Invasive Species Program 2013

by

Miles Falck
Wildlife Biologist

Dara Olson
AIS Project Coordinator

and

Ron Parisien
Wildlife Technician

Administrative Report 14-04
May 2014

Great Lakes Indian Fish & Wildlife Commission
Biological Services Division
P.O. Box 9
Odanah, WI 54861
(715) 682-6619

Table of Contents

List of Tables

List of Figures

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.

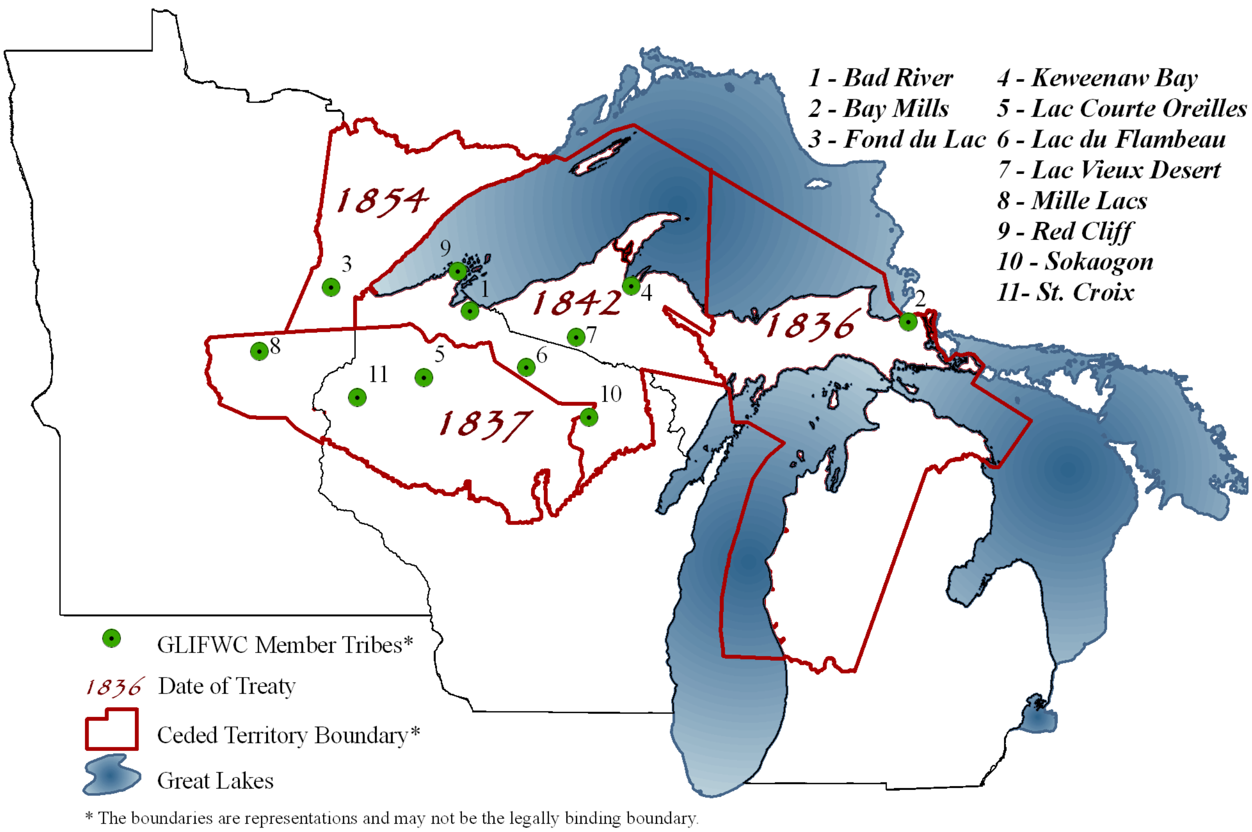

Figure 1. Location of GLIFWC member tribes and ceded territories.

This report summarizes the activities undertaken by GLIFWC staff during 2013 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
  - Great Lakes Restoration Initiative (GLRI) Tribal AIS

- U.S. Fish and Wildlife Service (USFWS)
  - Great Lakes Restoration Initiative (GLRI) Tribal AIS
  - Wisconsin State ANS Plan
  - St. Croix Interstate ANS Plan

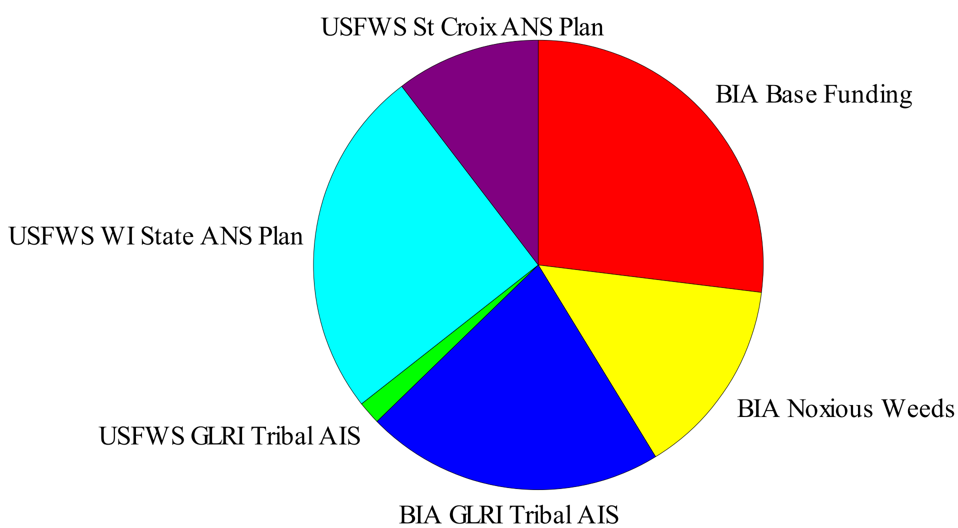

Figure 2. Funding sources for GLIFWC's invasive species program in 2013.

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 (Pimentel *et al.* 2005).

GLIFWC staff surveyed select ceded territory waters in 2013 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 2013, GLIFWC staff surveyed 43 lakes in northern Wisconsin including 39 lakes surveyed for aquatic invasive species (AIS) and four lakes for *manoomin* (wild rice) that are undergoing aquatic plant management efforts (Figure 3, Tables 1-2). Lakes surveyed for AIS were chosen in coordination with management partners including tribal, state, county and other local partners. These 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 driving a boat slowly, meandering back and forth in shallow water to 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. As much of the shoreline (including island shorelines) as possible was surveyed.

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.

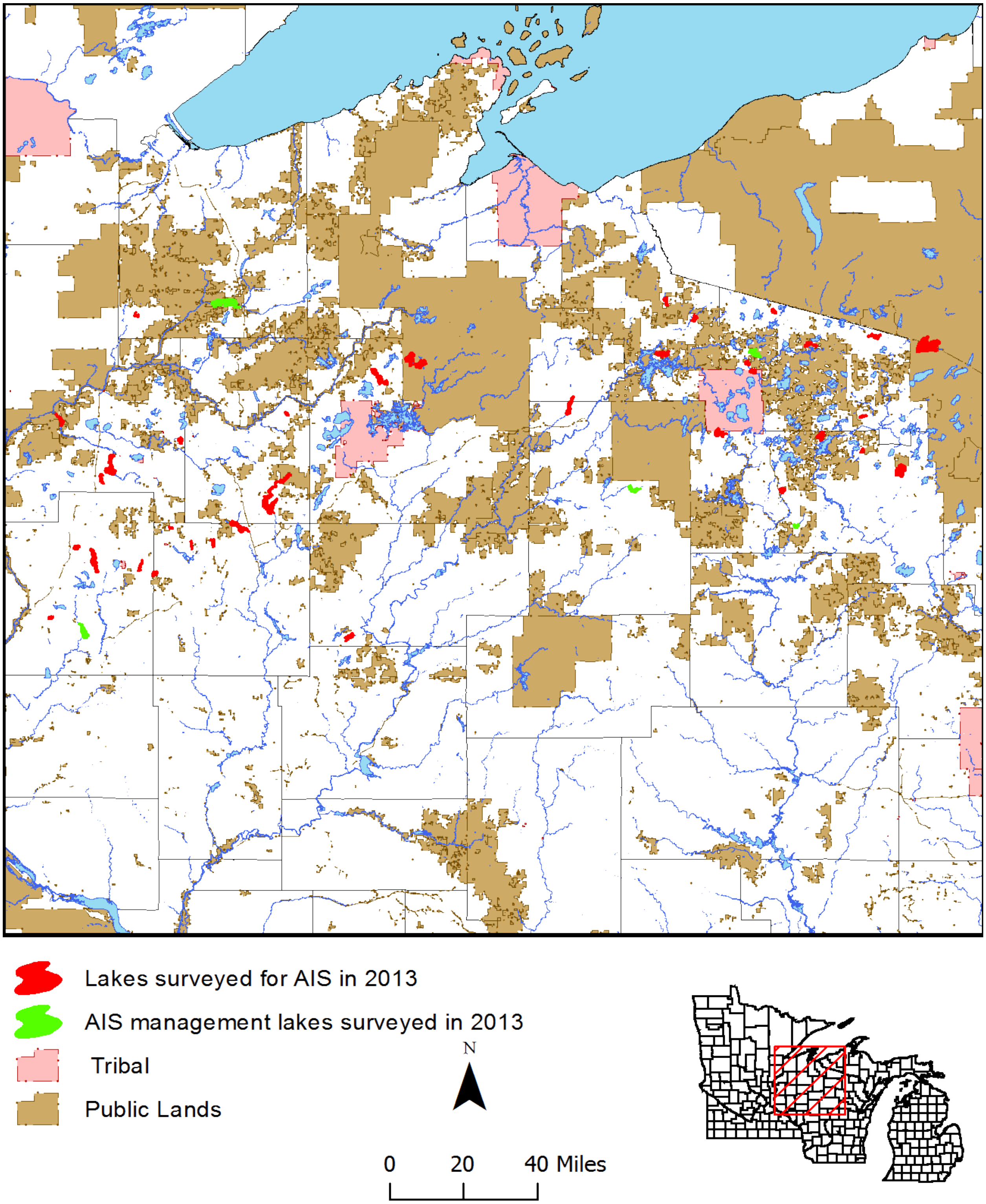

Figure 3. Lakes surveyed in 2013 for AIS detection and management.

Table 1. Lakes surveyed for aquatic invasive species in 2013.

State	County	Lake	WBIC	Acres	Dates Surveyed	Number of Samples	
						Veliger	Water fleas
WI	Barron	Horseshoe*	2469800	115	6/17		1
		Granite Lake*	2100800	154	7/2		2
		Silver Lake*	1881100	337	6/26		3
	Barron, Polk	Staples Lake	2631200	305	6/25	1	1
	Barron, Washburn	Bear Lake	2105100	1358	7/1	3	3
	Burnett	Clam Lake	2656200	1207	7/9	1	1
		Clam River Flowage	2654500	359	7/10	2	2
		Lipsett Lake	2678100	393	7/17	1	1
		Long Lake	2656400	318	7/10-11	1	1
		Lower Clam	2655300	337	7/9	1	1
	Douglas	Radigan Flowage*	2687500	140	7/8		0
	Iron	Pine Lake*	2949200	312	8/8		2
		Spider Lake*	2306300	352	8/20		3
		Trude*	2295200	781	8/19		3
	Oneida	Bearskin	1523600	400	8/7	1	1
		Booth Lake	1537800	207	8/15	1	1
		Chain Lake*	1598000	219	7/31		2
		Pickerel*	1590400	736	8/7		1
		Thunder Lake*	1618100	1768	7/29-30		1
	Oneida, Vilas	Buckskin Lake*	2272600	634	8/14		1
	Polk	Big Butternut Lake	2641000	378	6/19	2	1
		Bone Lake	2628100	1781	6/20 & 6/24	3	3
		North Pipe*	2485700	58	6/18-19		1
		Pipe Lake*	2490500	284	6/18-19		2
		Sand Lake	2495000	187	6/18	2	2
	Price, Ashland	Butternut Lake*	2283300	1006	8/12-13		2
	Rusk	Island Lake	2350200	526	6/25	3	3
	Sawyer	Lost Land Lake*	2418600	1304	7/24-25		1
		Teal Lake*	2417000	1049	7/24-25		1
		Tiger Cat Flowage	2435000	819	7/22-23	3	3
	Vilas	Alder Lake*	2329600	274	8/13		1
		Big Gibson*	1835200	116	8/6		1
		Black Oak Lake*	1630100	584	7/30		3
		Fishtrap	2343200	329	8/6	3	3
		Horsehead Lake*	2953100	234	8/5		1
		Snipe*	1018500	239	7/31		1
		Wild Rice Lake*	2329800	379	8/13-14		1
	Washburn	Bass Lake*	2451900	188	7/3		1
		Long Lake	2106800	3290	7/15-17	3	3
					Total	31	65

* Lakes considered not suitable to sustain a zebra mussel population, according to UW-Madison, Center for Limnology.

Table 2. Lakes undergoing AIS management where *Manoomin* beds were mapped.

State	County	Lake	WBIC	Lake Acres	*Manoomin* Acres
MI	Vilas, Gogebic	Lac Vieux Desert	1631900	4300	51.8
WI	Oneida	Oneida Lake	1518200	255	6.4
WI	Price	Musser Lake	2245100	563	15.6
WI	Vilas	Island Lake*	2334400	1023	298.2

* *Manoomin* area calculation includes islands.

The most ecologically destructive aquatic invasive species with limited abundance and distribution in the ceded territories were classified as “priority species” (Table 3). 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 watebody, and terrestrial invasive plants were classified as “present” and only their initial occurrence within a waterbody was mapped.

If a “priority” invasive plant species was found on a lake where it was previously unrecorded, 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. Snail samples were collected and sent to UW-LaCrosse for parasite analysis. Observations of *manoomin* and native populations of common reed (*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 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 file format using ESRI's ArcPad software. ArcPad provided an integrated environment to display the current GPS location overlain on GIS layers including lakes and local roads.

Plankton nets were used to sample for zebra and quagga mussel veligers, spiny water fleas and fishhook water fleas. 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 surveyed for veligers. Lake suitability information was obtained from the University of Wisconsin Center for Limnology (see http://aissmartprevention.wisc.edu). To check the lake's current suitability, specific conductance was measured in the deepest basin of each lake at a

Table 3. "Priority" species surveyed for in 2013.

Scientific Name	Common Name
Invertebrates	
Bithynia tentaculata	Faucet snail
Bythotrephes longimanus	Spiny water flea
Cercopagis pengoi	Fishhook water flea
Dreissena bugensis	Quagga mussel
Dreissena polymorpha	Zebra mussel
Potamopyrgus antipodarum	New Zealand mudsnail
Procambarus clarkii	Red swamp crayfish
Plants	
Butomus umbellatus	Flowering rush
Cabomba caroliniana	Fanwort
Callitriche stagnalis	Pond water-starwort
Crassula helmsii	Australian swamp stonecrop
Egeria densa	Brazillian waterweed
Eichhornia crassipes	Water hyacinth
Heracleum mantegazzianum	Giant hogweed
Hydrilla verticillata	Hydrilla
Hydrocharis morsus-ranae	European frog-bit
Myriophyllum aquaticum	Parrot feather
Myriophyllum spicatum	Eurasian water-milfoil
Najas minor	Slender-leaved naiad
Nymphoides pelata	Yellow floating heart
Phragmites australis ssp. *australis*	Common reed (Eurasian)
Pistia stratiotes	Water lettuce
Polygonum cuspidatum, P.sachalinense	Japanese and giant knotweed
Potamogeton crispus	Curly pondweed
Trapa natans	Water chestnut

depth of one meter using a YSI Model 30 meter. These data were shared with WDNR to add to the lake calcium concentrations data set.

Horizontal plankton tows were used to sample for spiny and fishhook water fleas following the protocol of Johnson (2004). At each sampling point, the net was towed through the water for approximately 100 meters. This distance was estimated by towing the plankton net for 120 seconds at a low boat speed. The water column was surveyed by allowing the net to sink as close to the bottom as possible and then slowly pulling it back up.

For larger lakes, three veliger and water flea samples were taken for each lake. On smaller or shallow lakes, only one or two samples were taken. Typically at least one sample was taken near the main boat landing. The remaining samples were taken in priority areas or other bays or basins.

Immediately after collection, 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. A label was placed on each sample bottle with information including lake name, county, state, waterbody identification code and sample number.

Veliger samples were sent to the WDNR Services Operations in Madison, Wisconsin for analysis. Water flea samples were examined by GLIFWC. Water flea samples were analyzed by taking five-10mL sub-samples of each sample collected in the field. Sub-samples were examined under a dissecting microscope for presence or absence of water fleas. The remainder of the sample was poured into a flat tray and visually inspected for water fleas. Water flea samples were also screened for the presence of bloody red shrimp, *Hemimysis anomala*, and another invasive water flea, *Daphnia lumholtzi*. All equipment was cleaned between lake samples.

Four additional lakes were surveyed that had known occurrences of both aquatic invasive species and *manoomin*. These lakes are being managed for AIS through various techniques including manual, chemical and water level draw down. *Manoomin* beds on each lake were mapped with GPS and annual AIS survey data were acquired from partnering agencies. These data will be collected annually to gain a better understanding of how these invasive plants are spreading, interacting with *manoomin*, and to judge the effectiveness and impacts of different management efforts over time.

After each survey was completed, the boat and all equipment were thoroughly disinfected. At the landing, plant fragments and other debris were removed by hand and the drain plug was pulled in an area that would ensure the water would not run into the lake. The boat, trailer and all equipment that had come into contact with the water (including plankton nets and cups, collection nets, ropes, weights, anchor and paddles) were sprayed with a 200 ppm bleach solution. After the appropriate contact time (ten minutes), the boat, trailer and all equipment were thoroughly rinsed. The boat motor was flushed with tap water by using a flushing attachment (flush muffs) for approximately five minutes. Veliger sampling equipment was disinfected with the bleach solution. The equipment was then rinsed and soaked in vinegar for ten minutes to dissolve any veliger remains to ensure that there are no false positives in samples from the next 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 water. Lakes with known infestations of easily spread invasives (i.e. water fleas, zebra mussels, *Heterosporis)* were surveyed at the end of each week, as an extra precaution to reduce chances of spread.

RESULTS

A total of 132 invasive species sites comprising 21 taxa were mapped in 2013. “Priority” species accounted for 25 of the sites (19%). Curly-leaf pondweed was the most frequently detected “priority” species. Eighty-one boat landings were surveyed for aquatic and terrestrial invasive species. A total of 31 zebra mussel veliger and 65 water flea plankton samples were collected during 2013. No zebra or quagga mussel veligers or spiny of fishhook water fleas were detected in any of the samples. Snail samples from 2 lakes were collected and sent to UW-LaCrosse in cooperation with a parasite study being conducted there. Table 4 provides a summary of invasive species detected for each lake. One new *manoomin* lake (Bass Lake, Washburn County, WBIC:2451900) was detected and native *Phragmites* (*Phragmites australis* ssp. *americanus*) was documented on 12 of the survey lakes.

DISCUSSION

Five lakes with small, pioneer infestations of AIS were found by GLIFWC staff, two lakes with Eurasian water-milfoil, two lakes with purple loosestrife, and one lake with curly-leaf pondweed. Early detection of invasive species before they become large, environmentally damaging populations makes eradication feasible and reduces the need to use herbicide.

Eurasian Water-milfoil (*Myriophyllum spicatum*):

Tiger Cat Flowage

Tiger Cat Flowage is a 819 acre flowage approximately 12 miles northeast of Hayward, Sawyer County WI. It has two public and one private boat landing. Eurasian water-milfoil was found on the north end of the flowage (Upper Twin). One plant was located on the northeast shoreline and approximately 3-5 plants were found in the narrow channel near the private boat landing on the north side of the flowage. Partnering agencies and groups were notified and a coordinated “rapid response” was initiated. Plants were hand-pulled by the Sawyer County AIS coordinator with the lake association. Follow up surveys were conducted by Sawyer County and WDNR and no additional plants were found. Follow-up monitoring and treatment will be necessary to keep this population in control. The lake association and county have committed to follow up efforts.

Table 4. Summary of invasive species detected in 2013.

			Aquatic							Terrestrial														
State	County	Lake	*Cipangopaludina chinensis*	*Iris pseudacorus*	*Lythrum salicaria*	*Myriophyllum spicatum**	*Orconectes rusticus*	*Potamogeton crispus**	*Viviparus georgianus*	*Aegopodium podagraria*	*Berberis thunbergii*	*Campanula rapunculoides*	*Caragana arborescens*	*Cirsium palustre*	*Digitalis grandiflora*	*Hesperis matronalis*	*Lonicera tatarica, L.morrowii, L. x bella*	*Myosotis scorpioides*	*Pastinaca sativa*	*Robinia pseudoacacia*	*Sedum* spp.	*Solanum dulcamara*	Total number of invasives detected	native phragmites
WI	Barron	Granite Lake			X			X														X†	4	X
		Horseshoe	X																				1	X
		Silver Lake	X‡					P†															2	
	Barron, Polk	Staples Lake	X					X	X														3	
	Barron, Washburn	Bear Lake	X‡		X			X	X‡													X†	5	
	Burnett	Clam Lake[a]						X											X†				3	
		Clam River Flowage			X			X															3	
		Lipsett Lake	X†		X			X														X†	4	
		Long Lake	X					X															2	
		Lower Clam[a]						X															2	X
	Douglas	Radigan Flowage										X†											2	
	Iron	Pine Lake			P†		X			X†													4	
		Spider Lake	X		X†																		2	X
		Trude							X†‡														2	X
	Oneida	Bearskin	X				X																2	
		Booth Lake	X‡		X†		X																3	X
		Chain Lake	X†‡		X		X											X†					4	
		Pickerel	X						X									X†					3	
		Thunder Lake							X†					X†			X†					X†	5	X
	Oneida, Vilas	Buckskin Lake	X‡		X†																		2	
	Polk	Big Butternut Lake	X†‡					X	X†								X†			X†		X†	6	
		Bone Lake	X†‡					X	X‡									X†					4	X
		North Pipe[b]																					1	
		Pipe Lake[b]	X‡													X†	X†						3	
		Sand Lake	X‡					X†															2	
	Price, Ashland	Butternut Lake	X‡	X	X		X		X								X†	X†				X†	8	
	Rusk	Island Lake	X†‡				X	X										X†				X†	5	
	Sawyer	Lost Land Lake[c]	X†			P†														X†			3	X
		Teal Lake[c]	X								X†												2	
		Tiger Cat Flowage			X	P†			X‡													X†	5	
	Vilas	Alder Lake[d]	X				X		X†‡								X†						4	
		Big Gibson																					1	
		Black Oak Lake					X							X†	X†			X†					5	
		Fishtrap	X†‡				X		X								X†	X†		X†			6	
		Horsehead Lake		X†						X							X†	X†					5	X
		Snipe	X		P†									X									3	X
		Wild Rice Lake[d]	X		X		X		X														4	
	Washburn	Bass Lake	X						X														2	
		Long Lake	X‡	X†				X	X‡			X†	X†				X†	X†		X†	X†	X†	11	X
		Total	26	3	13	2	10	14	14	2	1	2	1	3	1	1	8	9	1	4	1	9		12

* = priority species
a-d = lakes with common letters are connected
† = previously undocumented population
‡ = snail samples were sent to UW-LaCrosse for parasite analysis.
P = pioneer population
X = present

Lost Land Lake
Lost Land Lake is a 1304 acre seepage lake approximately 20 miles northeast of Hayward, Sawyer County, WI within the Chequamegon-Nicolet National Forest. It has one public boat landing which also provides access to Teal Lake. Approximately 5-10 plants were found just south of the boat landing and 5-10 plants scattered with native milfoil in the northern bay. Partnering agencies and groups were notified and a coordinated "rapid response" was initiated. Plants were hand-pulled by the the lake association and follow up surveys showed no additional plants. This lake will also require follow-up monitoring and treatment efforts which the lake association and county have committed to.

Curly-leaf pondweed (*Potamogeton crispus*):
Silver Lake
Silver Lake is a 337 acre seepage lake approximately 7 miles northeast of Cumberland, Barron County, WI. It has one public boat landing on the south end of the lake which is a county park and public beach. Curly-leaf pondweed was found in two locations on the lake. A cluster of approximately 5-10 plants were found along the west shoreline in the southern portion of the lake and two plants were found in the northwest bay. Partnering agencies and groups were notified of the new discovery and WDNR visited the lake after the plants had died back for the year. Although suitable habitat is limited on the lake, curly-leaf pondweed has the potential to spread in the shallow bays. Follow up surveys and manual treatment should be initiated in 2014 while the infestation is still small and manageable.

Purple loosestrife:

Pioneer populations of purple loosestrife were detected on Pine Lake in Iron County and Snipe Lake in Vilas County. WDNR and County AIS coordinators were notified of these new detections.

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 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 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 2013, beetles were collected from locally established populations in early June and released near the marina on Madeline Island. 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 2013, GLIFWC staff treated 104 purple loosestrife sites with herbicide. Figure 4 illustrates the distribution of chemical control efforts for purple loosestrife in 2013. 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 5-6). Several thousand *Galerucella* beetles were also collected from Fish Creek Sloughs near Ashland, Wisconsin and released near the marina on Madeline Island in 2013 to control purple loosestrife there.

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 7). This strategy also reduces the amount of herbicide applied at each site (Figure 8). 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.

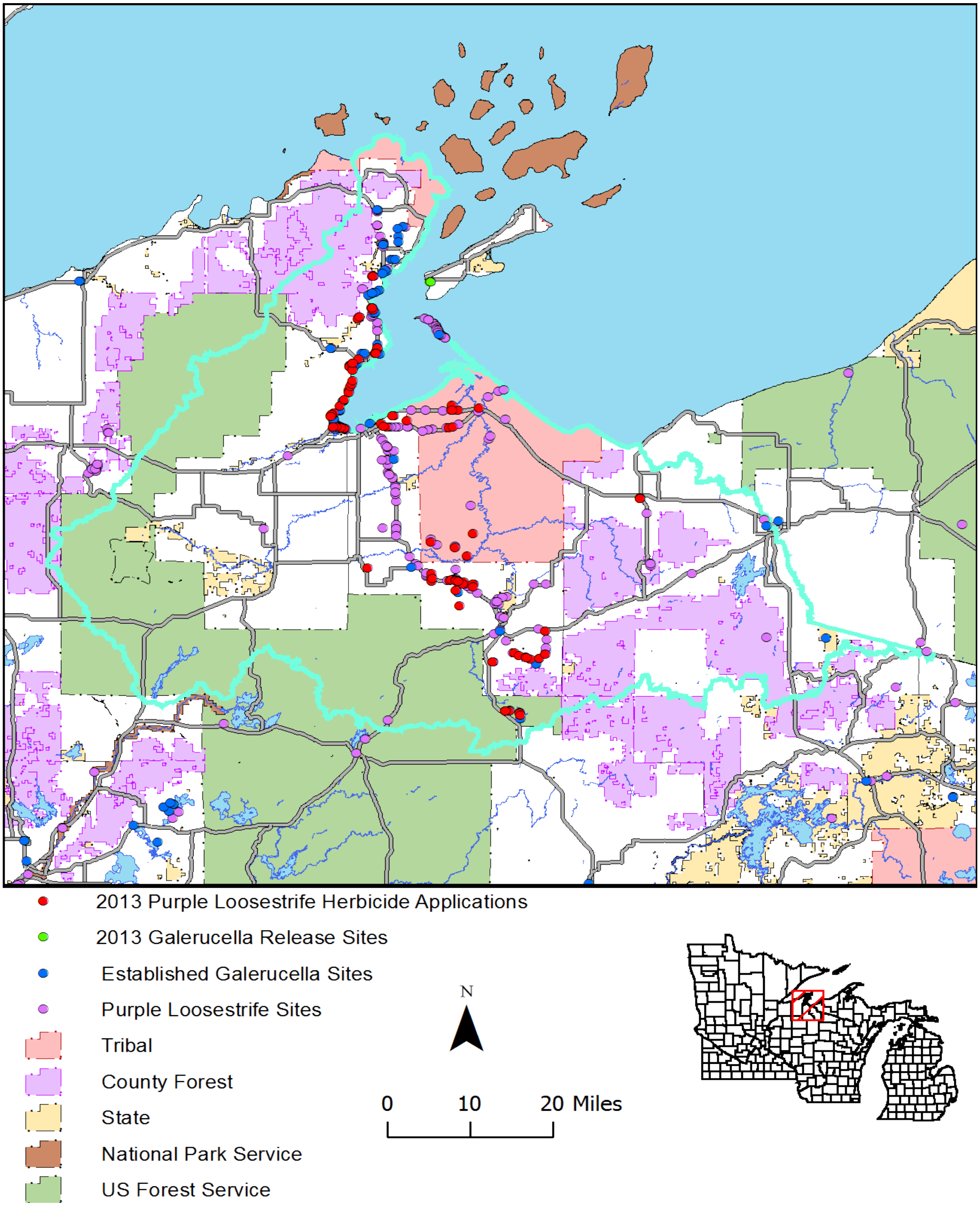

Figure 4. Distribution of purple loosestrife and 2013 biological and chemical control efforts.

Figure 5. *Galerucella* release site west of Bayfield, WI.

Figure 6. *Galerucella* release site at Underwood State Wildlife Area, Iron County, WI

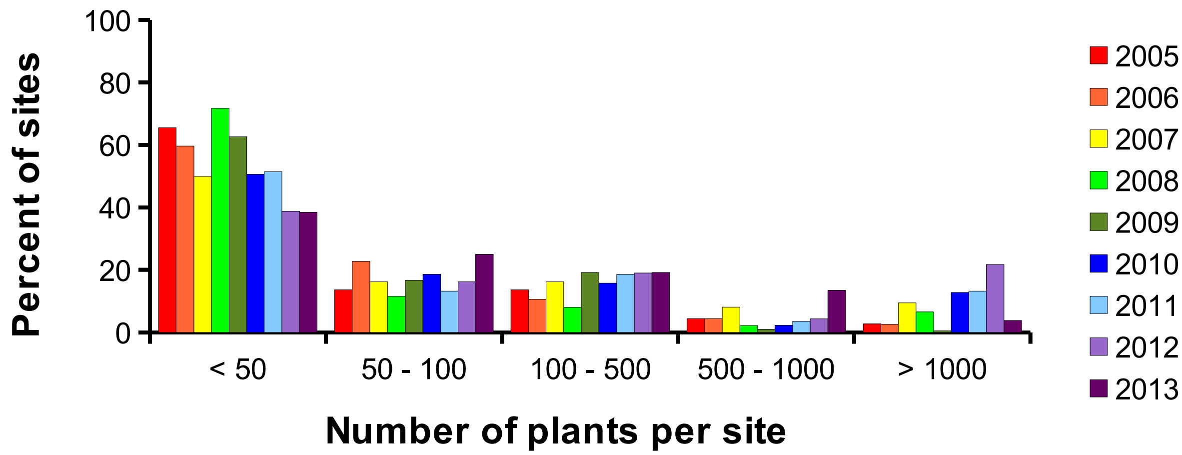

Figure 7. Abundance of purple loosestrife at sites treated in 2005-2013.

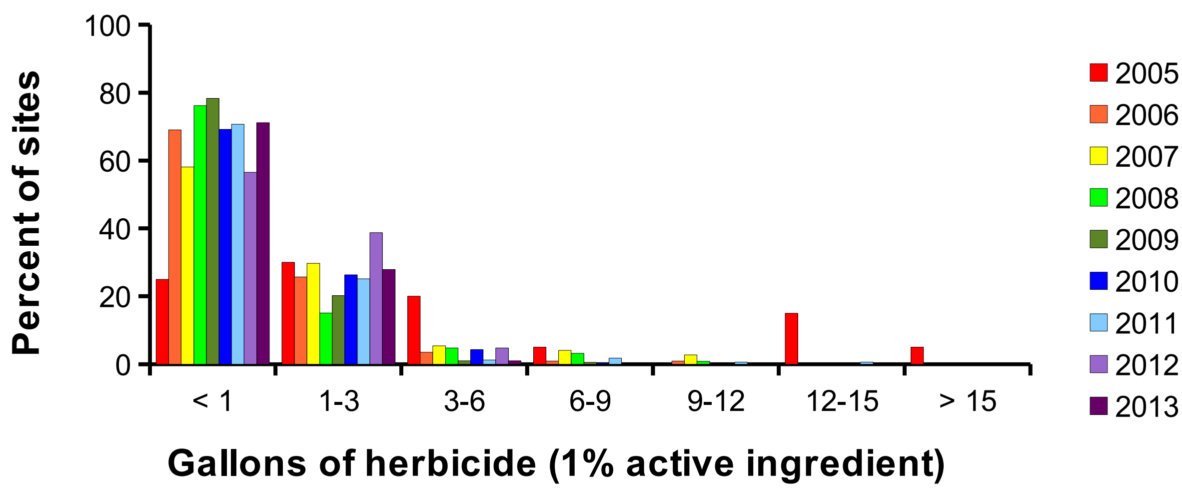

Figure 8. Amount of herbicide mix applied to purple loosestrife sites in 2005-2013.

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 2013, GLIFWC staff treated 14 sites with herbicide. In addition, several thousand *Aphthona lacertosa* were collected by GLIFWC staff from a site at Douglas County Wildlife Area and released at 3 sites in Bayfield County. Figure 9 illustrates the distribution of chemical and biological control efforts for leafy spurge in 2013. 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.

DISCUSSION

Annual control efforts have substantially reduced the abundance of leafy spurge. Figure 10 illustrates a trend towards more small sites and fewer large sites. As a consequence, the amount of herbicide used at each site has also trended downward (Figure 11). Integrated measures employing both herbicide and biological controls have shown great success on private lands west of Washburn, Wisconsin.

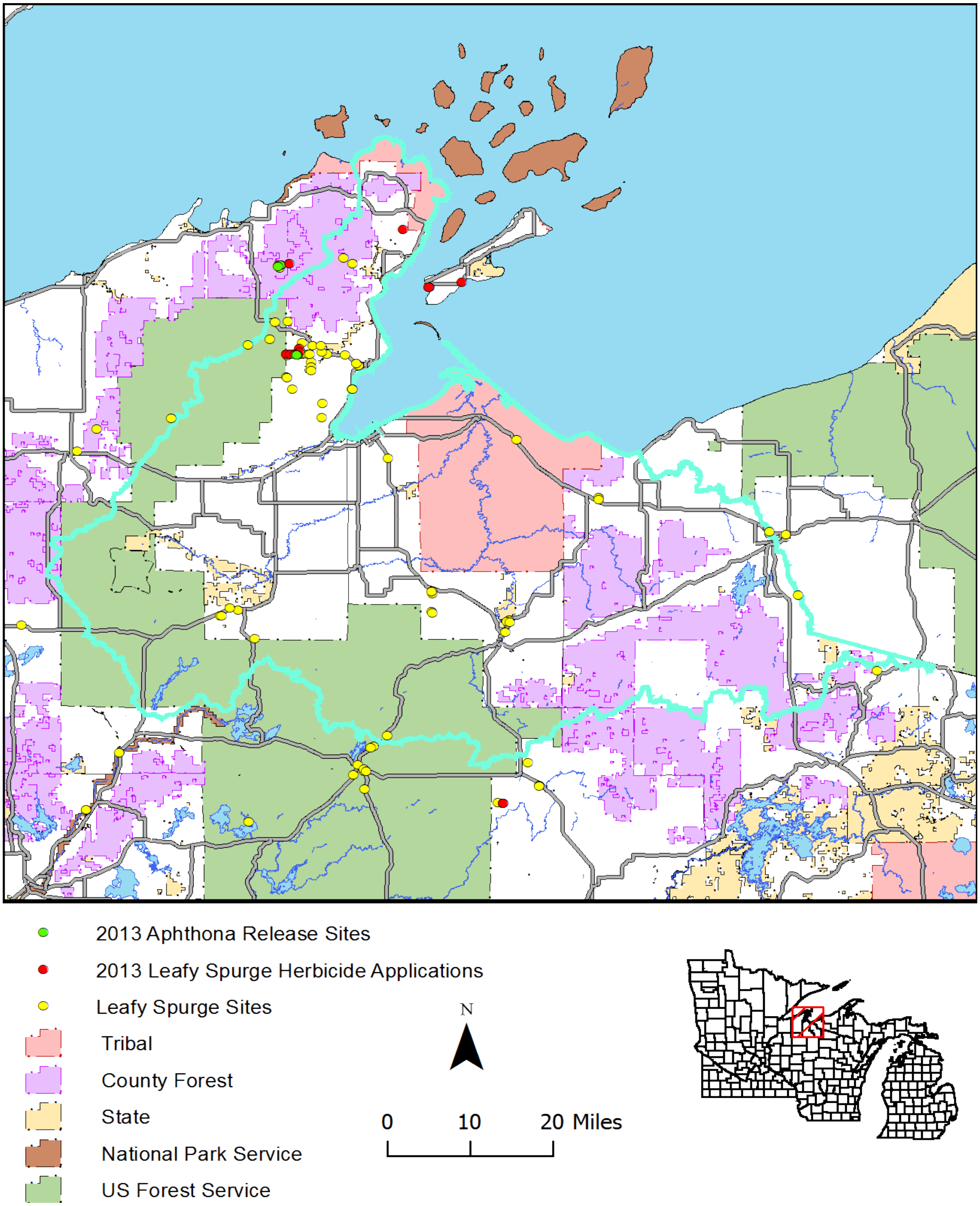

Figure 9. Distribution of leafy spurge and 2013 biological and chemical control efforts.

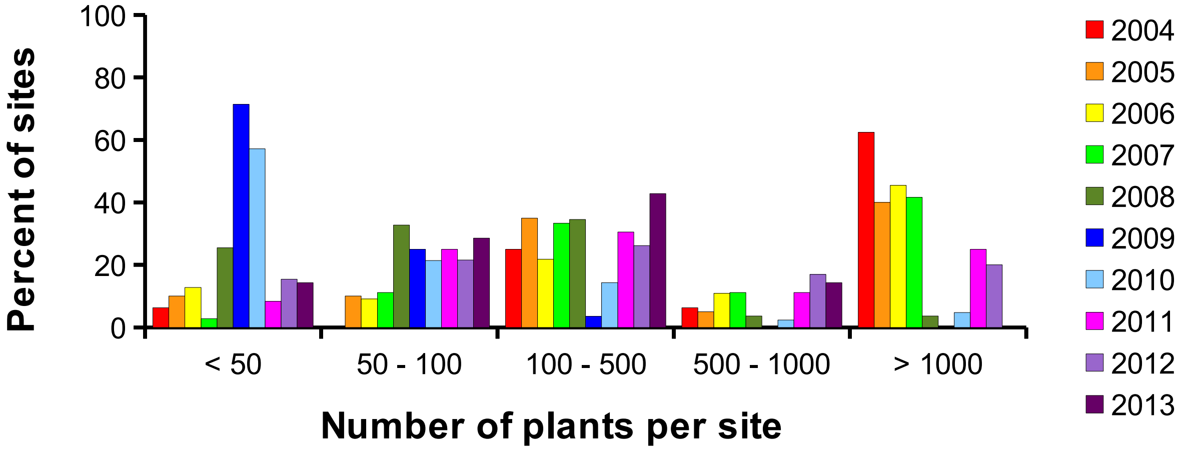

Figure 10. Abundance of leafy spurge at sites treated in 2004-2013.

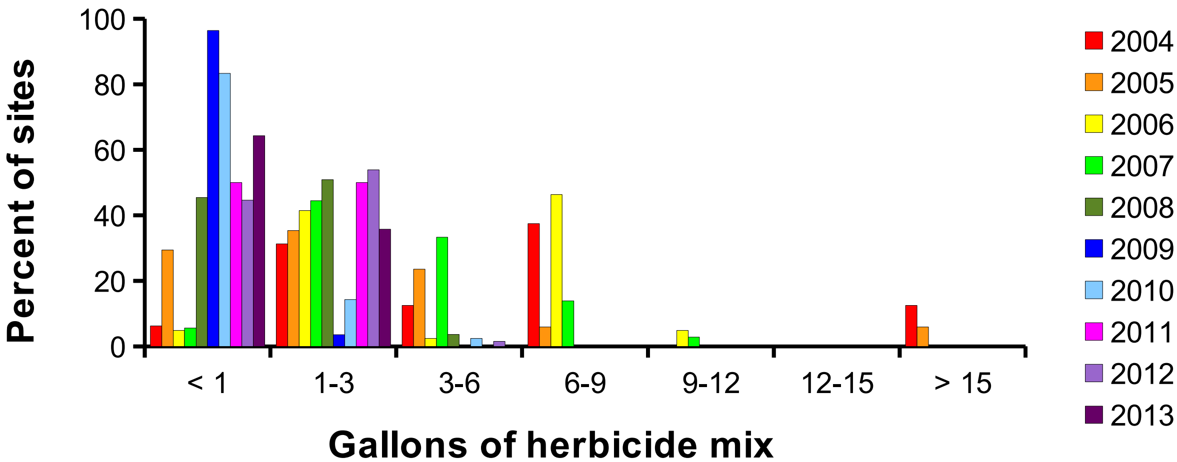

Figure 11. Amount of herbicide mix applied to leafy spurge sites 2004-2013.

PHRAGMITES CONTROL ACTIVITIES
BAD RIVER-CHEQUAMEGON BAY WATERSHED

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 Chequamegon Bay as well as inland *manoomin* (wild rice) waters if no action is taken. 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 cost-effective control efforts before it spreads any further and becomes too widespread to contain.

Several small populations of phragmites were detected in 2013 along the western shoreline of Chequamegon Bay near wastewater treatment plants (WWTPs) in Red Cliff, Bayfield, and Washburn. 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 did not spread by seed. However, recent studies suggest that seed viability is directly related to soil nutrients (Kettenring 2013). GLIFWC is actively engaged with all three communities and the permitting agencies to develop alternative species and more appropriate permit conditions to remove these phragmites seed sources from the landscape.

METHODS

Surveys: GLIFWC staff surveyed roadsides, trails, and much of the Chequamegon Bay shoreline and mapped both the native and non-native phragmites subspecies wherever they were encountered in 2013. GLIFWC staff also assisted staff from Bad River, Red Cliff and Douglas County to survey the Bad River sloughs, Red Cliff reservation roads and shorelines and to ground truth previously reported locations in Douglas County, respectively. A summary of data from previously reported sites was also acquired from the WDNR and Ottawa National Forest and many were ground-truthed in 2013. In addition, GLIFWC has routinely mapped native phragmites occurrences when encountered on invasive species surveys since 2007. All of the *verified* sites were summarized in 2013.

Control: GLIFWC crews cut and disposed of phragmites seed heads, then applied Imazapyr (Habitat®) herbicide with back-pack sprayers to control phragmites. Hand-held computers with GPS receivers and GIS software were used 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

Thirty two small pioneer sites (< 0.25 acres) were detected within the Lake Superior watershed of Wisconsin and 31 were treated in 2013 (Figures 12-14). These sites will be revisited in 2014 and treated if necessary to insure effective control. Data for an additional 107 phragmites sites were acquired from GLIFWC surveys in prior years, WDNR, and Ottawa National Forest. All phragmites occurrences that have been verified as either native or non-native were summarized online to coordinate appropriate responses (http://invasives.glifwc.org/phragmites/) among management partners.

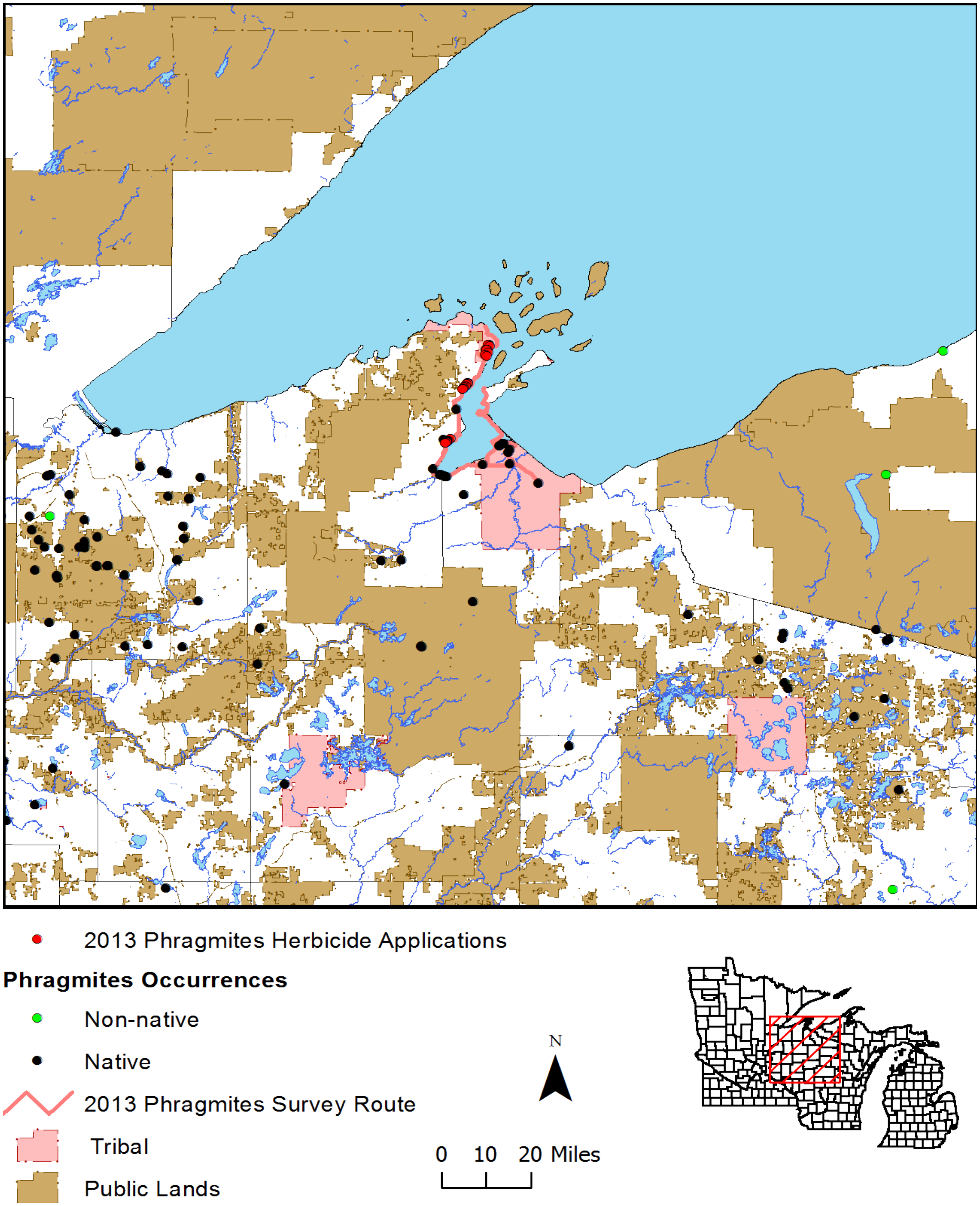

Figure 12. Distribution of phragmites and 2013 control and survey efforts.

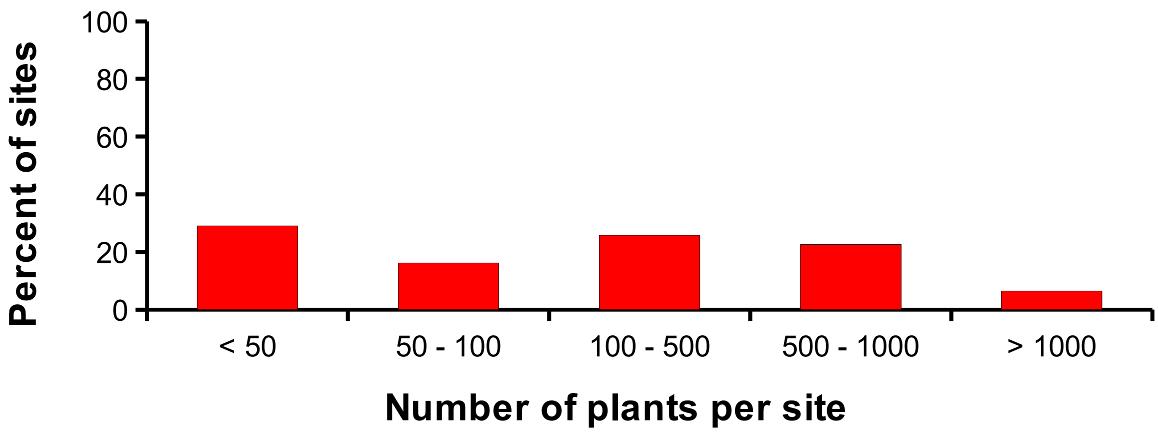

Figure 13. Abundance of phragmites at sites treated in 2013

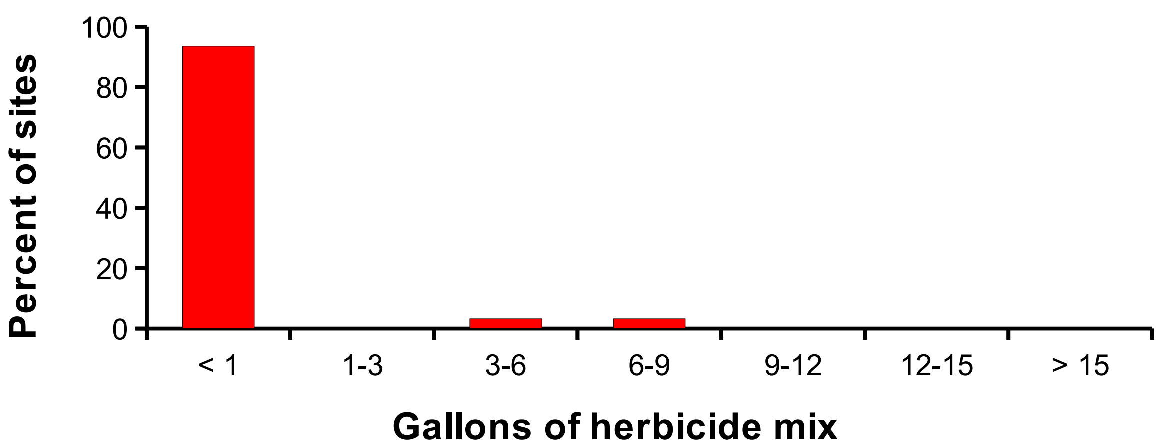

Figure 14. Amount of herbicide mix applied to phragmites sites in 2013.

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) and quarterly newsletter - *Mazina'igan*.

ACCOMPLISHMENTS

Mazina'igan Articles
GLIFWC's newsletter features articles on invasive species. Topics covered in 2013 included:

- "GLIFWC targets education, control and cooperation to manage invasive species" by Sue Erickson
  - Fall 2013 (http://www.glifwc.org/publications/mazinaigan/Fall2013)
- "Once here, invasive plants tend to stay" by Charlie Otto Rasmussen
  - Fall 2013 (http://www.glifwc.org/publications/mazinaigan/Fall2013)
- "Early detection of invasive phragmites in Chequamegon Bay prompts rapid response" by Miles Falck
  - Winter 2013 (http://www.glifwc.org/publications/mazinaigan/Winter2013)
- "Summer surveys keep tabs on aquatic invasive species, new method used to remove milfoil" by Dara Olson
  - Winter 2013 (http://www.glifwc.org/publications/mazinaigan/Winter2013)

http://invasives.glifwc.org/

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. In 2013, a new AIS web application (http://data.glifwc.org/ais) that provides information for tribal harvesters including prevention measures, tribal regulations and regional occurrence data by waterbody was developed and published.

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 2013, GLIFWC staff worked with the NCWMA to collect *Galerucella* beetles for the biological control of purple loosestrife, participated in strategic planning and management plan revision, and developed a web application to help NCWMA members plan and prioritize management activities (*http://invasives.glifwc.org/query*).

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) can be used to query multiple databases simultaneously and browse the results via an interactive table or map.

maps.glifwc.org: The goal of this project is to facilitate collaboration by providing a common communications infrastructure. 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

Falck, M., S.Garske and D. Olson. 2006. Invasive Species Program 2003 - 2005. Administrative Report 06-03. Great Lakes Indian Fish and Wildlife Commission, Odanah, Wisconsin, USA.

[GLERL] Great Lakes Environmental Research Laboratory. 2006. Great Lakes Aquatic Nonindigenous Species List. National Oceanic and Atmospheric Administration. http://www.glerl.noaa.gov/res/Programs/invasive/ (June 21, 2007).

Johnson, P. 2004. Sampling protocol for spiny water fleas (*Bythotrephes longimanus*) *In* Wisconsin Waters, version 2.0. Center for Limnology, University of Wisconsin, Madison, Wisconsin USA.

Kettenring, K. M. 2013. Seeds, Stolons, and Rhizomes. Oh My! Pathways of Introduction and Spread of Non-native Phragmites. Accessed on December 17, 2013. http://greatlakesphragmites.net/files/Kettenring-GLC-seminar_FINAL.pdf

Loos, A. and D. Ragsdale. 1998. Biological control of purple loosestrife: a guide to rearing leaf-feeding beetles. University of Minnesota Extension Service. http://www.extension.umn.edu/distribution/horticulture/dg7080.html (April 21, 2013).

Marcquenski, S. and S. AveLallemant. 2007. Boat and Gear Disinfection Protocol for Fish Health Statewide. Wisconsin Department of Natural Resources. Madison, Wisconsin, USA.

Michigan DEQ. A guide to the control and management of invasive phragmites. Accessed on December 17, 2013. http://www.michigan.gov/documents/deq/deq-ogl-ais-guidePhragBook-Email_212418_7.pdf

Pimentel, D., R. Zuniga, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien -invasive species in the United States. Ecological Economics 52 (3): 273-288.

Thompson, D., R. Stuckey, and E. Thompson. 1987. Spread, impact, and control of purple loosestrife (*Lythrum salicaria*) in North American wetlands. US Department of Interior, Fish and Wildlife Service, Washington, DC, USA.

Wisconsin Department of Natural Resources. 2010. Dreissenid (Zebra and Quagga) Mussel Monitoring Protocol. Wisconsin Department of Natural Resources. Madison, Wisconsin, USA.