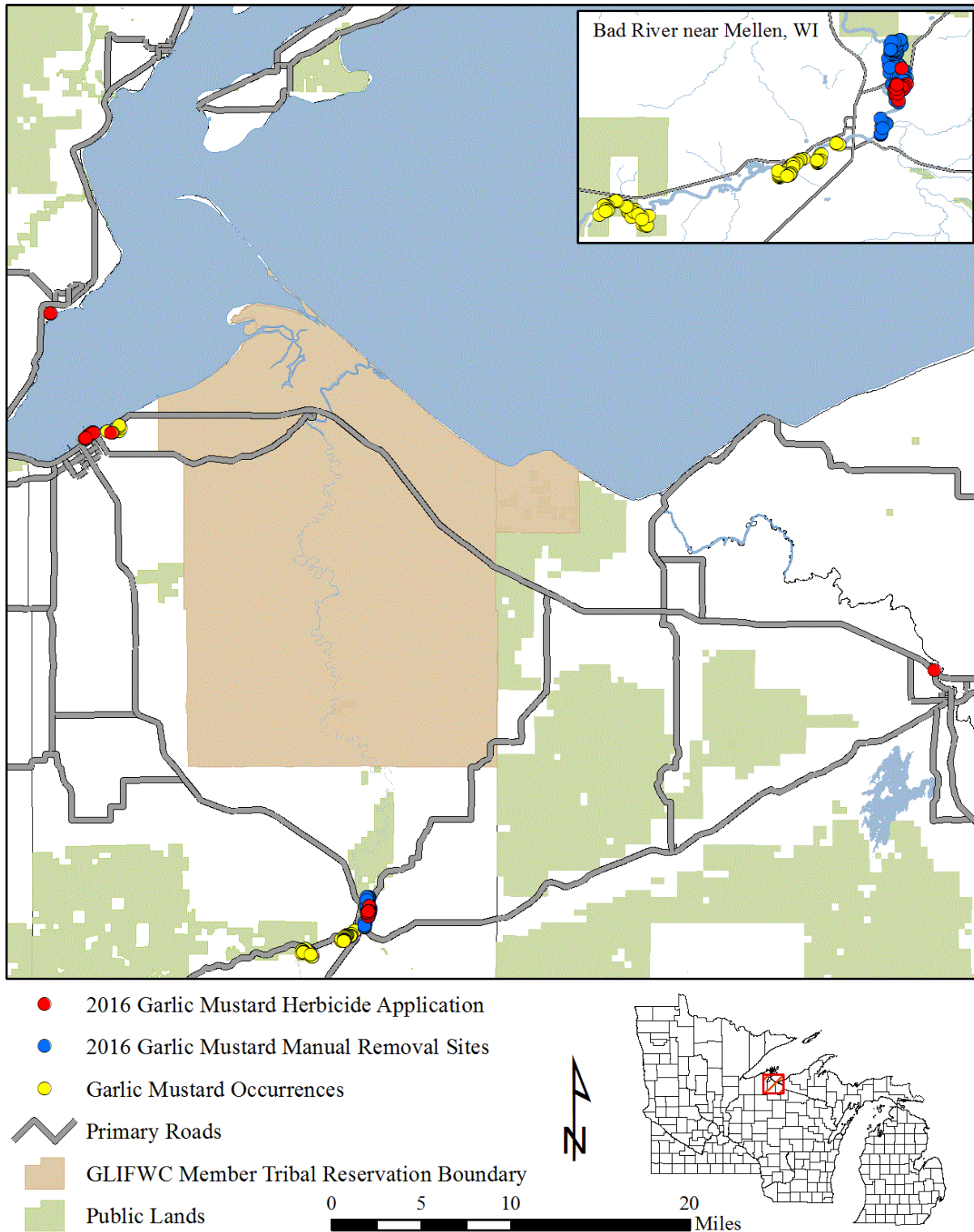
## **Results**

A total of 234 garlic mustard occurrences were detected. Of those sites, manual control was conducted on 147 sites and chemical on 24 sites. Figure 12 illustrates the distribution of detected occurrences and control efforts in 2016. Figures 13 illustrates the abundance of garlic mustard at detected sites.

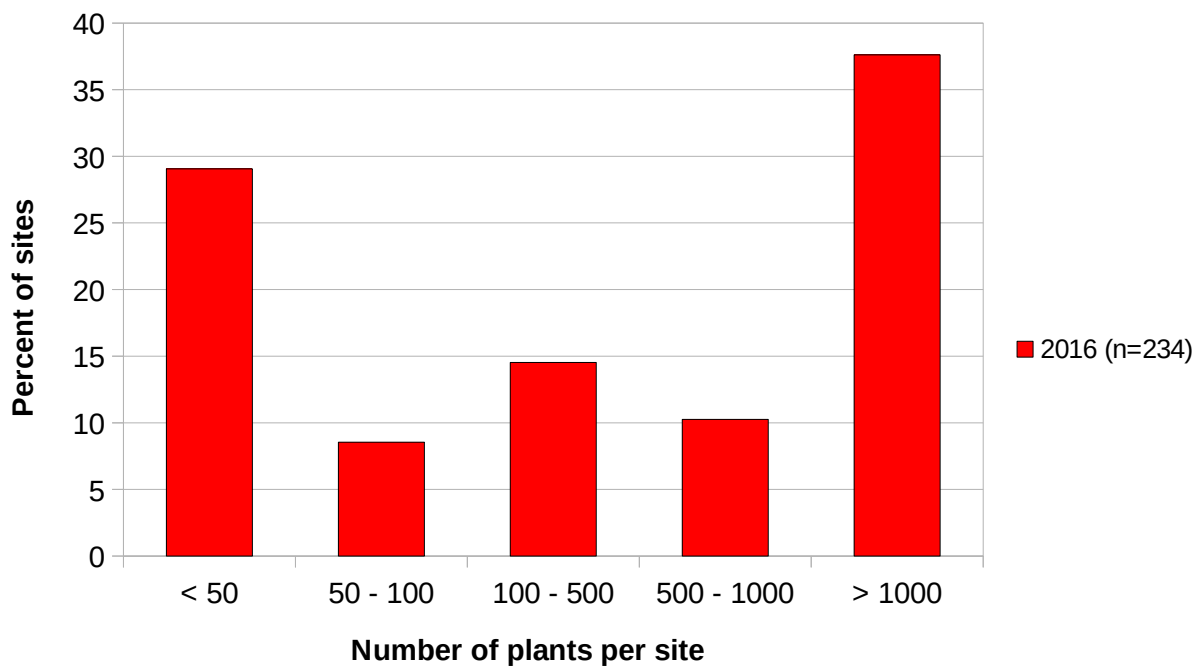
## **Discussion**

Garlic mustard was once considered an early detection rapid response species by GLIFWC. Due to the increase in number of detected infestations and expansion of known sites, eradication does not seem feasible. This species poses huge potential impacts to treaty resources, so it will continue to be a high priority for management efforts including containment and eradication where possible.

While GLIFWC took the lead for survey and management efforts along the Bad River in Mellen and the city of Ashland, NCWMA cooperators lead management efforts on multiple additional sites. GLIFWC staff assisted in spring manual and fall herbicide application along the Montreal River in Iron County and spring treatment in Washburn along the Lake Superior shoreline. NCWMA cooperators are also taking the lead on additional sites that were found at the City of Bayfield's composting facility and near Lake Namekagon in Bayfield County in 2016.



**Figure 12.** Distribution of garlic mustard integrated management efforts in 2016.



**Figure 13.** Abundance of garlic mustard at documented occurrence sites in 2016.



## PURPLE LOOSESTRIFE

### **Introduction**

Purple loosestrife is a perennial, herbaceous wetland plant native to Europe. It arrived in eastern North America in the early 1800's via plants brought by settlers, seeds carried within livestock, and in ballast soil carried by ships (Thompson *et al.* 1987). Its current distribution includes much of the U.S. and southern Canada.

Purple loosestrife can germinate in moist, exposed soils and tolerates a wide range of pH, nutrient, and light levels. Once established, seedlings can survive shallow flooding. The plant develops a large root crown and dense shoots that out-compete adjacent plant life. The stalks are square and commonly attain heights up to 2m on mature plants. The distinctive flowering spike of purple loosestrife blooms from mid July through early September in the upper Great Lakes region.

Purple loosestrife degrades wetland habitats by out-competing native vegetation. On exposed substrates, purple loosestrife seeds germinate at such a high density that they out-compete native vegetation. The herbivores and pathogens that keep loosestrife from dominating European wetlands are absent in North America. This lack of natural enemies combined with prolific seed production gives purple loosestrife a substantial advantage over native vegetation. Diverse wetland plant communities can quickly be displaced by monotypic stands of purple loosestrife. Reductions in native plant diversity result in a loss of food and shelter for the numerous insect, amphibian, mammal, and bird species that depend on healthy wetlands for their survival.

### **Methods**

GLIFWC's integrated control efforts continued to focus on purple loosestrife within the Bad River/Chequamegon Bay watershed in northern Wisconsin. Small sites (< 0.5 acres) in upper reaches of the watershed were prioritized for chemical control. Control crews applied triclopyr (Garlon 3A® or Renovate®) to purple loosestrife plants. Renovate® is approved for over-water use and was used on sites with standing water, while Garlon 3A® was used where standing water was absent. Triclopyr is dicot-specific, allowing grasses and sedges to persist and re-colonize sites in a shorter time period. Chemical control efforts focused primarily on road rights-of-way between Mellen and Bayfield, Wisconsin. Private properties were also treated after consent forms were signed by the landowner.

Large sites (> 1 acre) and sites with poor access were a high priority for biological control. The release of *Galerucella* beetles (native to Europe) in the United States for biological control of purple loosestrife was approved by USDA - APHIS in 1992. GLIFWC has been rearing and releasing *Galerucella* beetles and collecting and redistributing them in the watershed since 2000. Release sites from prior years were visited in late summer to ascertain overwinter survival and to

take site photos documenting the effects of beetle herbivory.

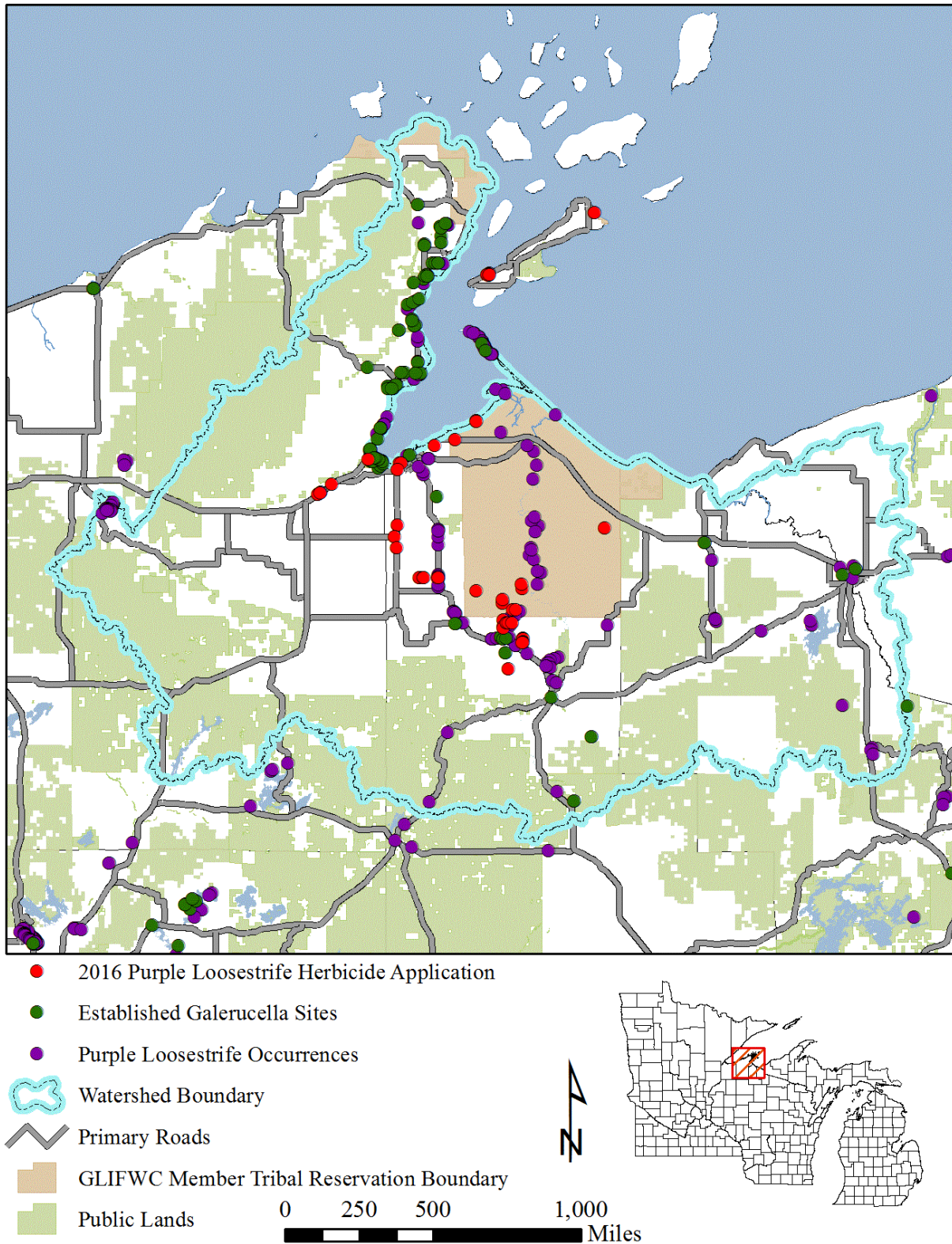
Treated sites were mapped using a mobile phone application to document the locations of purple loosestrife sites and control efforts. Attribute data collected for each site included an estimate of the number of plants, acreage class, type of control used (chemical or biological), and an estimate of the amount of control applied.

## **Results**

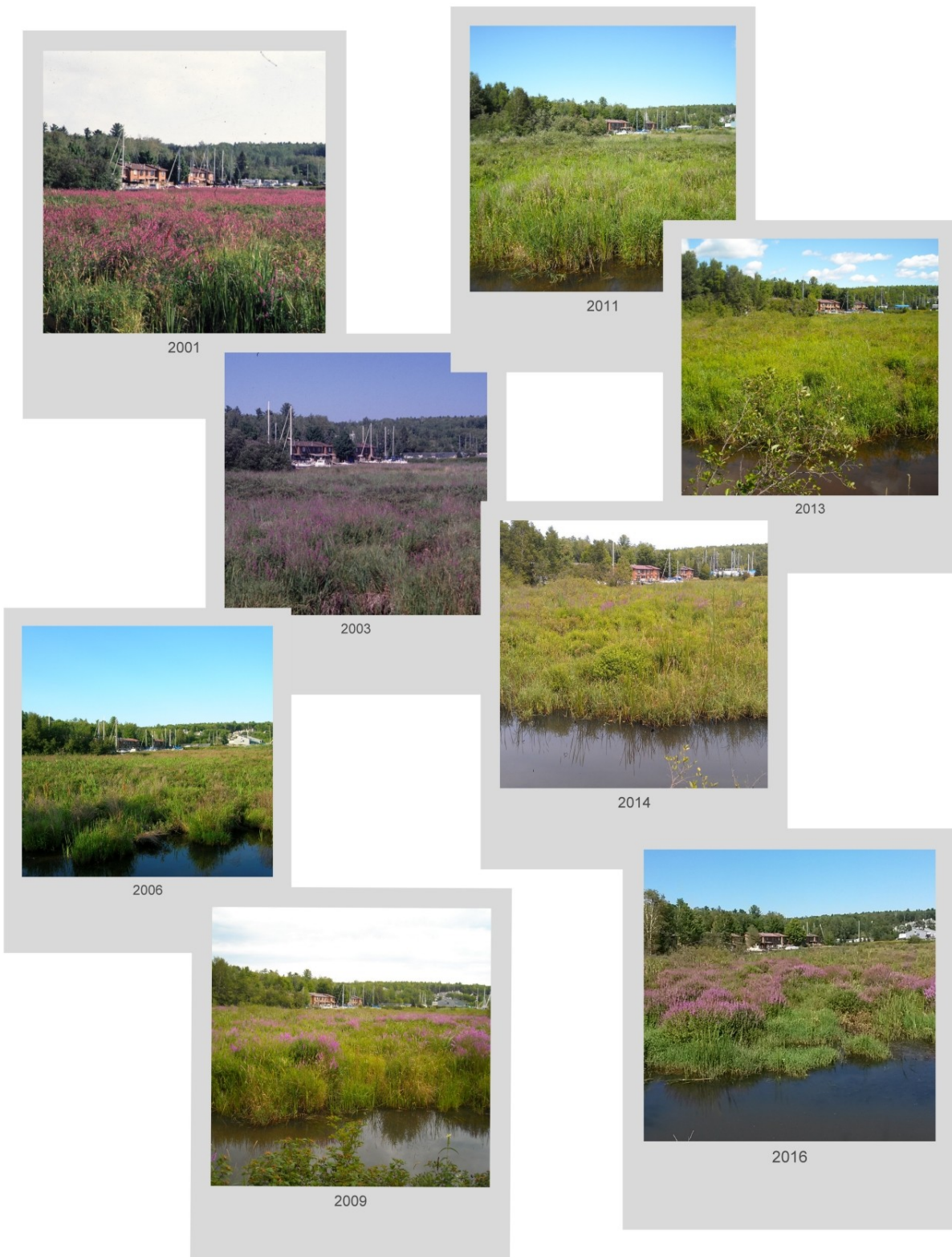
In 2016, GLIFWC staff treated 53 purple loosestrife sites with herbicide and one site manually. Figure 14 illustrates the distribution of biological and chemical control efforts for purple loosestrife. Biological control efforts since 2000 have established over 60 *Galerucella* populations throughout the Bad River – Chequamegon Bay watershed and site visits continue to document their impacts (Figure 15).

## **Discussion**

The use of biological controls has allowed GLIFWC's control crew to place greater emphasis on treating small populations with herbicide before they become significant source populations (Figure 16). This strategy also reduces the amount of herbicide applied at each site (Figure 17). Biological control has been effective in general throughout the watershed, although results vary with size, disturbance, native seed bed quality, weather, and wetness of the site. Typically, *Galerucella* beetles take some time to build up large enough populations to have an impact on purple loosestrife abundance, but then they overshoot their food source and both purple loosestrife and *Galerucella* populations crash. However, the beetles do not eradicate their host plant, and the purple loosestrife population rebounds. This is followed by a resurgent *Galerucella* population, although subsequent loosestrife abundance peaks at a lower level before the beetle population catches up enough to reduce it again. This sequence is evident in annual mid-August photos taken at a site south of Bayfield, Wisconsin (Figure 15).



**Figure 14.** Distribution of purple loosestrife control efforts in 2016.



**Figure 15.** *Galerucella* release site south of Bayfield, WI.

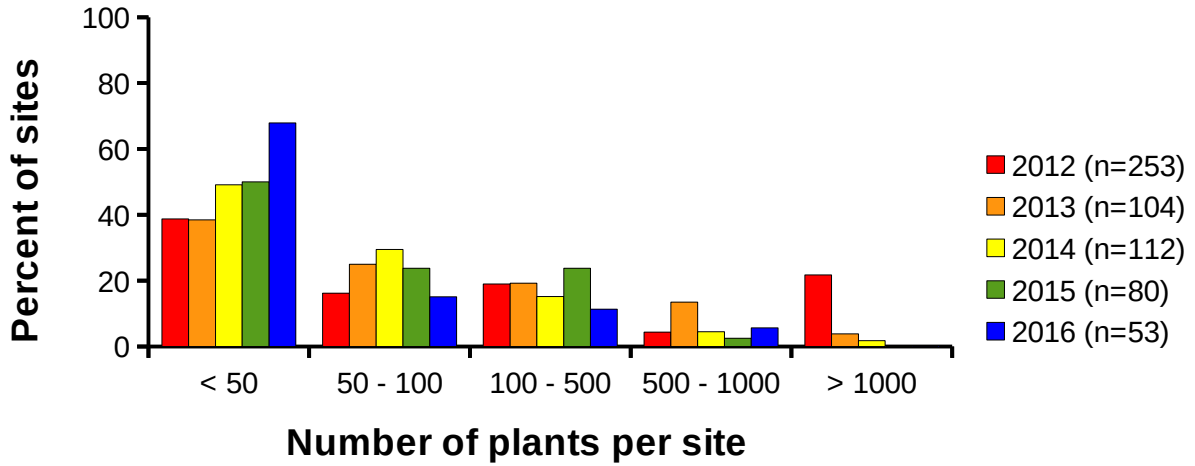


Figure 16. Abundance of purple loosestrife at sites treated in 2012-2016.

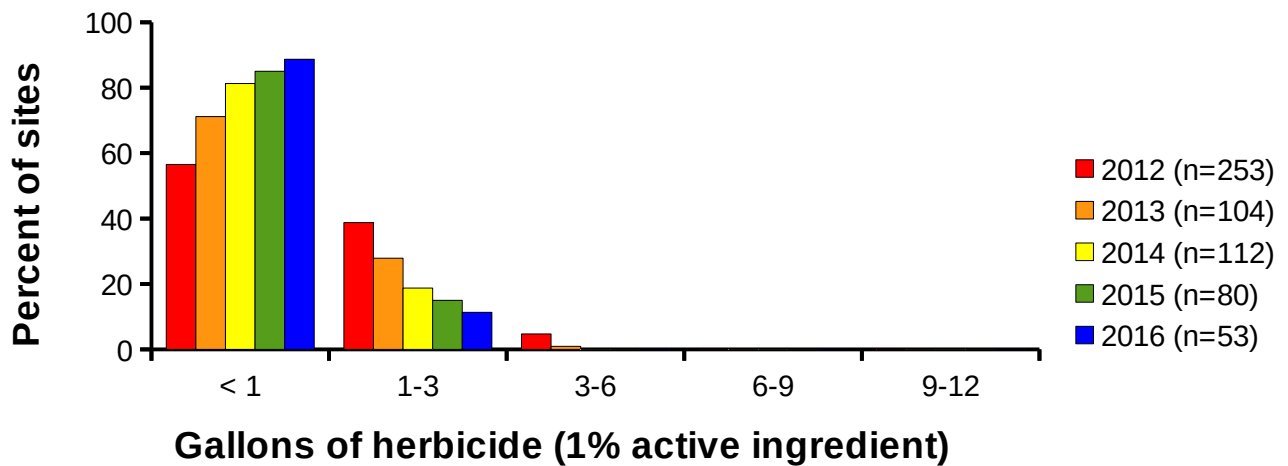


Figure 17. Amount of herbicide mix applied to purple loosestrife sites 2012-2016.

## RESEARCH

### Introduction

New invasive species continue to be introduced to ceded territory habitats and new management techniques are always being developed to reduce their spread. Research is required to address gaps in knowledge as they become evident, especially with respect to understanding potential impacts of invasive species and identifying or informing selection of cost-effective management actions.

### Accomplishments

Activities in 2016 included:

- Staff attended a variety of conferences, webinars and workshops to continue to stay informed about new invasive species making their way to the ceded territories, new prevention and monitoring measures, research and new management techniques. Events that staff attended in 2016 included:
  - Wisconsin First Detector Network webinar, “Biological control of invasive species, an overview of the concept, regulation and future of this method of control of invasive species”, April 22, 2016.
  - Wisconsin statewide identification and disinfection training, May 11, 2016, Wausau, WI.
  - Herbicide Use Training and Invasive Plant ID Workshop, May 23, 2016, Ashland WI.
  - Aquatic Plant Identification Class, June 28, 2016, Kemp Field Station, Minocqua, WI.
  - Upper Midwest Invasive Species Conference, October 17-19, 2016, LaCrosse, WI.

## COOPERATION AND COORDINATION

### Introduction

Because invasive species disperse widely across the landscape and administrative boundaries, it is necessary to work cooperatively to achieve success. In addition, the introduction and spread of new invasive species in the region continues to out-pace control activities, and is too much for any one agency to manage alone. GLIFWC strives to coordinate its activities with invasive species management partners to maximize the efficient use of limited resources. Management partners include Tribes, federal and state conservation agencies, county governments, municipalities, universities, and non-government organizations.

### Accomplishments

GLIFWC staff are actively engaged in several long-term initiatives that seek to enhance inter-agency cooperation and coordination of invasive species management and planning:

***Northwoods Cooperative Weed Management Area (NCWMA):*** Formally established in 2006, NCWMA provides a forum to share information, collaborate on planning and cooperate on management activities in Douglas, Bayfield, Ashland, and Iron Counties in northern Wisconsin. In 2016, GLIFWC staff worked with the NCWMA partners to organize several garlic mustard control days in Ashland, Bayfield and Iron Counties, monitored giant hogweed sites in Iron County, shared herbicide with partners for wild parsnip control activities and participated in wild parsnip control efforts in Iron County. GLIFWC staff also assisted in developing a priority list of garlic mustard boot brush station locations based on vector routes to contain and prevent the spread of garlic mustard along the Bad River.

***Wisconsin Headwaters Invasives Partnership (WHIP):*** Formally established in 2010, WHIP provides a forum to share information, collaborate on planning, and cooperate on management activities in Vilas and Oneida Counties in northern Wisconsin. GLIFWC has a history of surveying inland waters in Vilas and Oneida Counties for AIS and sharing the findings with WHIP partners.

***St. Croix National Scenic Riverway Comprehensive Interstate Management Plan for the Prevention and Control of Aquatic Nuisance Species:*** Completed in March of 1998 in cooperation with the Lower St. Croix Management Commission, Minnesota Department of Natural Resources, Minnesota-Wisconsin Boundary Area Commission, National Park Service, Wisconsin Department of Natural Resources, U.S. Fish and Wildlife Service, and the Upper St. Croix Management Commission. This plan makes GLIFWC eligible for funding from the U.S. Fish and Wildlife Service to implement tasks identified in the plan and helps facilitate cooperation on AIS issues within the St. Croix watershed.

**Wisconsin's Comprehensive Management Plan To Prevent Further Introductions and Control Existing Populations of Aquatic Invasive Species:** Completed in cooperation with the Wisconsin Department of Natural Resources and UW-Extension in September of 2003, this plan makes GLIFWC eligible for funding from the U.S. Fish and Wildlife Service to implement tasks identified in the plan and helps facilitate cooperation with the WDNR on AIS issues.

**Phragmites Management and Cooperation in the Lower St. Louis River Estuary:** In 2014, GLIFWC staff facilitated a multi-agency meeting to share results from surveys and coordinate follow up monitoring and control efforts for non-native phragmites along the Lower St. Louis River. In 2016, GLIFWC staff continued to work cooperatively to manage non-native phragmites along the St. Louis River Estuary. GLIFWC staff were instrumental in the creation of a new partnership with the Minnesota DNR, 1854 Treaty Authority, Fond du Lac Band, and St. Louis River Alliance to plan and conduct phragmites control efforts on the Minnesota side of the St. Louis River Estuary. In 2016, staff conducted follow up monitoring and treatment of sites on the Wisconsin side of the St. Louis River Estuary. GLIFWC staff are members of the technical advisory team overseeing the planning and management activities on the Minnesota side.

**[maps.glifwc.org](http://maps.glifwc.org):** The goal of this project is to facilitate collaboration by providing a common communications infrastructure. [maps.glifwc.org](http://maps.glifwc.org) provides a portal for viewing invasive species distribution and management in the context of the ceded territories and other GIS layers relevant to GLIFWC's member tribes such as *manoomin* and *ogaa* waters.

## LITERATURE CITED

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