Invasive Species Program 2012

by

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Administrative Report 14-01
May 2014

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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.
This report summarizes the activities undertaken by GLIFWC staff during 2012 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.

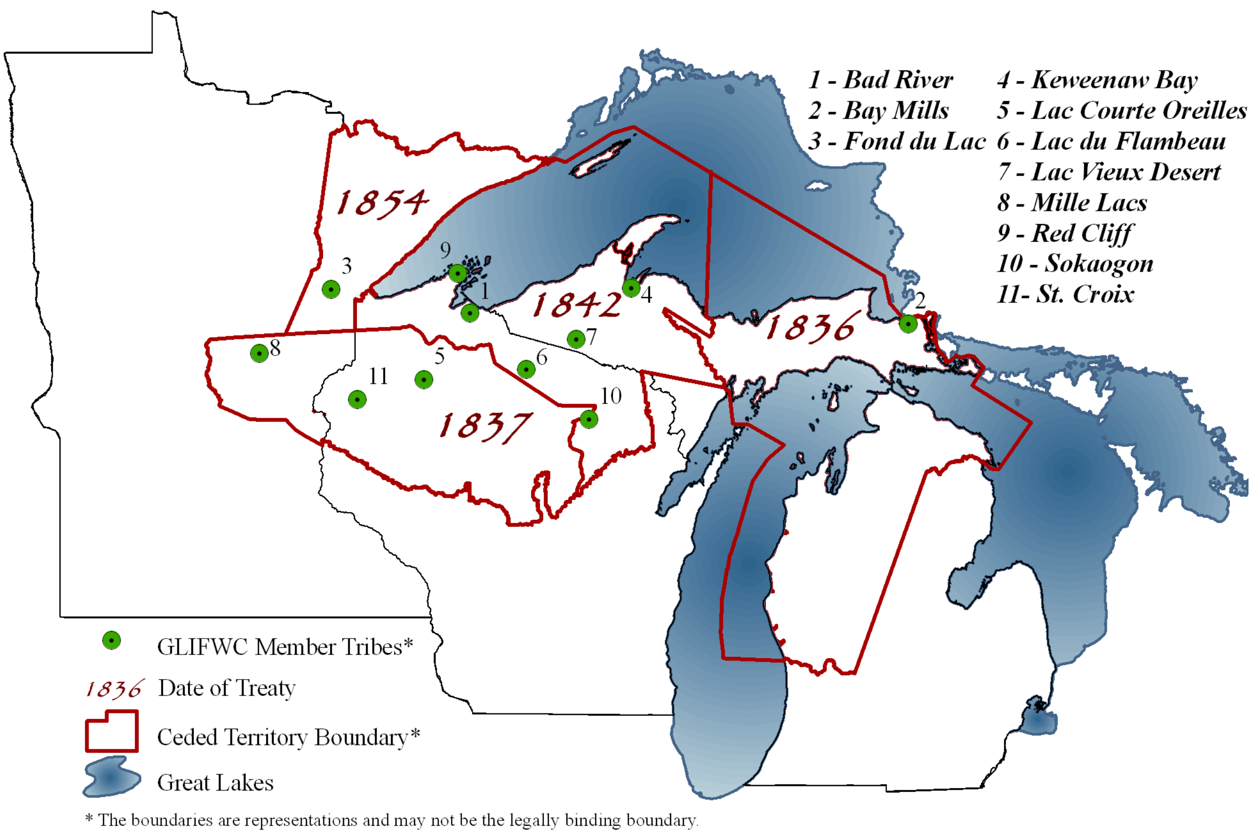

Figure 1. Location of GLIFWC member tribes and ceded territories.

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)
  - Wisconsin State ANS Plan
  - St. Croix Interstate ANS Plan

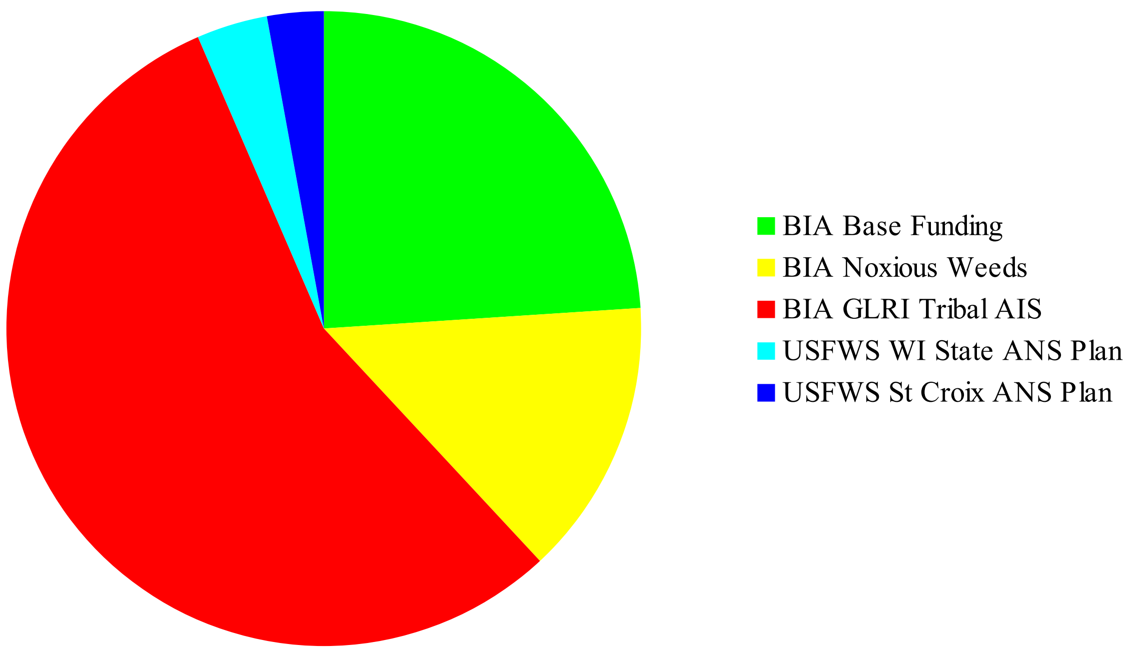

Figure 2. Funding sources for GLIFWC's invasive species program in 2012.

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 2012 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 2012, 31 lakes in northern Wisconsin and the western Upper Peninsula of Michigan were chosen for aquatic invasive species surveys in coordination with Lac du Flambeau, Lac Courte Oreilles, St. Croix and Lac Vieux Desert tribal natural resource departments, Wisconsin Department of Natural Resources (WDNR), Wisconsin County Aquatic Invasive Species (AIS) coordinators, Ottawa National Forest, Invasive Species Control Coalition of Watersmeet (ISCCW) and Onterra LLC. 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. Table 1 provides a list of lakes surveyed and a map is shown in Figure 3.

With two exceptions, lakes were surveyed for zebra mussels (*Dreissena polymorpha*), quagga mussels (*Dreissena rostriformis*), spiny water fleas (*Bythotrephes longimanus*), fishhook water fleas (*Cercopagis pengoi*), and several invasive plant species. An effort was made to visit each lake twice during the summer to increase the probability of detecting *Dreissena* veligers and invasive plants with varying phenology. Only *Dreissena* veliger and water flea plankton tows were conducted on Sand Lake in Sawyer County because Lac Courte Oreilles Natural Resources Department staff were conducting an aquatic plant survey. Surveys for Eurasian water-milfoil (*Myriophyllum spicatum*) were conducted on the Wisconsin side of Lac Vieux Desert only, to supplement surveys on the Michigan side by ISCCW and Ottawa National Forest.

Qualitative surveys for invasive species were conducted on each lake by observing the littoral zone from the water's surface. Surveys focused on submergent, emergent and shoreline plants. These areas were also inspected for invasive animals or evidence of their presence. The survey was conducted by driving a boat slowly, meandering back and forth in shallow water to the outer edge of the littoral zone. As much of the shoreline (including island shorelines) as possible was surveyed. On larger lakes, surveys targeted the most likely areas for introductions. These areas

Table 1. Lakes surveyed for aquatic invasive species in 2012.

State	County	Lake	WBIC	Acres	Dates Surveyed	Number of Samples	
						Veliger	Water fleas
MI	Iron	Hagerman	36-190	565	9/6	12	3
		Ottawa	36-417	532	7/19, 9/5	6	8
		Perch	36-1529	1038	7/16-17, 8/29	6	3
	Ontonagon	Bond Falls Flowage	66-31	2127	7/17-18, 8/30	6	6
MI, WI	Gogebic, Vilas	Lac Vieux Desert*	1631900	4300	8/27, 9/4-5	0	3
		Tenderfoot	2962400	437	7/10, 8/21-22	6	2
WI	Burnett	Devils	2461100	1001	6/18, 7/23	6	3
	Iron, Vilas	Sherman	1880700	123	6/25, 8/16	1	1
	Oneida	Clear*	977500	846	6/28, 8/9	0	3
		Hasbrook*	1589100	302	6/26, 8/7	0	3
		Katherine*	1543300	590	6/27, 8/8	0	3
		North Nokomis*	1595800	476	6/27, 8/6-7	0	3
	Polk	Balsam	2620600	2054	6/12, 7/24-25	6	3
		Big Round	2627400	1015	6/13, 7/24	6	1
		Half Moon	2621100	579	6/13, 7/26	6	2
	Sawyer	Clear*	2435800	250	6/19, 7/31-8/1	2	1
		Sand	2393200	928	6/18, 8/1	6	3
		Sissabagama*	2393500	719	6/20, 7/30	0	3
		Spider	2435700	1454	6/19, 7/31-8/1	4	2
	Vilas	Anvil*	968800	398	7/4, 8/15	0	1
		Averill	2956700	71	7/9, 8/20	0	0
		Ballard	2340700	505	7/2, 8/14	6	1
		Big Muskellunge*	1835300	930	7/3, 8/15	0	3
		Birch	2311100	584	7/11, 8/23	6	3
		Clear	2329000	555	7/11-12, 8/13	6	3
		Palmer	2962900	635	7/10, 8/21-22	2	0
		Presque Isle	2956500	1280	7/9, 8/20	6	3
		Razorback*	1013800	362	7/5, 8/14	0	1
		Van Vliet	2956800	220	7/9, 8/20	2	0
	Vilas, Oneida	Squaw	2271600	785	6/25-26, 8/8	6	1
	Washburn	Stone*	1884100	523	6/21, 8/2	0	3
					Total	107	75

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

included boat landings and areas around the landings, disturbed areas, developed shorelines areas, inlets and outlets, shallow or protected bays, and shorelines in close proximity to roads. The entire shoreline was typically surveyed on small to medium lakes (approx. 1000 acres or less).

Boat landings were the highest priority area for all 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 were conducted at the main boat landing. A point was chosen offshore from the landing and two rake tosses were made in both directions parallel to the shoreline. The material

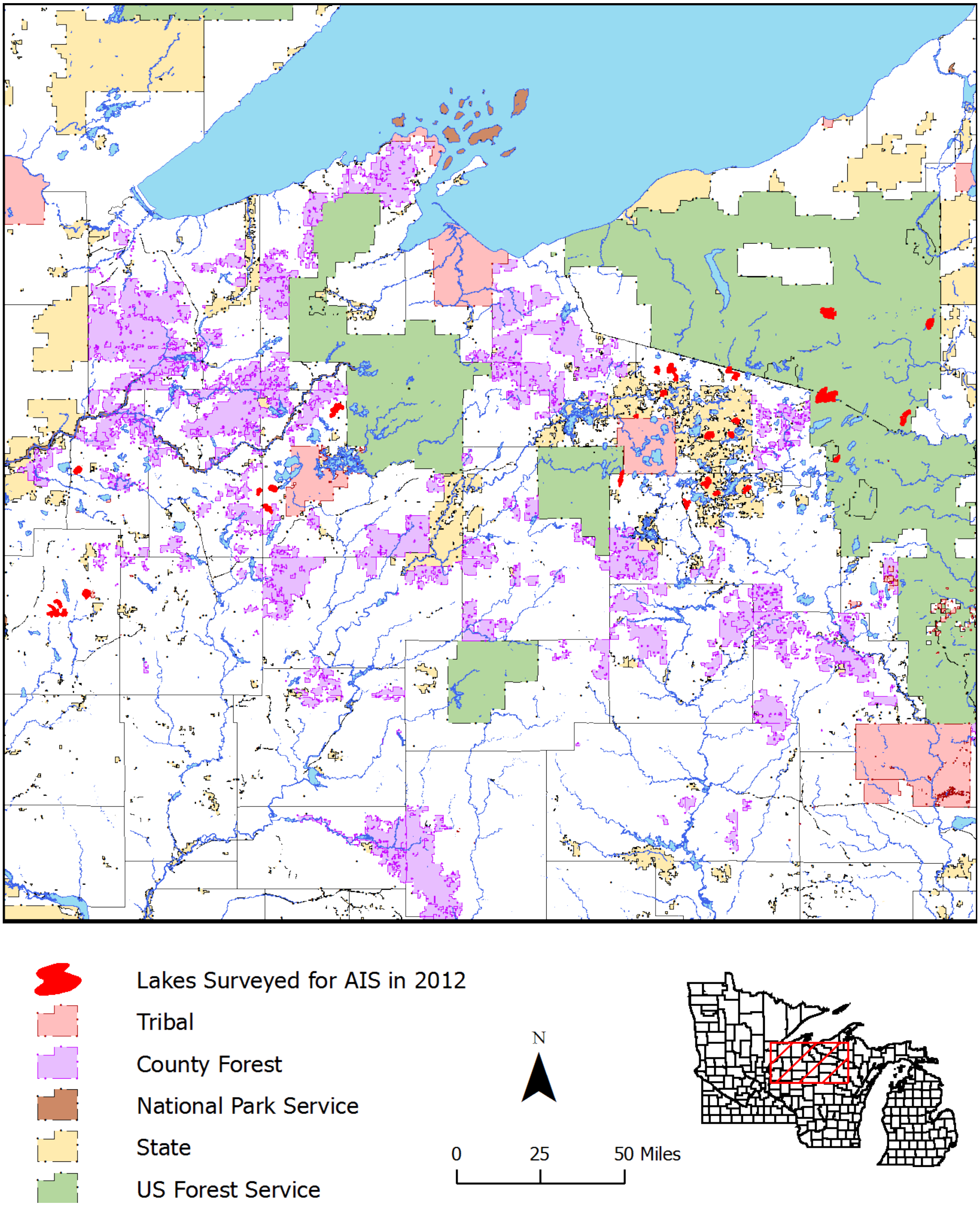

Figure 3. Lakes surveyed for aquatic invasive species in 2012.

retrieved by each throw was inspected for invasive plants and animals.

The most ecologically destructive 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 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.

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 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 are 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). At each veliger sampling point, specific conductance was measured at a 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 Wisconsin lakes, samples were collected on the second visit to lakes when water flea populations generally reach their peak. Due

Table 2. "Priority" species surveyed for in 2012.

Scientific Name	Common Name
<u>Invertebrates</u>	
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
<u>Plants</u>	
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

to the early, warm season and to avoid the possibility of missing water fleas at their peak, Michigan lakes were sampled on both visits.

For larger lakes, three veliger and water flea samples were taken on each visit. 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 other priority 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 to link back to the field data sheet. 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.

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). 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 (*e.g.* 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 170 invasive species sites comprising 21 taxa were mapped in 2012. "Priority" species accounted for 19 of the sites. Purple loosestrife was the most frequently detected species, occurring on 45% of the 31 lakes surveyed. Sixty-three boat landings were surveyed for aquatic and terrestrial invasive species. A total of 107 zebra mussel veliger and 75 water flea plankton samples were collected during 2012. No *Dreissena* veligers or spiny or fishhook water fleas were detected in any of the samples. Table 3 provides a summary of invasive species detected in each lake. *Manoomin* was observed on five lakes, native *Phragmites* was found on seven lakes. Additionally, two rare native aquatic plants species were found.

Table 3. Summary of invasive species detected in 2012.

			Aquatic								Terrestrial														
State	**County**	**Lake**	*Cipangopaludina chinensis*	*Iris pseudacorus*	*Lythrum salicaria*	*Myriophyllum spicatum**	*Orconectes rusticus*	*Potamogeton crispus**	*Viviparus georgianus*		*Aegopodium podagraria*	*Berberis thunbergii*	*Caragana arborescens*	*Cirsium palustre*	*Digitalis lutea*	*Euphorbia cyparissias, E.esula*	*Lonicera tatarica, L.morrowii, L. x bella*	*Myosotis scorpioides*	*Rhamnus cathartica*	*Robinia pseudoacacia*	*Salix alba, S.fragilis, S. x rubens*	*Sedum spp.*	*Solanum dulcamara*	*Valeriana officinalis*	Total number of invasives detected
MI	Iron	Ottawa										X		X											2
		Perch			X		X							X									X†		4
	Ontonagon	Bond Falls Flowage					X							X†											2
MI, WI	Gogebic, Vilas	Tenderfoot			X†							X†			X†		X†	X†					X†		6
WI	Burnett	Devils	X													X	X			X					4
	Iron, Vilas	Sherman																							0
	Oneida	Clear	X		X									X						X					4
		Hasbrook			X		X							X											3
		Katherine	X	X	X				X		X†					X	X	X†	X		X†	X†		X†	12
		North Nokomis	X						X												X†				3
	Polk	Balsam	X	X†	X†			X	X†				X†				X†	X†	X†		X†	X†	X†		12
		Big Round	X†				X	X	X†								X†	X†			X†				7
		Half Moon	X					X	X										X†		X†		X†		6
	Sawyer	Clear			X																				1
		Sissabagama	X		X†				X							X†		X†				X†			6
		Spider		P†	X			X										X†		X†			X†		6
	Vilas	Anvil	X			P†	X		X					X				X†			X†				7
		Averill					X																		1
		Ballard			P†				X					P†				X†					X†		5
		Big Muskellunge			X		X							X†							X				4
		Birch					X		X†									X†			X†		X†		5
		Clear					X		X												X		X†		4
		Palmer	X														X†	X†				X†	X†		5
		Presque Isle					X									X†		X†			X†				4
		Razorback	X		X†				X					X†				X†			X		X†		7
		Van Vliet					X											X†					X†		3
	Vilas, Oneida	Squaw	X		X†		X														X†				4
	Washburn	Stone			X		X									X	X		X	X					6
		Total	12	3	14	1	13	4	11	0	1	2	1	9	1	5	7	13	4	4	12	4	11	1	

* = priority species
† = previously undocumented population
P = pioneer population
X = present

DISCUSSION

Eurasian Water-milfoil (*Myriophyllum spicatum*):

Anvil Lake

Anvil Lake is a 398 acre lake approximately 10 miles east of Eagle River in Vilas County, Wisconsin. It has one public boat landing in the southeast bay. The boat landing and a campground east of the landing are part of the Chequamegon Nicolet National Forest. The remainder of the shoreline is privately owned. During our first visit on July 4, approximately 12 scattered Eurasian water-milfoil (EWM) plants were observed in the northern bay. One plant was found in the southwestern bay. The UW-Madison Center for Limnology had conducted a point intercept plant survey of Anvil Lake in 2010, but did not find any water-milfoil. This population is apparently a recent introduction to the lake.

Soon after the discovery of EWM in Anvil, the WDNR, Vilas County Conservation Department and the Chequamegon Nicolet National Forest were notified. On July 12th, WDNR conducted a point intercept plant survey of the lake and hand-pulled the EWM plants. Later in the summer additional plants were found scattered in the northern bay by GLIFWC, WDNR and Onterra LLC. In early September, the Anvil Lake association hand-pulled a total of 56 plants. On September 12th, WDNR conducted a follow up survey and hand-pulled one additional plant. Follow-up monitoring and treatment will be necessary to keep this population in control.

Lac Vieux Desert

Lac Vieux Desert is a 4300 acre lake on the Wisconsin-Michigan border. Eurasian water-milfoil was first discovered in the southeastern bay in 2008. This summer, GLIFWC surveyed the Wisconsin portion of the lake to supplement surveys of the Michigan portion conducted by ISCCW and the Ottawa National Forest. Plants were observed on the north edge of Thunder Bay. Near the tip of the bay were scattered EWM plants with a fairly substantial bed of EWM further north along the shoreline in 8-10 feet of water. These data were shared with management partners and will be used to inform future management decisions.

Spider Lake

During the 2005 GLIFWC AIS survey, one Eurasian water-milfoil plant was found in Spider Creek, the outlet for Spider Lake (Falck *et. al* 2006). This plant was hand-pulled. This summer, staff surveyed the Spider Lake chain and no additional plants were found. The lack of additional finds is encouraging and suggests that this small population has been eradicated.

<u>Straw Foxglove (*Digitalis lutea*):</u>

Tenderfoot Lake

Tenderfoot is a 437 acre lake straddling the Wisconsin-Michigan border. The Nature Conservancy's (TNC) Guido Rahr, Sr. Tenderfoot Forest Reserve borders the west side of the lake. In 2009, three straw foxglove plants were found by a TNC volunteer in two locations along trails in the reserve. This was the first documented population in Wisconsin. During the first survey of this lake, a population of a few hundred straw foxglove plants was found along the shoreline on the Michigan side of the lake not far from prior finds on the Wisconsin side. This newly discovered population could be the potential seed source for the other much smaller populations. Location data for this site were shared with TNC.

<u>Other – Native Plants:</u>

Manoomin was observed on Balsam, Squaw, Palmer and North (part of the Spider Chain) lakes in Wisconsin and on Perch Lake in Michigan. Vasey's pondweed (*Potamogeton vaseyi* J.W. Robbins) and perfoliate pondweed (*Potamogeton perfoliatus* L.) were both found during surveys in Wisconsin. Both are listed as “special concern” by the WDNR. There are currently only four documented records of perfoliate pondweed in Wisconsin.

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 2012, 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 2012, GLIFWC staff treated 253 purple loosestrife sites with herbicide. Figure 4 illustrates the distribution of chemical control efforts for purple loosestrife in 2012. 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 2012, primarily within the Fish Creek Sloughs near Ashland, Wisconsin (Figure 8).

DISCUSSION

GLIFWC has been pursuing a strategy of using biological control at the largest purple loosestrife sites and those with poor access while focusing labor-intensive herbicide applications on small pioneer sites in accessible right-of-way sites. The results of biological control efforts have been variable. In general, smaller sites have responded quicker to biological control efforts, especially where herbicide has also been applied. Large sites have taken longer for beetle populations to reach densities that reduce the loosestrife population. Most sites have shown a cyclic response as beetle and loosestrife populations alternately peak and crash, with lower amplitudes over time and large sites exhibiting less frequency in the cycles.

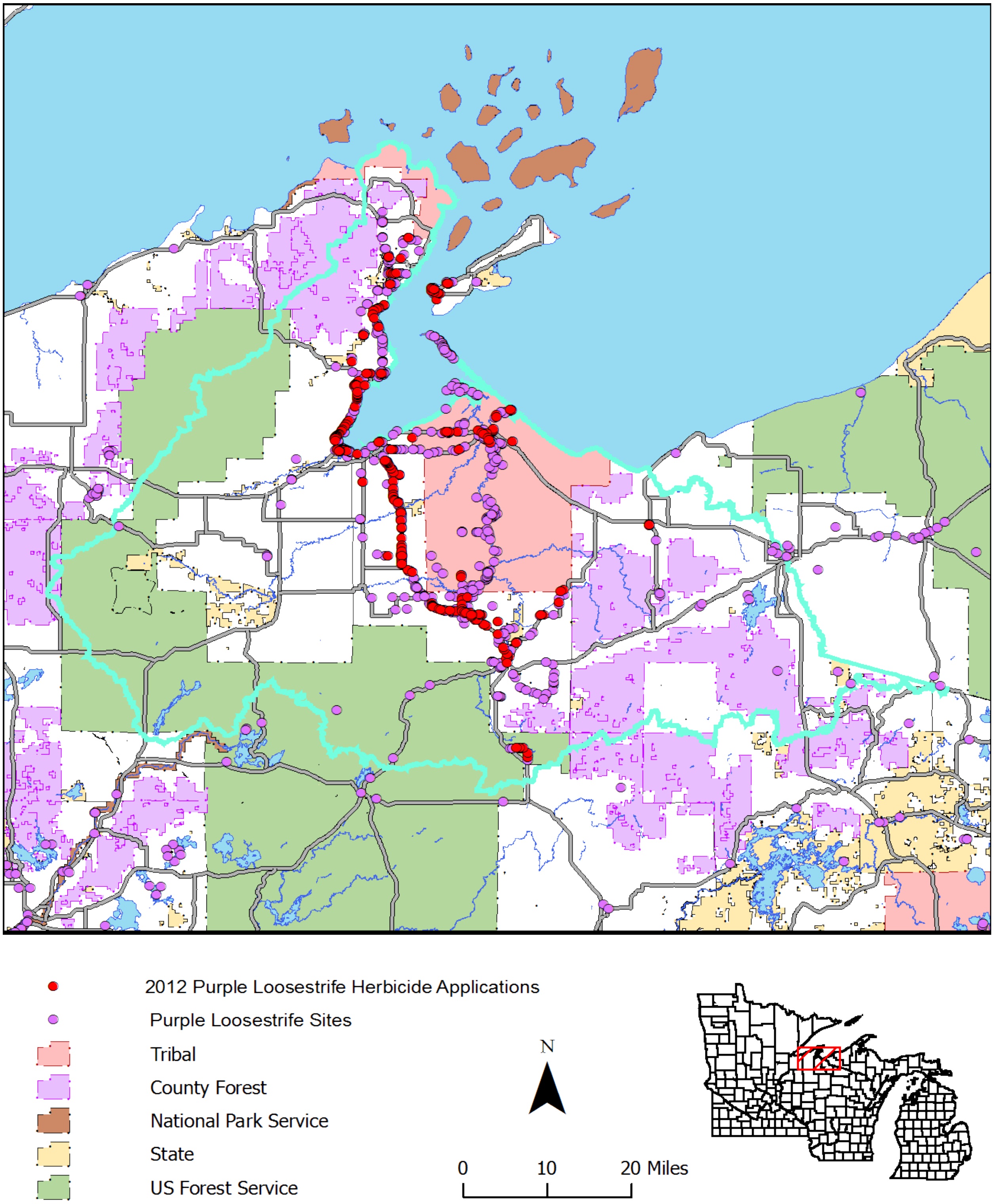

Figure 4. Distribution of purple loosestrife herbicide applications in 2012.

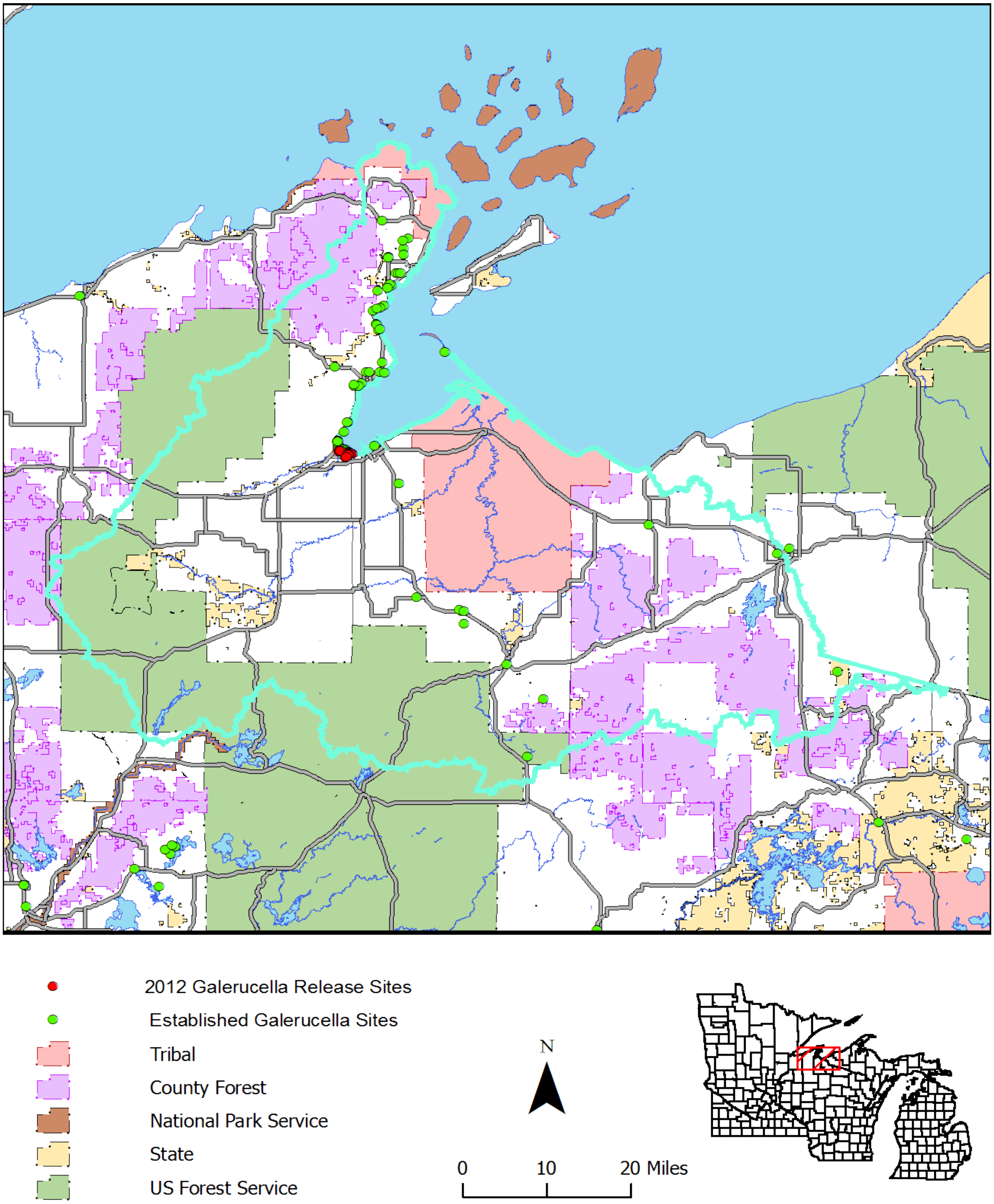

Figure 5. *Galerucella* release sites within the Bad River - Chequamegon Bay watershed.

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

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

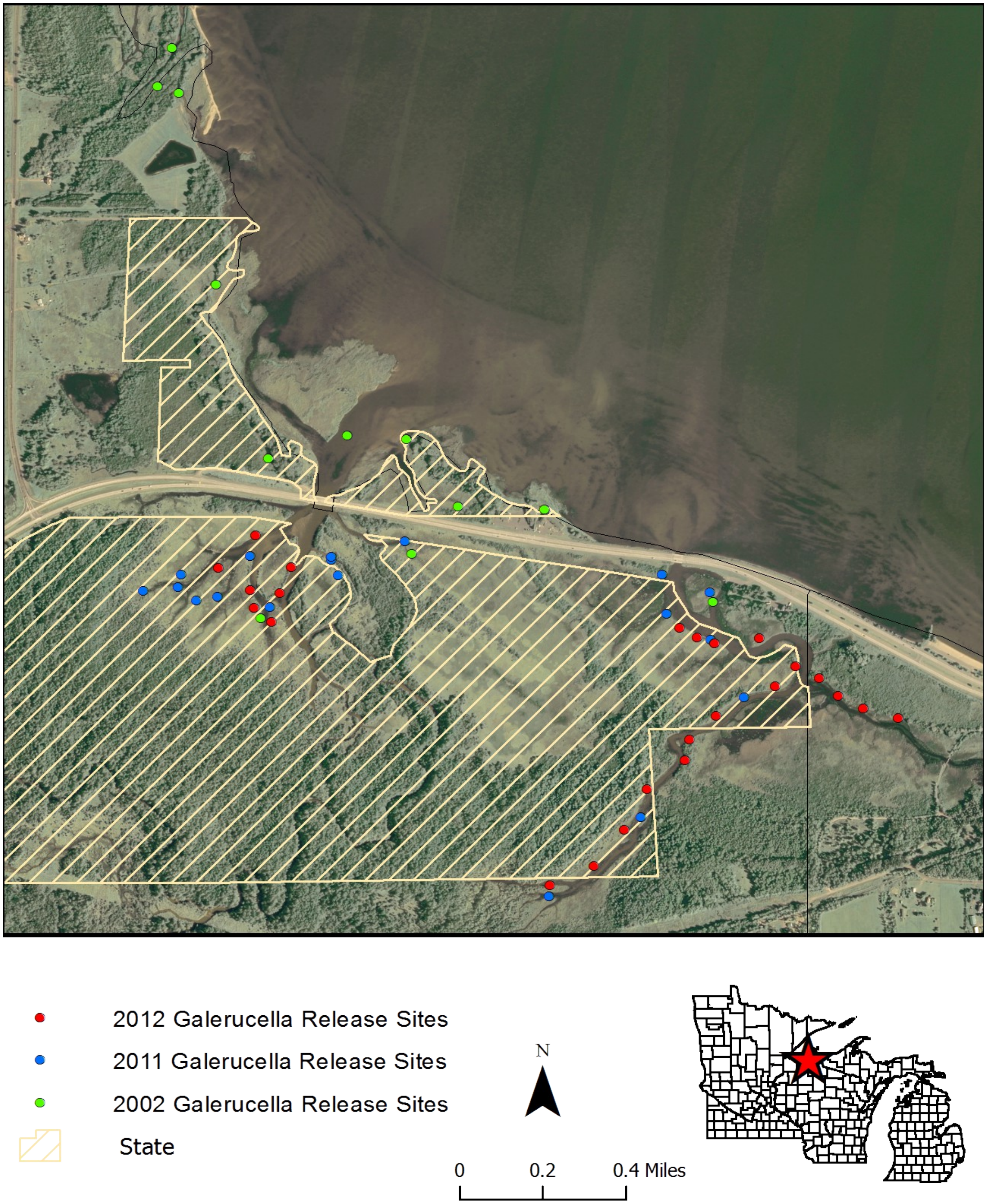

Figure 8. *Galerucella* release sites in Fish Creek Sloughs, near Ashland, WI

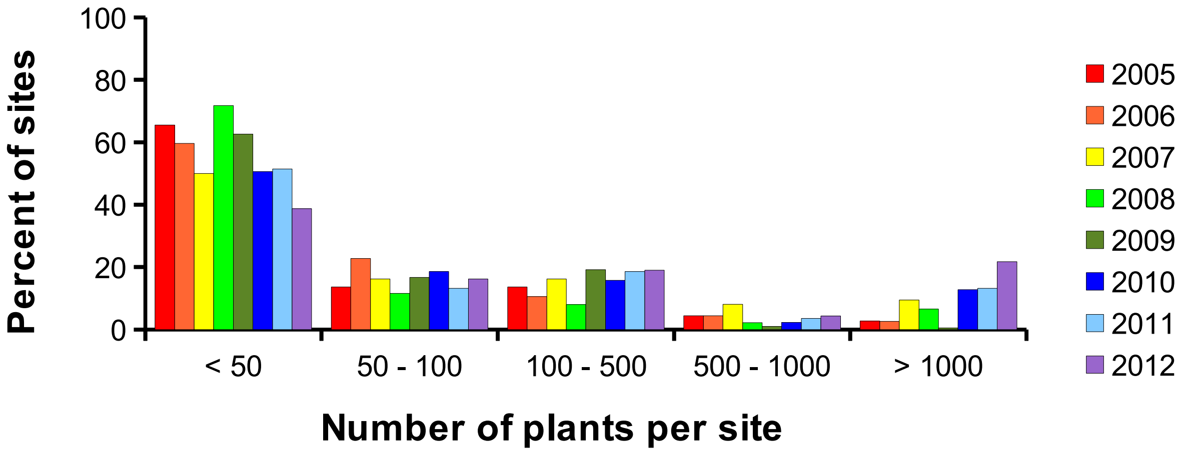

Figure 9. Abundance of purple loosestrife at sites treated in 2005-2012.

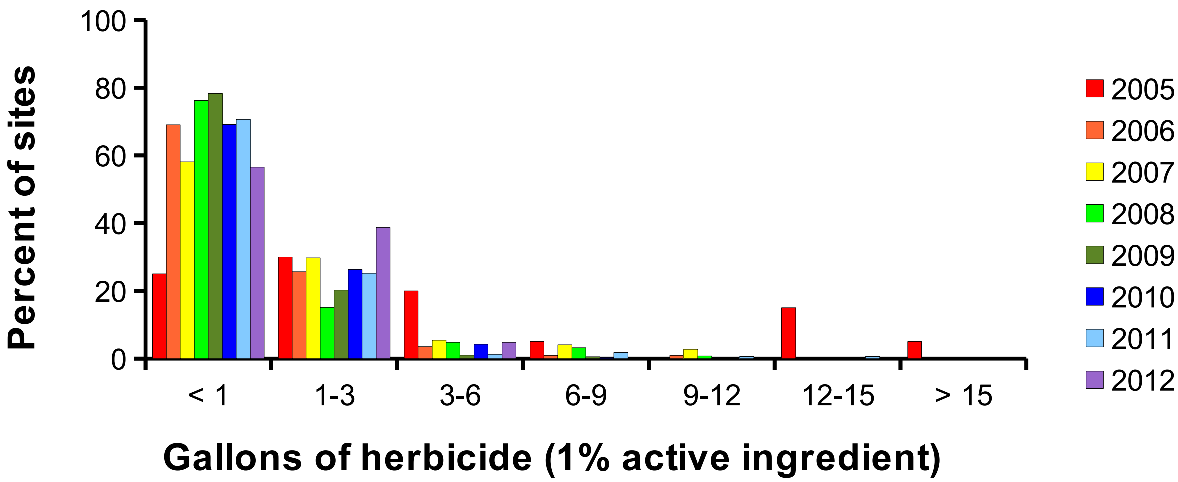

Figure 10. Amount of herbicide mix applied to purple loosestrife infestations in 2005-2012.

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 2012, GLIFWC staff treated 65 sites with herbicide. Figure 11 illustrates the distribution of chemical control efforts for leafy spurge in 2012. 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 significant 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 12 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 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 11).

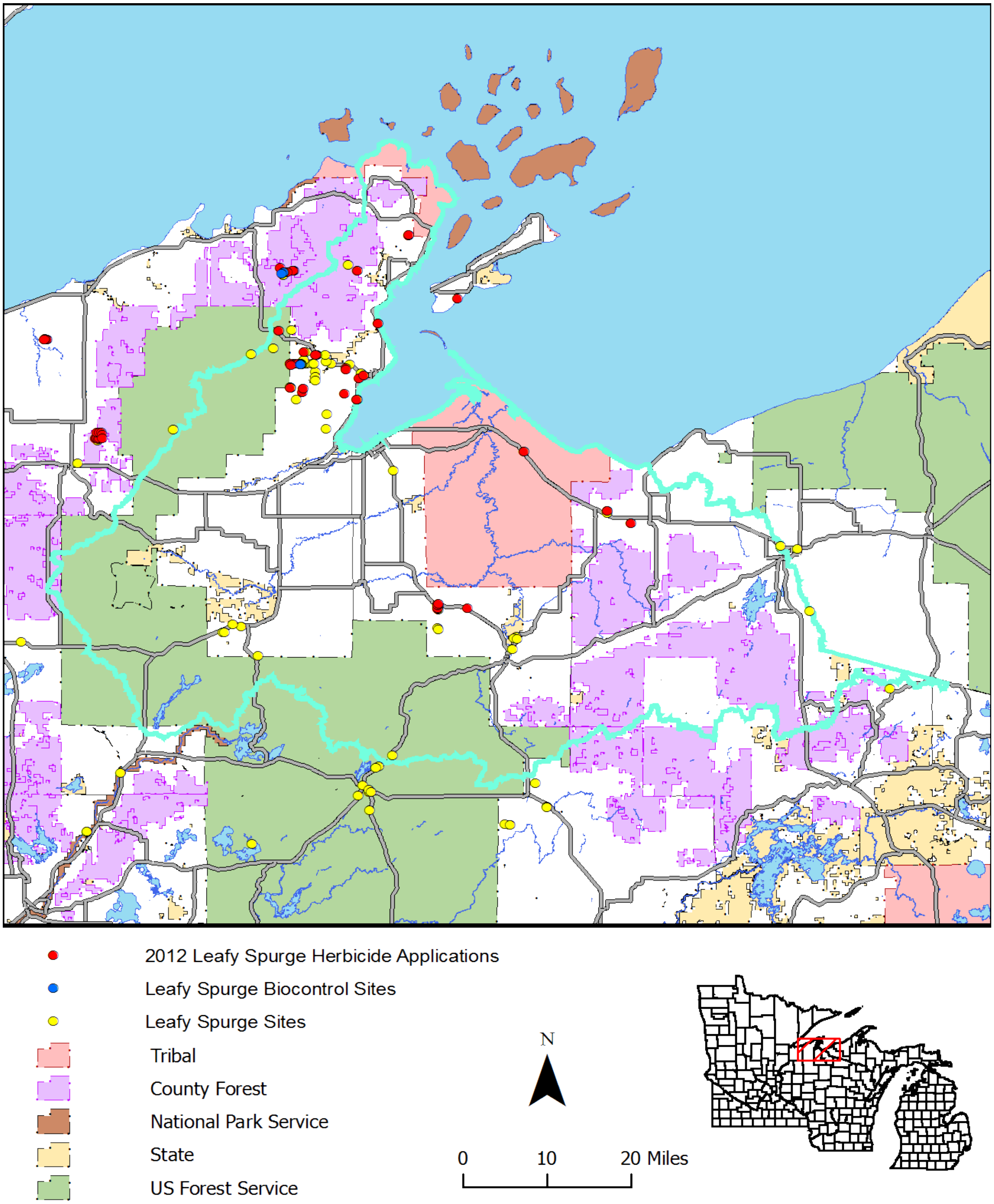

Figure 11. Distribution of leafy spurge, biological control sites, and 2012 herbicide applications.

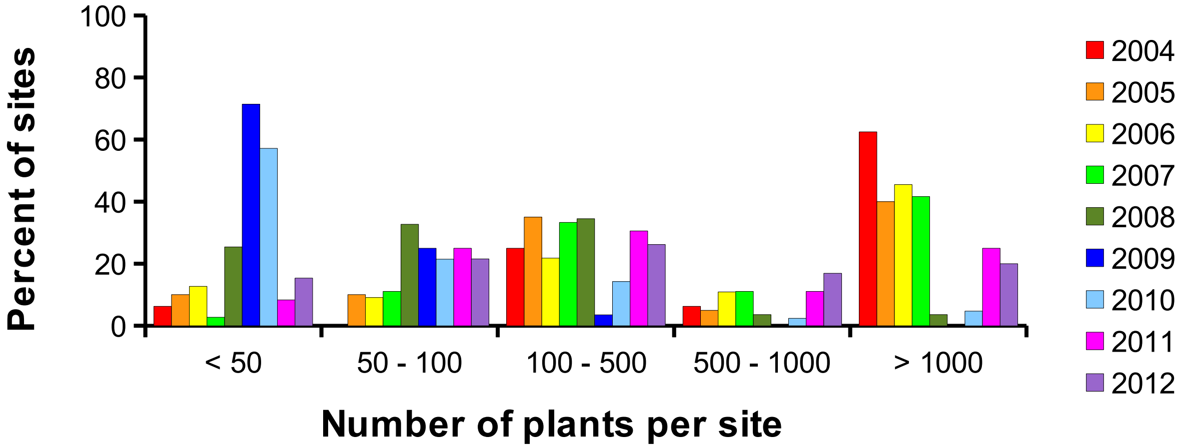

Figure 12. Abundance of leafy spurge at sites treated in 2005-2012.

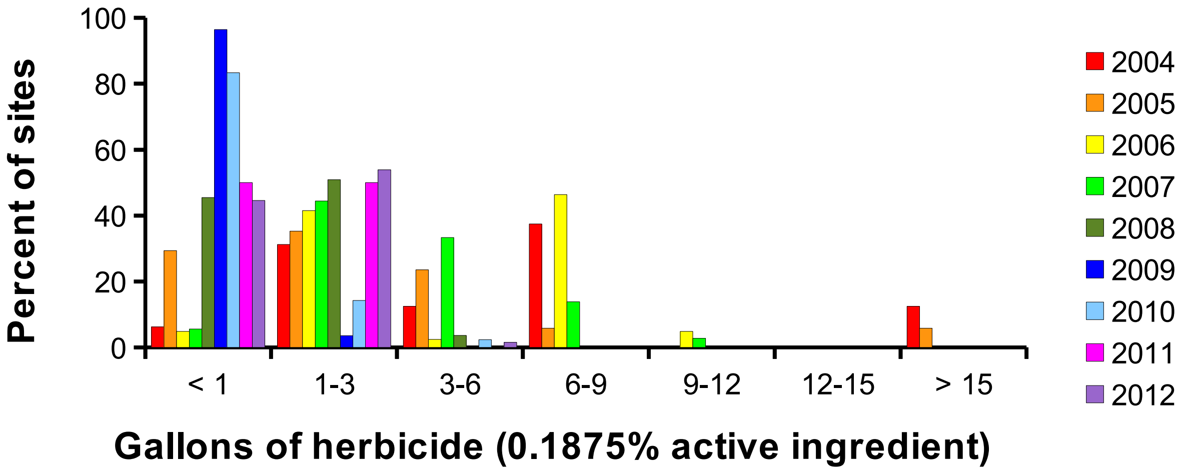

Figure 13. Amount of herbicide mix applied to leafy spurge infestations in 2005-2012.

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.invasives.glifwc.org) and quarterly newsletter - *Mazina'igan*.

ACCOMPLISHMENTS

Mazina'igan Articles
GLIFWC's newsletter features articles on invasive species. Topics covered in 2012 included:

- "Aquatic Invasive Species" by Miles Falck
  - Summer 2012 (http://www.glifwc.org/publications/mazinaigan/summer2012.pdf)
- "GLIFWC in pursuit of pervasive invasives " by Sue Erickson
  - Fall 2012 (http://www.glifwc.org/publications/mazinaigan/Fall2012.pdf)
- "Searching for aquatic invasive species" by Dara Olson
  - Winter 2012 (http://www.glifwc.org/publications/mazinaigan/Winter2012/index.html)

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.

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 2012, GLIFWC staff worked with the NCWMA 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 (http://gisin.glifwc.org) can be used to query multiple databases simultaneously and browse the results via an interactive table or map.

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