



## **Invasive Species Program 2011**

by

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## **Corrections**

This revision corrects errors in paragraph 1 on page 10 and table 4 on page 11.

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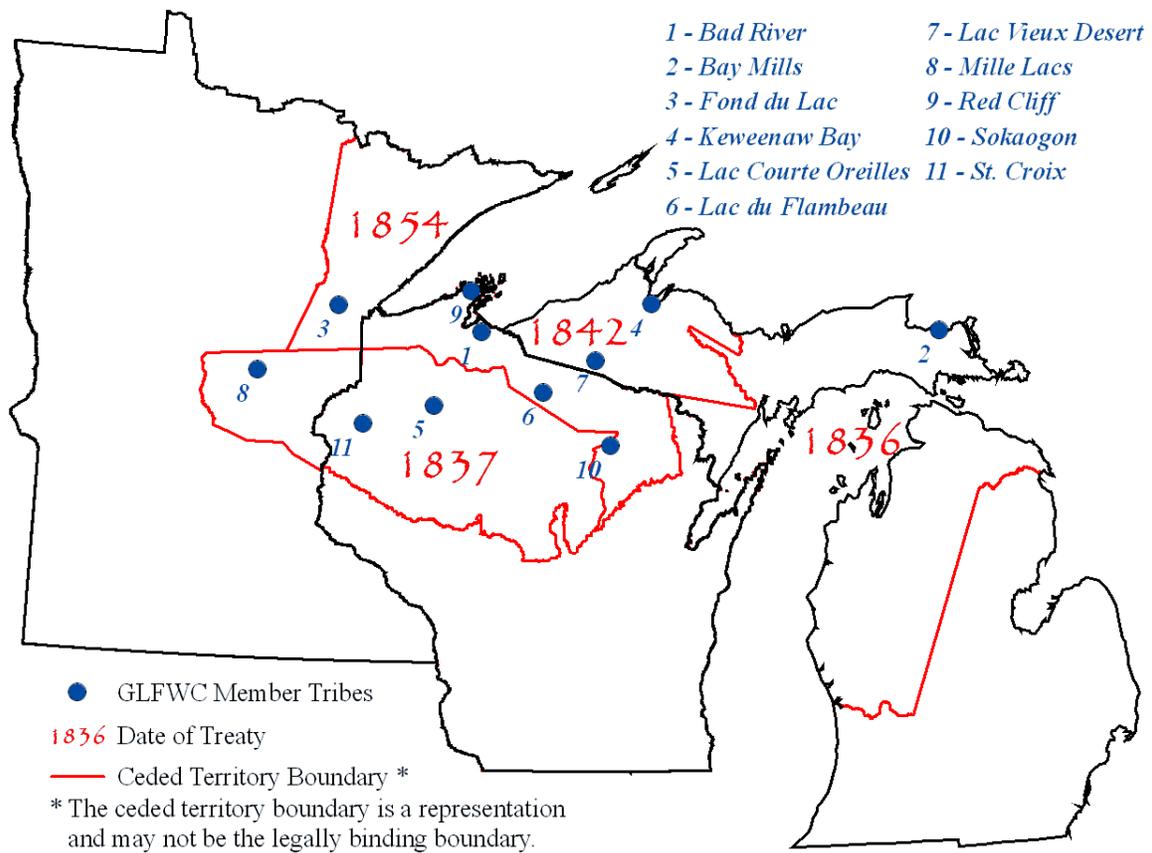
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## EXECUTIVE SUMMARY

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 life ways they sustain.



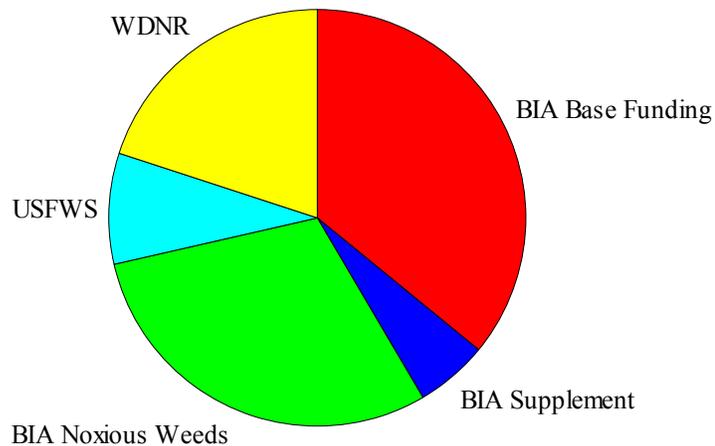
**Figure 1.** Location of GLIFWC member tribes and ceded territories.

This report summarizes the activities undertaken by GLIFWC staff during 2011 to address the spread of invasive species in the ceded territories. GLIFWC's invasive species program consists of 1) education outreach, 2) inventory and monitoring, 3) control, and 4) evaluation. Each of these components is coordinated with local cooperators 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)
  - GLIFWC's base funding
  - Noxious Weed Program
  - Supplemental Funding
- ◆ U.S. Fish and Wildlife Service (USFWS)
  - St. Croix Interstate Management Plan
  - Wisconsin AIS State Management Plan
- ◆ Wisconsin Department of Natural Resources (WDNR)
  - Aquatic Invasive Species Control Grants



**Figure 2.** Funding sources for GLIFWC's invasive species program in 2011.

## AQUATIC INVASIVE SPECIES INVENTORIES IN THE CEDED TERRITORIES

Since the early 1800s, at least 183 species of fish, plants, invertebrates, algae and pathogens have been introduced into riparian and aquatic habitats of the Great Lakes (GLERL 2006). 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-the economic cost of zebra mussels alone has been estimated in excess of \$1billion since their introduction (Pimentel *et al.* 2005).

GLIFWC staff surveyed select ceded territory waters in 2011 to 1) assess and document the scope of the problem, 2) detect small populations of the worst invasives before they become large, environmentally damaging populations, and 3) prioritize education and management efforts.

### METHODS

In 2011, 20 Lakes were selected for survey in coordination with the Wisconsin Department of Natural Resources (WDNR) UW-Madison Center for Limnology and County AIS coordinators. Surveys targeted lakes important to the tribes for *ogaa* (walleye) and *manoomin* (wild rice) harvest, as well as larger lakes with several boat landings which are thought to provide more opportunities for introductions (Table 1, Figure 3). An effort was made to visit each lake twice during the summer to increase the chances of detecting zebra mussel (*Dreissena polymorpha*) veligers and plants with varying phenologies. The Turtle-Flambeau flowage and Squirrel lake were only surveyed once.

Shorelines were surveyed from the outer edge of the littoral zone from a slow moving boat. The entire shoreline was surveyed for most of the smaller lakes (~ 500 acres and less). On large lakes (~ 500 acres and greater), surveys targeted the most likely areas for introductions. Likely areas for introductions included boat landings, inlets, outlets, shallow or protected bays, wetland areas, disturbed areas, developed shorelines and shorelines in close proximity to roads.

Dense beds of vegetation, and patches of unfamiliar vegetation were inspected intensively. Pier supports, rocks, floating fragments and beach debris in the vicinity of the landings were inspected for invasive plants and animals. The presence of aquatic invasive species informational signs at the landings was also recorded.

The most ecologically destructive aquatic invasive species threatening the ceded territory waters were categorized as “priority” (Table 2) and were recorded at each site they were detected. Discrete patches of vegetation, sampling locations and locations where invertebrates were detected were considered “sites”. Other aquatic invasive species considered less of a threat

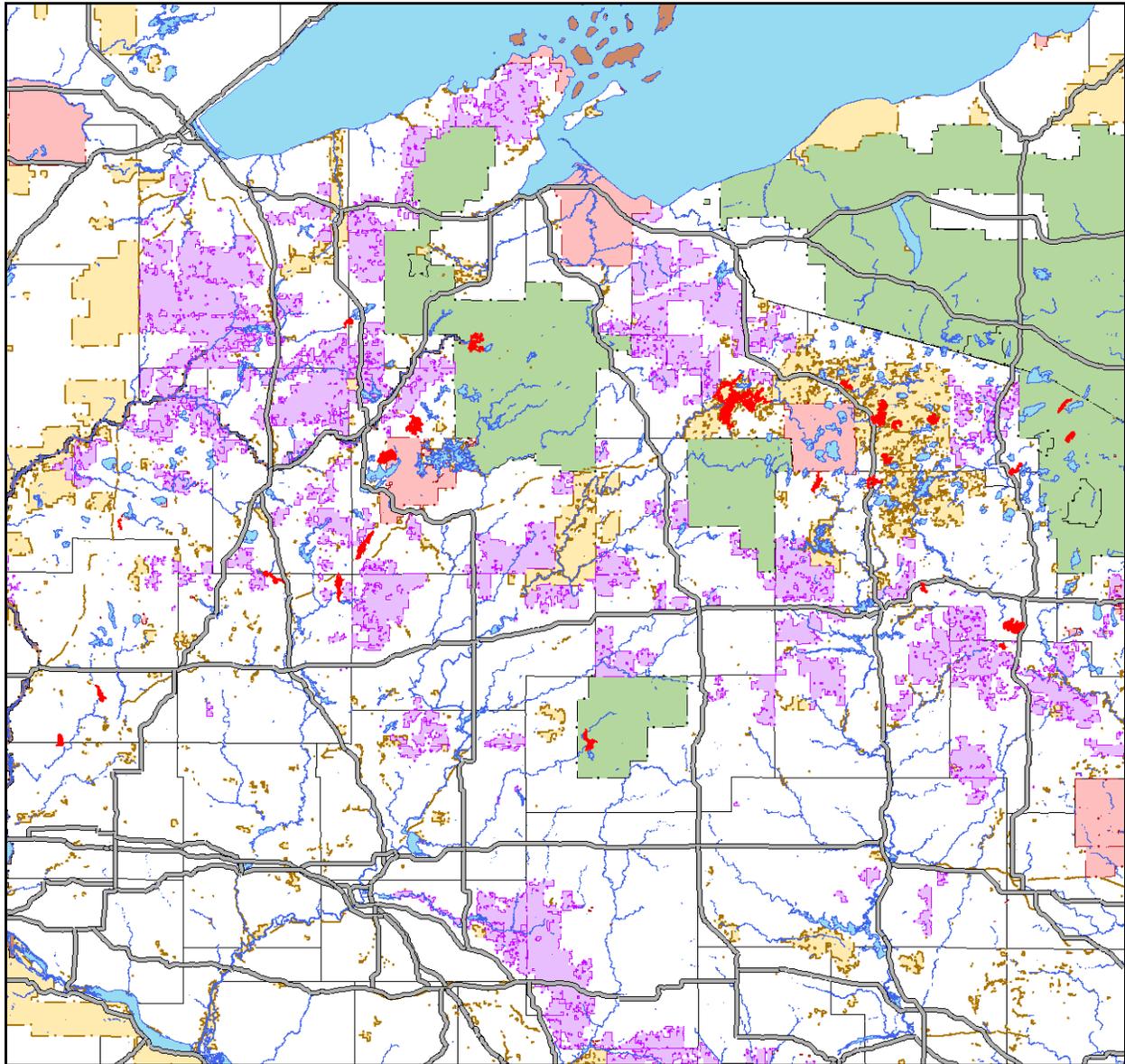
**Table 1.** Lakes surveyed for aquaqtic invasive species in 2011.

State	County	Lake Name	WBIC	Acres	Date Surveyed	Samples *	
						ZM	WF
WI	Barron	Red Cedar	2109600	1986.2	7/13, 8/25	6	3
	Bayfield	Namekagon	2732600	2607.2	6/20, 8/3	6	3
	Douglas	Lower Eau Claire	2741600	784.4	6/16, 8/1	4	2
	Iron	Turtle Flambeau Fl.	2294900	12942.0	07/19/11	3	
	Langlade	Enterprise	1579700	508.8	6/28, 8/8	6	1
	Oneida	Crescent	1564200	616.0	6/30, 8/9	6	2
		Pelican	1579900	3544.9	6/29, 8/15	6	3
		Squirrel Lake	1536300	1309.5	07/18/11	3	
	Polk	Wapogasset Lake	2618000	1185.9	7/13, 8/23	6	2
		Cedar Lake	2615100	1120.4	6/14, 7/28	6	2
	Sawyer	Lake Chetac	2113300	2399.6	7/11, 8/24	6	2
		Round Lake	2395600	3294.0	6/22, 8/1	6	3
		Grindstone	2391200	3176.4	6/23, 8/4	6	3
	Taylor	Chequamegon Waters	2160700	2366.0	7/12, 8/22	6	1
	Vilas	Island Lake	2334400	865.3	7/5, 9/1	6	3
		Kentuck	716800	1001.2	7/7, 8/17	6	3
		Long Lake	1602300	885.8	7/8, 8/16	6	3
		Star	1593100	1219.2	7/6, 8/18	6	3
		Big Arbor Vitae	1545600	1070.4	7/20, 8/31	6	3
		Trout	2331600	3864.3	7/21, 8/30	6	3
<b>Total</b>						112	45

\*ZM = Zebra Mussel Veliger Sample; WF = Water Flea Sample

or so common as to be impractical to delineate, along with some terrestrial invasive species were recorded as “present” if detected on a lake (Table 3). Voucher specimens for new finds were prepared and sent to the Wisconsin State Herbarium at the University of Wisconsin-Madison. Observations of *manoomin* were also recorded and the native type of common reed were also documented.

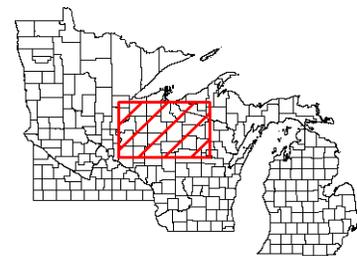
Locations were mapped using a TDS® Recon hand held computer with a GlobalSat® BC-337 compact flash GPS card. Attribute data for each site were entered directly into a GIS database using ESRI's® ArcPad software. ArcPad provided an integrated environment to display the current GPS location overlain on GIS layers including lakes, local roads and pre-existing invasive species data. Custom data entry forms were created using ESRI's® ArcPad Application Builder to increase accuracy and efficiency of data entry.



-  Lakes Surveyed for AIS in 2011
-  Tribal
-  County Forest
-  National Park Service
-  State
-  US Forest Service



0 25 50 Miles



**Figure 3.** Lakes surveyed for aquatic invasive species in 2011.

**Table 2.** "Priority" species surveyed for in 2011.

Scientific Name	Common Name	Detected
<b><u>Invertebrates</u></b>		
<i>Bythotrephes longimanus</i>	spiny waterflea	No
<i>Cercopagis pengoi</i>	fishhook waterflea	No
<i>Dreissena bugensis</i>	quagga mussel	No
<i>Dreissena polymorpha</i>	zebra mussel	No
<b><u>Plants</u></b>		
<i>Butomus umbellatus</i>	flowering rush	No
<i>Eichhornia crassipes</i>	water hyacinth	No
<i>Hydrilla verticillata</i>	hydrilla	No
<i>Hydrocharis morsus-ranae</i>	European frog-bit	No
<i>Iris pseudacorus</i>	yellow iris	Yes
<i>Lythrum salicaria</i>	purple loosestrife	Yes
<i>Myriophyllum spicatum</i>	Eurasian water-milfoil	Yes
<i>Najas minor</i>	brittle naiad	No
<i>Nymphoides peltata</i>	yellow floating-heart	No
<i>Phragmites australis</i> ssp. <i>australis</i>	common reed (Eurasian)	No
<i>Pistia stratiotes</i>	water lettuce	No
<i>Potamogeton crispus</i>	curly pondweed	Yes
<i>Trapa natans</i>	water chestnut	No

Plankton nets were used to sample for zebra mussel veligers, spiny water fleas and fishhook water fleas. Vertical plankton tows were used to sample for zebra mussel veliger following WDNR-UWEX (2006). Oblique plankton tows were used to sample for spiny and fishhook water fleas following Johnson (2004). When sampling for water fleas a suitable deep portion of the lake was chosen and the net was towed through the water for approximately 100 meters. The distance was estimated by towing the plankton net for 120 seconds at approximately 3 km per hour. The water column was surveyed by allowing the net to sink as close to the bottom as possible and then slowly pulling the net back up.

The number of veliger and water flea samples taken on each lake was based on lake size and available time. Three samples were taken on larger lakes or lakes with multiple bays or basins. Typically at least one sample was taken near a busy boat ramp and one or two additional samples taken throughout the lake. On smaller or shallow lakes, only one or two samples were taken. Both veliger and water flea 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. Zebra mussel veliger samples were sent to the WDNR Service Center in Plymouth, Wisconsin for analysis. Water flea samples were examined at the GLIFWC lab in Odanah, Wisconsin.

**Table 3.** "Lower priority" invasive species detected in 2011.

Scientific Name	Common Name
<b><u>Invertebrates</u></b>	
<i>Cipangopaludina chinensis</i>	Chinese mysterysnail
<i>Viviparus georgianus</i>	banded mysterysnail
<b><u>Plants</u></b>	
<i>Centaurea biebersteinii</i>	spotted knapweed
<i>Cirsium palustre</i>	Eurasian marsh thistle
<i>Euphorbia cyparissias</i>	cypress spurge
<i>Lonicera tatarica</i> , <i>L. morrowii</i> , <i>L. X bella</i>	Eurasian bush honeysuckles
<i>Mentha piperita</i> , <i>M. spicata</i> , <i>M. X gentilis</i>	Eurasian mints
<i>Myosotis scorpioides</i>	water forget-me-not
<i>Phalaris arundinacea</i>	reed canary grass
<i>Polygonum cuspidatum</i>	Japanese knotweed
<i>Rhamnus cathartica</i>	common buckthorn
<i>Salix alba</i> , <i>S. fragilis</i> , <i>S. X rubens</i>	white, crack and hybrid willow
<i>Solanum dulcamara</i>	bittersweet nightshade
<i>Typha angustifolia</i> , <i>T. X glauca</i>	narrow-leaf and hybrid cattail

After leaving each lake, the boat and all equipment were thoroughly disinfected. Plant fragments and other debris were removed at the landing by hand. The drain plug was pulled away from the landing to ensure the water would not run into the lake. The boat, trailer and all equipment that came into contact with the water (plankton nets, anchor, tow ropes, paddles, bilge pump and D-net) were sprayed with a 2200ppm bleach solution for a 10 minute contact time. After the appropriate contact time, the boat, trailer and all equipment were thoroughly rinsed. This procedure has been shown to kill *Heterosporis* spp., viral hemorrhagic septicemia virus (VHSV), spring viremia of carp (SVCV), largemouth bass virus (LMBV), lymphosarcoma and zebra mussel zooplankton (Marcquenski and AveLallemant 2007). If traveling to another lake the plankton nets were placed in a tub and treated with vinegar and soaked for ten minutes. This procedure was done to prevent contamination of samples with dead veligers from previous lakes. Bleach kills veligers, but dead shells may stick to nets giving a false positive for the next lake. Full strength vinegar has been shown to dissolve small veliger shells. The washing location was chosen to ensure that the water used to disinfect would not run into storm water drains or other areas that might contaminate water.

## RESULTS

A total of 217 invasive species sites comprising 18 taxa were mapped in 2011. “Priority” species accounted for 83 of the sites, Table 4 provides a summary of invasive species detected by lake. Yellow iris was the most frequently detected “high priority” species, occurring on 45% of the 20 lakes surveyed. The most frequently detected of the “lower priority” species was reed canary grass (90%), crack willow, white willow and their hybrids (90%), and Eurasian mints (75%). Sixty-six boat landings were also surveyed for aquatic and terrestrial invasive species, and AIS signage was documented at each landing. A total of 113 zebra mussel veliger and 45 water flea plankton samples were collected during 2011. No water fleas were detected in any of the samples. No zebra mussel veligers were detected in any of the samples analyzed. Samples from Crescent Lake in Oneida county, and Star and Long Lakes in Vilas county were not analyzed because these waters were thought to lack enough calcium for zebra mussels to survive (S. Van Egeren, WDNR, personal communication, January 11, 2012).

## DISCUSSION

Previously unknown infestations of Eurasian water milfoil, occurred at two lakes visited by GLIFWC staff. On July 7<sup>th</sup>, 2011 at Kentuck lake in Vilas county, fragments of Eurasian water milfoil were found floating in the water near the USFS campground launch. A thorough search of the area was done where the floating fragments were found. However no rooted plants were discovered in this section of the lake. Kevin Gauthier from the Rhinelander DNR service center was alerted of this find. Kevin relayed that the Wisconsin DNR had already conducted a point intercept at Kentuck lake. He also informed GLIFWC of the general location of the infestation. GLIFWC surveyed the area of infestation recording GPS points of plant and bed locations. A bitmap was created from this information. A version of the map was forwarded to Kevin Gauthier at the DNR Service Center in Rhinelander, Wisconsin.

A second infestation was documented on Pelican lake in Oneida County after learning of the general location from a Wisconsin DNR creel clerk. GLIFWC surveyed the area of infestation recording GPS points of plant and bed locations. A voucher specimen was prepared and sent to the Wisconsin State Herbarium. It was later discovered that Onterra lake management group had also documented this colony of Eurasian water milfoil during plant management surveys in June. Onterra, WDNR and the Pelican lake property owners association have combined their efforts to address this problem.

**Table 4.** Summary of invasive species detected in 2011.

County	Lake Name	High Priority				Lower Priority										Total			
		<i>Iris psuedacoris</i>	<i>Lythrum salicaria</i>	<i>Myriophyllum spicatum</i>	<i>Potamogeton crispus</i>	<i>Centaurea biebersteini</i>	<i>Cipangopalundina chinensis</i>	<i>Cirsium palestre</i>	<i>Euphorbia cyparissias</i>	<i>Lonicera tatarica, L.marrovii, L. X bella</i>	<i>Mentha peperita, M. spicata, M. X gentillis</i>	<i>Myosotis scorpioides</i>	<i>Phalaris arundinacea</i>	<i>Polygonum cuspidatum</i>	<i>Rhamnus cathartica</i>		<i>Salix fragilis, S. alba, S. X rubens</i>	<i>Solanum dulcamara</i>	<i>Typha angustifolia T. X glauca</i>
Barron	Red Cedar					✓			✓	✓				✓	✓	✓			7
Bayfield	Namekagon	✓				✓			✓	✓	✓				✓				7
Douglas	Lower Eau Claire		✓			✓				✓	✓				✓			✓	7
Iron	Turtle-Flambeau Flowage					✓				✓	✓	✓			✓	✓	✓		8
Langlade	Enterprise	✓	✓			✓				✓	✓				✓	✓			8
Oneida	Crescent	✓	✓							✓	✓	✓			✓	✓			8
	Pelican	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	15
	Squirrel Lake					✓				✓	✓	✓			✓	✓			7
Polk	Wapogasset Lake	✓		✓		✓			✓	✓	✓	✓		✓	✓	✓	✓	✓	12
	Cedar Lake	✓				✓				✓		✓			✓	✓	✓		9
Sawyer	Lake Chetac			✓		✓				✓	✓				✓		✓		7
	Round Lake									✓	✓	✓			✓	✓	✓		7
	Grindstone									✓	✓	✓						✓	5
Taylor	Chequamegon Waters			✓	✓	✓				✓		✓			✓		✓		8
Vilas	Island Lake	✓		✓				✓				✓	✓		✓		✓		8
	Kentuck		✓	✓		✓	✓			✓	✓	✓				✓	✓	✓	11
	Long Lake	✓		✓			✓			✓	✓	✓			✓	✓	✓		10
	Star	✓				✓		✓	✓	✓	✓	✓			✓		✓	✓	11
	Big Arbor Vitae					✓				✓	✓				✓			✓	6
	Trout														✓				2
Total		9	5	4	4	1	13	3	3	5	15	13	18	2	2	18	11	11	6

## **PURPLE LOOSESTRIFE CONTROL ACTIVITIES IN THE BAD RIVER - CHEQUAMEGON BAY WATERSHED**

### **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). After its introduction, purple loosestrife quickly spread westward displacing native wetland plant communities. 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 leaves are opposite each other and alternate at 90 degree angles along the stem. 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. Treated sites were mapped using a TDS® Recon 400 hand-held computer with a GlobalSat® BC-337 compact flash GPS card. Site locations and attribute data for each site were entered directly into a GIS database using ESRI's® ArcPad software. Custom data entry forms were created using ESRI's® ArcPad Application Builder to increase accuracy and efficiency of data entry. Attribute data for each site were also collected including an estimate of the number of plants, acreage class, type of herbicide used, and an estimate of the amount of herbicide applied. These data were used to prioritize effort and select control methods based on the areal extent of the site, number of plants, and the site's location within the watershed.

Small sites (< 0.5 acres) in upper reaches of the watershed were prioritized for chemical control. Control crews applied either Glyphosate (Glypro®) or Triclopyr (Garlon 3A®) to purple loosestrife plants. Glyphosate was used on sites with standing water, while Triclopyr 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.

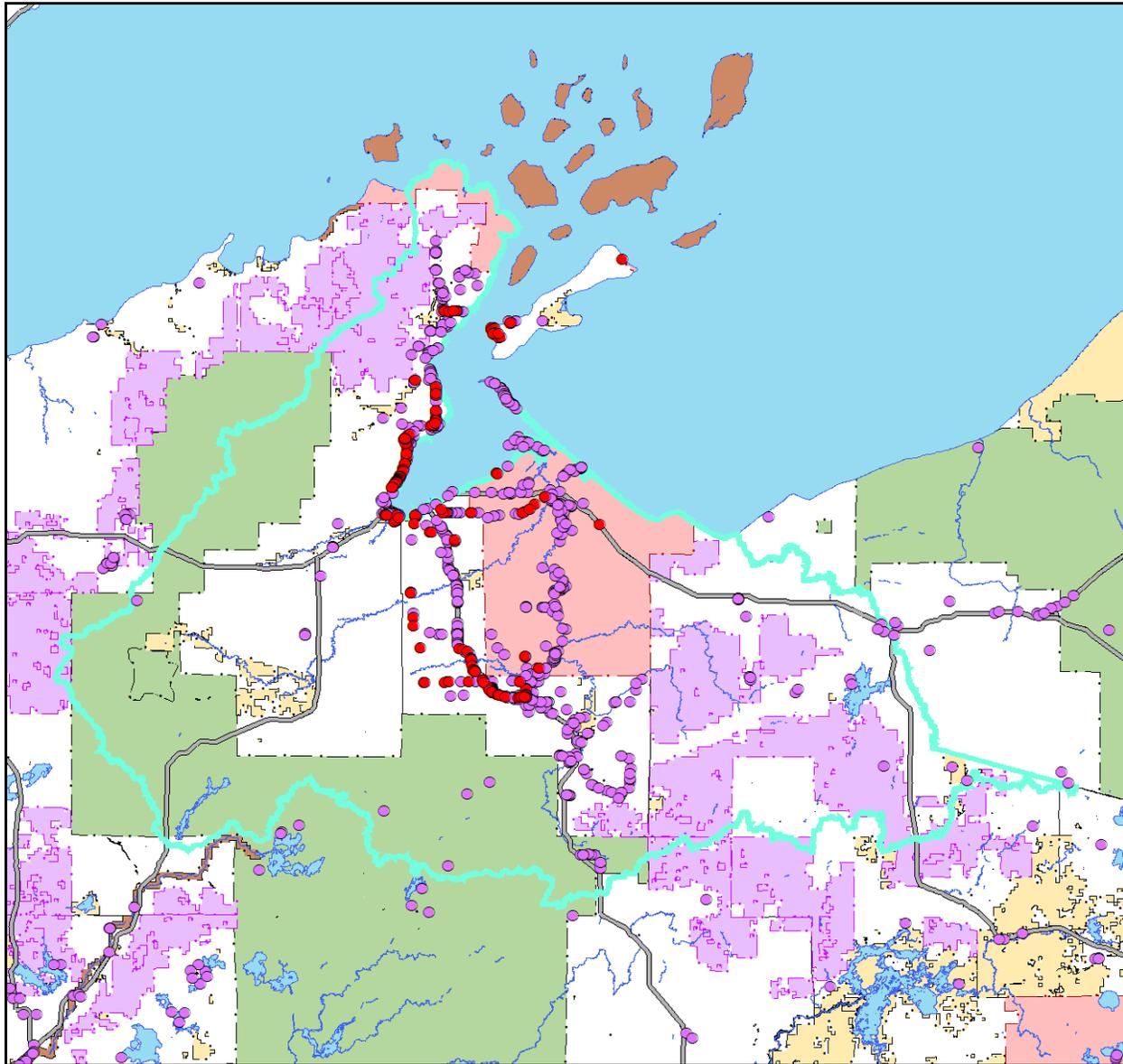
Large sites (> 1 acre) and sites with poor access are a high priority for biological control. The release of *Galerucella* beetles (native to Europe) in the United States for biological control of purple loosestrife was approved by USDA - APHIS in 1992. In 2011, GLIFWC staff reared *Galerucella* beetles at the Agriculture & Energy Resource Center (AERC) facility in Ashland, Wisconsin following the methods of Loos and Ragsdale (1998). Beetles were collected from locally established populations in early June and transferred to potted loosestrife plants at the AERC facility. These beetles were released in mid July. Release sites from prior years were visited in early June and again in late summer to ascertain overwinter survival, assess suitability of sites for collection of adults, and to take site photos documenting the effects of beetle herbivory.

## RESULTS

In 2011, GLIFWC staff treated 167 sites with herbicide. Figure 4 illustrates the distribution of chemical control efforts for purple loosestrife in 2011. 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 (Figures 5-7). Over 200,000 *Galerucella* beetles were reared and released in 2011, primarily within the Fish Creek Sloughs near Ashland, Wisconsin (Figure 8).

## 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 9). This strategy also reduces the amount of herbicide applied at each site (Figure 10). Biological control has been effective throughout the watershed, with the exception of some small upland sites where conditions are too dry and the expansive Fish Creek Sloughs west of Ashland, Wisconsin. Approximately 100,000 *Galerucella* beetles were released in Fish Creek Sloughs in 2002. Although they have persisted and their distribution within the wetland continues to expand, they have been slow to build their population to a density that reduces the abundance of purple loosestrife. Approximately 200,000 *Galerucella* beetles were released in Fish Creek Sloughs in 2011. While releasing beetles in 2011, significant *Galerucella* densities and feeding damage was observed in the vicinity of prior releases from 2002 (Figure 8). Additional *Galerucella* releases are planned for this site in 2012.



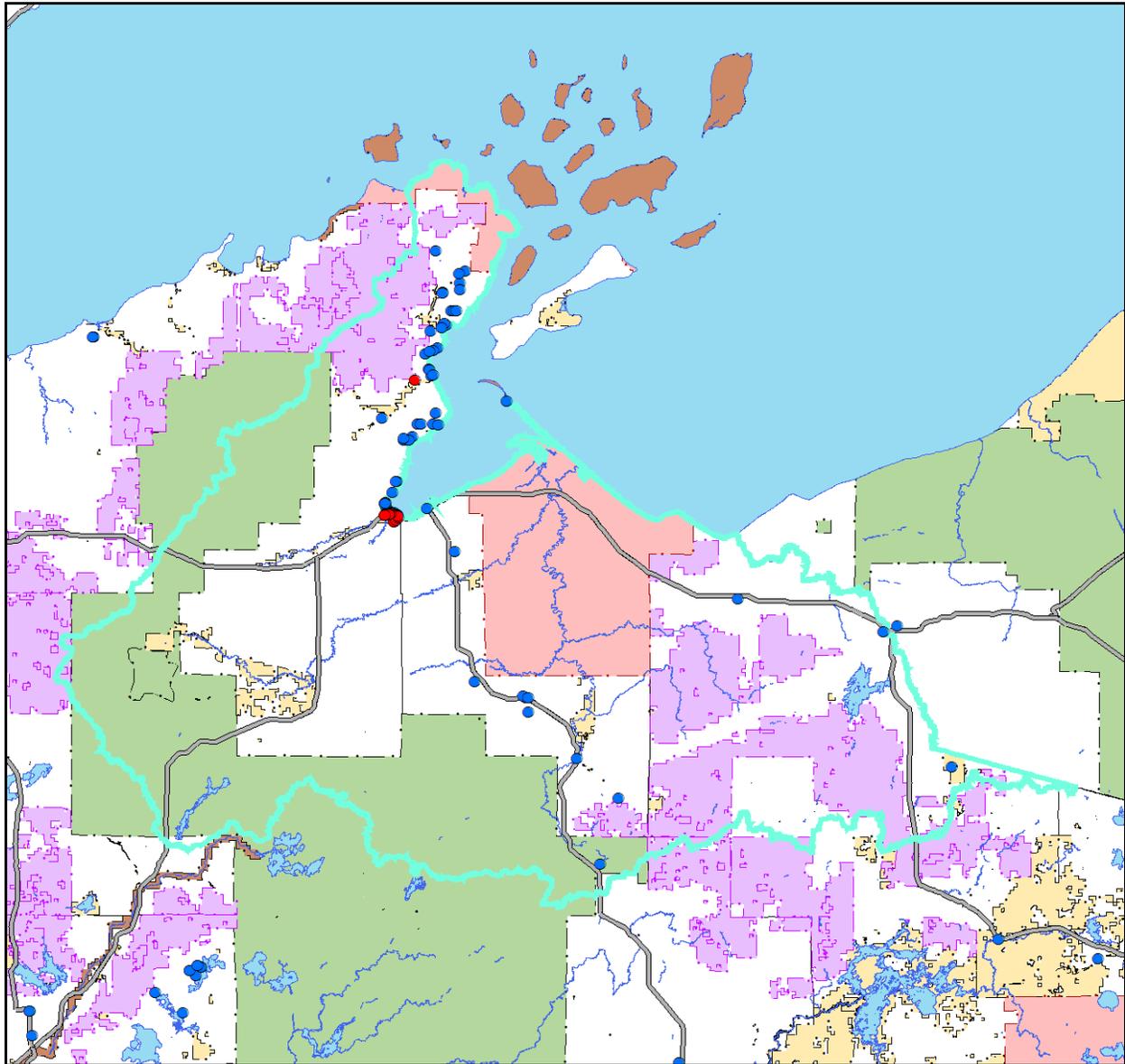
- 2011 Purple Loosestrife Herbicide Applications
- Purple Loosestrife Sites
- Bad River - Chequamegon Bay Watershed
- Tribal
- County Forest
- National Park Service
- State
- US Forest Service



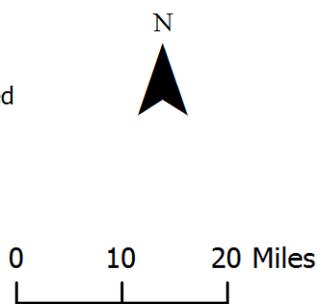
0 10 20 Miles



**Figure 4.** Distribution of purple loosestrife herbicide applications in 2011.



- 2011 Galerucella Release Sites
- Established Galerucella Sites
- Bad River - Chequamegon Bay Watershed
- Tribal
- County Forest
- National Park Service
- State
- US Forest Service



**Figure 5.** *Galerucella* release sites within the Bad River - Chequamegon Bay watershed.



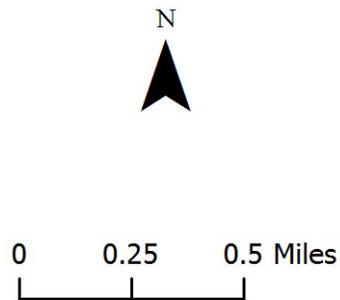
**Figure 6.** *Galerucella* release site north of Pike's Creek near Washburn, Wisconsin.



**Figure 7.** *Galerucella* release site south of Whittlesey Creek near Ashland, Wisconsin.



- 2011 *Galerucella* Release Sites
- 2002 *Galerucella* Release Sites
- ▭ State



**Figure 8.** *Galerucella* release sites in Fish Creek Sloughs, near Ashland, Wisconsin.

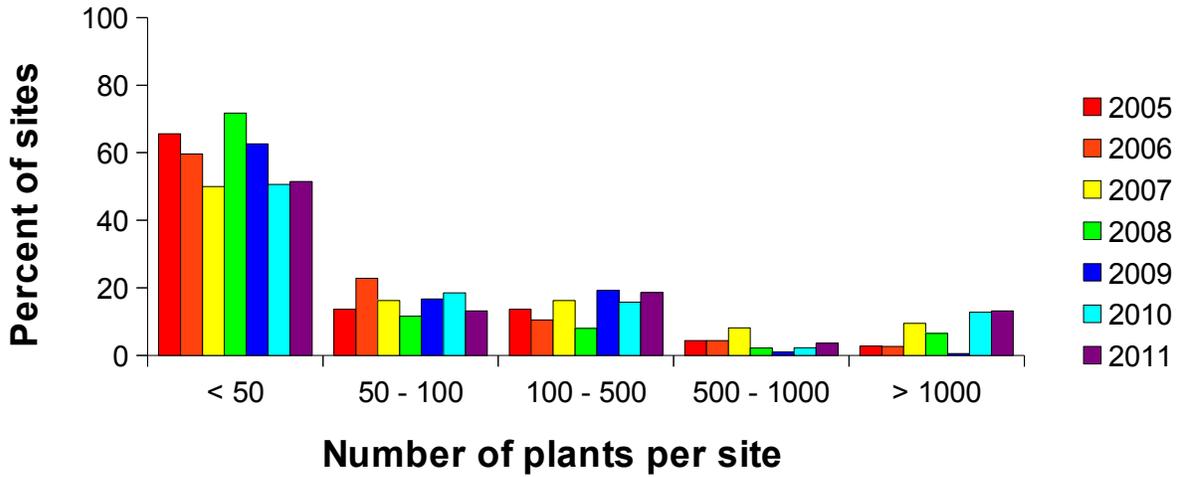


Figure 9. Abundance of purple loosestrife at sites treated in 2005-2011.

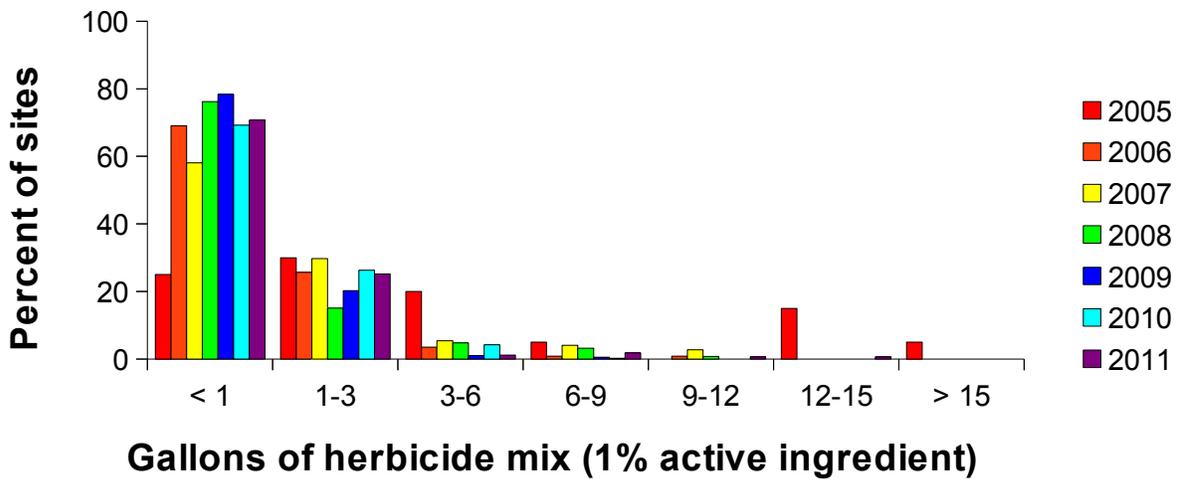


Figure 10. Amount of herbicide mix applied to purple loosestrife infestations in 2005-2011.

## **LEAFY SPURGE CONTROL ACTIVITIES IN THE BAD RIVER-CHEQUAMEGON BAY WATERSHED**

### **INTRODUCTION**

Leafy spurge is a perennial herb native to Eurasia. It was first recorded in North America from Massachusetts in 1827. It is thought to have arrived in contaminated seed. By the early 1900's, leafy spurge had spread as far west as North Dakota.

Leafy spurge thrives in open, sunny habitats. The plant reaches heights of up to 1 meter, though they are often shorter on poor sites. The plants bloom in late May and early June, producing clusters of inconspicuous flowers subtended by yellow bracts. The seed capsules of leafy spurge open explosively, dispersing seeds up to 15 feet. The seeds are often carried further by water, wildlife, and heavy equipment. Leafy spurge also spreads vegetatively, allowing the plant to dominate a site. The extensive root system of leafy spurge can penetrate as far as 15 feet underground.

Leafy spurge displaces native vegetation in open habitats including prairies, pine barrens, pastures, abandoned fields, and roadsides. It is especially dominant on dry or nutrient poor sites where its extensive root system and lack of natural enemies give it a substantial advantage over native vegetation. Because leafy spurge is unpalatable to cattle and deer, it can cause significant economic and ecological impacts.

Pine barrens habitats in northwestern Wisconsin are unique habitats that are especially vulnerable to the threats posed by leafy spurge. These areas provide habitat for a wide range of wildlife, as well as gathering and hunting opportunities for tribal members.

### **METHODS**

GLIFWC's integrated control efforts for leafy spurge are focused in the town of Washburn in Bayfield County, Wisconsin. GLIFWC crews applied imazapic (Plateau®) herbicide to leafy spurge in the fall when plants were senescing and drawing energy reserves back into their roots for the winter. Herbicide was applied until a hard freeze damaged or killed the shoots, preventing uptake by the plants. Shoot damage was monitored by checking for the presence of milky sap in broken stems. An assortment of biological control organisms have been approved by USDA-APHIS for controlling leafy spurge. Three of these have been released at leafy spurge sites in Bayfield County – *Aphthona lacertosa*, *A. nigriscutus* and *Oberea erythrocephala*.

Treated sites were mapped using a TDS® Recon 400 hand-held computer with a GlobalSat® BC-337 compact flash GPS card. Site locations and attribute data for each site were entered directly into a GIS database using ESRI's® ArcPad software. Custom data entry forms

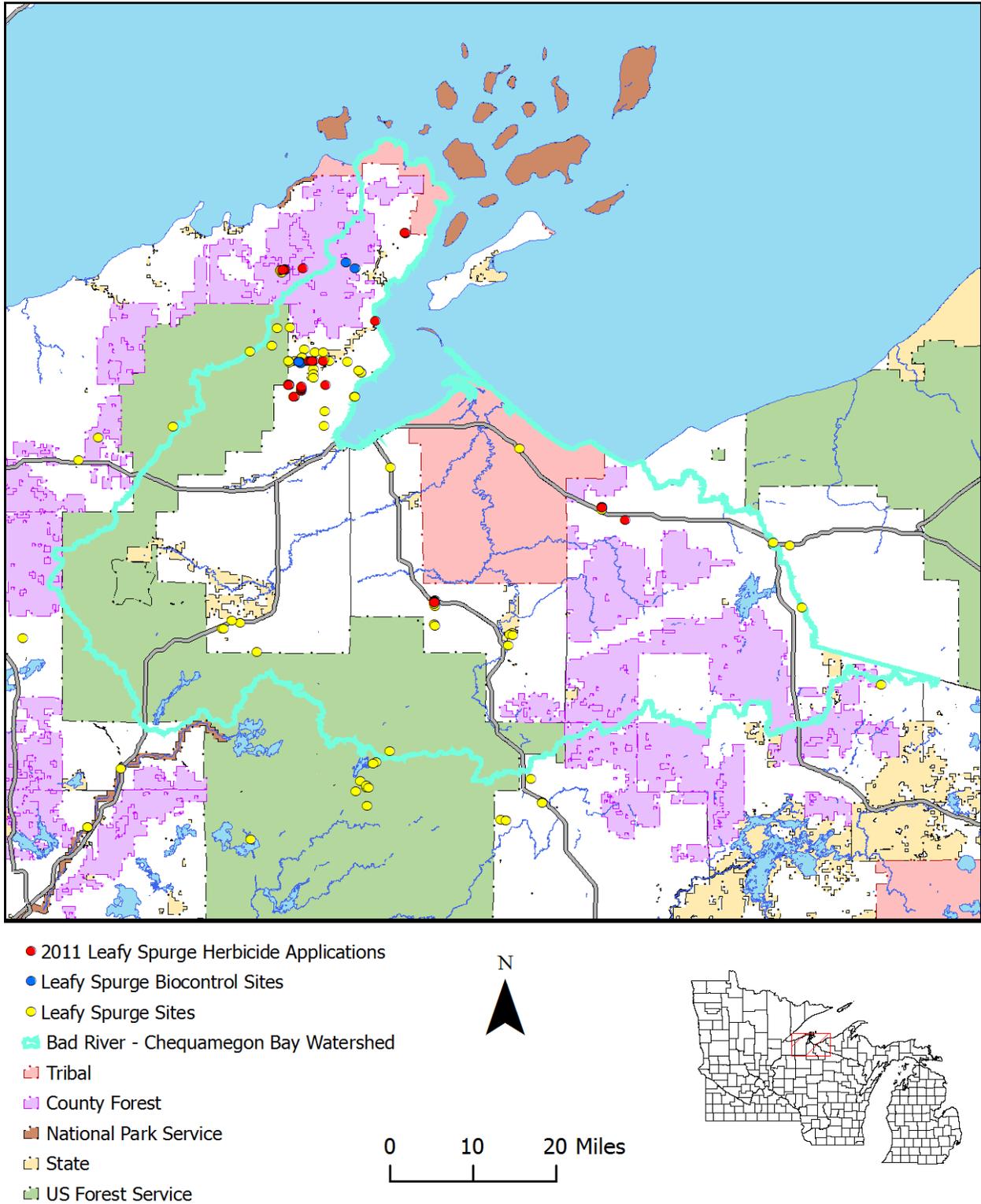
were created using ESRI's® ArcPad Application Builder to increase accuracy and efficiency of data entry. Attribute data for each site were also collected including an estimate of the number of plants, acreage class, type of herbicide used, and an estimate of the amount of herbicide applied.

## RESULTS

In 2011, GLIFWC staff treated 36 sites with herbicide. Figure 11 illustrates the distribution of chemical control efforts for leafy spurge in 2011. Road rights-of-way on the eastern edge of the Moquah Barrens near Washburn, Wisconsin comprised the core area of local leafy spurge populations and provided a massive seed source for dispersal via road maintenance activities such as mowing and grading. GLIFWC also contributed herbicide and back-pack sprayers to the annual leafy spurge work day efforts coordinated by the Northwoods Cooperative Weed Management Area (NCWMA) to treat leafy spurge on private lands.

## DISCUSSION

Annual control efforts have substantially reduced the abundance of leafy spurge. Over 50% of sites treated in 2011 consisted of less than 100 plants (Figure 12). Consequently, the amount of herbicide applied has also declined over time (Figure 13). Integrated measures employing both herbicide and biological controls have shown great success on private lands west of Washburn, Wisconsin. GLIFWC staff obtained several thousand *Aphthona* beetles from WDNR and released them at two sites in northern Bayfield County in 2009 (Figure 13).



**Figure 11.** Distribution of leafy spurge, biological control sites, and 2011 herbicide applications.

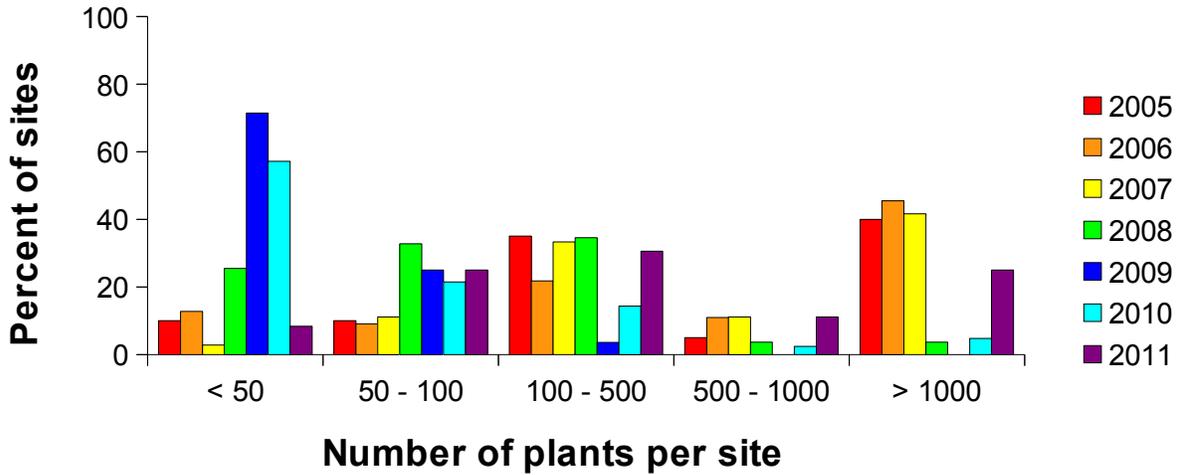


Figure 12. Abundance of leafy spurge at sites treated in 2005-2011.

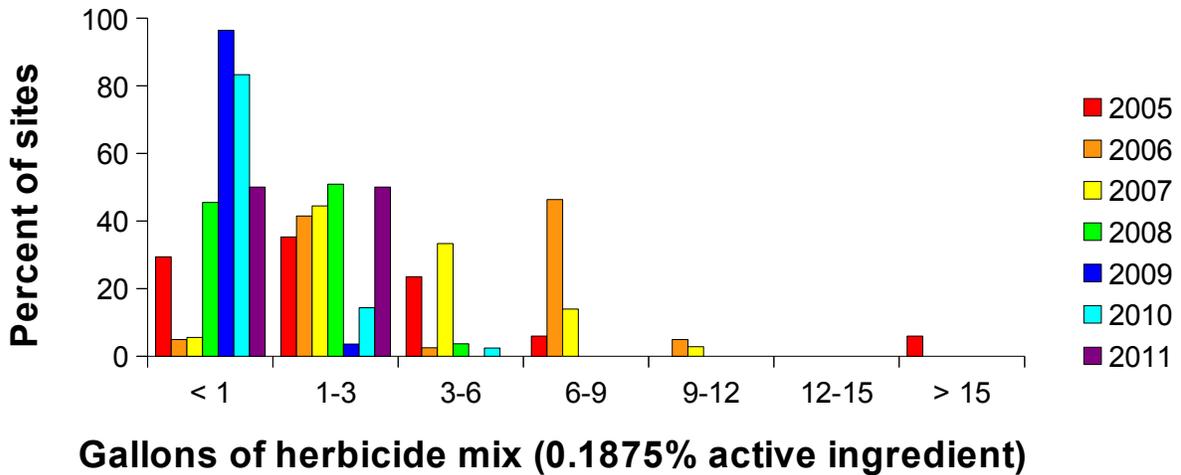


Figure 13. Amount of herbicide mix applied to leafy spurge infestations in 2005-2011.

## EDUCATION OUTREACH ACTIVITIES

### INTRODUCTION

Because the vast majority of invasive species introductions can be attributed to human activities, effective prevention and control efforts depend on an informed public. GLIFWC initiated an educational outreach program in 1998 to raise public awareness of this important issue.

### 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, slide and poster 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 ([www.glifwc.org/invasives](http://www.glifwc.org/invasives)) and quarterly newsletter - *Mazina'igan*.

### ACCOMPLISHMENTS

#### *Mazina'igan* Articles

GLIFWC's newsletter features articles on invasive species. Topics covered in 2011 included:

- ◆ Summer 2011 (<http://www.glifwc.org/publications/mazinaigan/Summer2011.pdf>)
  - “Traditional knowledge meets the computer age: mapping project extended to native plants” by Steve Garske
- ◆ Fall 2011 (<http://www.glifwc.org/publications/mazinaigan/Fall2011.pdf>)
  - “Fighting invasive garlic mustard takes hand-pulling: GLIFWC joins effort to clear infected site” by Miles Falck

#### [www.glifwc.org/invasives](http://www.glifwc.org/invasives)

GLIFWC's invasive species 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. The site received a total of 63 visits in 2011, down 96% from 2010's 1,499 visits.

## COORDINATION AND COOPERATION

### INTRODUCTION

Because non-native invasive plants disperse widely across the landscape and administrative boundaries, it is advantageous to work cooperatively towards management and control objectives. 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 invasive species activities with cooperating agencies, universities, non-governmental organizations, and the general public to maximize the efficient use of limited resources.

### 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 2010, GLIFWC staff worked with the NCWMA to control buckthorn and honeysuckle at Prentice Park in Ashland, Wisconsin, led field trips to collect *Galerucella* beetles for the biological control of purple loosestrife and provided herbicide and spraying equipment for annual leafy spurge control efforts in the town of Washburn.

***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.

**Global Invasive Species Information Network (GISIN):** GLIFWC staff participated on the standards committee to develop this standardized information exchange protocol for sharing invasive species information. An early adopter of the technology, GLIFWC's node of the Global Invasive Species Information Network ([gisin.glifwc.org](http://gisin.glifwc.org)) demonstrates how this technology can be used to query multiple databases simultaneously and browse the results via an interactive table or map.

**maps.glifwc.org:** Similar to GISIN, 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.

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