2017 Phragmites Monitoring Results

for

Wazee Lake Recreation Area

Jackson County, Wisconsin

Phragmites australis subsp. australis from Wazee Lake Recreation Area

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ABSTRACT

Jackson County Parks and Recreation developed a management plan for non-native *Phragmites australis subsp. australis* (hereafter Phragmites) in Wazee Lake Recreation Area from 2015 through 2020. In 2015, the county was successful in securing a four-year grant from the Wisconsin Department of Natural Resources (WDNR) to control Phragmites. Efforts began before the grant with herbicide treatment of an 11-acre unit around the Tailings Pond in 2014 and prescribed burn of the entire Tailings Basin in spring 2015. Observations in 2016 suggest Phragmites in the 11-acre unit to be reduced but new growth of Phragmites plants were extensive in 2017.

Fourteen additional treatment units were delineated by county staff in 2015 ranging in size from 0.1 to 10.37 acres and totaling 35 acres all together. These treatment units were located within and around the Tailings Basin. A total of 12 transects were established in 8 of the treatment units in 2015 for multi-year monitoring of Phragmites. Pre-treatment monitoring was done in August 2015 following modified methods from Moore (2015) with herbicide treatment of the 35 acres following one week later. In addition, 6 photo points were established where transects were problematic due to site access and/or high water levels. Transects and photo points were surveyed again in August 2016 and August 2017. There were a total of 197 quadrats along the 12 transects where dominance class was recorded. Forty-eight percent (94) of the quadrats were dominated by dead Phragmites stems from previous years. There were 34 quadrats dominated by living Phragmites, 6 of which were in an area that has not yet been treated. The remaining 69 quadrats were dominated by water, other undesirable species, desirable species, or mixed (no class dominated). These results suggest a maximum of 85% reduction after aerial spray in 2015 and hand spraying in 2016 However, substantial regrowth around the Tailings Pond demonstrates the need for aerial treatment in 2018.

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INTRODUCTION

Project Area

Wazee Lake Recreation Area is approximately 5 miles east of Black River Falls in Jackson County, Wisconsin. The property was the Jackson County Iron Mine from 1967 to 1983 owned by Inland Steel Mining Company. Before the mine closed, Inland Steel began reclamation of the site, which included planting vegetation to stabilize the soils. Due to the extremely poor nutrient content of the soils in the Tailings Basin area, less desirable plant species were selected for planting, one of which was the non-native and invasive *Phragmites australis subsp. australis,* hereafter Phragmites.[1]

Project Background

Jackson County Forestry & Parks Department was awarded an Aquatic Invasive Species Control Grant in 2015 from the Wisconsin Department of Natural Resources. The grant funds are provided through 2018 for the control of Phragmites within the Wazee Lake Recreation Area. Control efforts are concentrated within and around the Tailings Basin with approximately 46 acres of Phragmites units delineated, many of which are small patches less than 3 acres in size. The areas delineated in Figure 1 illustrate control efforts in 2014-2017 and do not reveal all the locations of Phragmites in Wazee.

Project Goals

Project goals listed below are an abbreviated version of those from the grant application submitted by Jackson County to the WDNR in early 2015. This report is intended to meet the requirements for Goal #3 in 2015 by establishing a monitoring strategy, defining monitoring locations, and providing pre- and post-treatment data for sites that were treated.

1. Reduce Phragmites by 90% in five years (2014-2018) using aerial and ground application of approved herbicides.
2. Remove biomass on treated sites through mechanical means and prescribed burning to aid in monitoring and increase effectiveness of re-treatment.
3. Conduct monitoring to determine effectiveness of treatment and the need for additional treatment.
4. Provide public education and outreach to prevent Phragmites control to new areas.

Control & Monitoring Efforts

2014-2015

Control efforts began in July 2014 with aerial spray application of Imazapyr[2] on 11 acres surrounding the Tailings Pond (blue polygon in Figure 1). Prescribed burning was attempted that winter but was unsuccessful because the fire would not carry. The following spring 2015, the entire tailings basin was burned, including the 11 acres that were treated with Imazapyr in 2014.

[1] See Appendix A for further information on *Phragmites australis subsp. australis.*
[2] See Appendix B for further information on Imazapyr.

Jackson County partnered with Aquatic Plant and Habitat Services (APHS) in spring 2015 to assist with monitoring as outlined in the grant application. Monitoring efforts began with installation of 12 transects and another 6 photo points that were surveyed August 10-17, 2015 to collect pre-treatment data. Aerial spray of Imazapyr was completed on another 35 acres on August 24, 2015 (purple polygons in Figure 1).

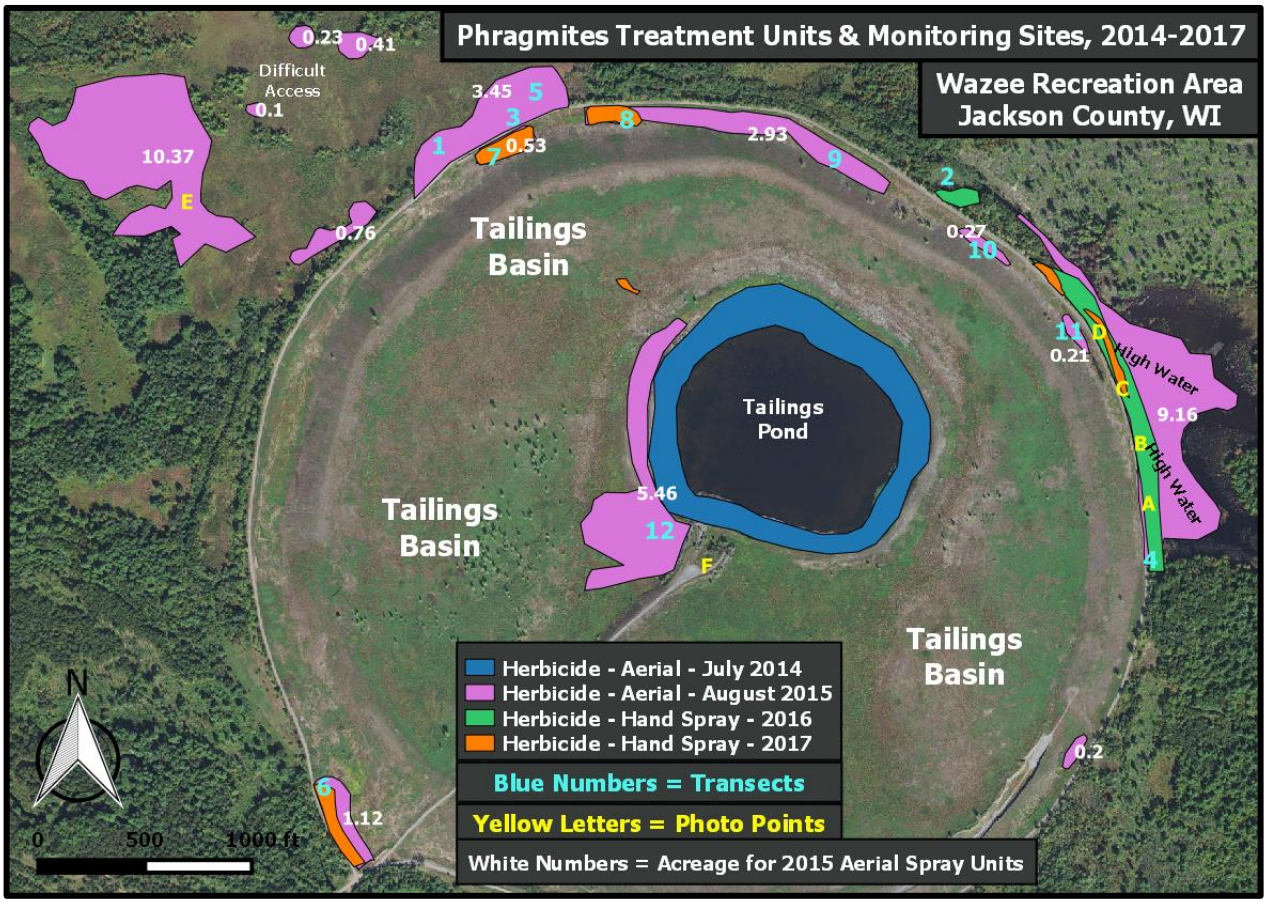
2016

The same 12 transects and 5 of the photos points were visited in August 12, 2016 to collect post-treatment data. The 11-acre unit that was treated in 2014 was also visited. Hand spraying with a solution of Imazapyr and glyphosate[3] was done in late September 2016 along the road near photos points A through D (green polygons in Figure 1) and at a small area along Lake Wazee at the Sherwood Forest Access (not illustrated on map).

2017

The same 12 transects and all 6 photos points were visited August 13, 2017 as part of continued post-treatment data collection. Hand spraying with a solution of Imazapyr and glyphosate was then completed in late summer 2017 at transects 6, 7, and 8, near photos points D and C, and at a small point northwest of the Tailings Pond (orange polygons in Figure 1).

Figure 1 – Tailings Basin Phragmites Monitoring Sites & Control Efforts



[3] See Appendix C for further information on glyphosate.

METHODS

Transects were installed at 12 locations in 2015 using 2 metal T-posts per transect to define each end with lengths ranging from 6 to 34 meters (Table 1). Transect length was largely dictated by site characteristics such as water depth and density of Phragmites with a resulting average length of 16 meters. Since the transects are to be visited over a number of years for monitoring purposes, T-posts were hammered using a post pounder to prevent ejection during freeze-thaw cycles. Latitude and longitude coordinates were captured using an iPhone 5c and Avenza Maps application. Transects were located within areas planned for 2015 herbicide treatment except for Transect 2 (Figure 1).

Table 1 – Transect & Photo Point Identifiers & Coordinates

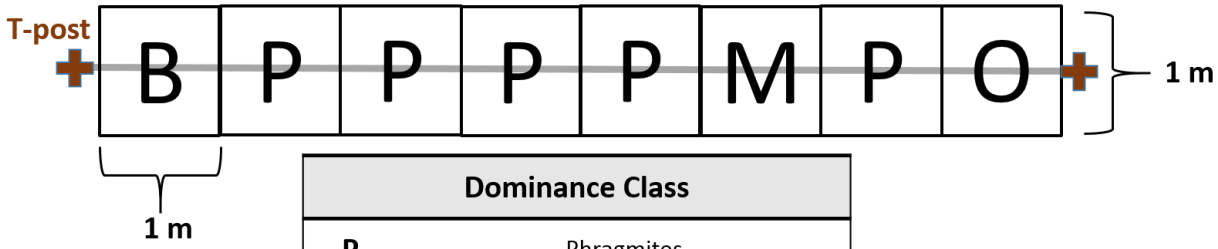
Transect Number	Transect Length (m)	Longitude	Latitude
1	15	*-90.720528*	*44.309271*
2	6	*-90.711455*	*44.308692*
3	18	*-90.719186*	*44.309609*
4	12	*-90.708002*	*44.303699*
5	34	*-90.718770*	*44.309929*
6	10	*-90.722902*	*44.301076*
7	16	*-90.719547*	*44.309107*
8	16	*-90.717151*	*44.309537*
9	15	*-90.713449*	*44.308957*
10	13	*-90.710856*	*44.307739*
11	14	*-90.709344*	*44.306663*
12	23	*-90.716775*	*44.304250*
Photo ID Letter		**Longitude**	**Latitude**
A		*-90.708204*	*44.304334*
B		*-90.708312*	*44.305107*
C		*-90.708612*	*44.305817*
D		*-90.709013*	*44.306553*
E		*-90.725241*	*44.308550*
F		*44.303689*	*44.303689*

Pre-treatment monitoring was completed August 10-17, 2015 with post-treatment monitoring on August 12, 2016 and August 13th, 2017. A measured rope was secured to each end of the transect and a one-square-meter quadrat frame was placed along the transect starting at the first meter. Dominance class was recorded as defined in Figure 2. "Water" and "Old Growth" were added to the dominance class list in 2016. Each meter along the transect was surveyed using this procedure. Photos were taken at each transect.

Photo points were established in 2015 at 6 locations as identified in Figure 1 and Table 1. Photos were taken at points A through D facing toward the 9.16-acre treatment unit (east). Point E photos were taken in 2015 and 2017. Photos at point F were taken facing northeast. All photos were taken in mid-August of 2015, 2016 and 2017.

Survey data were uploaded to an open source geographic information systems (GIS) program known as QGIS (QGIS, 2015). Maps were created to illustrate transect and photo point locations, treatment units, and dominance class within quadrats.

Figure 2 - Transect Illustration & Dominance Class Description



Dominance Class	
P	Phragmites
D	Desirable Species
O	Other (non-Phragmites) undesirable species such as narrow-leaved cattail
B	Bare ground
M	Mixed; no single component dominating
W*	Water
OG*	Old growth of Phragmites

*Dominance determined by >50% of quadrat with majority cover by the component. *Dominance classes added in 2016*

RESULTS

Transects

There were 192 quadrats in 2015, 180 quadrats in 2016 (transect 4 was not surveyed in 2016 due to high water), and 197 quadrats in 2017. All transects continue to have significantly reduced number of quadrats dominated by Phragmites except for transects 2 (not treated), transect 4 (along the edge of treatment), and transect 7 (increase of 13 Phragmites-dominated quadrats since 2016) (Table 2). Transects 1, 3, 5, 9 and 11 had quadrats that were dominated by old growth Phragmites. Most quadrats along transects 6 and 10 were dominated by desirable species. Quadrats along transect 8 were mainly dominated by desirable species or were mixed. All quadrats along transect 12 were dominated by water and a surprising abundance of submersed aquatic vegetation. Photos of all transects in 2015, 2016, and 2017 are included for visual comparisons in Figure 6 through Figure 9. With the exception of transects 2 (not treated), 4 (edge of 2015-2016 treatment), 7 (Phragmites dominated in 2017), and 8 (some Phragmites) all photos reveal a continued drastic decline in living Phragmites after herbicide treatment in 2015.

Due to the significant increase of Phragmites along transect 7 and west of transect 8, those areas were hand-sprayed in late summer 2017 after this survey took place (orange polygons in Figure 1). A linear strip between the road and transect 6 was also hand sprayed in 2017 due to increased Phragmites occurrence.

Photo Points

Photos of points A-F are found in Figure 10 and Figure 11 for pre- and post-treatment comparison. Points A-D were dense Phragmites in 2015 with water levels too high for establishing transects. After herbicide treatment, much of the 9.16-acre treatment unit had lower Phragmites infestation in 2016 but this was difficult to observe from the photo points because Phragmites had flourished along the perimeter and acted as a visual barrier for photo points A, B, and C. Consequently, that area was hand-sprayed with a solution of Imazapyr and glyphosate in September 2016 (green polygons in Figure 1), yielding reduced Phragmites and clear view of the treatment unit in 2017. Photo Point F was mixed-to-dense Phragmites in all directions and appears to have increased since 2016. Photo point pictures are in Figure 10 and Figure 11.

Figure 3 – Graph of Quadrats for Each Dominance Class 2015-2017

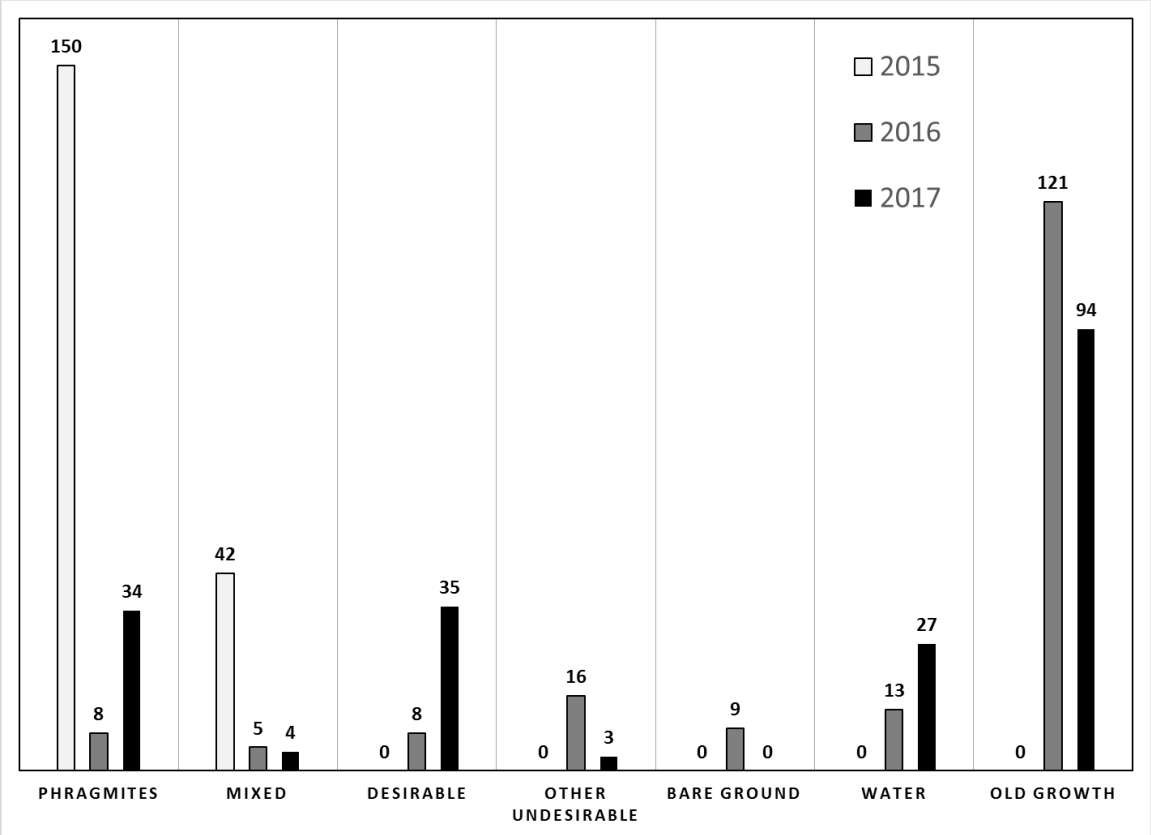
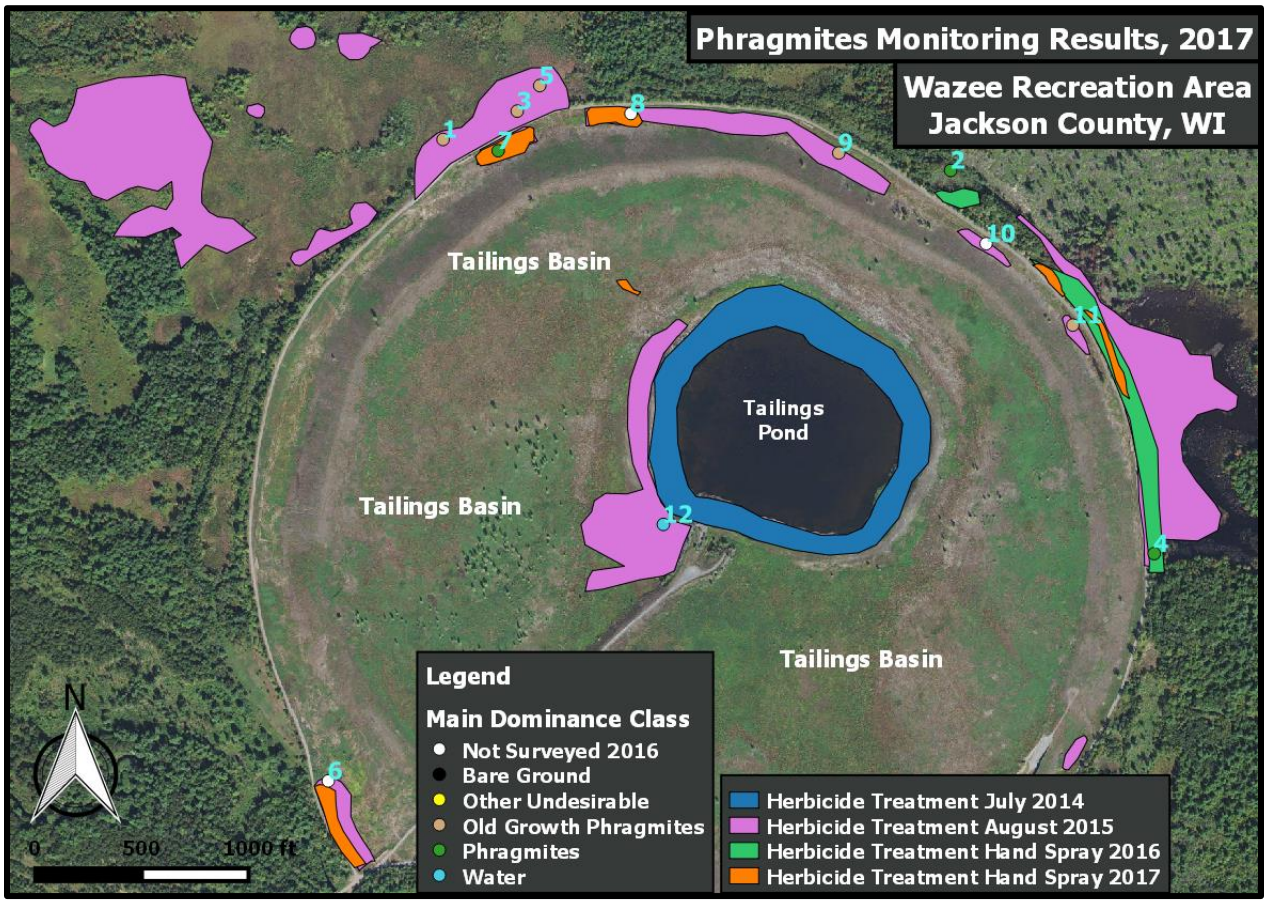


Table 2 – Table of Quadrats for Each Dominance Class 2015-2017

Dominance Class→		Phragmites Quadrats			Mixed Quadrats			Desirable Quadrats		Undesirable Quadrats		Bare Quadrats	Water Quadrats		Old Growth Quadrats	
Year→		2015	2016	2017	2015	2016	2017	2016	2017	2016	2017	2016	2016	2017	2016	2017
Transect Number	1	15	0	0	0	0	0	0	1	0	0	0	0	1	15	14
	2	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0
	3	18	0	0	0	0	0	0	0	0	0	0	0	0	12	12
	4	12	NS	11	0	NS	0	NS	0	NS	0	NS	NS	1	NS	0
	5	34	0	0	0	0	0	0	2	0	0	0	0	0	34	32
	6	0	0	0	10	0	0	4	16	1	3	5	0	0	0	0
	7	16	2	15	0	1	0	0	0	0	0	0	12	0	0	0
	8	13	0	2	3	0	4	3	4	0	0	0	1	2	12	2
	9	15	0	0	0	0	0	0	0	0	0	0	0	0	21	21
	10	7	0	0	6	0	0	0	12	0	0	0	0	0	13	0
	11	14	0	0	0	0	0	0	0	0	0	0	0	1	14	13
	12	0	0	0	23	4	0	1	0	15	0	4	0	22	0	0
TOTAL QUADRATS		**150**	**8**	**34**	**42**	**5**	**4**	**8**	**35**	**16**	**3**	**9**	**13**	**27**	**121**	**94**
% Quadrats by year		**78%**	**4%**	**17%**	**22%**	**3%**	**2%**	**4%**	**18%**	**9%**	**2%**	**5%**	**7%**	**14%**	**67%**	**48%**

Figure 4 – Main Dominance Classes of Transects, 2017



Results of the 2014 Herbicide Treatment

A walk around the tailings pond (11-acre treatment site) in June 2015 revealed very little Phragmites growing where herbicide was applied in 2014. Although there are no pre-treatment data from this site, it is reasonable to estimate there was at least 90% reduction between 2014 and 2015. Jackson County staff visited the 2014 treatment area again in 2016 and delineated areas where Phragmites was growing and planned for aerial spraying in 2017. Unfortunately, aerial herbicide applicators were not available to conduct treatment and the Phragmites has continued to spread around the Tailings Pond. The site visit in 2017 revealed high water conditions around the pond and native aquatic pondweeds (*Potamogeton spp.*) growing along transect 12 (Figure 5). Phragmites appeared to increase significantly and is planned for aerial spray in 2018.

Figure 5 – Tailings Pond Area Near Transect 12

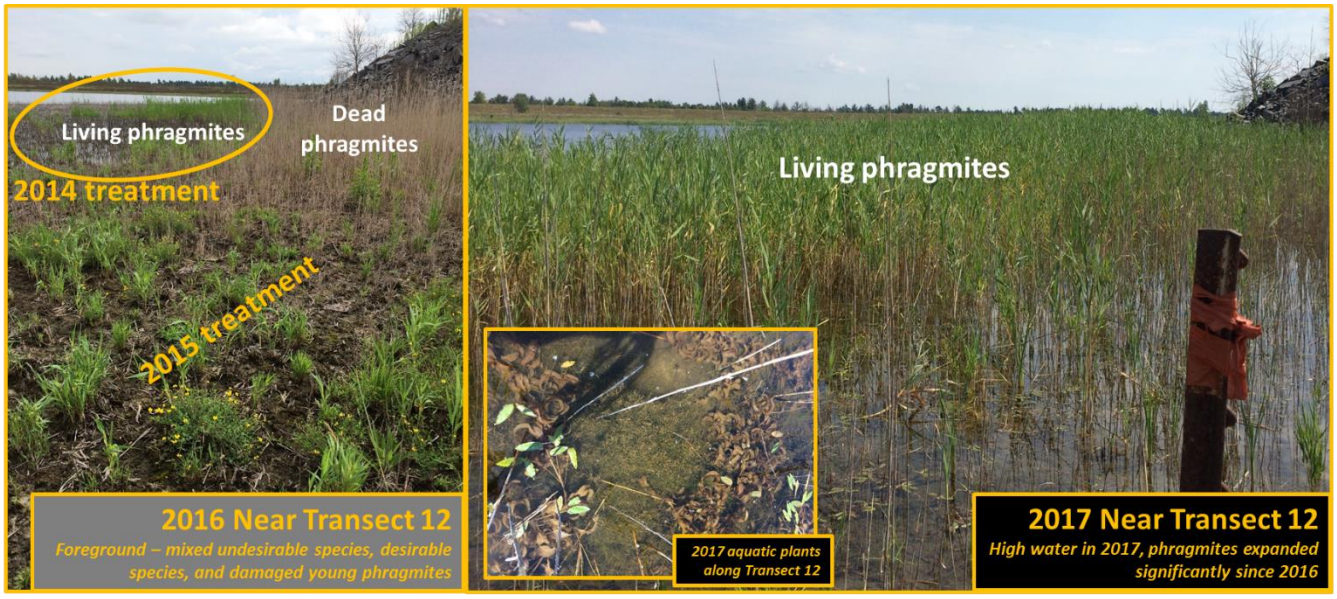


Figure 6 – Photos of Transects 1, 2, and 3

Figure 7 – Photos of Transects 4, 5, and 6

Figure 8 – Photos of Transect 7, 8, and 9

Figure 9 – Photos of Transect 10, 11, and 12

Figure 10 – Photos of Points A, B, and C

Figure 11 – Photos of Points D, E, and F

Sherwood Forest Lake Access Area

Hand spraying with a solution of Imazapyr and glyphosate was done in late September 2016 at a small area along Lake Wazee at the Sherwood Forest Access. Control of the area seemed effective in 2017 except for a small area of remaining Phragmites along shore (Figure 12). Controlling small areas of Phragmites, such as the remaining plants at Sherwood Forest, is strongly recommended before the plants spread to other areas of the lake.

Figure 12 – Sherwood Forest Phragmites

DISCUSSION

There were 150 quadrats dominated by Phragmites in 2015, 8 quadrats in 2016, and 34 quadrats in 2017 (Figure 3, Table 2). Survey results suggest a 90% reduction was achieved in 2016 after aerial herbicide treatment in 2015 (purple polygons in (Figure 1). The methods used do not allow for statistically rigorous analysis, but general conclusions can still be drawn from the data collected. If transect 2 (6 quadrats total, no herbicide treatment to date) is removed from the data set, there were 191 quadrats in 2017. Of those 191 quadrats, 28 were dominated by living Phragmites. This suggests a maximum of 85% reduction was sustained after aerial spray in 2015 and hand spraying in 2016.

Figure 13 - Stolon

The area surrounding the Tailings Pond, which includes transect 12 and photo point F, had high water and a visually striking increase in living Phragmites. Site visits in 2016 revealed living Phragmites sprouting in the 2014 treatment area. Observations in 2017 revealed a large Phragmites stand encircling the Tailings Pond, suggesting follow-up aerial herbicide treatment is needed (Figure 5). Submerged aquatic pondweeds (*Potamogeton spp.*) were found growing along transect 12 in 2017 where terrestrial prairie plants had been in 2016 (Figure 5).

Due to the impressive ability of Phragmites to spread via stolons and rhizomes, perimeter walks of treatment units are another level of monitoring recommended in 2018. Stolons are stems connected to the parent plant that grow along the soil surface and form new roots and shoots and can grow up to 4.25 inches in a ***day***[4]. Figure 13 is a photo of a Phragmites stolon from Transect 11 in 2017. The red line is drawn just left of the stolon, which is basically a fallen Phragmites stem. The gold circles show where new Phragmites shoots are growing vertically. The cover photo of this report is the same stolon laid on the access road for a better view. If a stolon, or fallen stem, is 10 feet long then the new growth quickly extends 10 feet from the parent plant. Rhizomes are basically stolons that are beneath the soil surface. The rate of lateral spread by rhizomes averages 15.7 inches per year[4]. Perimeter walks of accessible treatment units will help determine whether Phragmites is continuing to grow beyond the edges and whether small spot treatments or manual removal are required.

Restoration after Phragmites Management

The 46 acres of treated Phragmites are not all alike in water levels, natural recovery of native plant species, other invasive species presence, and density of previous years' growth. Therefore, native plant revegetation will require consideration of each units' conditions. If native revegetation is occurring naturally, no replanting is needed. If Phragmites recurrence plagues a treatment unit, native planting is not recommended because continued herbicide treatment will kill what was just

[4] https://www.greatlakesphragmites.net/phragbasics/spread/. 16 March, 2018.

planted. If dead Phragmites biomass is shading the soil, removal is needed to allow natural revegetation to occur, with hopes that native plants will appear.

The first step is to develop a restoration plan and select native plants that are appropriate to the site's soil, nutrient requirements, drainage, and availability of plants and seeds mixes. The restoration plan should also include a monitoring protocol and planning for site access that minimizes disturbance once seeds are planted.

The second step is to prepare the sites for revegetation by removing old/dead Phragmites biomass as much as possible through burning or manual removal. Pre-planting monitoring should then occur as established in the monitoring protocol. A sanitation protocol should also be included to prevent the spread of invasive plants to other sites.

The third step is actual planting of native plants in accordance with the restoration plan followed by the final step of monitoring to determine effectiveness and if changes are needed for future restoration efforts. Monitoring also provides the opportunity to remove emerging invasive plants that colonize the site before native plants.

Figure 14 – Management Recommendations for 2018

Transects 1, 3, 5, 9, and 11 – Remove dead Phragmites biomass in spring 2018 to expose soil. Monitor the area for native species, Phragmites, or other invasive plants. If no native plant regrowth occurs AND Phragmites does not regrow, consider planting native seeds in 2019.

Transect 2 –This area has not yet been treated and should be delineated for aerial spraying.

Transect 4 –Abundant Phragmites growth in 2017 so aerial spraying is recommended.

Transects 6 – Monitor because native species growth is occurring naturally. Plants in 2017 included wooly mullein (not native, but generally beneficial), black-eyed Susan, goldenrod, crown vetch (invasive, but not behaving invasively), ferns, Joe-Pye weed, bee balm, asters, flea bane, and birds foot trefoil (invasive). Native planting not needed.

Transect 7 – Monitor because of significant increase in Phragmites since 2016 and herbicide treatment in 2017. Native planting is not recommended in 2018.

Transect 8 – Monitor because of Phragmites presence and herbicide treatment in 2017. Native species present included boneset and softstem bulrush. Cattails were common but species could not be confirmed due to lacking flower spike. Narrow-leaved cattail is common in the area and likely the species present.

Transect 10 – Monitor because some native species growth is occurring naturally (horsetail and moss) but young Phragmites is also sprouting. Native planting is not recommended because Phragmites is still actively growing and follow-up treatment may be needed.

Transect 12 & Photo Point F – Aerial spray around the Tailing Pond is recommended for 2018.

Photo Points A, B, C, D, and E – Monitor because Phragmites control appears to be well maintained in 2017 in A, B, C, and E. The area surrounding points C and D was hand sprayed in 2017 and should continue to be monitored.

Sherwood Forest – Hand spray or manually remove remaining Phragmites in 2018.

Perimeter Walks – Walk the perimeter of treatment units where possible and look for lateral spread of Phragmites outside treatment units.

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APPENDIX A – INFORMATION ON *PHRAGMITES AUSTRALIS SUBSP. AUSTRALIS*

Phragmites australis is an erect perennial grass growing up to 15 feet tall. It remains standing through all seasons and the woody stems from previous years' growth make it challenging to navigate through. The plant is fairly easy to recognize based on its plume-like inflorescences (flowers). There is some difficulty, however, in identifying three subspecies because one is native and widespread in North America (*P. australis subsp. americanus*), one is non-native and from Europe *(P. australis*), and one whose origin is unclear but it occurs in the southern U.S. and into Central America (*P. australis subsp. berlandieri*) (Swearingen & Saltonstall, 2010).

Identification of *P. australis* (WDNR, 2016):

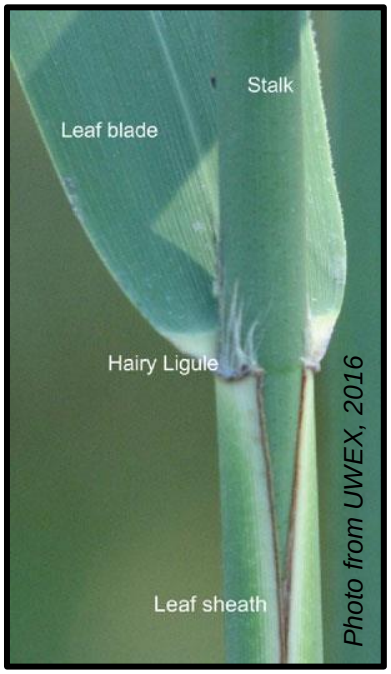
Leaves: Smooth, narrow leaves are 6- 24" long, 0.4-2.4" wide and blue-green in color. Leaf sheaths tightly clasp the stem, are difficult to remove, and stay on through winter. Long hairs are present at the junction of leaf and sheath.

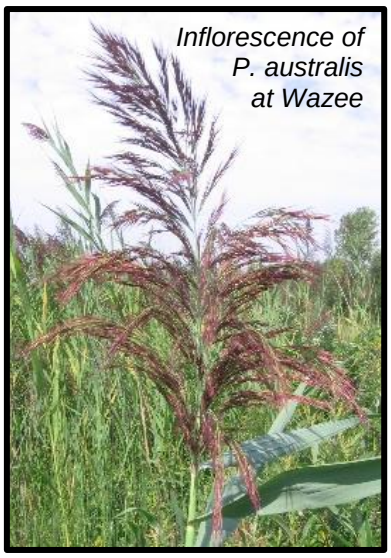
Flowers: Bushy, light brown to purple plumes are composed of spikelets that bloom July-September. Plumes are 7.5-15" long and often resemble feather dusters.

Fruits & seeds: Small and tan with many white hairs attached.

Roots: Stout oval rhizomes can reach to 6'deep and 10' horizontally.

Similar species: Native Phragmites (*Phragmites australis ssp. americanus*) has smooth, reddish-brown, flexible stems, often with shiny, round, black spots (a fungus). Its inflorescence is usually sparser than non-native Phragmites, as are most patches where it grows. Several species of Miscanthus grasses can be easily confused with Phragmites due to their showy, feathery plumes. However, they have smaller stems, a white mid-rib on the leaves, and white inflorescences.





Inflorescence of P. australis at Wazee

APPENDIX B – WDNR IMAZAPYR CHEMICAL FACT SHEET

Wisconsin Department of Natural Resources

January 2012

Imazapyr Chemical Fact Sheet

Formulations

Imazapyr was registered with the EPA for aquatic use in 2003. The active ingredient is isopropylamine salt of imazapyr, (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridinecarboxylic acid). Formulations that can be used on aquatic vegetation in Wisconsin include Habitat™, Ecomazapyr 2sl™, Imazapyr 2sl™, and Polaris AC. Imazapyr is used for control of emergent and floating-leaf vegetation. It is not recommended for control of submersed vegetation.

Aquatic Use and Considerations

Imazapyr is a systemic herbicide that moves throughout the plant tissue and prevents plants from producing a necessary enzyme, acetolactate synthase (ALS), which is not found in animals. Susceptible plants will stop growing soon after treatment and become reddish at the tips of the plant. Plant death and decomposition will occur gradually over several weeks to months. Imazapyr should be applied to plants that are actively growing. If applied to mature plants, a higher concentration of herbicide and a longer contact time will be required.

In Wisconsin, imazapyr is used to control the invasive plants common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*) and Japanese knotweed (*Polygonum cuspidatum*). Native species that are also controlled include cattails (*Typha* spp.), water lilies (*Nymphaea* sp.), pickerelweed (*Pontederia cordata*), duckweeds (*Lemna* spp.) and arrowhead (*Sagittaria* spp.).

It is important to note that repeated use of herbicides with the same mode of action can lead to herbicide-resistant plants, even in aquatic plants. More resistant weeds have developed to the ALS inhibitor herbicides than to other herbicide types, and so this mechanism of action may be more susceptible to developing resistance. In order to prevent herbicide resistance, avoid using the same type of herbicides year after year, and when possible, use non-herbicide methods of control instead.

Post-Treatment Water Use Restrictions

There are no restrictions on recreational use of treated water, including swimming and eating fish from treated water bodies. If application occurs within a ½ mile of a drinking water intake, then the intake must be shut off for 48 hours following treatment. There is a 120-day irrigation restriction for treated water, but irrigation can begin sooner if the concentration falls below one part per billion (ppb).

Herbicide Degradation, Persistence and Trace Contaminants

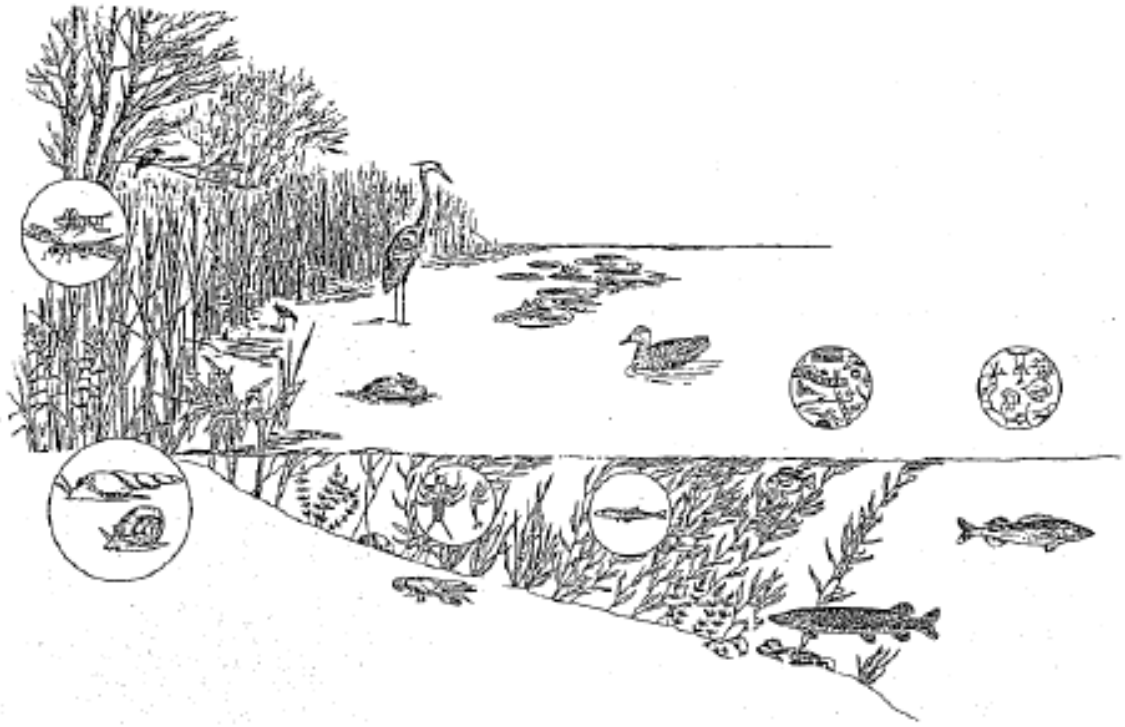
Imazapyr is broken down in the water by light and has a half-life (the time it takes for half of the active ingredient to degrade) ranging from three to five days.

Three degradation products are created as imazapyr breaks down. These are pyridine hydroxy-dicarboxylic acid, pyridine dicarboxylic acid (quinolinic acid), and nicotinic acid. These degradates persist in water for approximately the same amount of time as imazapyr (half-lives of three to eight days).

In soils imazapyr is broken down by microbes, and persists with a half-life of one to five months. It doesn't bind to sediments, so leaching through soil into groundwater is likely.

Impacts on Fish and Other Aquatic Organisms

Imazapyr is practically non-toxic (the EPA's lowest toxicity category) to fish, invertebrates, birds and mammals. Toxicity tests were not conducted on amphibians or reptiles. It does not bioaccumulate in animal tissues.



Human Health

Concentrated imazapyr has low acute toxicity on the skin or if ingested, but is harmful if inhaled and may cause irreversible damage if it gets in the eyes. Applicators should wear chemical-resistant gloves while handling, and persons not involved in application should avoid the treatment area during treatment.

Chronic toxicity tests for imazapyr indicate that it is not carcinogenic, mutagenic, or neurotoxic. It also does not cause reproductive or developmental toxicity, and is not a suspected endocrine disrupter.

Imazapyr degradates are no more toxic than imazapyr itself, and are excreted faster than imazapyr when ingested.

For Additional Information

Environmental Protection Agency
Office of Pesticide Programs
www.epa.gov/pesticides

Wisconsin Department of Agriculture, Trade, and Consumer Protection
http://datcp.wi.gov/Plants/Pesticides/

Wisconsin Department of Natural Resources
608-266-2621
http://dnr.wi.gov/lakes/plants/

Wisconsin Department of Health Services
http://www.dhs.wisconsin.gov/

National Pesticide Information Center
1-800-858-7378
http://npic.orst.edu/

Wisconsin Department of Natural Resources
Box 7921
Madison, WI 53707-7921

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APPENDIX C - WDNR GLYPHOSATE CHEMICAL FACT SHEET

Wisconsin Department of Natural Resources

January 2012

Glyphosate Chemical Fact Sheet

Formulations

Glyphosate is a commonly used herbicide that is used in both aquatic and terrestrial sites. The use of glyphosate-based herbicides that are not approved for aquatic use is very unsafe and is a violation of federal and state pesticide laws. Different formulations of glyphosate are available, including isopropylamine salt of glyphosate (Rodeo®, Shore-Klear®, Aquapro®) and potassium glyphosate (Refuge®).

Aquatic Use and Considerations

Glyphosate is a systemic herbicide that moves throughout the plant tissue and works by inhibiting an important enzyme needed for multiple plant processes, including growth.

Glyphosate is effective only on plants that grow above the water. It will not be effective on plants that are submerged or have most of their foliage under water, nor will it control regrowth from seed. Glyphosate can be used to control reed canarygrass (*Phalaris arundinacea*), cattails (*Typha* spp.), purple loosestrife (*Lythrum salicaria*), phragmites (*Phragmites australis*), water hyacinth (*Eichornia crassipes*) and water lettuce (*Pistia stratiotes*).

Glyphosate needs to be applied to plants that are actively growing. Effectiveness of glyphosate treatments may be reduced if applied when plants are growing poorly, such as due to drought stress, disease, or insect damage.

Experience with species such as purple loosestrife has shown that broadcast spray treatment can be ineffective if surrounding non-target plants are killed, since this clears an area for rapid regrowth from seeds. An alternative method of glyphosate application for small stands is effective but time-intensive: painting cut stems with glyphosate suing a wick type applicator. The herbicide will then travel from the cut stem down into the roots and kill the remaining portion of the plant. With some species, such as phragmites, it is important to remove the cut vegetation to avoid re-rooting from the cut material that is not treated with herbicide.

A surfactant approved for aquatic sites must be mixed with glyphosate before application. A surfactant helps the herbicide "stick" to the plant surfaces, and increases the rate of absorption. Not all surfactants are approved for use in aquatic environments and some may be toxic to aquatic organisms; the surfactant labels should be carefully read and followed.

Care must be used when applying glyphosate to prevent injury or death to desirable plants. To avoid drift, application is not recommended when winds exceed 5 mph. In addition, excessive speed or pressure during application may allow spray to drift and must be avoided.

Following treatment, plants will gradually wilt, appear yellow, and will die in approximately 2 to 7 days. It amy take up to 30 days for woody plants. Cooler or cloudy weather following treatment may delay the visible effects of treatment. Application should be avoided when heavy rain is predicted within 6 hours, because the herbicide may wash off the plants.

Post-Treatment Water Use Restrictions

Most aquatic forms of glyphosate have no restrictions on swimming or eating fish from treated water bodies. However, potable water intakes within ½ mile must be turned off for 48 hours after treatment. Due to different formulations and products containing glyphosate, every product label should be carefully reviewed by the user for varying post-treatment water use restrictions.

Herbicide Degradation, Persistence and Trace Contaminants

In water, the concentration of glyphosate is reduced through dispersal by water movement,

binding to the sediments, and break-down by microorganisms. Glyphosate's half-life (the time it takes for half of the active ingredient to degrade) is between 3 days and 19 weeks depending on water conditions. Glyphosate disperses rapidly in water so dilution occurs quickly, thus moving water will decrease concentration, but not half-life. The primary breakdown product of glyphosate is aminomethylphosphonic acid (AMPA), which is also degraded by microbes in water and soil. According to the EPA, available data do not suggest that this compound poses any hazard distinct from its parent compound, glyphosate.

Glyphosate contanes a nitrosamine (n-nitroso-glyphosate) as a contaminant at levels of 0.1 ppm or less. Tests to determine the potential health risks of nitrosamines are not required by the EPA unless the level exceeds 1.0 ppm.

Impacts on Fish and Other Aquatic Organisms

Laboratory testing by an herbicide manufacturer indicates that glyphosate is toxic to carp, bluegills, trout, and water fleas (*Daphnia* spp.) only at dosages well above the label application rates. Similarly, it is rated practically non-toxic to aquatic species tested. Studies by other researchers with glyphosate on important food chain organisms such as midge larvae, mayfly nymphs, and scuds have demonstrated a wide margin of safety between application rates and toxic dosages to rats and rabbits.

Human Health

Most concerns about glyphosate's adverse health effects revolve around applicator exposure or exposure via drift and the surfactant used in application. Some adverse effects from direct contact with the herbicide include temporary symptoms of dermatitis, eye ailments, headaches, dizziness, and nausea. Protective clothing (goggles, a face shield, chemical resistant gloves, aprons, and footwear) should be worn by applicators to reduce exposure to glyphosate. Confirmed and unconfirmed incidences involving the active ingredient glyphosate have been reported to the Health Effects Branch of the EPA. Recently it has been demonstrated that glysophate is toxic effect to human embryonic cells and linked to endocrine disruption.

For Additional Information

Environmental Protection Agency
Office of Pesticide Programs
www.epa.gov/pesticides

Wisconsin Department of Agriculture, Trade, and Consumer Protection
http://datcp.wi.gov/Plants/Pesticides/

Wisconsin Department of Natural Resources
608-266-2621
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