Bad River Reservation

Invasive Species Management Plan for Aquatic and Terrestrial Plants

2015

Bad River Natural Resources Department

Front Cover Photograph Credits

LEFT: Eurasian water-milfoil (*Myriophyllum spicatum*) photograph from the Robert W. Freckmann Herbarium/Steve Garske, University of Wisconsin-Stevens Point.
MIDDLE: Purple loosestrife (*Lythrum salicaria*) photograph from the Bad River Natural Resources Department (BRNRD).
RIGHT TOP: Reed canary grass (*Phalaris arundinacea*) photograph from BRNRD.
RIGHT BOTTOM: Garlic mustard (*Alliaria petiolata*) photograph from BRNRD.

Acknowledgements

The development of this management plan was funded by the US Department of the Interior, Fish and Wildlife Service under the CFDA Program 15.662, Grant # F13AP01048.

This plan was also peer reviewed by colleagues and coworkers from the Bad River Natural Resources Department, the Ashland and Iron County Land and Water Conservation Departments, the Bureau of Indian Affairs Forestry Program, and the Great Lakes Indian Fish and Wildlife Commission.

Adoption

This plan was approved and adopted by the Bad River Natural Resource Department on the 27th day of October, 2015.

FOREWORD

The Bad River Natural Resources Department created this plan to document and support the implementation of the management strategy used to address invasive species within the Reservation of the Bad River Band of Lake Superior Tribe of Chippewa Indians. Aligned with the Natural Resources Department's Mission Statement and Integrated Resources Management Plan, this plan seeks to use the best available science to maintain ecosystem integrity on the Reservation by protecting natural resources through invasive species management. Maintaining ecosystem integrity through invasive species management will allow the Natural Resources Department to retain sustainable resources for the next seven generations.

Ervin Soulier
Director, Bad River Natural Resources Department

Table of Contents

Acronyms

AIS – Aquatic Invasive Species
BRNRD – Bad River Natural Resources Department
EPA – Environmental Protection Agency
GLIFWC – Great Lakes Indian Fish and Wildlife Commission
IRMP – Integrated Resources Management Plan
IS – Invasive Species
NPS – National Park Service
USDA – United States Department of Agriculture
USFWS – United States Fish and Wildlife Service

1.0 Note to Reader

As the Bad River Natural Resources Department (BRNRD) continues to study the invasives species on the Reservation it will be necessary to update information in this document to reflect new invasive species occurrences, new treatment techniques, and other species-specific information. Thus, this plan was formatted and arranged with specific species data separated from the overall scope, goals, and objectives of the Plan so that the document has an extended longevity and does not necessarily require complete revisions to remain solvent. The scope, goals, and objectives within this Plan have been developed with the intention of helping to direct the management efforts of the BRNRD without limiting the BRNRD's ability to incorporate new information. For this reason the majority of the details pertaining to specific invasive species are located in the appendices so they may be updated independently of the main document body.

2.0 INTRODUCTION

Invasive species are a continuing concern for natural resource departments as an integral part of maintaining and improving the ecosystems and environments under their jurisdiction. Invasive species are defined as species "non-native (or alien) to the ecosystem under consideration and whose introduction does or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13112). Invasive species—whether plants, pathogens, insects, wildlife, or fish—are considered one of the "most significant environmental and economic threats facing [the United States'] forest, grassland, and aquatic ecosystems" (USDA 2013). Invasive species tend to spread quickly in new habitats to which they are introduced due to a lack of predators and competitors in the new environment. Once they are introduced to an area, invasives are known to impact water quality, recreation, forest sustainability, wildlife habitat, property values, the economy, and human health and safety (USDA 2013).

While invasive fish, insects, and pathogens contribute to the range of impacts associated with invasive species, a large portion of impacts are associated with plants. The USDA (2014) estimates that every year invasive plant species cause $30 billion dollars of economic impacts and spread to an additional 1.7 million acres. In 2009, the National Park Service estimated that seventy percent of the documented invasive species on park lands were invasive plants (NPS 2009). However, aside from impacting the economy, there are human health concerns related to invasive plants, as the USFWS reports that approximately half of the poisonous plants here in the United States are non-native, with many of those considered invasive (2008). In addition, colonization of an area by invasive plants can cause ecological harm, leading to the extirpation of existing plants, habitat alteration, and flooding.

Since all invasive species, including plants, are notoriously hard to eradicate once they are established, prevention is the best management strategy when dealing with these species. However, for newly established or existing populations of invasive species it is necessary to have an existing control/management plan that provides guidance toward reducing the spread of these species into the surrounding environment. So, this plan will address both prevention and control/management strategies for invasive species, as well as aspects like monitoring for early detection and cooperation and coordination with outside entities.

3.0 Background

The Reservation of the Bad River Band of Lake Superior Tribe of Chippewa Indians (Tribe) includes over 124,000 acres in northern Wisconsin, including almost 200 acres located on Madeline Island (Figure 3a). Bordering the shores of Lake Superior for over thirty-five miles, the majority of the Reservation is a water-rich environment in the northern-third, or downstream portion, of the 1,000-square-mile Bad River Watershed. The watershed, located in parts of Ashland, Bayfield, and Iron counties of northwestern Wisconsin, is exceptionally intact with only three small dams located within the myriad of twenty-seven streams and rivers. The Bad River, after which the watershed is named, flows seventy miles from its headwater (Caroline Lake) into Lake Superior on the shores of the Reservation.

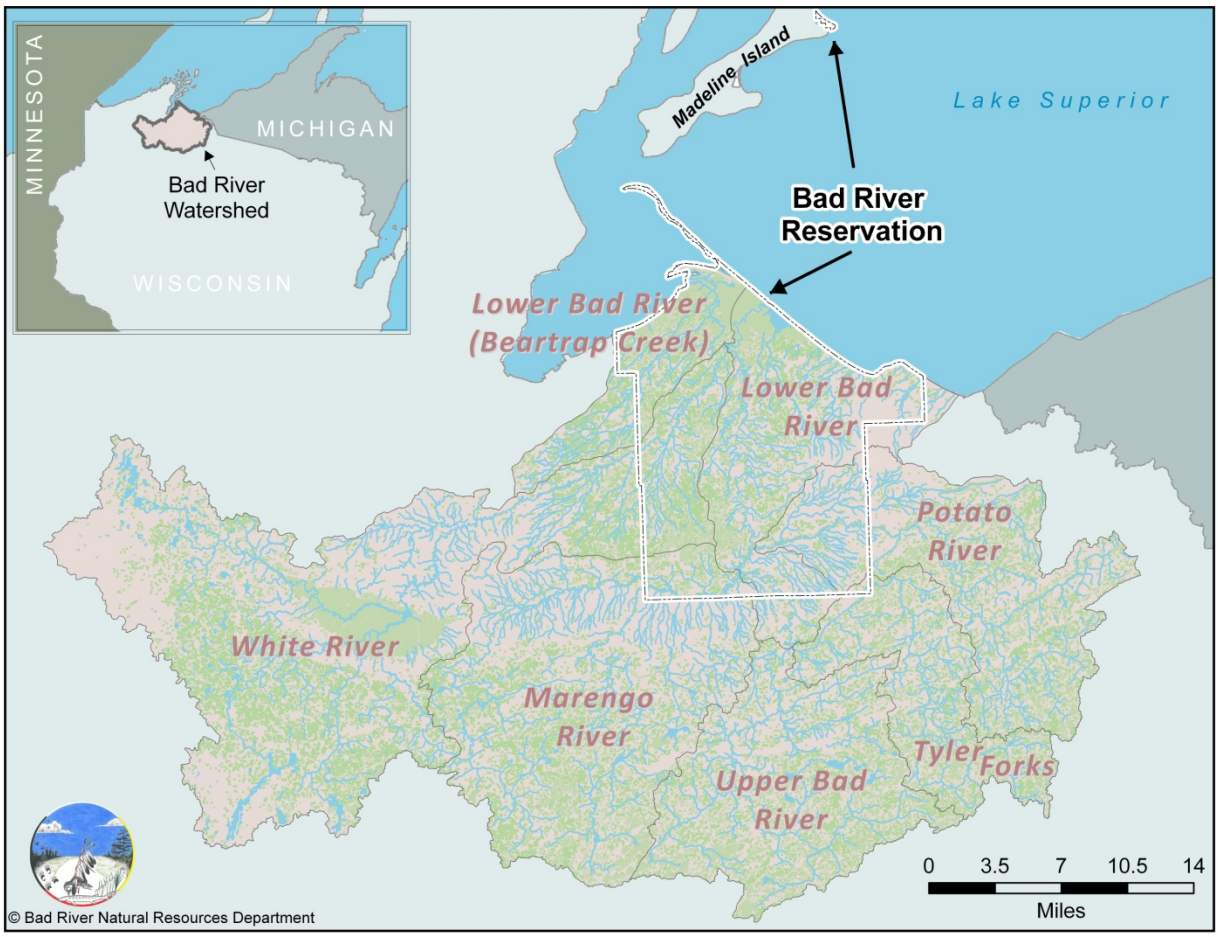

Figure 3a. Location of the Bad River Reservation within the Bad River Watershed.

For years the Tribe has taken an active stance on trying to manage the invasive species already found within the boundaries of the Reservation and limit the possibility of new introductions. Though invasive control and prevention efforts are Reservation-wide, the Tribe is especially focused on controlling and limiting the number of aquatic invasives species (AIS). Introduction and spread of AIS is worrisome to the Tribe because the numerous rivers, streams, lakes,

ponds, springs, and wetlands are important resources to the Ojibwe people who have relied on them for generations. For example, the Kakagon-Bad River Sloughs Complex (Figure 3b) holds the largest wild rice beds on the Great Lakes and is an integral part of the lives of the Tribal members. Wild rice (*manomin*) harvesting has been a cornerstone of tribal culture, subsistence, and commercial enterprises for several generations. In addition, waterfowl and fish, especially walleye (*ogaa*), are harvested for subsistence purposes annually on the Reservation. Most importantly, water (*nibi*) is a primary component in the creation story of the *Anishinabe* (Ojibwe) people, and its protection and quality are essential for survival, both physically and spiritually.

Figure 3b. Honest John Lake, a waterbody within the Kakagon and Bad River Sloughs system, harbors wild rice and cranberry, culturally important species to the Bad River Tribe. These species are threatened by the encroachment of invasive species in other areas where they grow on the Reservation.

Although the wild rice wetlands of the sloughs have been a focus of the past invasive species management efforts (as discussed in more detail below), the Tribe recognizes that invasive species threaten the health of all the resources on the Reservation. (Past and current efforts have focused on the Kakagon-Bad River Sloughs Complex because the area is ecologically important within the Great Lakes Basin and especially sensitive to invasive species encroaching from upstream water, and from Chequamegon Bay and the rest of Lake Superior.) The Bad River Band's Integrated Resources Management Plan (IRMP) contains sections throughout that set objectives related to the management of invasive species (Elias 2001). Also, preventing the introduction and mitigating the spread of invasive species within the Bad River Watershed and reducing competition for native perennials are two objectives identified in the draft document

entitled "Long Range Plan for Management of Manoomin (Wild Rice) in the Kakagon Sloughs on the Bad River Reservation" (Gibala 2007).

The BRNRD has been monitoring and controlling aquatic invasive plant species since the early 1990's, though efforts were made to determine the extent of invasives on the Reservation prior to the nineties by the use of historical imagery and data. Some of the past management activities have consisted of:

- mapping the spread of native and non-native invasive species within wild rice habitat;
- experimenting with different control methods to determine which method is the most effective and efficient for controlling an invasive species;
- working cooperatively with outside agencies to treat invasive species within the boundaries of the Reservation;
- collecting baseline data on the extent of invasive species already on the Reservation;
- monitor the quality of water resources within the Reservation and possible determine the impact, if any, invasive species or invasive species control have on water resources;
- sending staff to workshops and conferences to learn about invasive species and remain updated on invasive species monitoring, prevention, and control efforts in other regions; and
- educating the local community about the spread of invasive species and the importance of control.

Additional information about past activities specific to each invasive species can be found in Appendix A along with details about the plant growth form, treatment options, and possible impacts the plant has as it invades. Aside from those plants specifically called out in Appendix A, other invasive plant species that the Tribe is concerned about include: Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), curly-leaf pondweed (*Potamogeton crispus*), wild parsnip (*Pastinaca sativa*), giant hogweed (*Heracleum mantegazzianum*), giant knotweed (*Polygonum sachalinense*), Japanese knotweed (*Polygonum cuspidatum*), common teasel (*Dipsacus fullonum*), and cut-leaved teasel (*Dipsacus laciniatus*).

The Tribe seeks to monitor, prevent, and control the spread of invasive species on the Reservation to protect and restore the quality of all waters on the Reservation for the benefit of the next seven generations into perpetuity.

4.0 Management Goals, Objectives, and Actions

The Tribe has identified the following priority goals for BRNRD in addressing invasive species:

> **Goal 1:** Prevent the introduction of new invasive species within the exterior boundaries of the Reservation.
>
> **Goal 2:** Monitor current invasive populations and detect new occurrences on the Reservation, especially within or near water resources.
>
> **Goal 3:** Control current invasive populations to reduce/prevent their spread to new areas within the Reservation.
>
> **Goal 4:** Protect culturally sensitive and native species, such as *ogaa* (walleye), *wiisagaak* (black ash), *giishkaatig* (cedar), *manomin* (wild rice), and *zispaagwadaatig* (maple).
>
> **Goal 5:** Cooperate and coordinate with local stakeholders to efficiently and effectively manage invasive species within the Reservation and the surrounding watershed.

These goals align with the following goals and objectives identified in the IRMP (Elias 2001). The IRMP goals and objectives include monitoring and controlling exotic species especially in Conservation Areas and Watershed Protection Areas; restoring degraded wetlands to increase the quality of wetland resources on the Bad River Reservation; managing traditional berry-picking and wild-ricing areas to improve harvesting opportunities; and maintaining a diverse mix of plant communities on the Bad River Reservation. In addition, these goals align with the invasive species management goals of the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), which seeks to fulfill the mission of protecting and enhancing the treaty-reserved rights of the Anishinabe tribes, and to provide cooperative protection and management of natural resources within the territories ceded to the United States in the 1836, 1837, 1842 and 1854 treaties (Miles Falck, *personal communication*). The goals identified by GLIFWC in their invasive species management are prevention, early detection and rapid response, control and management, and cooperation and coordination. Additionally, these goals coincide with the goals of the Ashland County Aquatic and Terrestrial invasive Species Strategic Plan which are education, prevention, monitoring, and control (Norwood, 2015).

In the paragraphs below, each goal and its associated objectives and action are described in further detail.

4.1 Prevention

The Tribe seeks to prevent the introduction of new invasive species within the exterior boundaries of the Reservation because the most cost-effective approach to combating the spread of invasive species is to prevent their initial establishment. Though implementing best management practices (BMPs) to prevent new species from getting established within the boundaries of the Reservation does take time and funding, it can be incorporated easily into activities already performed by the BRNRD and other Tribal organizations without increasing the strain on funds specifically earmarked for treating invasive populations

already established within the Reservation. Also, outreach activities can enlist community support to help with prevention because it is often an easy way for the public to participate.

Objective: Develop and implement BMPs that reduce the possible introduction of new invasive species or populations of invasive species within the exterior boundaries of the Reservation.

Action 1. BRNRD develops standard BMP language focused on invasive species and applies it to all BRNRD-regulated activities (e.g., construction projects, utility maintenance, timber harvests, etc.) within the Reservation.

Action 2. Each Tribal Program and Enterprise (e.g., Tribal Roads, Bad River Housing Authority, Bad River Casino, etc.) develops BMPs to follow in their own work to prevent the introduction and spread of invasive species. For example, Bad River Housing Authority can ban the use of invasive species for landscaping.

Objective: Increase community awareness of invasive species and the steps that can be taken to reduce the spread of these species.

Action 1. Create or acquire educational outreach materials and make them available to target audiences by participating in meetings, conferences, and other events.

Action 2. Keep the community informed by highlighting invasive species related work and information in the BRNRD newsletter *Common Ground*.

Objective: Support other stakeholders that seek to prevent the spread of invasive species in areas surrounding the Reservation. (See 4.5 Cooperation/Coordination section below.)

4.2 Monitoring

To better understand the effect and spread of current populations and to detect new populations early, the Tribe monitors key areas within the Reservation for invasive species. These key areas include the Kakagon and Bad River Sloughs, waterbodies with boat access, right-of-ways for roads and utilities, and floodplains along the main rivers (i.e., the Bad, White, Potato, Marengo, and Tyler Forks Rivers). Early detection monitoring for newly established species with the Reservation may increase the chances for successfully eradicating the species before it becomes a permanent presence. Monitoring for new populations of current invasives can help prevent the spread of established populations into new areas that have not yet been impacted by a species by allowing a rapid control response before the specie is established.

Objective: Detect new occurrences of invasive species within the Reservation.

Action 1. Complete suitable habitat assessments focusing within the exterior boundaries of the Reservation for invasive species present within the surrounding watershed that have not yet been reported on the Reservation (i.e., new invaders). If feasible, habitat assessments are performed for other invasive species (e.g., water lettuce, water hyacinth) that are known to be aggressively invasive and found within Wisconsin but not yet in the Bad River Watershed.

Action 2. Conduct meander surveys of areas identified as suitable habitat for possible new invaders, focusing first on the key areas of concern within the Reservation.

Objective: Detect additional populations of invasive species within the Reservation.

Action 1. Complete suitable habitat assessments for invasive species known to exist within the exterior boundaries of the Reservation.

Action 2. Conduct meander surveys of areas identified as suitable habitat for known invaders, focusing first on key areas of concern within the Reservation.

Objective: Incorporate citizen science into invasive species monitoring.

Action1. Setup a system for community members to report invasive species sightings and locations to the BRNRD.

Action 2. Develop a protocol for verifying these sightings and adding them to the invasive species database.

4.3 Control

Once an invasive species becomes established within the Reservation, it may be necessary to try to reduce the population in order to mitigate the impacts it has on the surrounding habitat and protect habitats not yet invaded by the species. This control, or management, of the invasive species should be the most effective method available that does not negatively impact the environment. Control should be specific to the species targeted and may include mechanical, biological, and chemical means. However, mechanical and biological means, when available, should be used preferentially over chemicals unless the Bad River Tribal Council (Council) has indicated otherwise. Also, all biological means of control—unless already approved—must be approved by the Council. As research and knowledge related to the control of invasive species increase, the Tribe will incorporate applicable methods into their control strategy. Control efforts will meet the conditions of the Bad River Sloughs Protection Ordinance and the Right-of-Way Maintenance Method Ordinances, plus all other applicable tribal codes.

Objective: Reduce populations of invasive species in key areas of concern within the Reservation and slow the spread of the populations within these areas.

Action 1. Identify and locate populations of invasive species in Conservation Areas (as identified by the IRMP) within the Reservation especially focusing on the Kakagon and Bad River Sloughs Complex.

Action 2. Prioritize species for control. GLIFWC's invasive species management priorities are species with: a high potential to impact cultural resources; a high potential for ecological impacts; low abundance; limited distribution; a high degree of invasiveness; landowner/partner support; and, viable control options. (M. Falck, *personal communication*) In addition, species identified by the Council as those of concern will be given a higher priority.

Action 3. Control species using the best method available.

Action 4. Gather monitoring data for evaluation of control efforts, including reassessing methods to assure the most effective method is used.

Action 5. Complete restoration (e.g., wild rice reseeding) in areas where control occurred, as appropriate.

Objective: Reduce and contain the spread of invasive species throughout the Reservation.

Action 1. Identify and locate populations of invasive species within the Reservation outside of the Conservation Areas.

Action 2. Prioritize species for control. Same as previous Action 2.

Action 3. Control species using the best method available.

Action 4. Gather monitoring data for evaluation of control efforts, including reassessing methods to assure the most effective method is used.

Objective: Find uses and markets for invasive species within the Reservation to generate public support and interest in control efforts.

Action 1. Research invasive species to identify where they came from and how they are used and valued in their home range.

Action 2. Educate the community on how invasive species can be used while still emphasizing the priority of controlling their populations.

Action 3. Identify markets where community members and other organizations can create products made from or raw materials derived from invasives species control (as appropriate).

4.4 Protection

Protect culturally sensitive species, such as *ogaa* (walleye), *wiisagaak* (black ash), *giishkaatig* (cedar), *manomin* (wild rice), and *zispaagwadaatig* (maple) by identifying impacts related to invasive species and working to mitigate these impacts.

Objective: Reduce and mitigate impacts of invasive species on culturally sensitive species.

Action 1. Identify native species that are a priority to the Tribal community.

Action 2. Evaluate invasive species within the Reservation for potential impacts to priority species and their habitats.

Action 3. Use the steps outlined in Section 4.3 to control invasive species that are impacting priority species or their habitats.

4.5 Cooperation/Coordination

Cooperate and coordinate with local stakeholders to efficiently and effectively manage invasive species within the Reservation and the surrounding watershed. This includes working with local county and municipal governments, federal and state government, universities, volunteer community organizations, individual community members, GLIFWC, the Northwoods Cooperative Weed Management Area (NCWMA), and other stakeholders within the Bad River Watershed and neighboring counties. Working together to coordinate efforts results in the most effective use of the resources available to combat the growing and ongoing problem of invasive species and the impacts they have on the local ecosystem and economy.

Objective: Enhance cooperation and coordination with local partners identified in the above paragraph following the steps followed by GLIFWC in their invasive species management work. (M. Falck, *personal communication*)

Action 1. Share invasive species distribution, abundance, monitoring, and control effort data.

Action 2. Coordinate management activities with partners.

Action 3. Maintain frequent communication with management partners by participating in meetings, conferences, and other events.

Action 4. Cooperate directly with GLIFWC in order to access and share information with their established network of invasive species groups.

5.0 Summary

The Tribe seeks to manage the impacts of invasive species on the Reservation by working within the Tribe and with local partners to prevent the introduction of invasive species to new habitats, and to monitor and control existing invasive species populations. The Tribe's main focus will be on protecting culturally sensitive species and their habitats, especially in key areas of concern throughout the Reservation. To do this, the Tribe proposes the goals, objectives, and actions outlined in Section 4.0 of this management plan, which also aligns with the goals and objectives outlined in the Invasive Species Management Plan of Ashland County and discussed with GLIFWC staff. Also, the Tribe has developed Appendix A to this plan which will be used to summarize information on invasive species of concern within the Reservation, including previous control and monitoring efforts, known locations, treatment options, and identification information. Since the overall goals and objectives of the Tribe are expected to be broad enough to cover most management decisions and will not need to be revised on an annual basis, the appendices were developed to be easily updatable with new management information, including the most effective means for controlling a given species. Thus, the Tribe has designed this plan to allow for most of the effort of management to go towards meeting the goals and objectives and minimize time spent updating the plan.

6.0 References

Elias, J. (Editor), 2001. Bad River Band of Lake Superior Tribe of Chippewa Indians Integrated Resources Management Plan. Odanah, Wisconsin, Bad River Natural Resources Department, 95 pp.

Executive Order 13112 on Invasive Species, 1999. United States of America. Federal Register 64(25):6183-6186.

Falck, M., Great Lakes Indian Fish and Wildlife Commission, 2014. Personal communication.

Gibala, L., 2007. Long Range Plan for Management of Manoomin (Wild Rice) in the Kakagon Sloughs on the Bad River Reservation, Draft Plan, February 2007, Odanah, Wisconsin.

Norwood, T., 2015. Ashland County Aquatic and Terrestrial Invasive Species Strategic Plan, Draft. Ashland County Land and Water Conservation Department, Ashland, Wisconsin.

NPS (National Park Service), 2009. Biology: Invasive Species Management. http://www.nature.nps.gov/biology/invasivespecies/, *accessed* March 6, 2014.

USDA (US Department of Agriculture), 2013. Forest Service National Strategic Framework for Invasive Species Management, FS-1017.

USDA (US Department of Agriculture), 2014. Invasive Plants Program. http://www.fs.fed.us/foresthealth/management/fhm-invasives-plants.shtml, *accessed* March 6, 2014.

USEPA (US Environmental Protection Agency), 2005. Overview of EPA Authorities for Natural Resource Managers Developing Aquatic Invasive Species Rapid Response and Management Plans, EPA842-B-05-002. http://water.epa.gov/type/oceb/habitat/invasives_management_index.cfm, *accessed* January 15, 2014.

USFWS (U.S. Fish & Wildlife Service),2008. Invasive Species. http://www.fws.gov/invasives/index.html, *accessed* December 8, 2008.

7.0 APPENDICES

Appendix A: Priority Non-Native Invasive Species

Appendix A1: *Allaria petiolata* (garlic mustard)
Appendix A2: *Lonicera* spp. (honeysuckles)
Appendix A3: *Lythrum salicaria* (purple loosestrife)
Appendix A4: *Myriophyllum spicatum* (Eurasian water-milfoil)
Appendix A5: *Phalaris arundinacea* (reed canary grass)
Appendix A6: *Phragmites australis* (giant reed grass)
Appendix A7: *Rhamnus* spp. (buckthorns)
Appendix A8: *Tyhpa angustifolia* and *T. x glauca* (narrow-leaf and hybrid cattails)
Appendix A9: *Cycloloma atriplicifolium* (winged pigweed)

Appendix B: Decontamination Procedures

APPENDIX A: PRIORITY NON-NATIVE INVASIVE SPECIES

This appendix includes biological details of certain invasive plant species that are considered to be a priority for management efforts, as well as any past management activities that have already taken place that relate to the species.

The priority species that have been targeted by the Tribe include the following non-native plants: *Allaria petiolata* (garlic mustard), *Lonicera maackii* (Amur honeysuckle), *Lonicera* x *bella* (Bell's honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Lonicera tatarica* (Tartarian honeysuckle), *Lythrum salicaria* (purple loosestrife), *Myriophyllum spicatum* (Eurasian water-milfoil), *Phalaris arundinacea* (reed canary grass), *Phragmites australis* (common reed grass), *Rhamnus cathartica* (common buckthorn), *Rhamnus frangula* (glossy buckthorn), *Typha angustifolia* (narrow-leaf cattail), *Typha x glauca* (hybrid cattail), and *Cycloloma atriplicifolium* (winged pigweed).

The Tribe targets these invasive species because they are either found on or very near the Reservation, and are known to spread quickly, form dense monocultures, and invade sensitive habitats (e.g., wild rice beds). Just as there are several species on this list not yet found on the Reservation, there are several species already documented within the Reservation boundaries that are not found on the list because they are considered to be of less concern as they do not have the same invasive rigor as other species.

Figure Aa. Members of the BRNRD Invasive Species Crew hand remove hybrid and narrow-leaf cattail encroaching on the emergent native species within the Kakagon Sloughs. (Photograph from BRNRD.)

Appendix A1: *Alliaria petiolata* (garlic mustard)

Updated 9/30/15

Garlic mustard is an herbaceous biennial that forms large, dense mats in the understory and edges of moist to moderately moist woods. During its first year of growth the plant forms an evergreen, basal rosette with leaves kidney- or heart-shaped (Figure A1a). The second year of growth is an upright forb growing 12-40 inches tall, with alternate, triangular leaves (Figure A1b). Though, during both years of growth the leaves are coarsely toothed. Garlic mustard flowers during the second year, a short cluster of four-parted white flowers. The seed pods are long, thin, and hold many small dark seeds. (This information pertaining to garlic mustard was gleaned from the Robert W. Freckmann Herbarium (2012) and Boos et al. (2010).)

FIGURE A1a. Garlic mustard with basal rosette leaves.[i]

A1.1 Distinguishing Features

The leaves and stems smell like garlic when crushed, an important characteristic when distinguishing first-year rosettes from similar-looking native violets (*Viola* spp.) and non-native creeping Charlie (*Glenchoma hederacea*). Other white-flowering natives may be blooming at the same time as mature garlic mustard, but the garlic smell of the crushed leaves and stems can also be used to differentiate the flowering plants, as the natives will lack a the garlic smell when crushed. (Boos et al., 2010)

A1.2 History on the Bad River Reservation

As of the summer of 2014 there have been no known populations of garlic mustard discovered on the Reservation. However, populations of the plant (Figure A1.2) are known to exist just beyond the southern border of the Reservation and close by in the City of Ashland (GLIFWC 2014). One of the southern populations grows within Copper Falls State Park, which is just upstream of the Reservation along the Bad River. Since an infestation of this invasive is so close it has been the practice of the BRNRD to periodically send staff to Copper Falls State Park to participate in control efforts and learn how to properly identify the plant.

A1.3 Possible Impacts

Garlic mustard quickly invades high-quality forests, repressing native species and establishing an invasive monoculture in the understory. This results in garlic mustard directly competing with many native spring ephemerals—some of which are already threatened by other changes in their environment—and possibly extirpating them from certain habitats.

A1.4 Treatment and Control

Possible treatment options include:

- Pulling plants from the ground before they set seed (root must also be removed) and disposing of them by burning or bagging them for proper disposal in a landfill.
- Controlling dense patches by conducting controlled burns at the site.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the Tribe requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned and inspected so that all soil, seeds, and plant materials are removed. The BRNRD also internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B).

FIGURE A1b. Several mature garlic mustard plants in bloom.[ii]

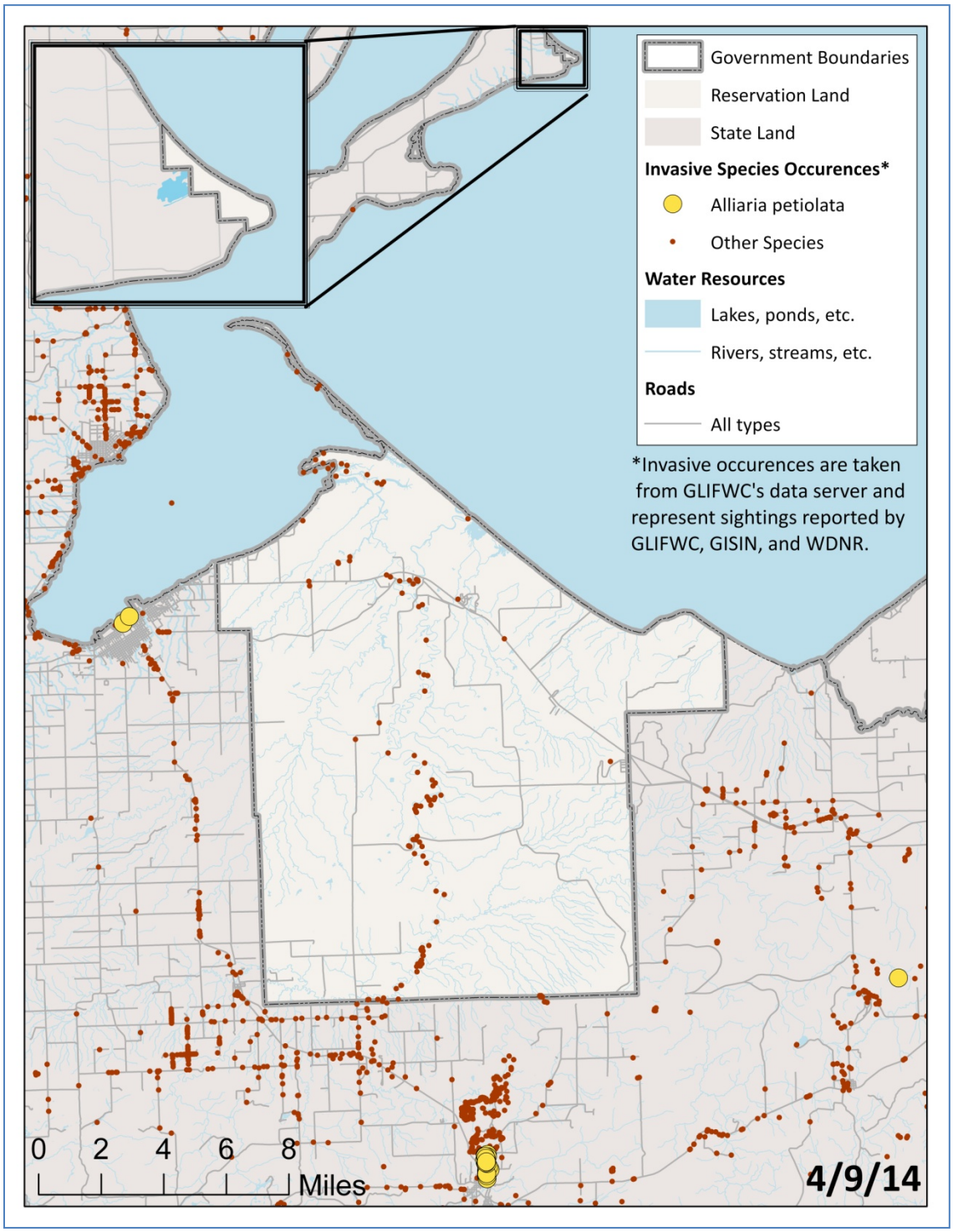

FIGURE A1.2 Occurrences of garlic mustard (*Allaria petiolata*) within the lands surrounding the Bad River Reservation. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

A1.5 References

Boos, T., K. Kearns, C. LeClair, B. Panke, B. Scrivner, and B. Williams, 2010. A Field Guide to Terrestrial Invasive Plants in Wisconsin. DNR PUB-FR 436-2010, Wisconsin Department of Natural Resources, Madison, Wisconsin.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

Robert W. Freckmann Herbarium, 2012. Plants of Wisconsin. http://wisplants.uwsp.edu/Wisplants.html, *accessed* January 2014.

---

[i] Photograph from the Robert W. Freckmann Herbarium/ Merel R. Black, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu

[ii] Photograph from the Bad River Natural Resources Department.

Appendix A2: *Lonicera* spp. (honeysuckles)

Updated 9/30/15

There are four different honeysuckle species that Tribe has put their priority list: *Lonicera maackii* (Amur honeysuckle), *Lonicera* x *bella* (Bell's honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), and *Lonicera tatarica* (Tartarian honeysuckle). All of these honeysuckles grow as dense, multi-stemmed shrubs that form dense thickets. However, whereas Bell's, Morrow's, and Tartarian honeysuckles grow 3-10 feet tall, Amur honeysuckle usually grows from 6-12 feet tall. All of the species prefer woods or wood edges where there is sun to partial shade, and grow in all but the wettest habitats.

All of the species have leaves that are opposite and untoothed, but they all have slightly different shapes. Amur honeysuckle has oblong leaves with a pointed tip. Bell's honeysuckle has oval leaves. Morrow's honeysuckle has oval leaves too, but they taper more quickly to the stalk and tip than Bell's honeysuckle. Tartarian honeysuckle also has oval shape leaves but the bases are blunt and almost heart-shaped.

All the honeysuckle species produce fragrant flowers in pairs at the leaf axils and a fleshy fruit that contains a single seed; however, there are slight differences in color between the species (Figure A2a and A2b). Amur honeysuckle has white flowers that turn into red fruit. Bell's honeysuckle has pink flowers and orange-red fruit. Morrow's honeysuckle also has white flowers but the fruit is orange-red. Tartarian honeysuckle has a light to dark pink flowers with fruit that is orange-red to red. (This information pertaining to honeysuckles was gleaned from the Robert W. Freckmann Herbarium (2012) and Boos et al. (2010).)

FIGURE A2a. The flowers of non-native honeysuckles (clockwise from top left) Amur honeysuckle[i], Bell's honeysuckle[ii], Tartarian honeysuckle[iii], and Morrow's honeysuckle[iv].

A2.1 Distinguishing Features

There are native honeysuckle species that grow in the same habitats as the non-natives listed here but there are features to look for that will help differentiate the natives from the non-natives. The four non-natives we are discussing will have shaggy, sometime peeling bark on their older stems. Also, these older stems may be hollow between the nodes whereas native honeysuckles will have a white pith. Another difference is that flowers on native honeysuckles are yellow, not white or shades of pink. The last difference is that the non-natives produce leaves earlier than native honeysuckles and retain them longer into the fall. (Boos et al. 2010)

FIGURE A2b. The fruit of non-native honeysuckles (clockwise from top left) Amur honeysuckle[v], Bell's honeysuckle[vi], Tartarian honeysuckle[vii], and Morrow's honeysuckle[viii].

A2.2 History on the Bad River Reservation

Though a comprehensive inventory has not been recently completed for *Lonicera* spp. (honeysuckles), in the summer of 2014 an incidental site visit located some on the western edge of the Reservation on land near the Wake House. Past surveys from the summer of 2010 found a population within the southern boundary of the Reservation along Government Road nearby the Marengo River (Figure A2.2a). During the 2010 inventory there were also *Lonicera*

spp. spotted just south of the Reservation boundary along Government Road to where it terminates at County Road C. According to records of occurrences maintained by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) there are populations of *Lonicera* spp. surrounding the Reservation (2014). GLIFWC records (Figure A2.2b) show plants in: the City of Ashland; the upstream reaches of the White, Marengo, and Bad Rivers; and, the western edge of Iron County. However, there are probably more locations where *Lonicera* spp. grow within the region since these species are known to be a commonly planted ornamentals in Wisconsin (GLIFWC 2006a).

A2.3 Possible Impacts

Lonicera spp. invade a range of habitats (forest edges, woodlands, fields, pastures, fens, bogs, lake shores, and roadsides) and forms dense, even-aged thickets. This can deplete soil moisture and nutrients, as well as reduce light availability for the understory, reducing the regeneration of native species.

A2.4 Treatment and Control

Possible treatment options include:

- Hand pull smaller plants; dig out larger plants.
- Cut stems near to rootstock and treat stumps with glyphosate or triclopyr herbicide.
- Burn seedlings in spring.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the Tribe requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned so that all soil, seeds, and plant materials are removed. The BRNRD also internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B).

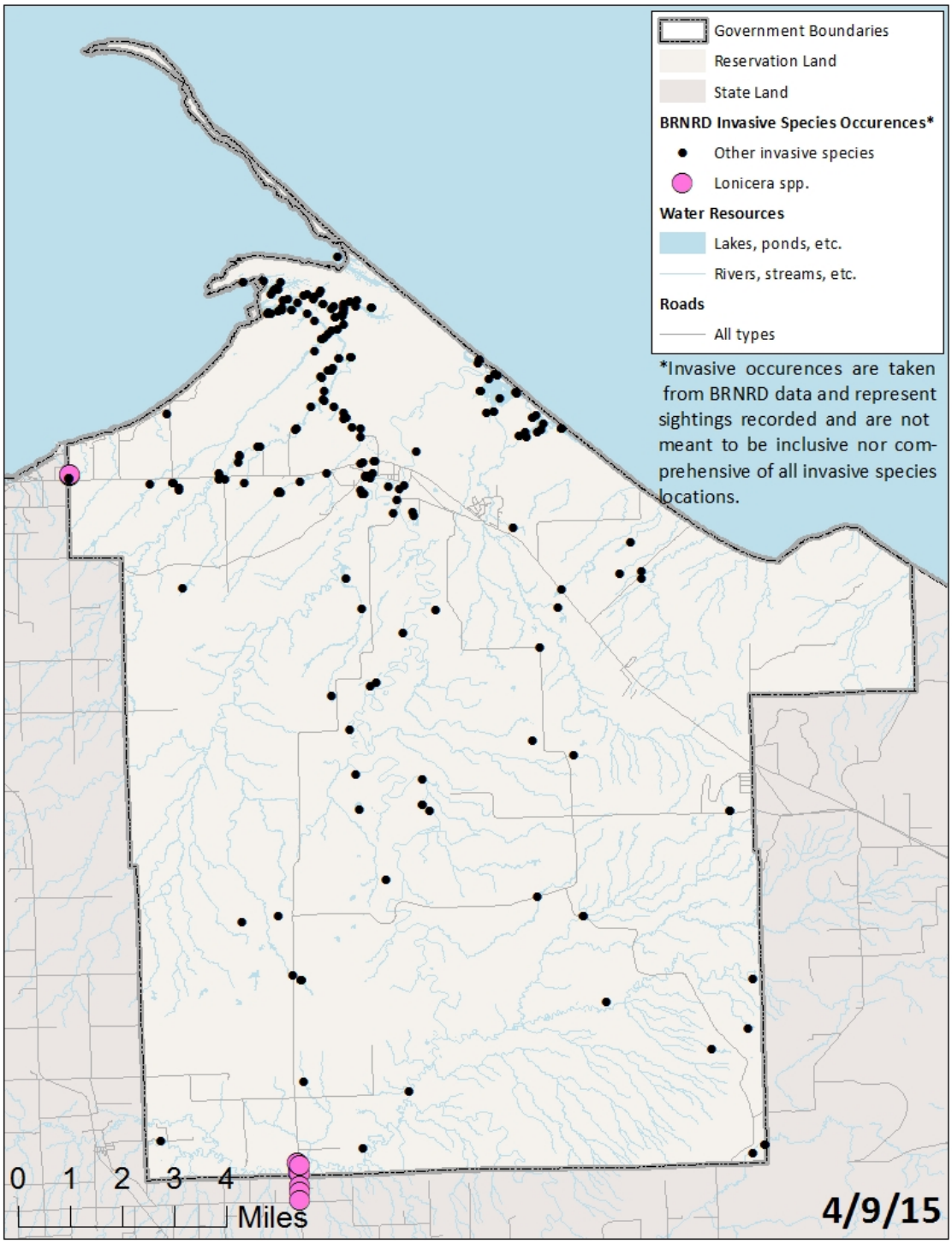

FIGURE A2.2a. Occurrence of honeysuckles (*Lonicera* spp.) within the Bad River Reservation. Location data was compiled from records kept by the Bad River Natural Resources Department (BRNRD) as of April 9, 2015. The locations are not meant to be a comprehensive listing of all sites where honeysuckles are found at this time.

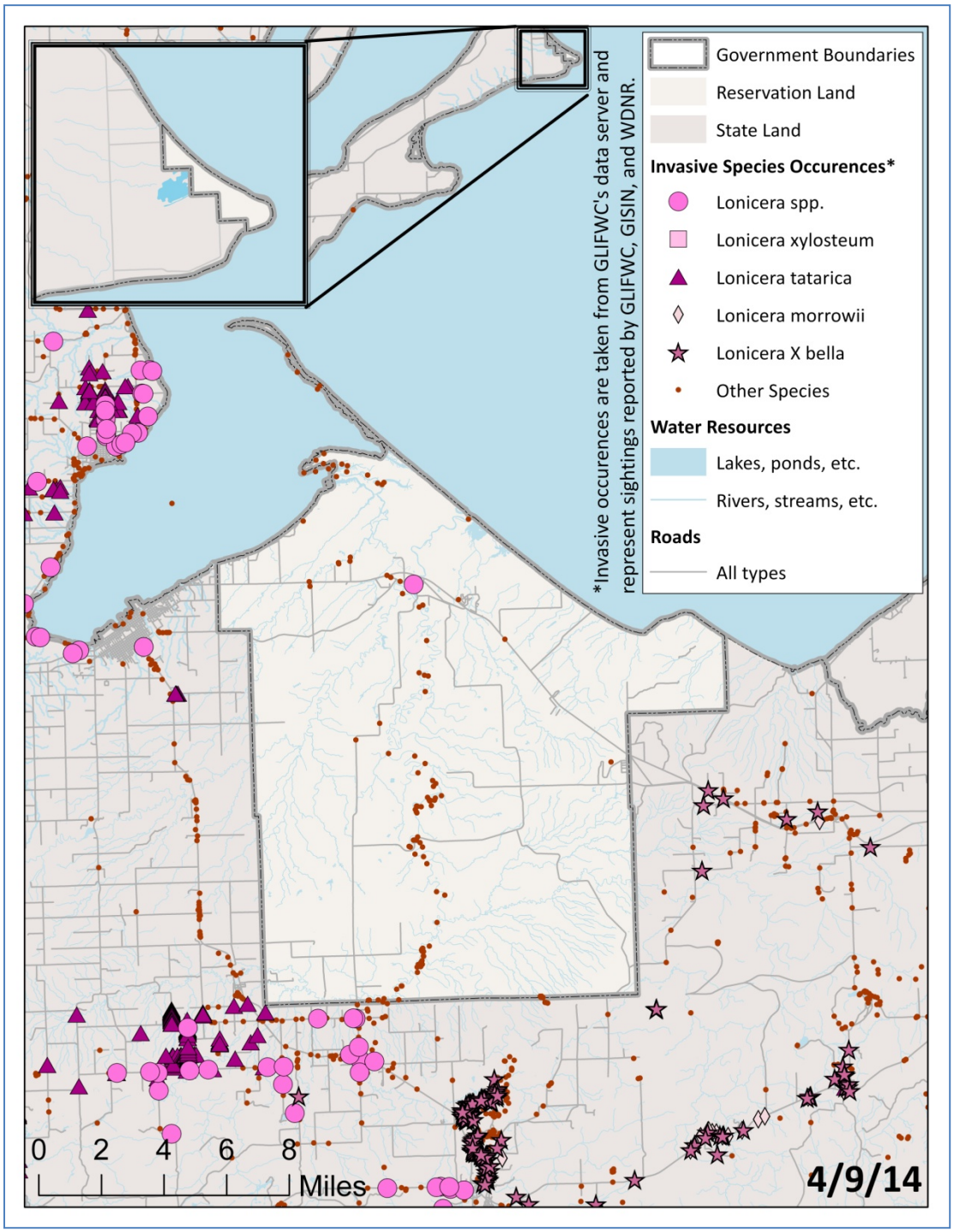

FIGURE A2.2b. Occurrences of honeysuckles (*Lonicera* spp.) within the Bad River Reservation and surrounding lands. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

A2.5 References

Boos, T., K. Kearns, C. LeClair, B. Panke, B. Scrivner, and B. Williams, 2010. A Field Guide to Terrestrial Invasive Plants in Wisconsin. DNR PUB-FR 436-2010, Wisconsin Department of Natural Resources, Madison, Wisconsin.

GLIFWC (Great Lakes Indian Fish and Wildlife Commission), 2006a. Identification: Eurasian Bush Honeysuckles. http://invasives.glifwc.org/Lonicera_spp/id.html, *accessed* March 27, 2014.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

Robert W. Freckmann Herbarium, 2012. Plants of Wisconsin. http://wisplants.uwsp.edu/Wisplants.html, *accessed* January 2014.

---

[i] Photograph from the Robert W. Freckmann Herbarium/Dan Tenaglia, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[ii] Photograph from the Robert W. Freckmann Herbarium/Steve Garske, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[iii] Photograph on from the Robert W. Freckmann Herbarium/Kenneth J. Sytsma, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[iv] Photograph from the Robert W. Freckmann Herbarium/Steve Garske, University of Wisconsin-Stevens Point, Wisconsin Plants web site.
[v] Photograph from USDA-NRCS PLANTS Database/Herman, D.E., et al. 1996. North Dakota tree handbook. USDA NRCS ND State Soil Conservation Committee; NDSU Extension and Western Area Power Administration, Bismarck.
[vi] Photograph from the Robert W. Freckmann Herbarium/Steve Garske, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[vii] Photograph from the Robert W. Freckmann Herbarium/Paul Drobot, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[viii] Photograph from the Robert W. Freckmann Herbarium/ Kenneth J. Sytsma, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).

Appendix A3: *Lythrum salicaria* (purple loosestrife)

Updated 9/30/15

Purple loosestrife (Figure A3a) is a semi-aquatic perennial that grows on stout, 4- to 6-sided stems that are somewhat woody. These plants can grow in dense stands and become larger and more bush-like with each year of growth (i.e., they add more branches each year). The leaves are opposite, stalkless, somewhat hairy, and grow at right angles to the next pair, except when they happen to grow in a whorl of three. The flowers are purple to red and grow in terminal, spike-shaped clusters with each flower having 5-7 petals surrounding a yellow center. Purple loosestrife blooms anytime from July until September. (This information pertaining to purple loosestrife was gleaned from the Robert W. Freckmann Herbarium (2012) and Boos et al. (2010).)

FIGURE A3a. Purple loosestrife in flower.[i]

A3.1 Distinguishing Features

Purple loosestrife stems are 4-6 sided, not smooth like some purple-flowered natives that grow in the same habitat (e.g., northern willow-herb [*Epilobium ciliatum*]).

A3.2 History on the Bad River Reservation

Purple loosestrife was first observed on within the Reservation boundaries in 1988 on Long Island (Soltis 1999). Though as of 2013 it has been found throughout the Reservation (Figures A3.2a & A3.2b), including much of the Kakagon Slough Complex, road right-of-ways, along the Marengo River, and along the Bad River. In 2007, an effort was made to map the locations of the purple loosestrife within the Kakagon Sloughs using GPS. (However, locations of purple loosestrife were recorded as early as 1998, when GLIFWC started chemical treatment of select populations within the Reservation boundaries.) More recent mapping of purple loosestrife within the Reservation usually occurs in association with treatment. Populations of purple loosestrife within the Bad River-Chequamegon Bay watershed were inventoried by GLIFWC in the years of 1994, 1995, 1999, and 2000 (Falck and Garske 2002) with continued annual—but not targeted—monitoring occurring during aquatic invasive species inventories of lakes in the ceded territories (Falck, Gilane, and Parisien 2012).

In 1990, a couple years after purple loosestrife was first discovered on Long Island, staff from the Apostle Island National Lakeshore completed a controlled study to determine the effectiveness of hand removal. Data collected showed that the density of the purple loosestrife increased at both the treated and untreated sites, but the increase was greater at the treated

site (Soltis 1999). Soltis (1999) surmised that hand pulling the plants disturbed the soils, allowing for purple loosestrife to more easily spread.

Starting in 1998 and continuing until 2009 (except for years 2000 and 2006) GLIFWC has been treating populations of purple loosestrife on the Reservation with foliar herbicides. GLIFWC used a 3% Rodeo® solution for treatment near open water sites and a 1% Garlon® solution for treatment within road right-of-ways. Starting in 1999 and continuing for five years the BRNRD intensively treated purple loosestrife (Figure A3.2c) located at Brush Point, employing a 16-person crew to foliar spray the plants with herbicide. In 2004 purple loosestrife treatment strategy switched to spot treatments of populations throughout the Kakagon Sloughs system by foliar spraying herbicide; treatment years include 2005-2014 except for 2012. The Tribe originally treated areas with Rodeo® but switched to treatment with 1-1.5% solution of Garlon® supplemented with Preference® nonionic surfactant in 2013 and 2014.

In 2006 a pilot project was begun to test the efficacy of using *Gallerucella pusilla* and *G. calmariensis*[1] beetles as a biological control for purple loosestrife on the Reservation, and a population of beetles were released at 0.75 acre test plot along Beartrap Creek at the end of Goslin Road. This population was bolstered in 2007 by a second release of beetles onto the site. Unfortunately, the overall success of the biological control at the site cannot be determined because the site was also sprayed with herbicide in 2008 and has not been re-evaluated as of the date of this publication.

A3.3 Possible Impacts

Purple loosestrife invades wet meadows, marshes, riparian zones, bogs, ditches, and all other types of open wet habitat. The plant spreads and grows in dense stands that inhibit the growth of other wetland species, decreasing species richness and ecosystem health. Since the average adult purple loosestrife plant can produce up to 2 million seeds annually (GLIFWC 2006b) the plant can spread quickly within a habitat once the first plant is established. Also, since the seeds are small and light they can be spread by a variety of vectors (e.g., humans, wind, and water). Tolerant of various conditions, purple loosestrife will spread in most wetlands, altering the plant communities and habitat found on site. One example of significant habitat alteration caused by purple loosestrife is the decline of open water habitat within a wetland as purple loosestrife can grow as an emergent and displace other native open water species.

FIGURE A3.2c. A stand of purple loosestrife plants after treatment with a pesticide.[ii]

[1] *Gallerucella* beetles are two species of leaf-eating insect that are native to Europe and have been found to be detrimental to the purple loosestrife plants (GLIFWC 2006).

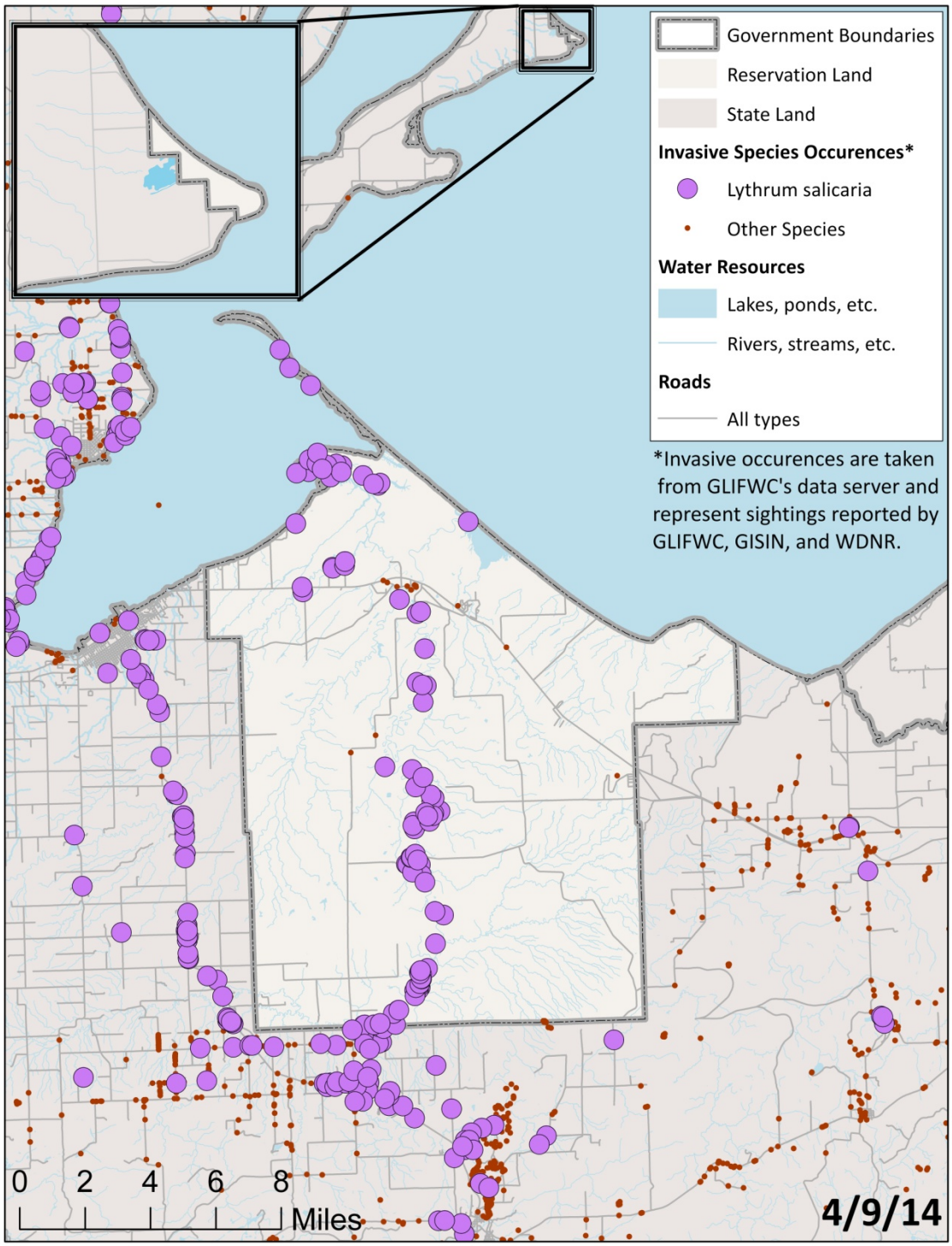

FIGURE A3.2a. Occurrences of purple loosestrife (*Lythrum salicaria*) within the Bad River Reservation and surrounding lands. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

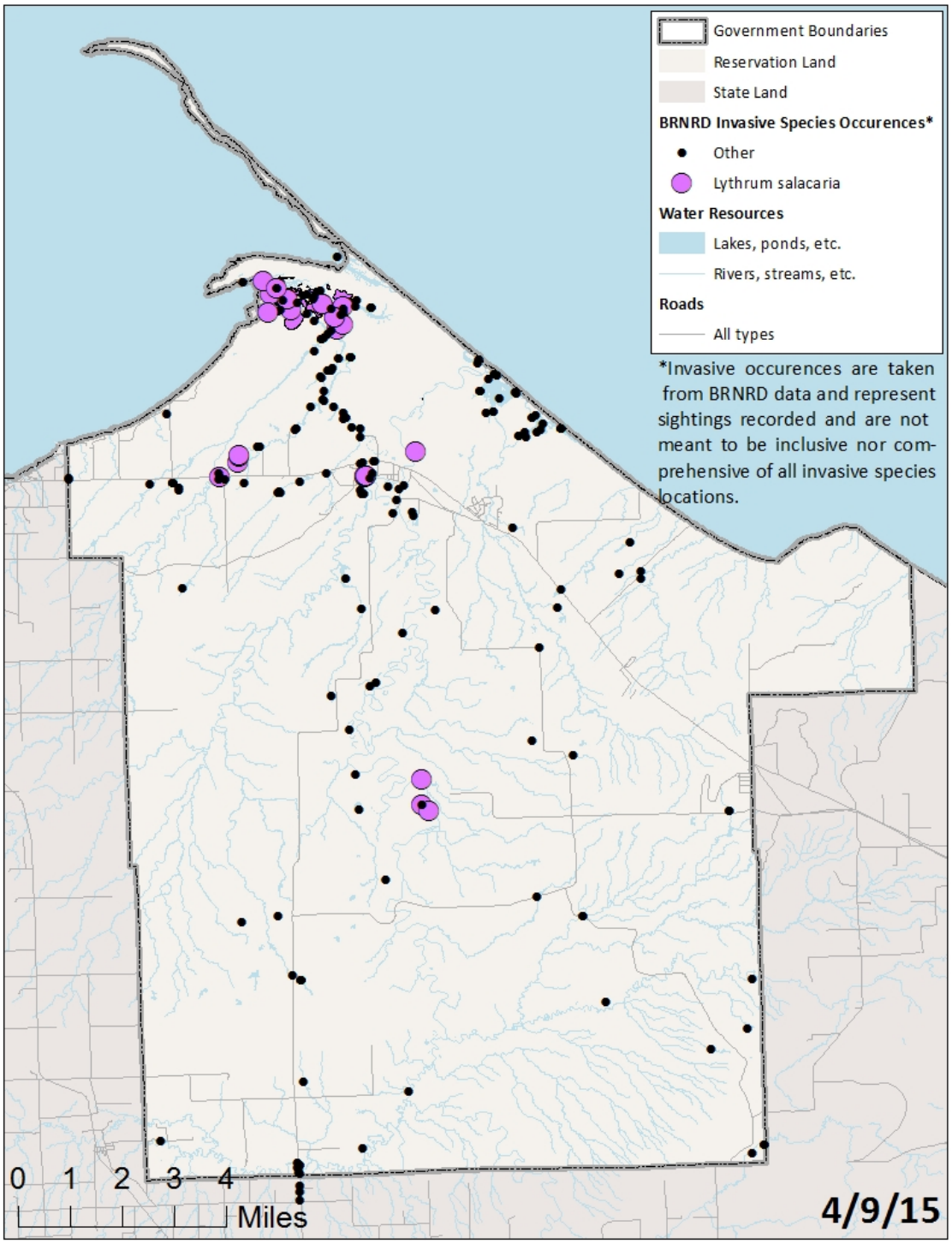

Figure A3.2b. Occurrence of purple loosestrife (*Lythrum salicaria*) within the Bad River Reservation. Location data was compiled from records kept by the Bad River Natural Resources Department (BRNRD) as of April 9, 2015. The locations are not meant to be a comprehensive listing of all sites where purple loosestrife is found at this time.

A3.4 Treatment and Control

A targeted approach adopted by GLIFWC (2006b) when controlling purple loosestrife in the Bad River-Chequamegon Watershed is to focus on controlling populations in the headwaters of the watershed before working on controlling populations near the mouth (Figure A3.4). Since the majority of the invasive species work completed by the Tribe is limited to within the external boundaries of the Reservation, this approach cannot be implemented fully by the Tribe. However, the Tribe does try to prevent and treat new small populations of the plant before they gain a foothold. Possible treatment options depend on the size of the population and the proximity of the treated area to other purple loosestrife seed banks and sensitive areas (e.g., wild rice and cranberry habitats).

- Isolated young plants can be dug from the ground in loose soils but if the plant is older or growing in hard soils there is possibility that root pieces left behind will sprout again. (Flowering spikes can also be cut to prevent seed production but the plant will come back from the root the next year.)
- Small populations can treated by spraying flowering plants with Garlon® herbicide. Garlon® supplemented with Preference® nonionic surfactant is applied at a 1-1.5% solution rate as a broadcast spray.
- Larger populations can also be treated by spraying flowering plants with Garlon® herbicide.
- Larger populations of more than one acre of dense purple loosestrife are treated best with biological control efforts. Black-margined loosestrife beetles (*Galerucella calmariensis*) or golden loosestrife beetles (*Galerucella pusilla*) can be bought or reared then released in areas with large infestations. Beetle control may take several years to start killing loosestrife plants but eventually the reduction of purple loosestrife will allow for natural competition and many native wetland plants should reestablish (GLIFWC 2006b).
- A combination of biological and chemical treatments can be used at the same site for very large infestations. Site where *Galerucella* beetles are released can be treated with herbicide in late August after the adult beetles have burrowed into the soil for the winter. (M. Falck, *personal communication*)

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the Tribe requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned so that all soil, seeds, and plant materials are removed. The BRNRD also internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B).

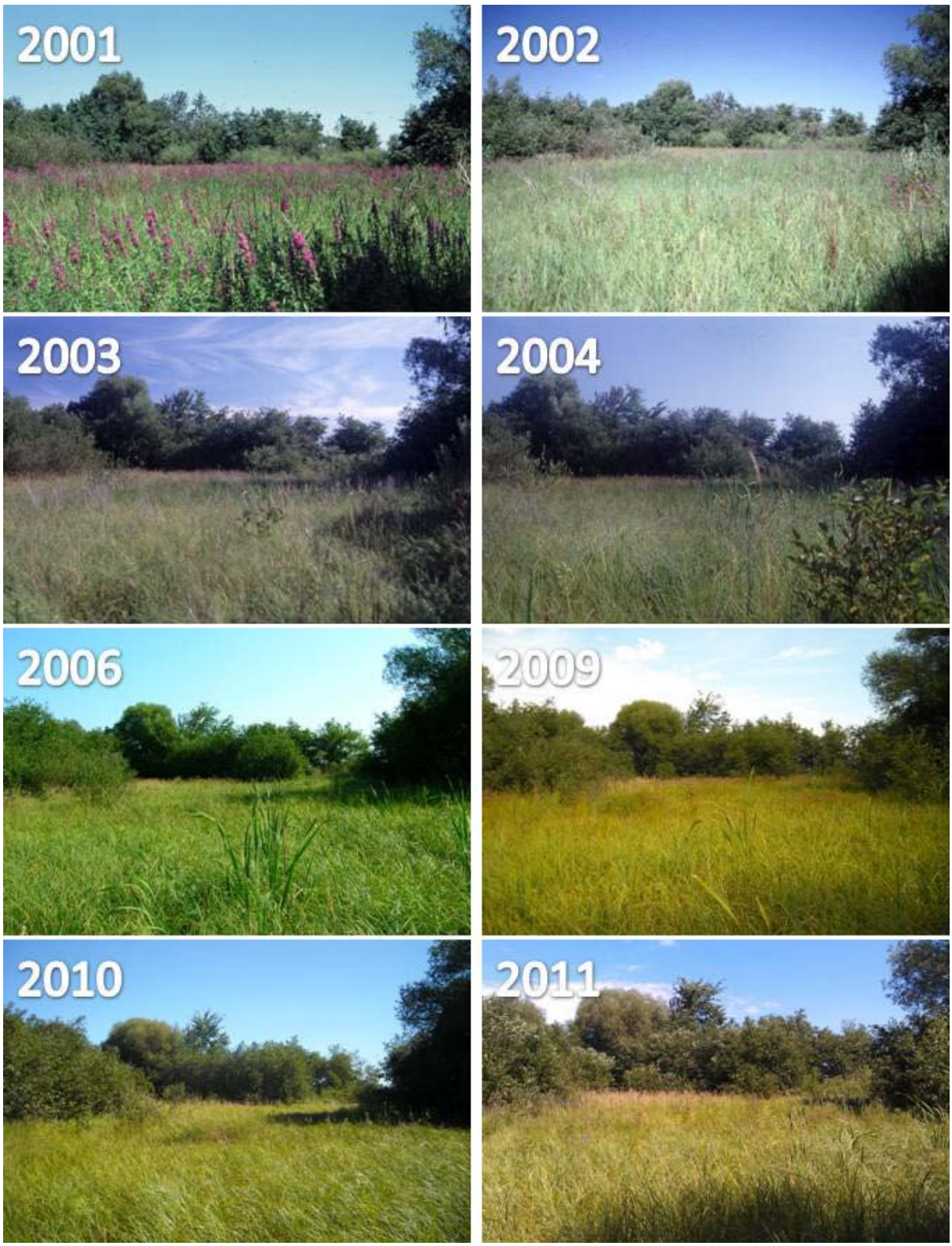

FIGURE A3.4. A purple loosestrife infestation near Whittlesey Creek that was treated using *Galerucella* beetles by GLIFWC in 2001. Follow-up assessment work accompanied by photographs allows us to see how the beetles reduced the infestation from 2001 to 2011.[iii]

A3.5 References

Boos, T., K. Kearns, C. LeClair, B. Panke, B. Scrivner, and B. Williams, 2010. A Field Guide to Terrestrial Invasive Plants in Wisconsin. DNR PUB-FR 436-2010, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Falck, M., and S. Garske, 2002. Invasive Non-Native Plant Management During 2001. Administrative Report 02-08, Great Lakes Indian Fish and Wildlife Service, Odanah, WI.

Falck, M., W. Gilane, and R. Parisien, 2012. Invasive Species Program 2011. Administrative Report 12-02, Great Lakes Indian Fish and Wildlife Service, Odanah, WI.

GLIFWC, 2006b. Identification: Purple Loosestrife. http://invasives.glifwc.org/Lythrum_salicaria/id.html, *accessed* March 27, 2014.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

Robert W. Freckmann Herbarium, 2012. Plants of Wisconsin. http://wisplants.uwsp.edu/Wisplants.html, *accessed* January 2014.

Soltis, D. G., 1999. Purple Loosestrife (*Lythrum salicaria*) An Overview of the Plant and Techniques for its Best Management on the Bad River Reservation.

---

[i] Photograph from the Robert W. Freckmann Herbarium/Derek Anderson, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[ii] Photograph from the Bad River Natural Resources Department.
[iii] Photograph from the Great Lakes Indian Fish and Wildlife Commission.

Appendix A4: *Myriophyllum spicatum* (Eurasian water-milfoil) *9/30/15*

Eurasian water-milfoil (EWM) is a submersed aquatic with long spaghetti-like stems that will oftentimes grow long enough to float along the water surface (Figure A4). The feather-like leaves grow in whorls of 4-5 along the stem with each leaf having 14-20 thread-like pairs of leaflets. The majority of the leaflet pairs are the same length, though those nearer the tip will be shorter, giving the leaflet a feather-like appearance. EWM can reproduce via seed, but also spreads easily from sections of broken stems and leaflets that can root to grow a new plant.

Flowers are arranged in whorls along a terminal spike that grows above the water surface. Male flowers are produced near the top of the spike and have 4 small pink petals; female flowers are arranged underneath the male flowers and lack petals. Each fruit produced is small, smooth, hard, and four-parted.

(This information pertaining to EWM was compiled from the Robert W. Freckmann Herbarium (2012) and Borman et al. (1997).)

FIGURE A4. Eurasian water-milfoil that has grown to a length where it is long enough to float stretched along the water surface.[i]

A4.1 Distinguishing Features

There are seven native milfoils that grow in Wisconsin that must be distinguished from EWM (Figure A4.1a). The native most often mistaken for EWM is northern water-milfoil (*M. sibericum*), which has a similar growth form but also has some differing characteristics:

- EWM has 14-20 pairs of thread-like leaflets, northern only has 5-12 pairs (WDNR 2004);
- EWM leaflets are mostly equal length which results in a feather-like leaf, but northern has leaflets that taper in length towards the tip of the leaf which results in a Christmas tree shape to the leaf (WDNR 2004);
- EWM leaves are limp while out of the water, but northern leaves are usually stiff (WDNR 2004);

- EWM does not produce turions (reproductive winter bud tips), whereas northern does (GLIFWC 2006c); and,
- EWM stems oftentimes have a yellowish hue while northern stems are whitish to whitish green in color (WDNR 2004).

Note: Native milfoils are sometimes hard to distinguish from EWM and hybridization is a possibility; it is best to get sightings confirmed by a botanist familiar with EWM before starting treatment.

FIGURE A4.1a. Eurasian water-milfoil segment that has already started to produce roots.[ii]

A4.2 History on the Bad River Reservation

Eurasian water-milfoil was suspected to be within the Reservation boundaries as of 2013. And, the Wisconsin Department of Natural Resources (WDNR) website listed that the WDNR received one report of EWM within the Kakagon Sloughs in 2012 (WDNR 2013); however, this occurrence has not been confirmed by BRNRD staff. In addition to the possible sighting in the Kakagon Sloughs, a plant sample that may have been EWM was collected from the Bad River Slough in 2011 but the identification was never verified by a accredited botanist prior to the sample degrading. EWM has was found in Washburn Harbor in 1992 and Chequamegon Bay in 1997 (GLIFWC 2014). Since EWM has been established in nearby areas of Lake Superior for over a decade (Figure A4.2a) it is very likely that it could have spread to either of the two suspected Reservation locations.

Due to the suspected sighting of EWM within the Tribal boundaries, the Tribe secured funding to complete a survey for EWM in 2014. The inventory for EWM focused within the Bad River Slough and high-risk portions of the Kakagon Slough and Bad River during the 2014 growing season. (High-risk areas are those that have a greater chance of a EWM infestation because of the proximity to established populations, as well as the type and extent of anthropogenic disturbance.) In 2014 meander surveys accompanied by rake tosses were completed in these areas (Figure A4.2b) and suspected EWM samples collected. However, review of the samples

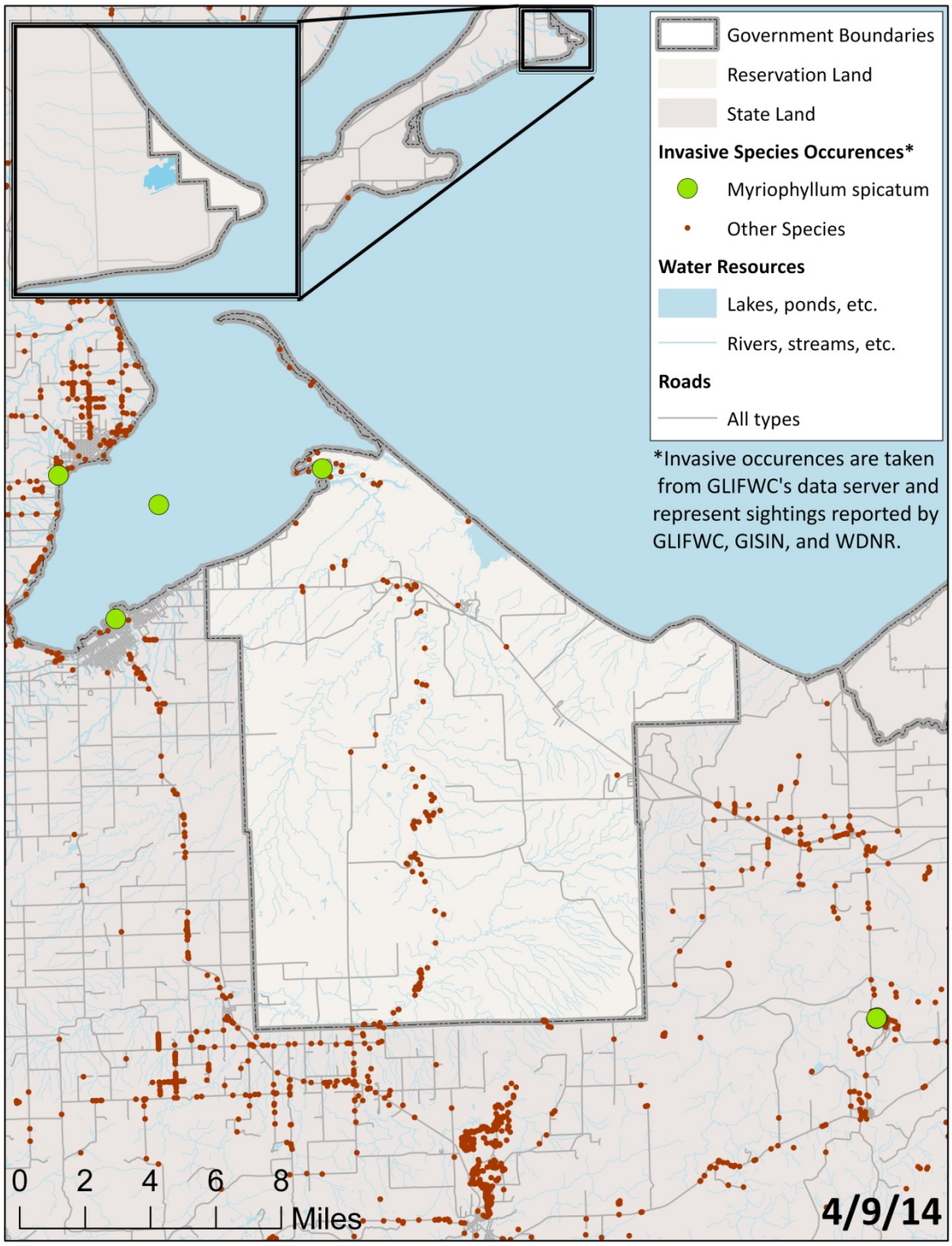

FIGURE A4.2a. Occurrences of Eurasian water-milfoil (*Myriophyllum spicatum*) in waterbodies within the Bad River Reservation and surrounding lands. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

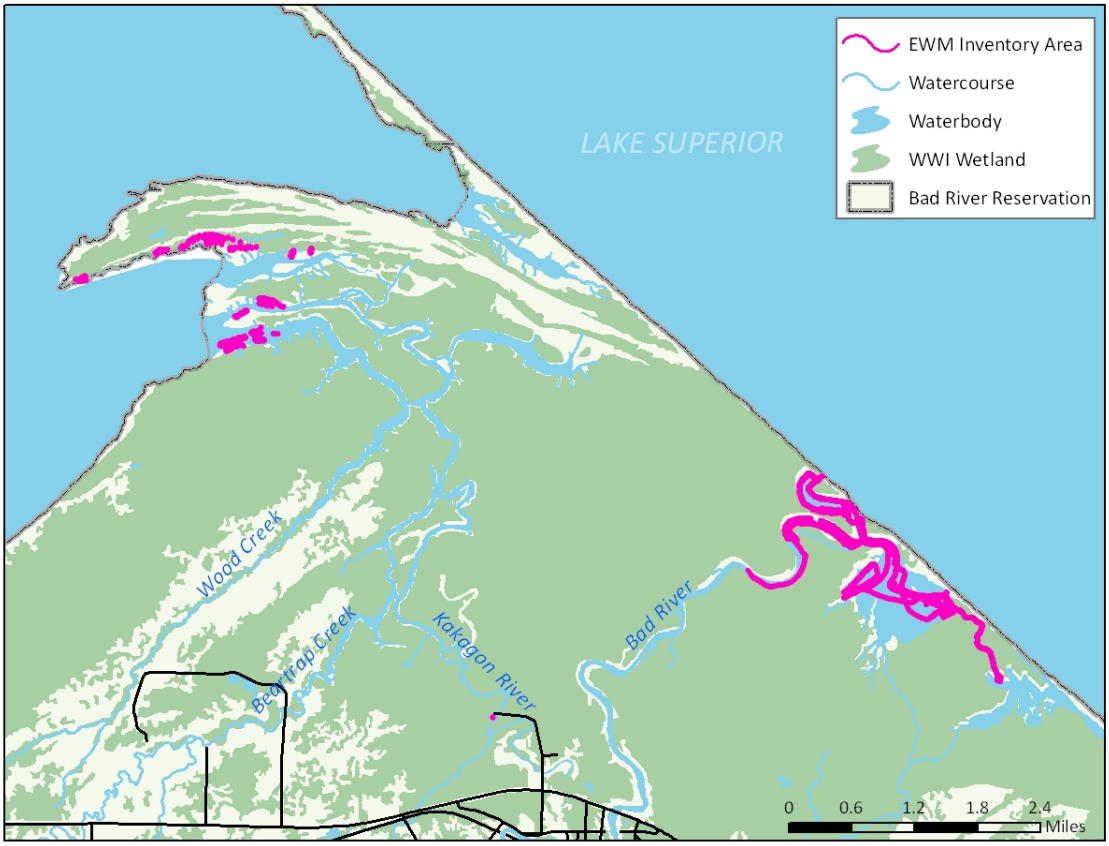

FIGURE A4.2b. Meander survey routes completed in 2014 as part of a survey for EWM in Reservation waters. Data and survey work collected by BRNRD under USFWS funds.

In-house by BRNRD staff and independently by GLIFWC staff resulted in the samples being identified as northern water-milfoil (*M. sibericum*). Vouchers were collected for several of the samples and added to the BRNRD herbarium.

A4.3 Possible Impacts

EWM quickly invades wetland, lake, and river habitats that are three to fourteen feet deep, and can grow to form large dense mats of vegetation (Figure A4.3). Though considered a submergent plant, stems of EWM can keep growing once they reach the surface and float horizontally across the water. These dense branches prevent sunlight from reaching native plants while the plant depletes available nutrients, which ultimately alters the native species regime. Dense mats of EWM are even thick enough to inhibit boating and other recreational activities in some areas.

One of the primary concerns of the Tribe in relation to this species is that EWM directly competes with wild rice for habitat space, sunlight, and nutrients. Also, herbicide treatment of EWM infestations may result in damage to the surrounding plant (Netherland, Getsinger, and Skogerboe, 1997) and macroinvertebrate communities (Harrahy, Edwards, and

Hedmand 2014), so the Tribe hopes to prevent EWM from gaining a foothold on the Reservation to alleviate the need for the use of herbicides in treatment.

A4.4 Treatment and Control

Though mechanical, chemical, and biological treatments have been developed for use in controlling EWM, the Tribe does not plan to use chemicals for EWM treatment.

- Small populations and individual plants can be pulled by hand from a boat or, in shallow water, while wading. Every effort should be made to remove all of the stems and the roots of the plant to prevent plants from sprouting again. Also, a fine grade mesh net should be used to scoop any floating EWM plant fragments from the water to minimize the chance of the fragment growing into a new colony at the treated site or elsewhere. All plant parts should be bagged and removed to an area where they cannot accidentally re-enter a waterbody. Plants may be composted.
- Larger populations can attempt to be treated by releasing the native milfoil weevil (*Euhrychiopsis lecontei*) which feeds on the stalks and tips of the EWM. (Groves, Tyning, and Hausler 2010) If the weevil release is effective in shrinking the larger population, then the rest can be managed by targeted hand removal.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the BRNRD has posted signs at tribal boat launches within the Reservation to remind users to drain and clean boats before leaving the launch. In addition, the BRNRD cleans all of the equipment used for off Reservation fish shocking work by spraying the equipment with bleach water, letting it sit, and rinsing it with clean water after each off-Reservation trip.

FIGURE A4.3. A lake infested with EWM that has grown long enough to float along the surface of the water. [iii]

A4.5 References

Borman, S., R. Korth, and J. Temte, 1997. Through the Looking Glass… A Field Guide to Aquatic Plants, D. Snyder (Editor). Wisconsin Lakes Partnership, Merrill, Wisconsin, 248 pp.

GLIFWC, 2006c. Identification: Eurasian Water-Milfoil. http://invasives.glifwc.org/Myriophyllum_spicatum/id.html, *accessed* April 8, 2014.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

Groves, T., P. Tyning, and P. Hausler, 2010. Weevil Stocking to Control Eurasian Milfoil. Michigan Lake Info, www.michiganlakeinfo.com.

Hattahy, E.A., D.S. Edwards, and C.J. Hedman, 2014. Persistence of @,4-D and its Effects on Benthic Macroinvertebrates Following Spring Treatment of Eurasian Watermilfoil, *Myrioyllum spicatum* L. in Two Lakes in Southeastern Wisconsin, USA. Bulletin of Environmental Contamination and Toxicology 92:404-409.

Netherland, M.D., K.D. Getsinger, and J.D., Skogerboe, 1997. Mesocosm Evaluation of the Species-Selective Potential of Fluridone. Journal of Aquatic Plant Management 35:41-50.

Robert W. Freckmann Herbarium, 2012. Plants of Wisconsin. http://wisplants.uwsp.edu/Wisplants.html, *accessed* January 2014.

WDNR (Wisconsin Department of Natural Resources), 2004. Northern Water-Milfoil. Invasive Species Flashcard PUB-WT-394 2004, University of Wisconsin – Extension.

WDNR, 2013. Aquatic Invasive Species: Eurasian Water-Milfoil Locations. http://dnr.wi.gov/lakes/invasives/AISLists.aspx?species=EWM&groupBy=County#footnote, *accessed* April 1, 2014.

---

[i] Photograph from the Robert W. Freckmann Herbarium/Steve Garske, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[ii] Photograph from the Robert W. Freckmann Herbarium/Steve Garske, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).
[iii] Photograph from the Robert W. Freckmann Herbarium/Steve Garske, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).

Appendix A5: *Phalaris arundinacea* (reed canary grass) *Updated 9/30/15*

Reed canary grass (RCG) is an erect, perennial grass that grows 2 – 6 feet tall and spreads by both seed and rhizomes, spreading rapidly to form dense monocultures. There is some disagreement about whether or not some strains of RCG are native to North America, but it is believed that the aggressive strains are non-native (Boos et al. 2010).

FIGURE A5. Reed canary grass competing with wool-grass (*Scirpus cyperinus*) as it invades a sedge meadow within the Reservation.[i]

The grass's gray-green leaves are flat and rough textured with an unusually large, transparent ligule. The leaves also tend to have a lengthwise green and white strip pattern (GLIFWC 2006). While in bloom the flower head is an open green spike with a slightly purple tinge; as the spike matures it tightens and turns tan (Figure A5).

The NRCS (2003) characterizes RCG as preferring moist to wet open areas, though it is tolerant of droughty soils as well. Stream banks, floodplains, wet meadows, pastures, marshes, lakeshores, and right-of-ways are all aggressively invaded by this species.

A5.1 Distinguishing Features

Different species of grasses can be difficult to distinguish for those not overly familiar with the plants. Boos et al. (2010) note that there are at least two similar species that grow in Wisconsin with which RCG can be mistaken. However, the following characteristics make RCG distinguishable:

- The leaves have a large, transparent ligule 0.1 – 0.3 inches tall; bluejoint grass (*Calamagrostis canadensis*) does not have a transparent ligule.
- The leaves are usually 0.5 inches wide, which is wider than similar-looking orchard grass (*Dactylis glomerta*).
- The flower heads are 3 – 6 inches, and loose at first before tightening up when mature.
- The plant forms dense stands (Figure A5.1) with fibrous rhizome mats.
- RCG is one of the first grasses to grow up in the spring.

A5.2 History on the Bad River Reservation

Reed canary grass is already widespread on the Reservation (Figure A5.2a), though the exact date of the first occurrence is unknown as well as the entire extent of the invasion. Even within northern Wisconsin documentation of occurrence is sparse (Figure A5.2b) which is mostly likely due not to the scarcity of the species but its commonness and unremarkable appearance. This idea of under-reporting being due to the commonness of the species is supported by GLIFWC (2006) which notes that RCG is so widespread in that invasion is inevitable and "landowners should act aggressively to control existing populations and reduce damage to natural communities".

FIGURE A5.1. Mature reed canary grass seed heads.[ii]

Unfortunately, guarding against the spread of RCG on the Reservation is difficult because of several factors, including: 1) the already established large, widespread populations in the area; 2) it is still often actively planted as a forage crop off-Reservation, particularly on sites too wet for other species (NRCS 2003); and, 3) the WDNR continues to leave RCG unregulated (Boos 2014).

As of the 2013 growing season there has been no active control completed by the BRNRD for RCG on the Reservation. However, protocols and BMPs have been put in place to minimize the spread of RCG on the Reservation.

A5.3 Possible Impacts

Reed canary grass invades wetlands, stream banks, floodplains, wet meadows, pastures, marshes, lakeshores, and right-of-ways and forms dense monospecific stands with diminished species richness. From these habitats RCG spreads into forests, prairies, and fields. Large patches can sometimes choke waterways and alter the hydrology of an area.

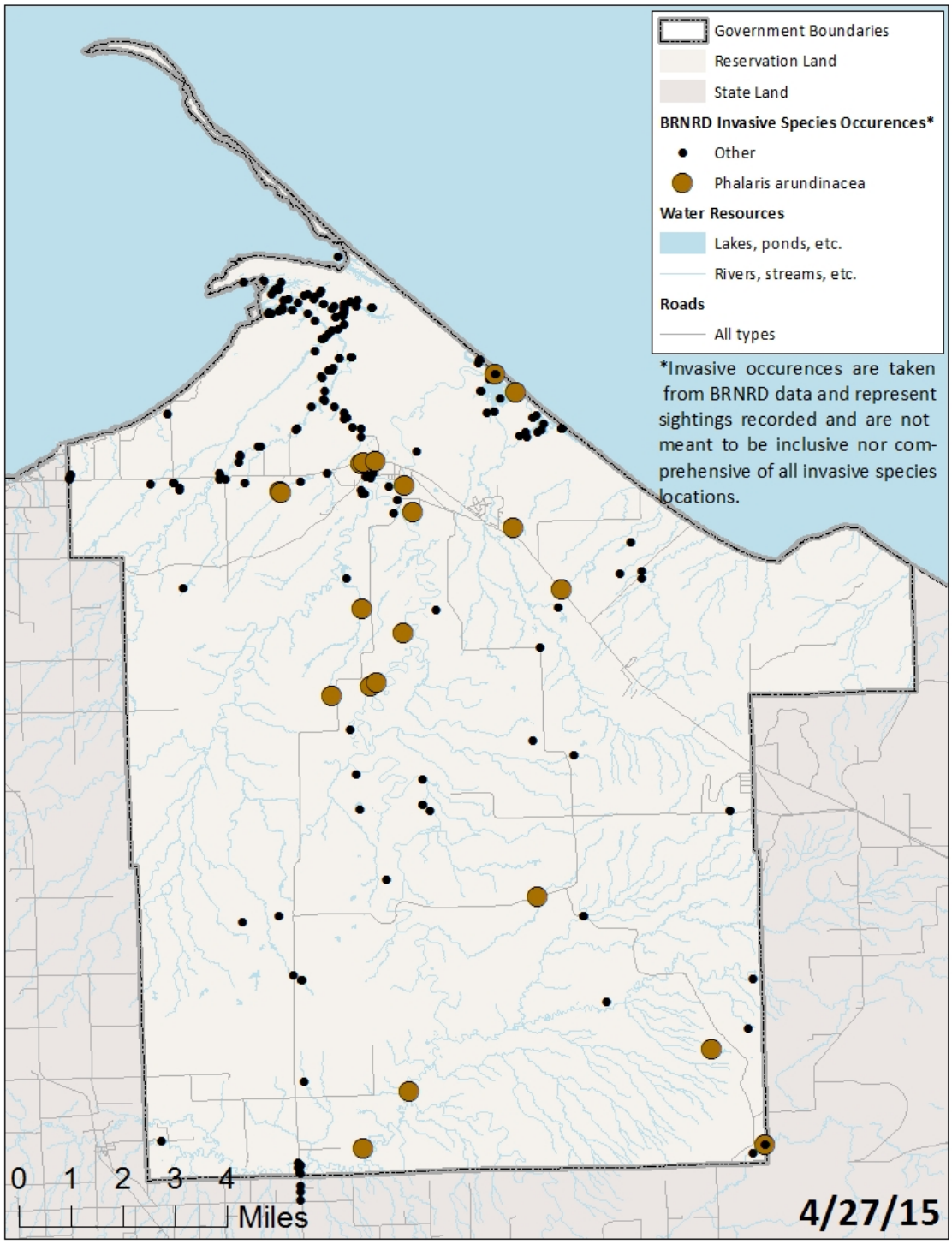

FIGURE A5.2a. Reed canary grass (*Phalaris arundinacea*) occurrences within the Bad River Reservation. Location data was compiled from records kept by the Bad River Natural Resources Department (BRNRD) as of April 27, 2015. The locations are not meant to be a comprehensive listing of all sites where reed canary grass is found at this time. This map does not include occurrence data collected by the Tribe.

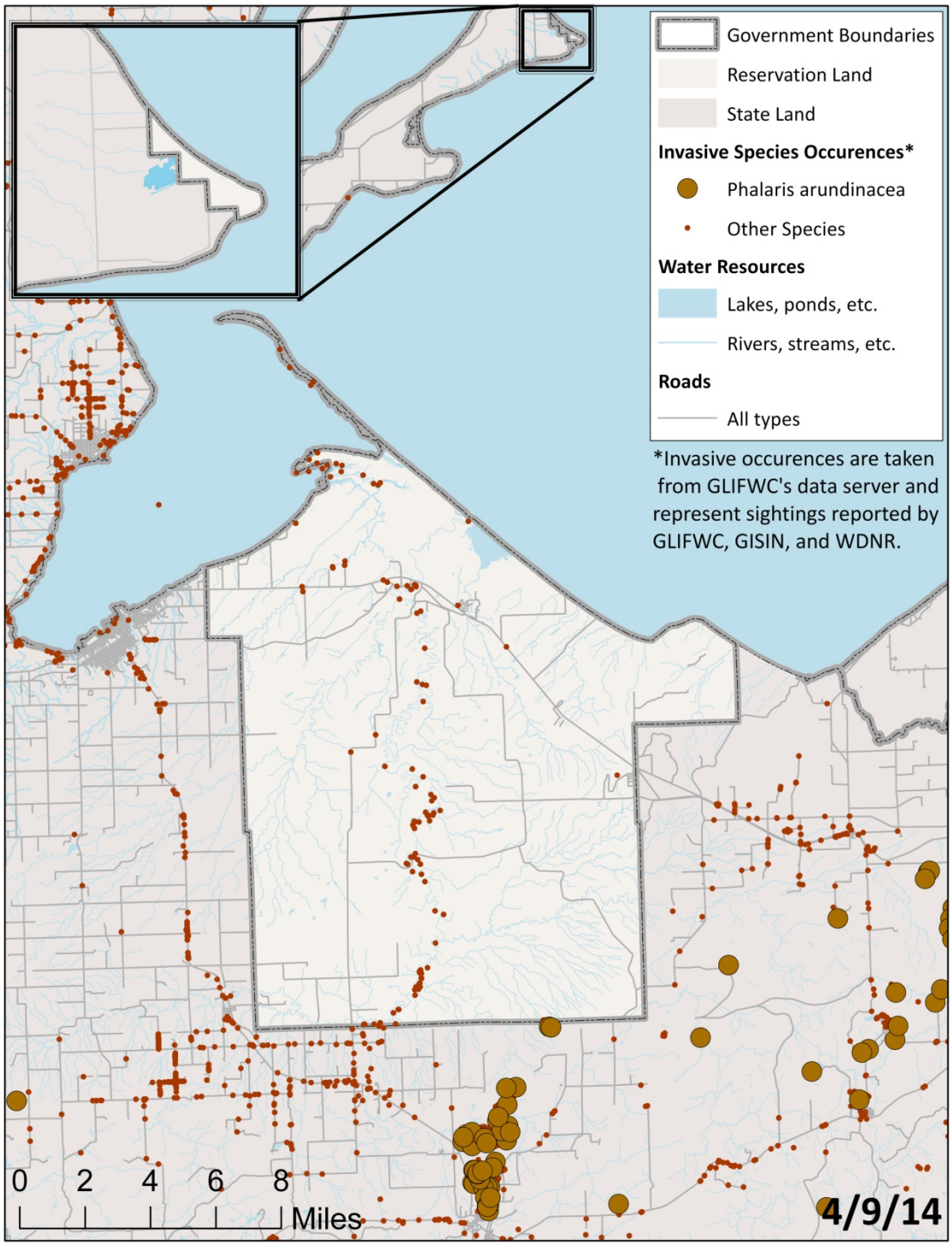

FIGURE A5.2b. Occurrences of reed canary grass (*Phalaris arundinacea*) within lands surrounding the Bad River Reservation. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

A5.4 Treatment and Control

There are many different techniques used to treat RCG depending upon the habitat it is found in, the reasons for control, and the funding available for control.

- Thick patches of plants can be dug up to remove the plant and the surrounding sod layer which would be necessary so the plant does not resprout from root fragments.
- Patches that can be accessed with mowing equipment can be cut 3 times during the summer to prevent seed set. However, this will not prevent spread from the rhizomes.
- A controlled burn can be done in the late spring or fall in successive years to reduce infestations.
- Plants in sensitive areas can be bundled, cut, and treated with Rodeo®.
- Large areas can receive a broadcast treatment of herbicide.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the BRNRD internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B). The Tribe also requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned so that all soil, seeds, and plant materials are removed.

A5.5 References

Boos, T., 2014. New Wetland Invaders: Revisions to Wisconsin's Invasive Species Rule. Wisconsin Wetland Association Conference Presentation, LaCrosse, Wisconsin.

Boos, T., K. Kearns, C. LeClair, B. Panke, B. Scrivner, and B. Williams, 2010. A Field Guide to Terrestrial Invasive Plants in Wisconsin. DNR PUB-FR 436-2010, Wisconsin Department of Natural Resources, Madison, Wisconsin.

GLIFWC, 2006. Identification: Reed Canary Grass. http://invasives.glifwc.org/Phalaris_arundinacea/id.html, *accessed* April 16, 2014.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

NRCS (Natural Resources Conservation Service), 2003. USDA PLANTS Database Plant Guide: Reed Canary Grass. http://plants.usda.gov/core/profile?symbol=PHAR3, *accessed* April 16, 2014.

---

[i] Photograph copyright of the Bad River Natural Resources Department.
[ii] Photograph copyright of the Bad River Natural Resources Department.

Appendix A6: *Phragmites australis* (common reed grass) *Updated 9/30/15*

Common reed grass (*Phragmites australis*) can be found throughout the continental United States. Research has shown however that some of the strains of *P. australis* are actually native lineages that have existed in North America for 3000 years (Blossey 2003). Furthermore, it has been shown that the more invasive *P. australis* clones are composed of strains that are recent arrivals to North America which have European lineages. Though there are morphological differences that can be used to tell the different strains apart, the overall appearance of common reed grass is similar across strains.

This semi-aquatic, perennial grass forms dense stands with individuals ranging from 3.5 – 16 feet tall (Boos et al. 2010). The stems of the plant oftentimes persist throughout the winter. The gray-green leaves are 6 – 24 inches long and form overlapping sheaths around the stems. Common reed grass flowers in large, feathery panicles (Figure A6). Common reed grass inhabits fresh meadows and other wetland habitats.

FIGURE A6. A large clone of common reed grass.[i]

A6.1 Distinguishing Features

There are distinct morphological differences recorded between the native lineages of common reed grass and the more common of the two European lineages (Figure A6.1) that are spreading invasively throughout North America (Blossey 2003). However, morphological traits can vary by habitat and throughout the season. Traits that distinguish that native strains from the more common introduced strain are (per Blossey 2003):

- "Native populations appear to have a lower stem density, and produce a reddish-purple color on their stems and ligules in spring and summer that is not present in non-native populations."
- "Stems of native genotypes are smooth and shiny as if polished, particularly in the winter, while stems of introduced genotypes are dull, rough and ribbed (ridges visible with the naked eye once leaf sheath has been removed)."

- "For all native genotypes leaf sheaths either fall off by themselves or are very easily removed when handling Phragmites. In the introduced genotypes, leaf sheaths may fall off at the base of the stem (which is also occasionally reddish or brownish) but on upper nodes are very difficult to remove (hold a stem close to an internode and use a twisting motion to check)."
- "Introduced genotypes remain sturdy and erect and move little while native genotypes easily bend and swing in the wind."
- "In the fall and winter, differences in the density of inflorescences are also obvious; introduced genotypes appear to have much denser and larger inflorescences."
- "Native haplotypes have round rhizomes that are yellow and rhizome diameters of less than 15mm. Rhizomes of introduced haplotypes, particularly when freshly excavated and rinsed are white (they darken over time) and compressed (flattened). Although there are some rhizomes with diameters <15mm, most rhizome diameters in introduced genotypes are larger than 15mm (measure in the center of an internode and use largest diameter)."

FIGURE A6.1. *Phragmites* invasion replacing native wetland plants.[ii]

A6.2 History on the Bad River Reservation

Phragmites mapping and monitoring first began within the Reservation boundaries in the mid 1990s, when Dr. James Meeker collaborated with the BRNRD to start studying *Phragmites* within the Bad River Sloughs and Honest John Lake area (Leah Gibala, personal communication). Additional mapping was completed in 2007 within the Kakagon Sloughs when stands of it were mapped by BRNRD (Figure A6.2a). Since then it has been found in Sand Cut, along road right-of-ways, and in other locations within the Kakagon-Bad River Sloughs Complex. Within the phragmites clones mapped in 2007 there were two plots set up in which the floral community was surveyed. In 2008, two plots within the *Phragmites* beds were controlled, one

by the bundle/cut/treat method and the other by hand-pulling with removal of the roots by digging.

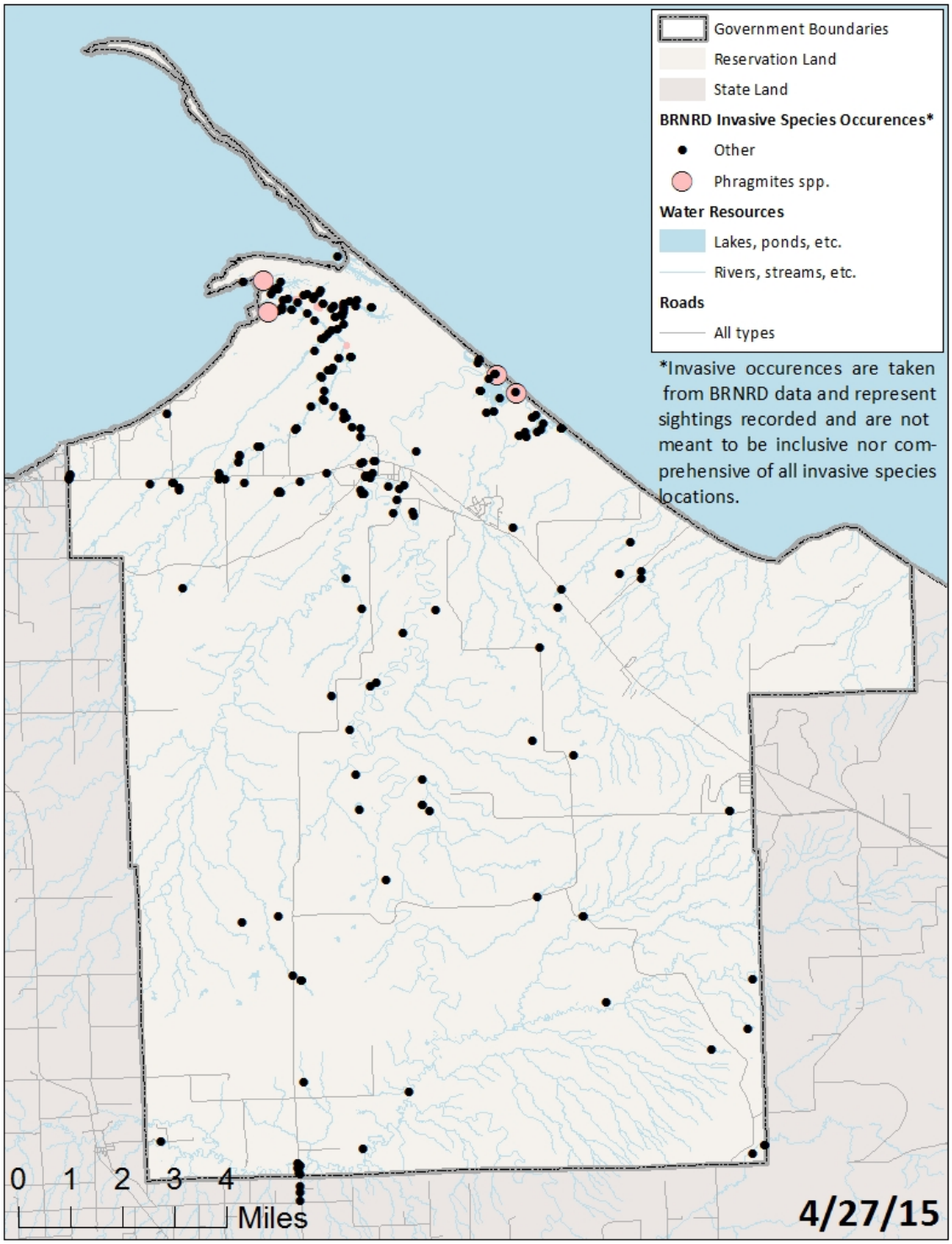

FIGURE A6.2a. Giant reed grass (*Phragmites* spp.) occurrences within the Bad River Reservation. Location data was compiled from records kept by the Bad River Natural Resources Department (BRNRD) as of April 27, 2015. The locations are not meant to be a comprehensive listing of all sites where *Phragmites* is found at this time.

However, there was some debate about whether it was necessary to control the *Phragmites* in the Kakagon Sloughs system, because while control efforts were implemented in the past, the slow spreading nature of the *Phragmites* in the Kakagon Sloughs meant that these clones were probably a native strain. In 2013, the *Phragmites* on the Reservation was confirmed to be the native strain *P. australis* subsp*. americanus* by GLIFWC staff (M. Falck, *personal communication*) by looking at genotypic characteristics. However, Dr. James Meeker (*personal communication*) believed that this native strain was not native to the Reservation and efforts should be made to remove it before it had a chance to impact the plant community Kakagon-Bad River Sloughs. Based on Dr. Meeker's recommendation, the BRNRD plans on treating *Phragmites* as an invasive species and will start controlling it within the Reservation boundaries.

However, another concern is the non-native strains of *Phragmites* that exist along the opposite shoreline of Chequamegon Bay (Figure A6.2b). The close proximity of these non-native clones means that the Reservation is vulnerable to invasion from the aggressively spreading *Phragmites australis* subsp. *australis*. Efforts were underway (as of 2014) by GLIFWC to coordinate a response to treating these non-native populations.

A6.3 Possible Impacts

Though native *Phragmites* has been show to cohabitate with native wetland plants, non-native *Phragmites* quickly invades moist habitats, disrupting hydrology, excluding native plants, altering wildlife habitat, and increasing fire potential. On the Reservation there would be the potential for a non-native strain to decimate the native plant community in the sloughs and damage the migratory bird habitat found in the area.

A6.4 Treatment and Control

There are many different techniques used to treat *Phragmites* depending upon the habitat it is found in, the reasons for control, and the funding available for control.

- Phragmites infested areas can be mown 3-5 times during the growing season to stress the plant and reduce the production of seeds.
- Phragmites can be treated with herbicide used as a broadcast spray or as part of a bundle, cut, and treat control measure. However it is necessary to burn or mow areas treated with herbicide to help speed the decomposition of the plants and aid in the reestablishment of the native plant community.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the BRNRD internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B). The Tribe also requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned so that all soil, seeds, and plant materials are removed.

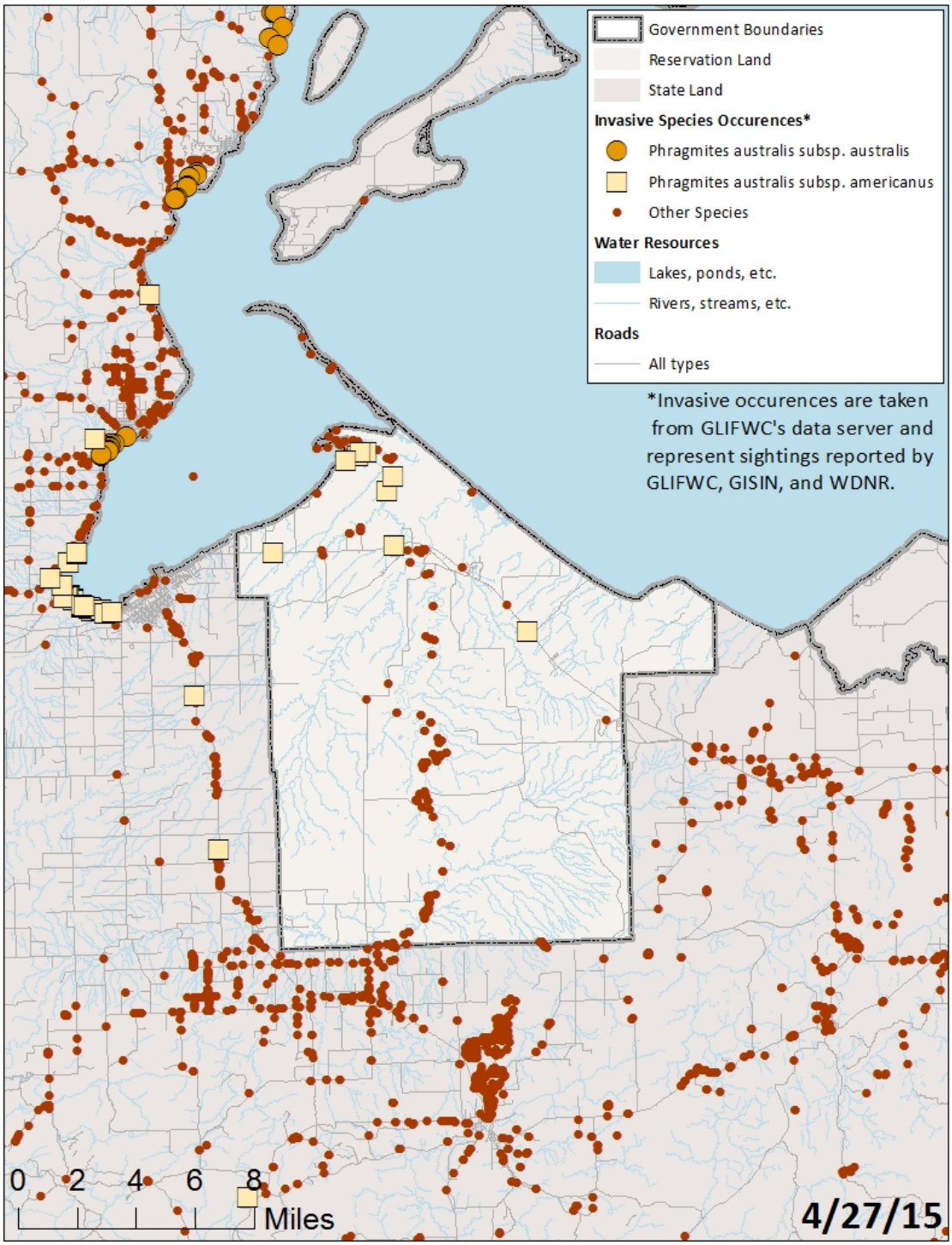

FIGURE A6.2b. Occurrences of *Phragmites* spp. within lands surrounding the Bad River Reservation. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

A6.5 References

Blossey, B., 2003. Phragmites: Common Reed – Native to North America or Introduced (or Both)? http://www.invasiveplants.net/phragmites/natint.htm, *accessed* April 16, 2014.

Boos, T., K. Kearns, C. LeClair, B. Panke, B. Scrivner, and B. Williams, 2010. A Field Guide to Terrestrial Invasive Plants in Wisconsin. DNR PUB-FR 436-2010, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Falck, M., Great Lakes Indian Fish and Wildlife Commission, 2014. Personal communication.

Gibala, L., former Bad River Natural Resources Department Wetlands Specialist, 2015. Personal communication, October 2015.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

Meeker, J., Northland College. Personal communication, multiple years.

---

[i] Photograph from the Ecology and Management of Invasive Plants Program, Cornell University web site (http://www.invasiveplants.net/phragmites/phrag/resources2.htm).

[ii] Photograph from the Ecology and Management of Invasive Plants Program, Cornell University web site (http://www.invasiveplants.net/phragmites/phrag/resources2.htm).

Appendix A7: *Rhamnus* spp. (buckthorns)

Updated 9/30/15

There are two species of buckthorn that are of a concern to the Tribe, *Rhamnus cathartica* (common buckthorn) and *R. frangula* (glossy buckthorn). Both species grow as a medium- to large-sized shrub, though common tends to grow slightly taller (25 feet) than glossy (20 feet). The shrubs are usually composed of multiple trunks with a spreading crown. Both species invade wetlands and various upland habitats, growing well in full sun and deep shade, to form dense even-aged canopies. However, there are some morphological difference between the plants (Figures A7a).

FIGURE A7a. A common buckthorn leaf (left) and a glossy buckthorn leaf (right).[i]

Common buckthorn has twigs with gray-brown bark and light lenticels that sometimes end in sharp spines. The sapwood of the twigs is yellow and the heartwood is orange. The leaves are opposite (but occasionally alternate), toothed, oval, and have veins that curve toward the tip. The small, greenish-white flowers are fragrant and clustered in the leaf axils (Figure A7b). Berries are round and black.

FIGURE A7b. Common buckthorn in flower.[ii]

Whereas glossy buckthorn has alternate leaves that are not toothed they're oval and have veins that curve towards the tip (though not as prominently as common buckthorn). The small flowers are greenish-white to yellow, fragrant, and clustered in the leaf axils. Berries are round and purple-black to deep red (Figure A7c).

FIGURE A7c. Fruit clusters of glossy buckthorn.[iii]

A7.1 Distinguishing Features

There are different characteristics that can be looked for to distinguish non-native buckthorns from each other and from native buckthorn species.

- Common buckthorn leaf veins are prominent and curve toward the leaf tip.
- Common buckthorn has inner sapwood that is yellow.
- Common buckthorn has twigs that often end in spines.
- Common buckthorn has opposite leaves with occasionally a few alternate.
- Common and glossy buckthorn leaves turn bright yellow and persist into the fall.
- Glossy buckthorn has long, naked buds that lack stalks.
- Glossy buckthorn have leaves with a shiny surface and a hairy underside.
- Glossy buckthorn leaves sometimes have a wavy edge and may be faintly toothed.

A7.2 History on the Bad River Reservation

Buckthorn was first found on the Reservation in 2010 when monitoring located buckthorn along Marengo River Road in the southwestern portion of the Reservation and along the southern portion of Government Road. Since that time additional monitoring and random reported sighting have indicate buckthorn has spread to new areas, including the floodplains of the Bad River and properties in the northwest corner of the Reservation (Figure A7.2a). Since there are quite a few recorded occurrences surrounding the Reservation on all sides (Figure A7.2b) there is the possibility that seed transported by birds or water could have resulted in the populations on the Reservation.

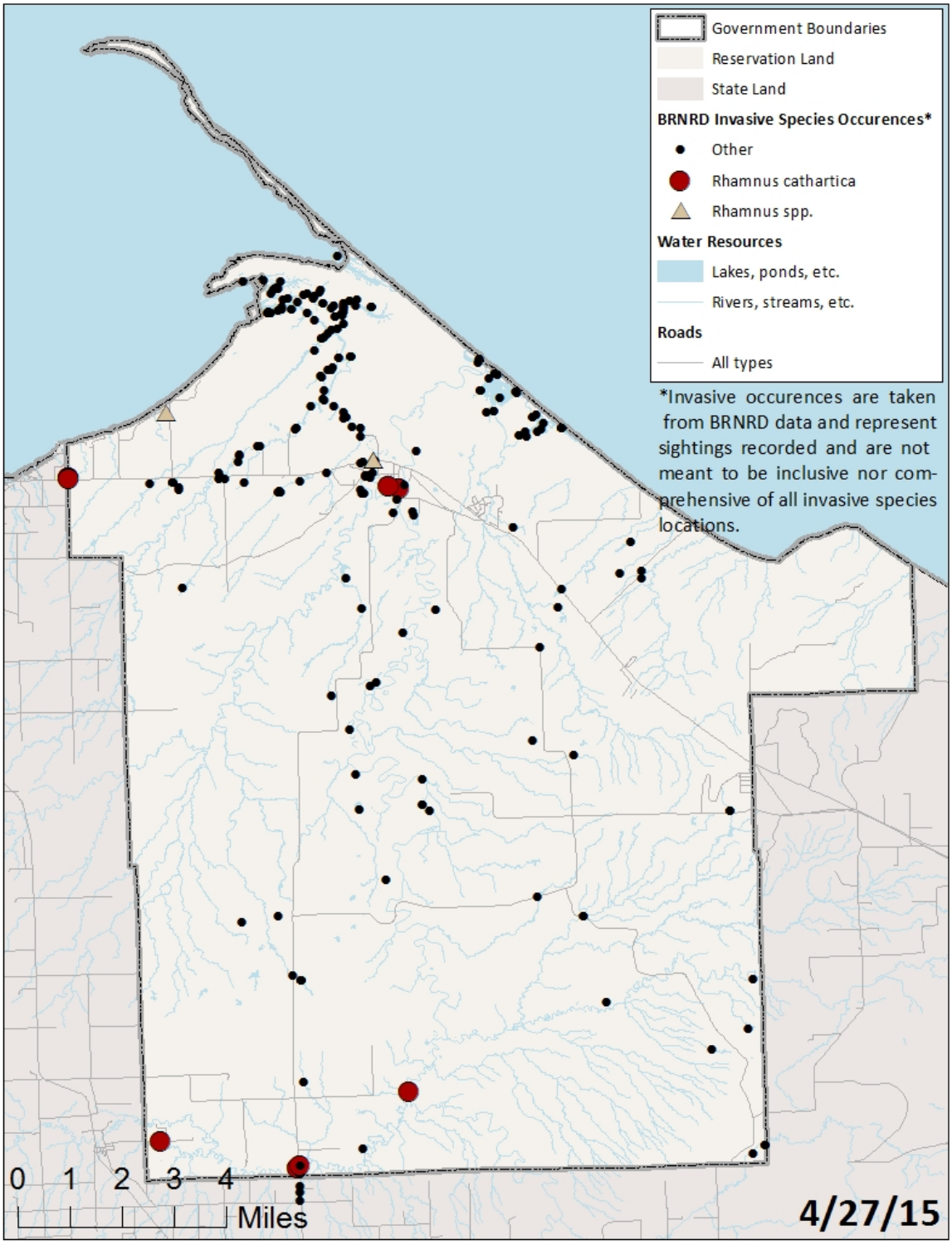

FIGURE A7.2a. Buckthorn (*Rhamnus* spp.) occurrences within the Bad River Reservation. Location data was compiled from records kept by the Bad River Natural Resources Department (BRNRD) as of April 27, 2015. The locations are not meant to be a comprehensive listing of all sites where buckthorn are found at this time.

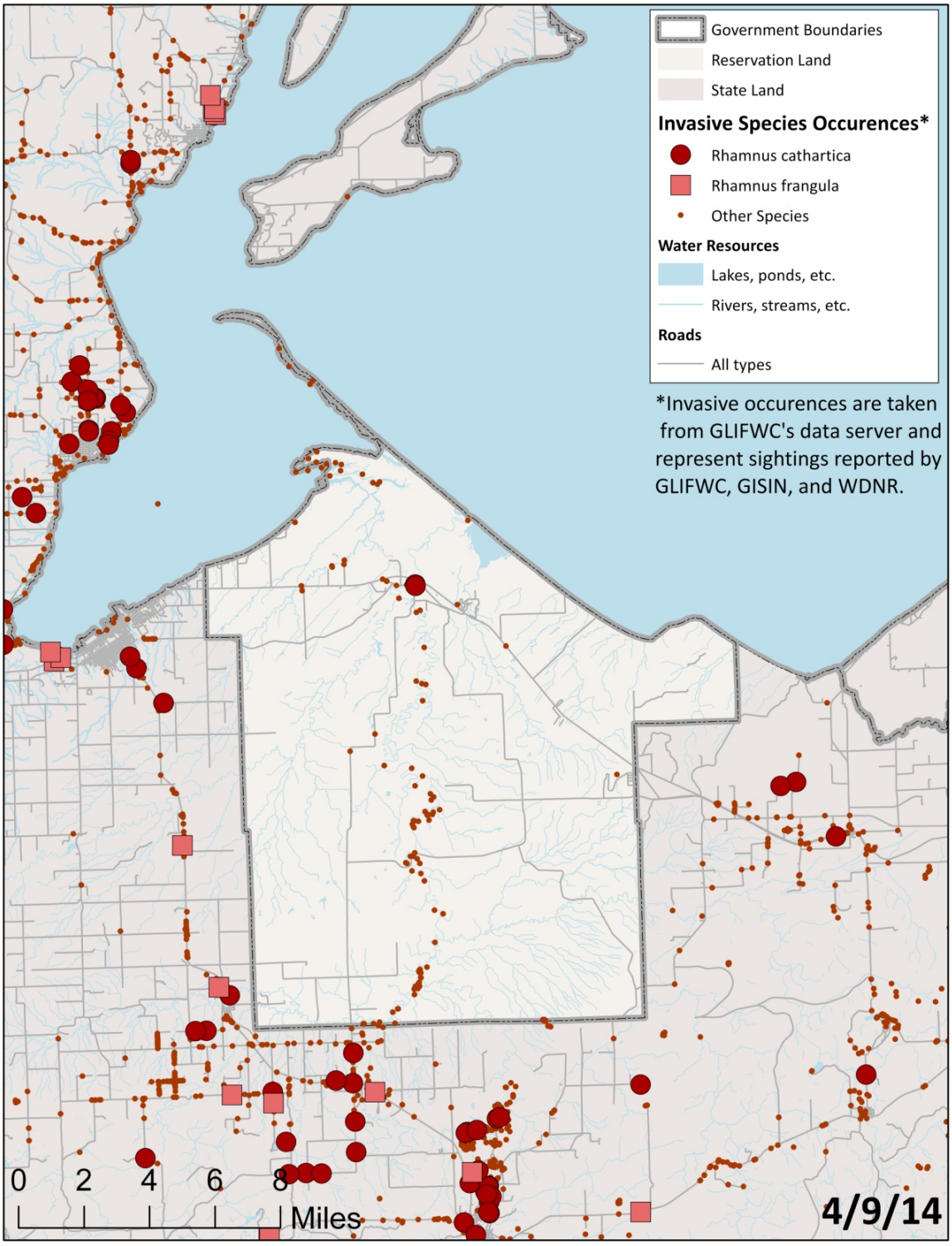

FIGURE A7.2b. Occurrences of *Rhamnus* spp. within the Bad River Reservation and surrounding lands. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

During the summer of 2014 when even more buckthorn was found on the Reservation, control efforts funded by the Wisconsin Tribal Conservation Advisory Council (WTCAC) were carried out on populations on the Reservation excluding the population in the Bad River floodplain near its confluence with Marengo River and the population along Marengo River Road. During this two day effort, three BRNRD staff members cut and stump treated buckthorn in these areas. In addition, in 2015, invasive buckthorn species growing between Ackley Road and the western edge of the Reservation were also controlled.

A7.3 Possible Impacts

Buckthorns quickly invade habitats, shading out native species and forming dense, even-aged thickets. Buckthorn might also alter nitrogen content in the soil and facilitate non-native earthworm invasion (Boos et al. 2010). The nitrogen-rich leaves have also been shown to decompose rapidly and facilitate the decomposition of other leaf litter to not only alter the nitrogen levels in the soil but also the depth of duff on the forest floor (Knight et al. 2007). Fruit and leaf litter may also release allelopathic chemicals into the soil that reduce seed germination and growth of other plant species (Knight et al. 2007).

A7.4 Treatment and Control

There are many different techniques used to treat buckthorns depending upon the habitat it is found in, the reasons for control, and the funding available for control. The methods the Tribe will employ include:

- Removal of small saplings by hand-pulling.
- Removal of larger saplings and shrubs by cutting at the base and applying Rodeo® to the stump.
- Removal of seedlings by burning in the spring in areas of dense infestation.
- Or, in areas where burning is not safe, foliar spraying the seedling with herbicide is the alternative.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the BRNRD internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B). The Tribe also requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned so that all soil, seeds, and plant materials are removed.

A7.5 References

Boos, T., K. Kearns, C. LeClair, B. Panke, B. Scrivner, and B. Williams, 2010. A Field Guide to Terrestrial Invasive Plants in Wisconsin. DNR PUB-FR 436-2010, Wisconsin Department of Natural Resources, Madison, Wisconsin.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

Knight, K.S., J.S. Kurylo, A.G. Endress, J.R. Stewart, and P.B. Reich, 2007. Ecology and ecosystem Impacts of Common Buckthorn (*Rhamnus cathartica*): A Review. Biological Invasions 9: 925-937.

---

[i] Photographs copyright of the Bad River Natural Resources Department.

[ii] Photograph from Wisconsin Department of Natural Resources/Lisa Karimi, Invasive Species Photo Gallery website (http://dnr.wi.gov/topic/Invasives/photos/index.asp?mode=photoview&RecID=201&spec=135).

[iii] Photograph from Wisconsin Department of Natural Resources/Lisa Karimi, Invasive Species Photo Gallery website (http://dnr.wi.gov/topic/Invasives/photos/index.asp?mode=photoview&RecID=1079&spec=134).

Appendix A8: *Typha angustifolia* and *T.* x *glauca* (narrow-leaf and hybrid cattail)

Updated 9/30/15

Narrow-leaf and hybrid cattails (Figure A8) are wetland perennials that can grow up to 10 feet tall (Boos et al. 2010). They grow in most wetland habitats, including ditches, and can survive in moist to wet soil. The non-native narrow-leaf cattail (*Typha angustifolia*) hybridizes with native broad-leaved cattail (*T. latifolia*) to form the highly invasive hybrid cattail (*T.* x *glauca*).

In general, cattails species are plants with erect, lance-like basal leaves that are mostly flat (Freckmann 2012). They produce male and female flowers on spikes and the seed heads turn brown as they mature. Cattail is perhaps one of the most easily recognizable wetland plant geneses.

FIGURE A8. Fruiting narrow-leaf cattails have a characteristic space between the male and female flower parts.[i]

A8.1 Distinguishing Features

There are several features that help distinguish non-native narrow-leaf from native broad-leaf cattail. However, the identification of the hybrid cattail is harder, since characteristics that are intermediates of the parent species (Boos et al. 2010).

- Narrow-leaf cattail has a space ½ - 1 inch gap between the male and female flowers on its spike, whereas in broad-leaf cattail they touch (Figure A8.1). (Hybrid cattail may or may not be spaced.)
- Narrow-leaf has leaves no more than 0.5 inches wide but broad-leaf cattail leaves are usually wider, up to 1 inch.
- Narrow-leaf has leaf blades that are slightly rounded on one side whereas broad-leaf cattail does not.

FIGURE A8.1. Broad-leaf cattail has no space between the male and female flowers.[ii]

A8.2 History on the Bad River Reservation

Due to the difficulty sometimes encountered in distinguishing narrow-leaf and hybrid cattails from each other, the separation during identification on the Reservation usually places the three species into two categories: native (broad-leaf) and invasive (narrow-leaf and hybrid). It is unknown when invasive cattails were first appeared within the Reservation boundaries during but they are found throughout the Reservation (Figure A8.2a) and the surrounding lands (Figure A8.2b).

Since 2007, when many of the cattail clones in the Kakagon Sloughs were mapped, the Tribe has actively focused on trying to reduce the spread of these invasives. (In 2006 the cattails near the hatchery fish ponds were cut but not many details of this treatment have survived and it is not known what long-term results may be.) In 2007 there were also four plots set up within the cattail clones to use for long-term monitoring of the spread, these sites were mapped, photographed, and florally assessed. In 2008 test plots were set up to test treatment techniques, where one plot the plants were cut twice below the water and the other plot the plants were pulled by hand. In 2009 a summer crew made up of BRNRD staff, tribal youth, and consortium workers hand cut 5.63 acres of cattails in 43 areas in the Kakagon Sloughs; these areas were reseeded with wild rice after the harvest was opened that year. In 2010 another 8 areas (3.25 acres) in the Kakagon Sloughs (along Beartrap Creek) were cut by hand twice during the summer. Cattail control also took place in the summers from 2011 through 2014, with the control of 5.59 acres in the Kakagon Sloughs in 2014.

In addition to the cattail assessment and mapping work completed by BRNRD staff (Figure A8.2c), Dr. James Meeker, a Northland College professor, collaborated with the Tribe to complete research on the spread of invasive cattail in the Kakagon and Bad River Sloughs. There were three years of data collection in 1998, 2005, and 2013. The result of this research has been to show that invasive cattail clones have increased in size from 1998-2013 (inset Figure A8.2c) and the species richness of the plant community has been impacted in these areas (Meeker and Johnson 2013). Based on this research the Tribe will be expanding the focus of the cattail control efforts so to also work on controlling the establishment of new clones within the sedge meadow communities and not just into the wild rice beds habitat.

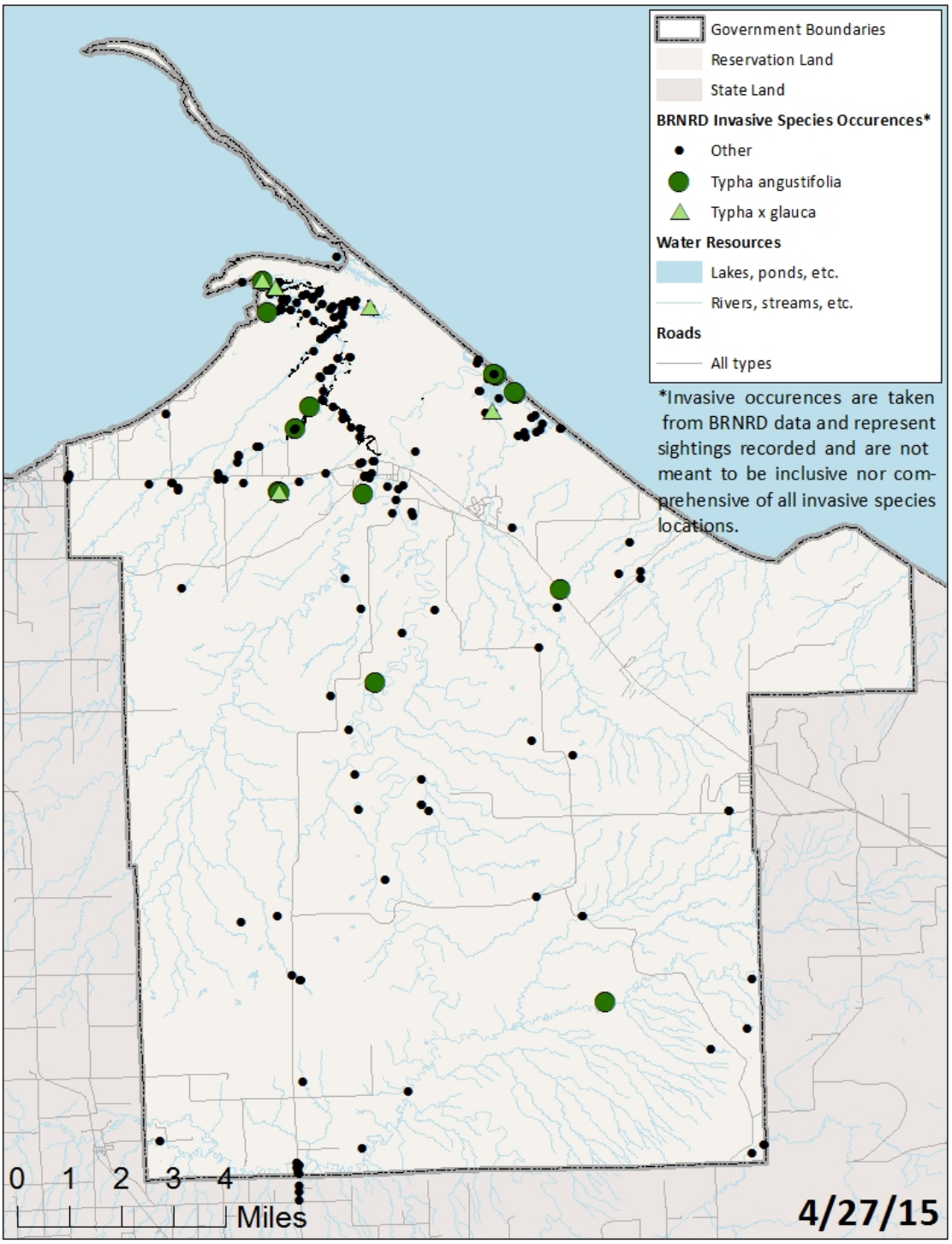

FIGURE A8.2a. Invasive cattail (*Typha* spp.) occurrences within the Bad River Reservation. Location data was compiled from records kept by the Bad River Natural Resources Department (BRNRD) as of April 27, 2015. The locations are not meant to be a comprehensive listing of all sites where invasive cattails are found at this time.

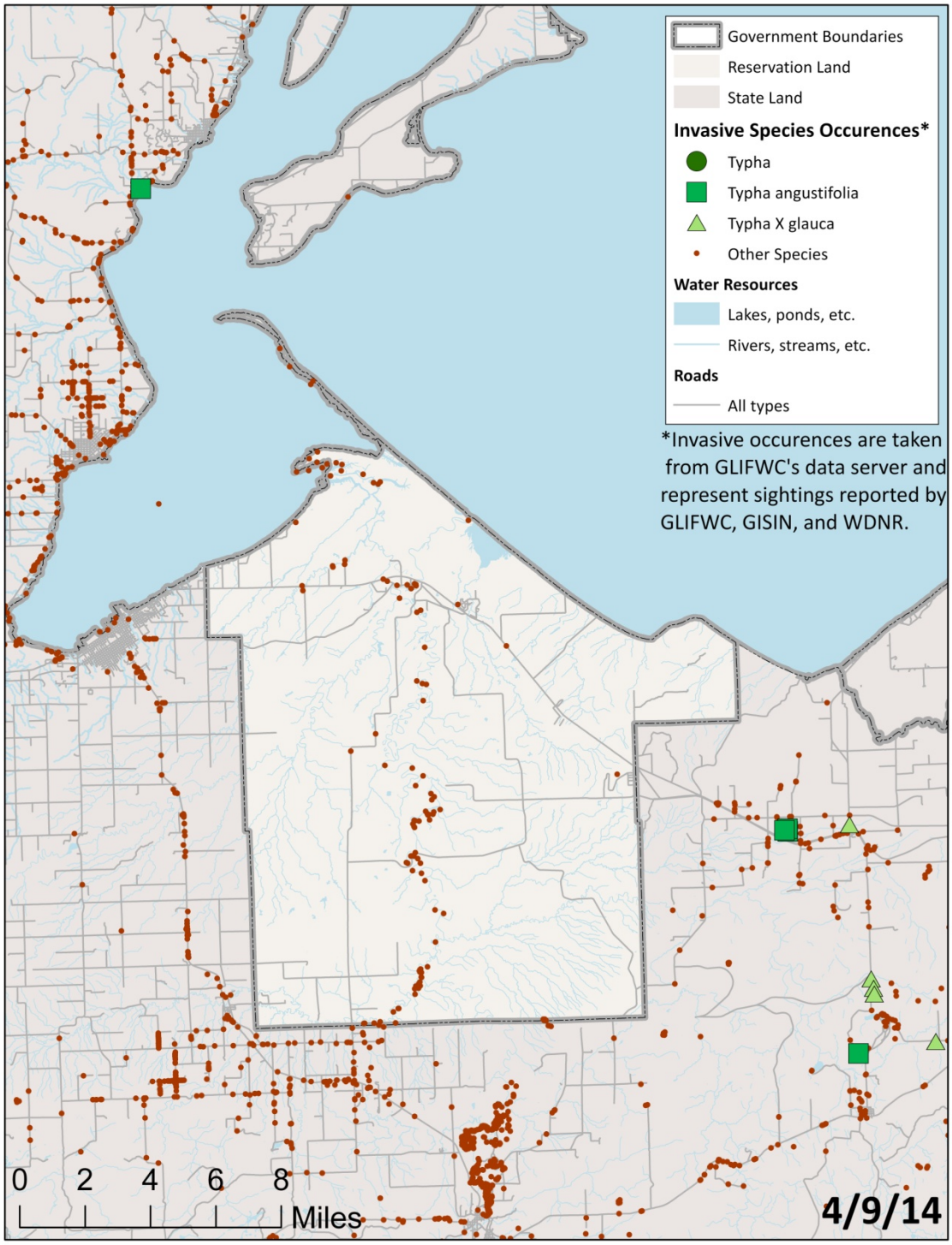

FIGURE A8.2b. Occurrences of *Typha* spp. within lands surrounding the Bad River Reservation. Location data was harvested from the Great Lakes Indian Fish and Wildlife Agency's (GLIFWC) data portal; occurrence data represents sightings reported by GLIFWC, the Wisconsin Department of Natural Resources (WDNR), and the Global Invasive Species Information Network (GISIN) as of April 7, 2014. This map does not include occurrence data collected by the Tribe.

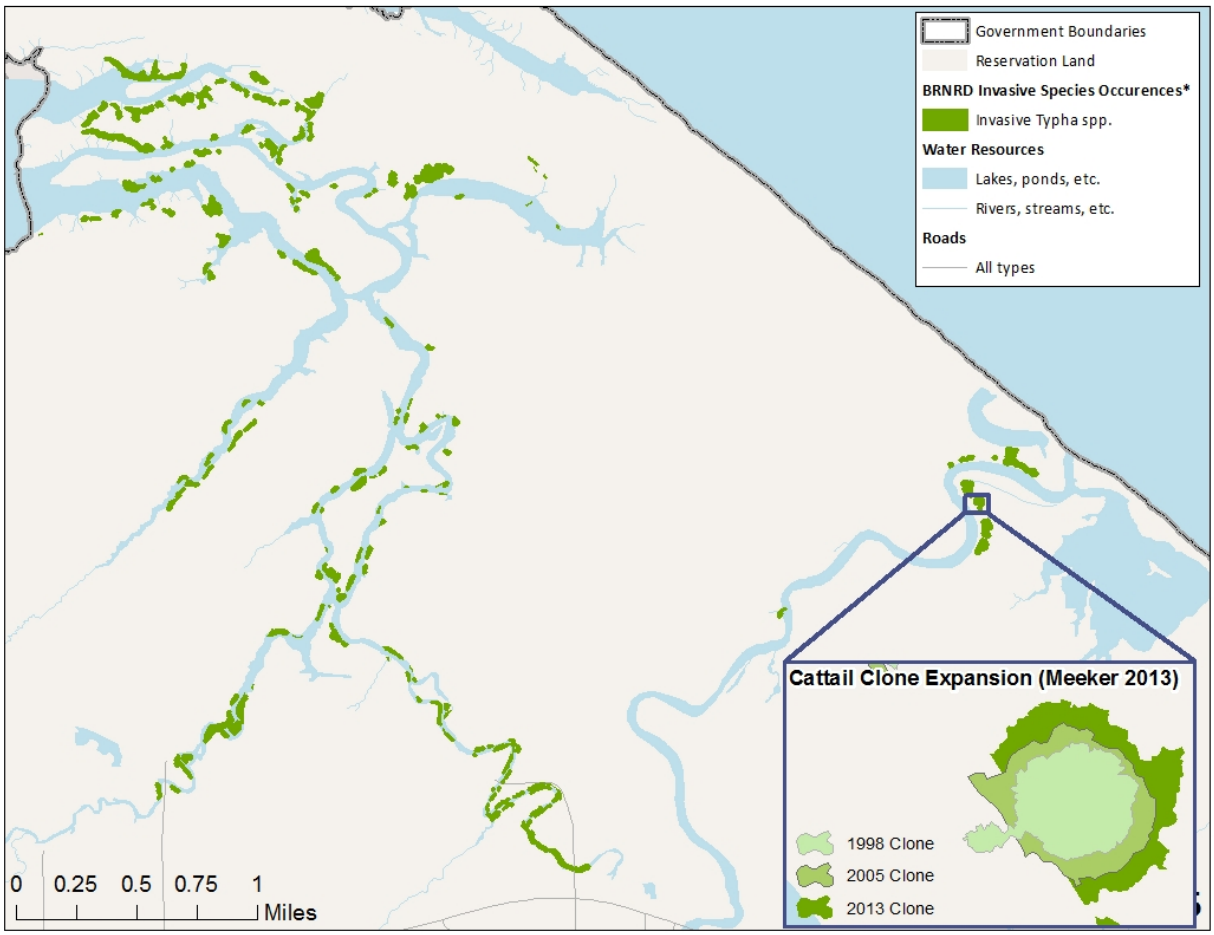

FIGURE A8.2c. Detailed mapping of invasive cattail clones in the Kakagon and Bad River Sloughs has been a part of monitoring and treating this invasive. Mapping includes detail mapping of the expansion of select cattail clones (inset) as part of a fifteen year study conducted by Dr. James Meeker and his associates from 1998 to 2013.

A8.3 Possible Impacts

Invasive cattails spread quickly in wetlands to form dense monocultures that outcompete native plants, alter habitat, and can even change the hydrology of a wetland. In areas where sensitive plant species survive this could mean extirpation within that area. Cattail growing from rhizomes can also choke out watercourse channels and spread into habitats usually reserved for other emergents. This makes them a direct competitor to wild rice, a culturally important plant to the Bad River Tribe.

A8.4 Treatment and Control

There are many different techniques used to treat invasive cattails depending upon the habitat it is found in, the reasons for control, and the funding available for control.

- Cattail can be mechanically or manually cut to below the water level during the growing season to stress the plant. Continual cutting on an annual basis can cause the reduction of clone size.
- In areas where cattails cannot be cut below the water surface (e.g., sedge meadow and bog areas), the BRNRD hopes that repeated removal of green tissue will be enough to reduce clones size, if this is not effective, possibly adding herbicide treatment of the cut stems will be explored.
- Cattails can be pulled but the chance of some of the roots being left behind and creating disturbed soil usually results in cattail or another invasive growing in this spot.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the BRNRD internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B). The Tribe also requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned so that all soil, seeds, and plant materials are removed.

A8.5 References

Boos, T., K. Kearns, C. LeClair, B. Panke, B. Scrivner, and B. Williams, 2010. A Field Guide to Terrestrial Invasive Plants in Wisconsin. DNR PUB-FR 436-2010, Wisconsin Department of Natural Resources, Madison, Wisconsin.

GLIFWC, 2014. Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Node of the Global Invasive Species Information Network (GISIN). http://gisin.glifwc.org/, *accessed* April 7, 2014.

Meeker, J., and S. Johnson, 2013. Repeat Sampling of Typha Species Abundance in the Kakagon Sloughs and Bad River Systems, Final Report. Bad River Natural Resources Department Report, Odanah, WI.

Robert W. Freckmann Herbarium, 2012. Plants of Wisconsin. http://wisplants.uwsp.edu/Wisplants.html, *accessed* January 2014.

---

[i] Photograph from the Robert W. Freckmann Herbarium/Robert Freckmann, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).

[ii] Photograph from the Robert W. Freckmann Herbarium/Dennis Woodland, University of Wisconsin-Stevens Point, Wisconsin Plants web site (http://wisplants.uwsp.edu).

Appendix A9: *Cycloloma atriplicifolium* (winged pigweed) *Updated 9/30/15*

Winged pigweed is a low-growing bush-like plant with dense branches. In the spring and summer the plant is green with almost holly-like leaves (Figure A9) that are shed at the end of the summer as the plant matures. The plant and fruit may become purple-red in the fall during the tumbleweed stage, at which point the plant may break off from its roots to roll across the landscape and scatter its thousands of seeds. The plant grows in sandy disturbed ground, like beaches, river banks, and gravel pits. (Michigan Flora Online 2011; Robert W. Freckmann Herbarium 2012)

There is some disagreement over the invasiveness of this plant in the Midwest. The Wisconsin State Herbarium (Flora of Wisconsin) and the Robert W. Freckmann Herbarium both list the plant as native to the state of Wisconsin. However, the University of Michigan Herbarium (Michigan Flora Online 2011) postulates that the plant is most likely adventive outside of its home range in the Great Plain west of the Mississippi River, a statement supported by Flora of North America (FNA 2008).

FIGURE A9. Winged pigweed on a Long Island beach, the piping plover habitat within the Bad River Reservation.[i]

A8.1 Distinguishing Features

There are several features that help identify winged pigweed as noted in the Robert W. Freckmann Herbarium (2012).

- Overall spherical shape with densely branched stems.
- Small green flowers, 5-parted and stalkless.
- Irregulately toothed leaves that fall off as the plant matures.
- Reddish color of plant at maturity (Figure A8.1).

FIGURE A8.1. Winged pigweed that has turned red with maturity.[ii]

A8.2 History on the Bad River Reservation

Winged pigweed sightings on the Reservation were first documented in 2009. In 2011 the National Park Service found at least 3000 individuals on Long Island and removed some to reduce the plant density in nesting habitat for the piping plover. In 2012 BRNRD staff removed winged pigweed from the beaches on either side of the mouth of Bad River. BRNRD staff have also reported possible winged pigweed as growing along the river at the Bad River Falls, but these sightings have not been confirmed.

There are no maps currently available to show the range of winged pigweed on or near the Reservation.

A8.3 Possible Impacts

The National Park Service suspects winged pigweed could have a negative impact on piping plover nesting and feeding sites. (NPS 2011)

A8.4 Treatment and Control

Winged pigweed is pulled by hand and bagged. The bags are then disposed of in a non-composting waste facility.

To prevent the spread of this invasive onto the Reservation by anthropogenic means, the BRNRD internally follows standard decontamination procedures meant to prevent the spread by staff members (Appendix B). The Tribe also requires that all equipment brought onto the Reservations for projects (e.g., construction projections, road and utility maintenance, etc.) be cleaned so that all soil, seeds, and plant materials are removed.

A9.5 References

FNA (Flora of North America), 2008. eFlora.org: Cycloloma atriplicifolium. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242415375, *accessed* May 1, 2015.

Michigan Flora Online (A.A. Reznicek, E.G. Voss, & B.S. Walters), 2011. University of Michigan. Web. http://michiganflora.net/species.aspx?id=79, *accessed* April 27, 2015.

NPS, 2011. Cycloloma atriplicifolium (winged pigweed; Russian thistle; tumbleweed): Discover in Apostle Islands National Lakeshore. Report by Daniel McConnell, APIS Exotics BioTech, October 3, 2011.

Robert W. Freckmann Herbarium, 2012. Plants of Wisconsin. http://wisplants.uwsp.edu/Wisplants.html, *accessed* January 2014.

---

[i] Photograph from the "Cycloloma atriplicifolium (winged pigweed; Russian thistle; tumbleweed) Discovery in Apostle Islands National Lakeshore" report by the National Parks Service, October 3, 2011.
[ii] Photograph from University of Michigan Herbarium/A.A. Reznicek, University of Michigan (michiganflora.net).