2018 Phragmites Monitoring Results

for

Wazee Lake Recreation Area

Jackson County, Wisconsin

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ON THE COVER

1. Phragmites stolon with new plant shoots growing.

2. Herbicide treatment area with dead Phragmites stems compacted and native plants growing.

3. Phragmites seed head.

4. Monitoring transect.

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. Control efforts began in 2014 with herbicide treatment of an 11-acre unit around the Tailings Pond and prescribed burn of the entire Tailings Basin in spring 2015. Aerial Imazapyr (herbicide) application was done in late August 2015 over an additional 35 acres followed by small-scale hand-spraying in 2016 and 2017 in parts of the same 35 acres. Biomass of dead Phragmites stems was flattened with a UTV in spring 2018 in some treatment units.

Following previous years' monitoring methods, 12 transects were assessed and 5 photo points visited following modified methods from Moore (2015). Along those 12 transects were a total of 195 quadrats where dominance class was recorded.

Forty-eight percent (93) of the quadrats were dominated by dead Phragmites stems from previous years. There were 41 quadrats dominated by living Phragmites, 18 of which were in an area that has not yet been treated. The remaining 61 quadrats were dominated by water, other undesirable non-native species, or desirable native species. The 11-acre treatment unit that was sprayed in 2014 around the Tailings Pond had solid regrowth of Phragmites as did the adjacent treatment unit to the southeast that encompasses Transect 12. These results suggest Phragmites control to be around 70% since treatment began. Aerial herbicide treatment is recommended for the Tailings Pond area, transect 2 area, transect 4 area, and the majority of transects 8&9 area. Other treatment is recommended for (in order of priority) the area between the access road and transects 1,3, and 5, transect 10 area, and transect 7 area. Treatment units for transect 6 and 11 should be monitored because young Phragmites is present and will continue to grow and spread.

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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 2014-2018 but do not necessarily 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).
2. Remove biomass on treated sites.
3. Conduct monitoring to determine effectiveness of 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 on 11 acres surrounding the Tailings Pond (blue polygon in Figure 1). The following spring 2015, the entire tailings basin was burned, including the 11 acres that were treated with Imazapyr in 2014.

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).

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

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 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).

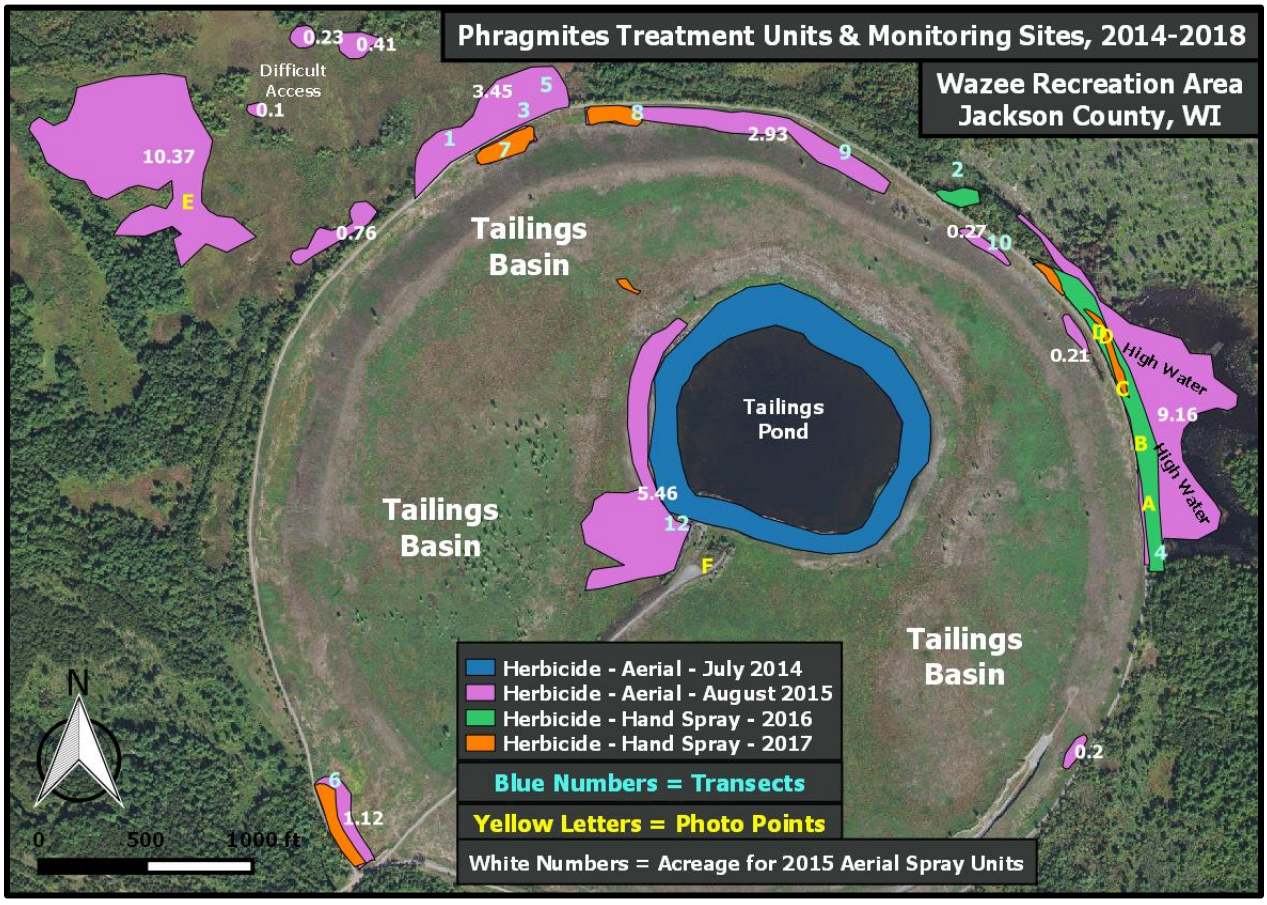
2017

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).

2018

The same 12 transects and 5 photos points were visited August 9th and 24th, 2018 to continue post-treatment monitoring. A utility vehicle (UTV) was used to flatten dead Phragmites stems in some areas to allow native vegetation to grow. No hand spraying was completed in 2018 because aerial spray was the preferred and anticipated form of treatment. Unfortunately, the aerial spray technician did not make it to Wazee in 2018 and was not reachable by Jackson County staff.

Figure 1 – Tailings Basin Phragmites Monitoring Sites & Control Efforts



METHODS

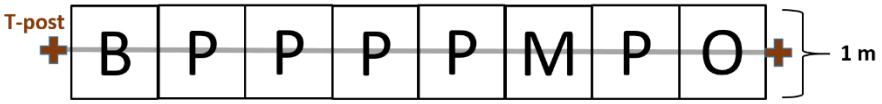
Transects were installed at 12 locations in 2015 using 2 metal T-posts per transect to define each end (Table 1). Transect length was largely dictated by site characteristics such as water depth and density of Phragmites with a resulting average length of 16 meters. Latitude and longitude coordinates 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).

Pre-treatment monitoring was completed August 10-17, 2015 with post-treatment monitoring on August 12th 2016, August 13th 2017, and August 9th/24th 2018. 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. 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 each year facing toward the 9.16-acre treatment unit (east). Point E photos were taken in 2015 and 2017. Photos at point F were taken each year facing northeast. All photos were taken in mid-August 2015 through 2018. Survey data were uploaded to an open source geographic information systems (GIS) program known as QGIS (QGIS, 2018). Maps were created to illustrate transect and photo point locations, treatment units, and dominance class within quadrats.

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*

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 195 quadrats surveyed in 2018. 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 12 near the tailings basin (increase of 23 Phragmites-dominated quadrats since 2017) (Table 2, Figure 3). Transects 1, 3, 5, 7, 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 other undesirable species, mainly narrow-leaved cattail (*Typha angustifolia)*. Unfortunately, quadrats along transect 12 near the Tailings Pond were dominated by Phragmites, which is significant change from previous years. Photos of all transects from 2015 through 2018 are included for visual comparisons in Figure 6 through Figure 9. Photos for transects 2 and 4 are not included because they have not been treated and continue to be dominated by Phragmites. With the exception of transect 12, all photos reveal a continued decline in living Phragmites after herbicide treatment in 2015 and selected hand spraying in 2016 and 2017.

Photo Points

Photos of points A-D and F are found in Figure 10 and Figure 11 for pre- and post-treatment comparison. After aerial herbicide treatment in 2015 and hand spraying in 2016-17, photos points A-D have significant reductions in Phragmites. Photo Point F of the tailings pond reveals Phragmites to have taken over the area that was treated with herbicide in 2014 and 2015.

Figure 3 – Graph of Quadrats for Each Dominance Class 2015-2018

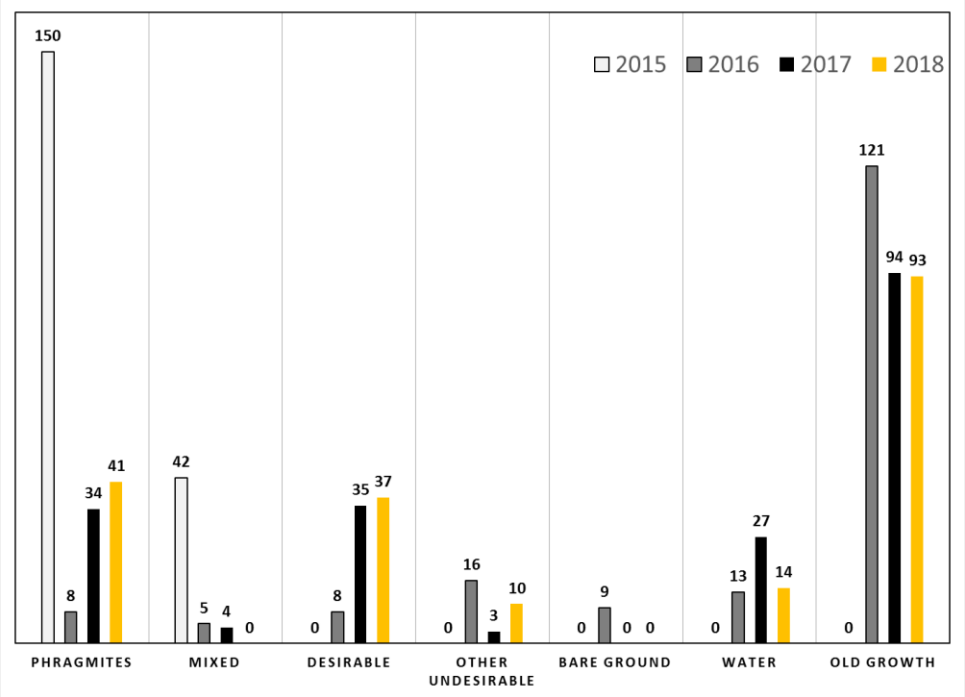
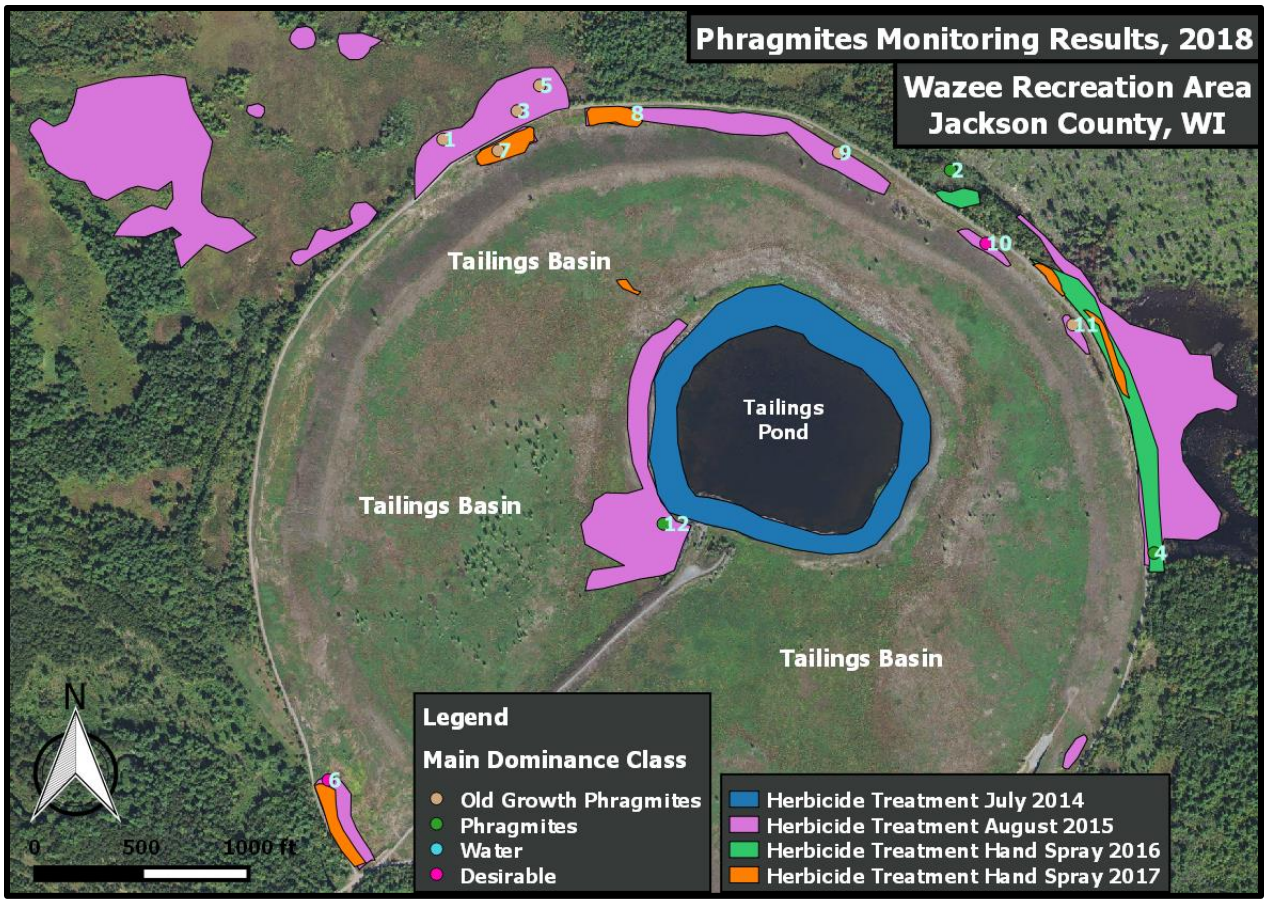


Table 2 – Table of Quadrats for Each Dominance Class 2015-2018

Dominance Class→		Phragmites Quadrats				Mixed Quadrats			Desirable Quadrats			Undesirable Quadrats			Bare	Water Quadrats			Old Growth Quadrats		
Year→		2015	2016	2017	2018	2015	2016	2017	2016	2017	2018	2016	2017	2018	2016	2016	2017	2018	2016	2017	2018
Transect Number	1	15	0	0	0	0	0	0	0	1	2	0	0	3	0	0	1	5	15	14	5
	2	6	6	6	6	0	0	0	0	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	0	0	0	0	12	12	12
	4	12	NS	11	12	0	NS	0	NS	0	0	NS	0	0	NS	NS	1	0	NS	0	0
	5	34	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	34	32	32
	6	0	0	0	0	10	0	0	4	16	18	1	3	0	5	0	0	0	0	0	0
	7	16	2	15	0	0	1	0	0	0	0	0	0	0	0	12	0	0	0	0	15
	8	13	0	2	0	3	0	4	3	4	2	0	0	7	0	1	2	3	12	2	2
	9	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	21	21	14
	10	7	0	0	0	6	0	0	0	12	12	0	0	0	0	0	0	0	13	0	0
	11	14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	14	13	13
	12	0	0	0	23	23	4	0	1	0	0	15	0	0	4	0	22	0	0	0	0
TOTAL QUADRATS		150	8	34	41	42	5	4	8	35	37	16	3	10	9	13	27	14	121	94	93
% Quadrats by year		78%	4%	17%	21%	22%	3%	2%	4%	18%	19%	9%	2%	5%	5%	7%	14%	7%	67%	48%	48%

Figure 4 – Main Dominance Classes of Transects, 2018



Summary Results of the 2014 Herbicide Treatment Around Tailings Pond

- 2015 - Estimated 90% reduction of Phragmites surrounding Tailings Pond after 2014 herbicide treatment (blue polygon in 1). Herbicide treatment of purple polygons (Figure 1) completed late August 2015.
- 2016 - Young Phragmites found growing in large enough units to plan for aerial herbicide spraying again in 2017.
- 2017 - High water conditions and Phragmites continued to grow and spread. Aerial spray contractor was contacted but not available.
- 2018 – Shoreline of Tailings Pond is dominated by Phragmites and it continues to spread out and away from the pond. Aerial spray contractor was scheduled but did not follow through.

Lake Wazee Sherwood Forest

Hand spraying in 2016 and 2017 along Lake Wazee at the Sherwood Forest Access resulted in effective control in 2018 (Figure 5). Continued monitoring of this area is recommended with small follow-up treatments as needed.

Figure 5 – Sherwood Forest Photos

Figure 6 – Photos of Transects 1, 3, & 5

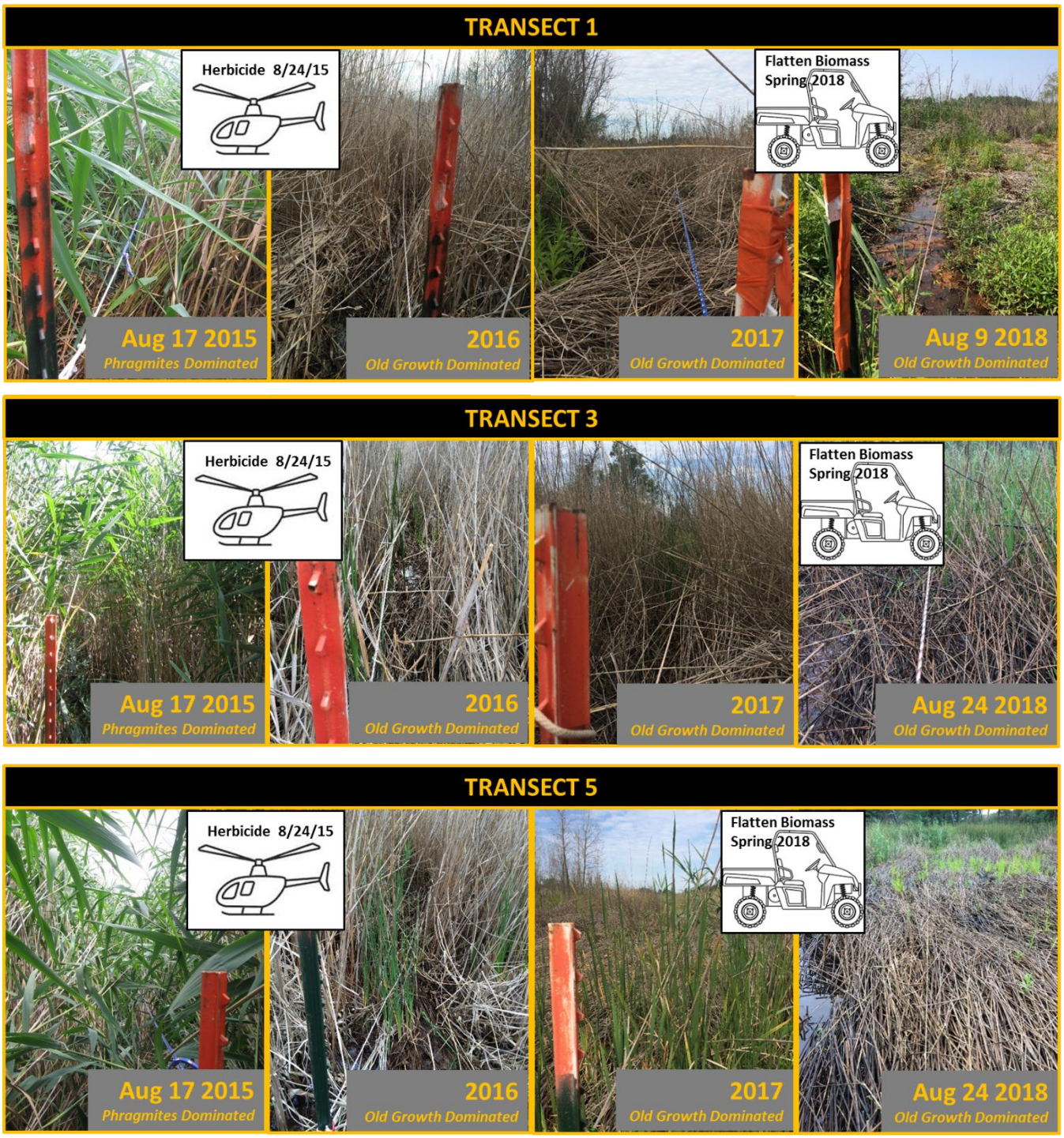


Figure 7 – Photos of Transects 6, 7, & 8

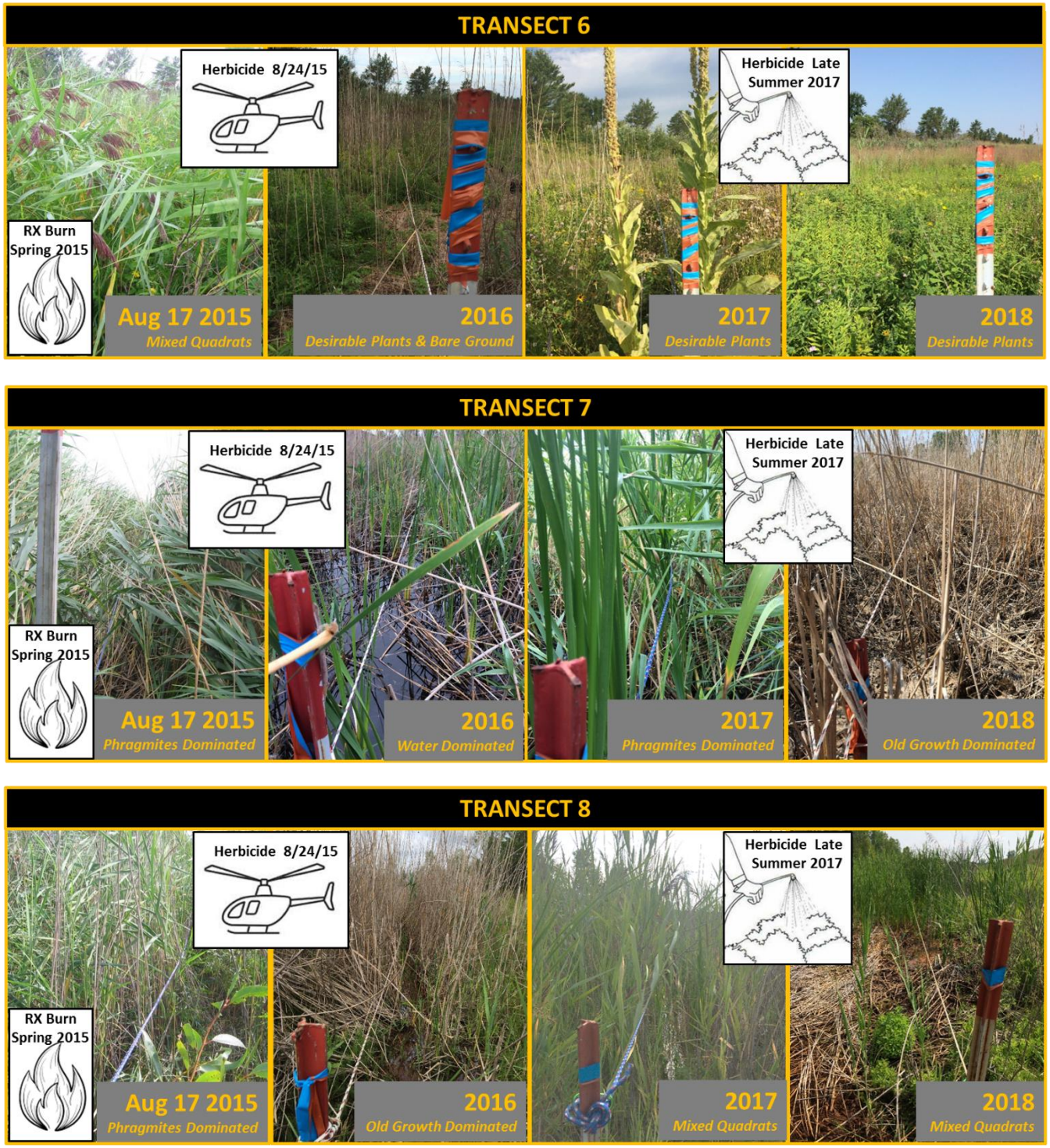


Figure 8 – Photos of Transects 9, 10, & 11

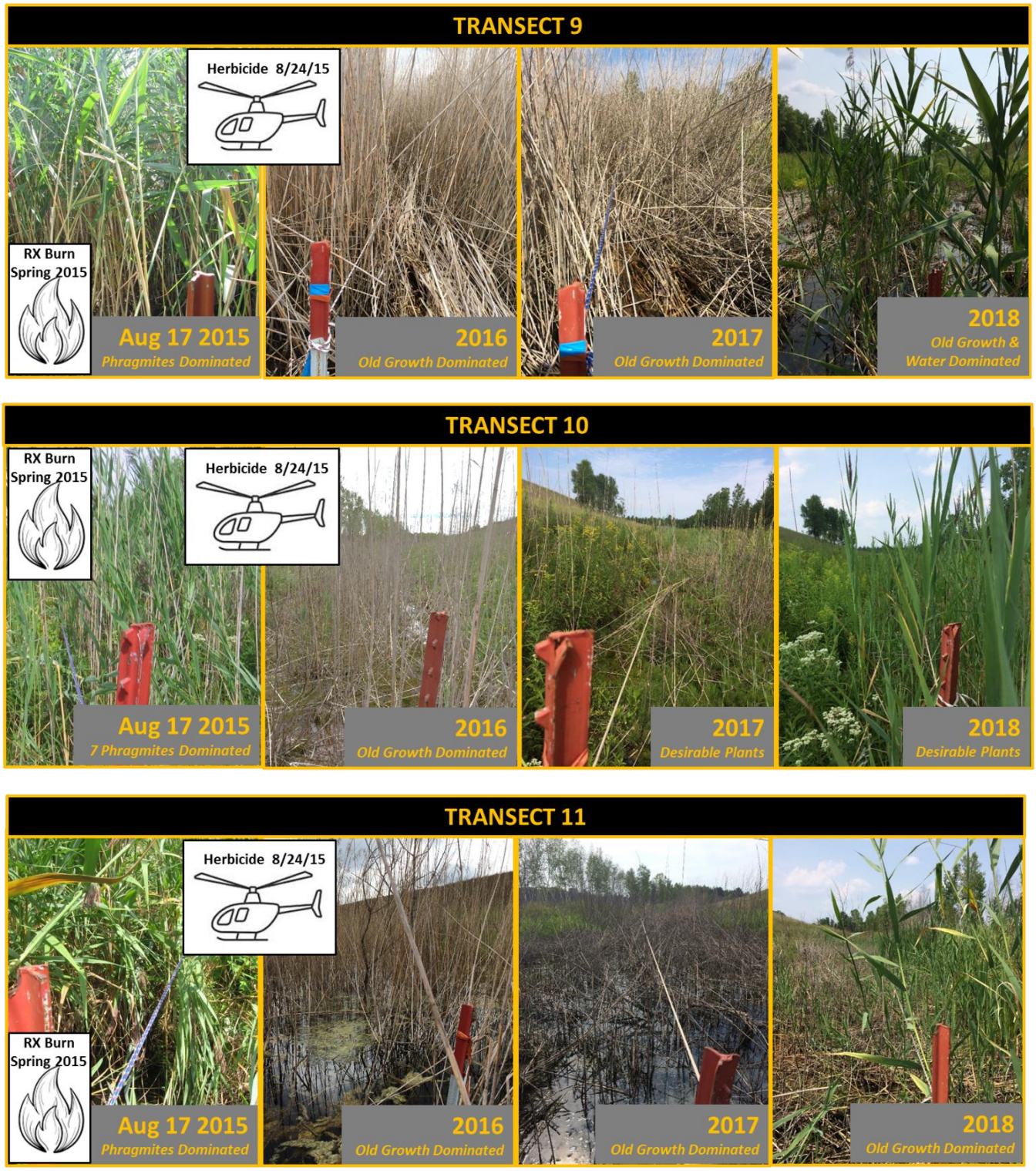


Figure 9 – Photos of Transect 12

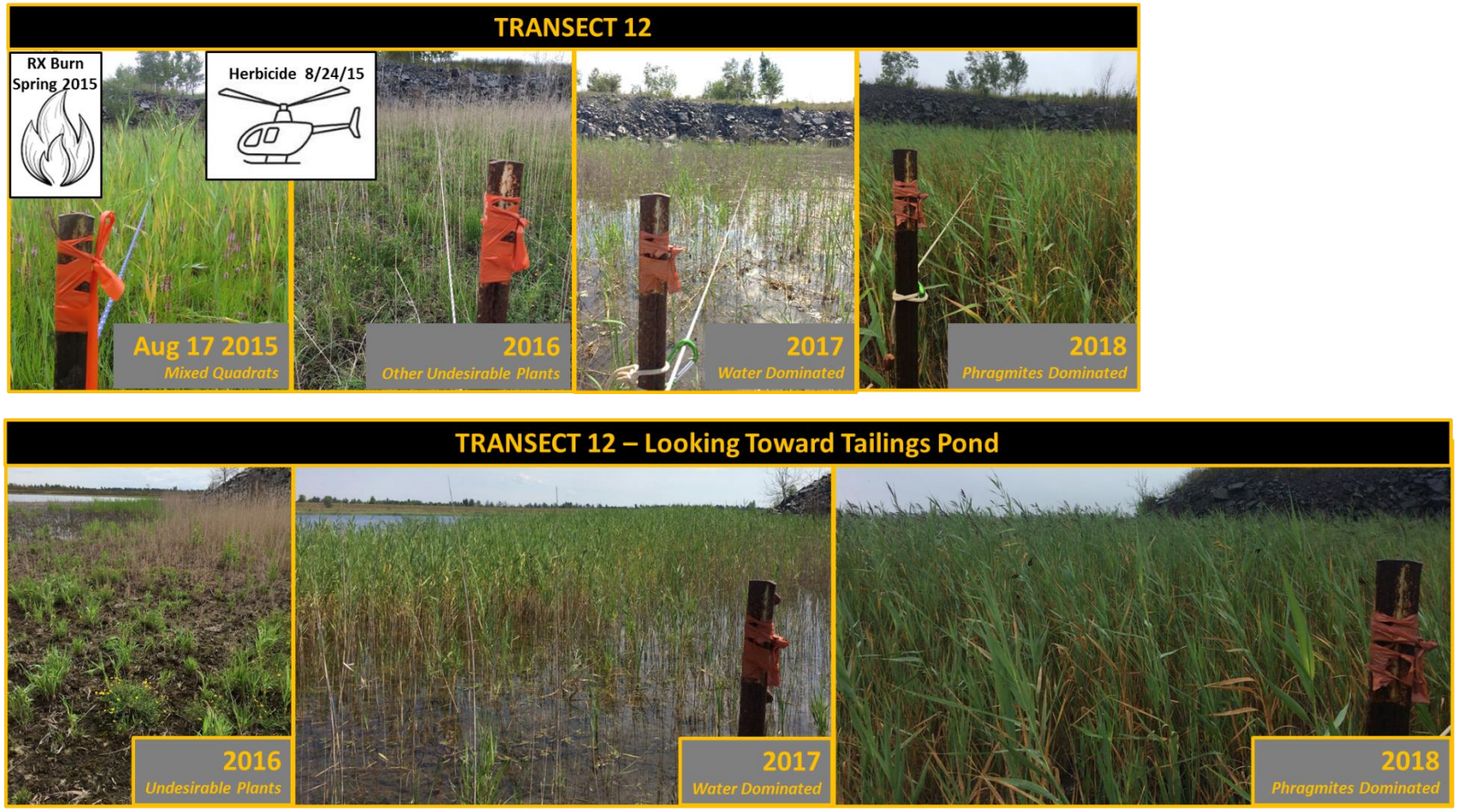
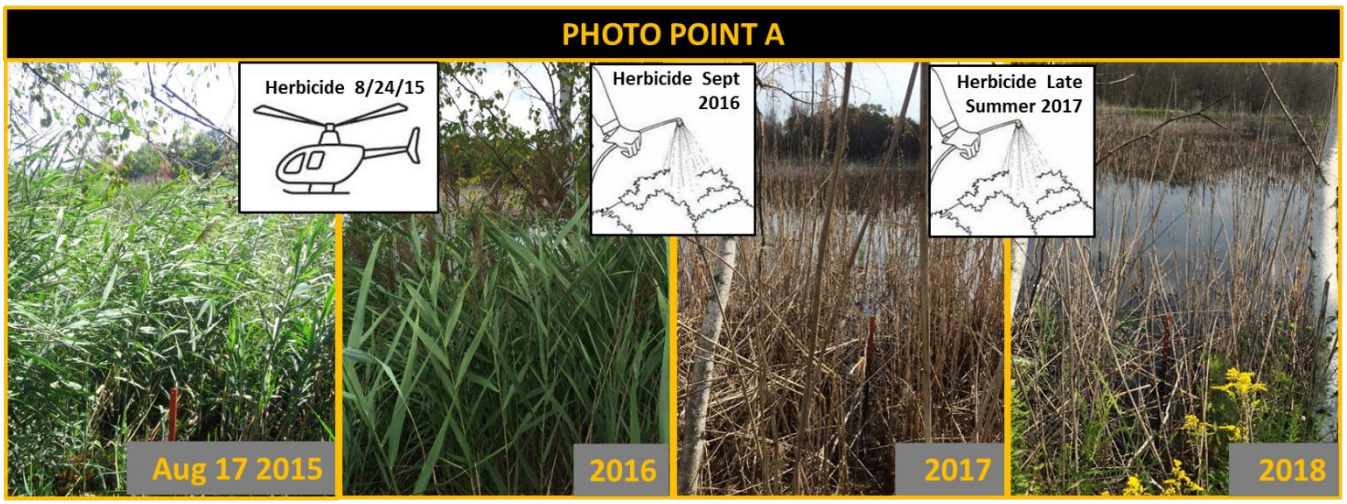
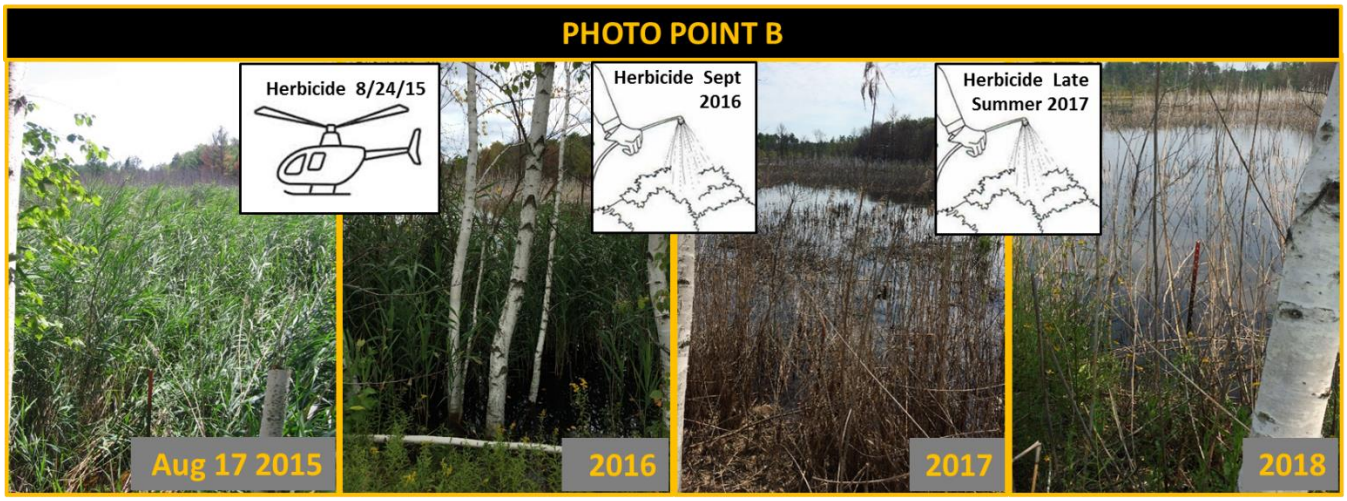


Figure 10 – Photos Points A, B, and C





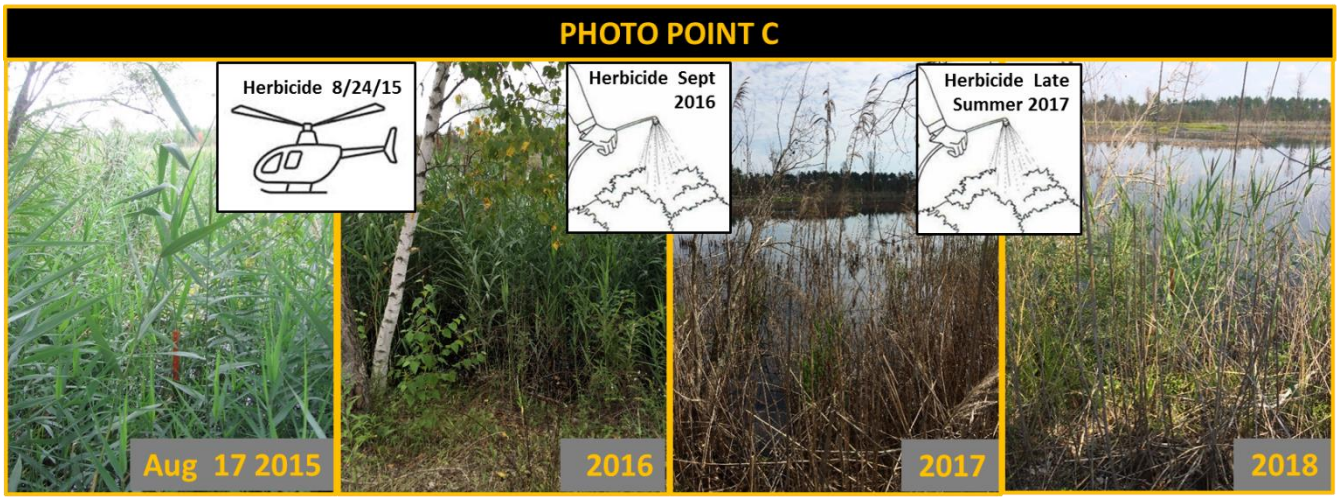
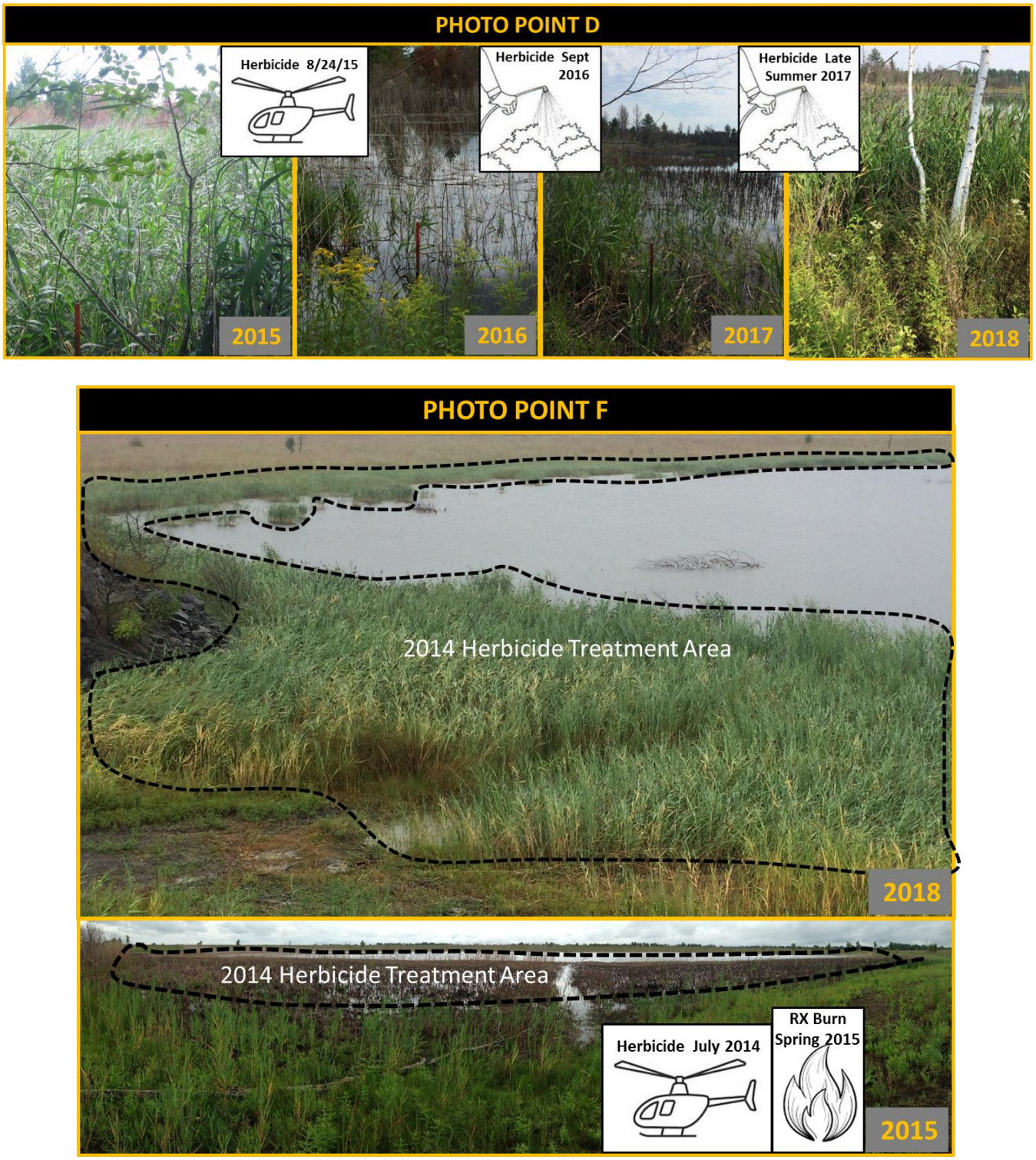


Figure 11 – Photo Points D & F



DISCUSSION

Estimated Phragmites Reduction

There were 41 quadrats dominated by Phragmites in 2018 out of a total of 195 (Figure 3). If transects 2 and 4 are removed from the data set since those areas have not yet been treated, 177 quadrats remain. A quadrat-based calculation to estimate Phragmites control suggests up to 77% reduction since 2015 (1-(41/177)).

The 11-acre unit surrounding the Tailings Pond (blue polygon), continues to yield strong Phragmites growth that continues to expand into the 5.5-acre unit (purple polygon). If we estimate 15 acres of Phragmites regrowth overall, an acreage-based calculation suggests up to 67% Phragmites reduction since 2015.

Restoration after Phragmites Management

Steps for restoration were listed in the 2017 Phragmites report (Hatleli, 2017). Those same steps continue to be relevant for Wazee. Flattening the dead Phragmites biomass appears to better allow native plant species to grow, as is evident in 2018 photos from transects 1 and 5 (Figure 6). Extra care should be taken to avoid live, growing Phragmites when flattening dead stems because any live stem that is knocked over will simply sprout new Phragmites at each node, as illustrated in Figure 13.

Figure 12 – Management Recommendations for 2018

Transects 1, 3, & 5 – Native plant growth is occurring within the treatment unit. Area between the access road and transects has increased Phragmites that is recommended for treatment in 2019.

Transects 2 & 4 – Delineate treatment area for 2019 control efforts.

Transect 6 – Monitor. Native species growth is occurring naturally but Phragmites continues to grow along the perimeter of the unit and scattered within. Plants in 2018 included wooly mullein (not native, but generally beneficial), black-eyed Susan, goldenrod, crown vetch (invasive, but not behaving invasively), Canadian thistle (invasive), ferns, Joe-Pye weed, bee balm, asters, flea bane, big blue stem, horsetail, sedges, and birds foot trefoil (invasive).

Transect 7 – Remove, burn, or flatten dead Phragmites biomass in spring 2019 to promote native plant growth. Phragmites growing scattered and low density along southern border. Low priority for treatment in 2019.

Transects 8 & 9 – Phragmites growth was occurring east of the 2017 hand-spray area. The area between transect 8 and 9 had significant regrowth of Phragmites and should be treated in 2019. Area southeast of transect 9 had scattered and low density Phragmites and is lower priority for treatment in 2019. If aerial spraying is planned, the entire unit should be considered for treatment but should exclude the area hand sprayed in 2017. Narrow-leaved cattail common along transect 8.

Transect 10 – Native species growth is occurring naturally along the transect (horsetail, moss, boneset, goldenrod, birds foot trefoil (invasive), rushes, and ferns). However, the overall treatment unit encompassed Phragmites that was just sprouting in 2017 but was >6 feet in 2018. Treatment could be done in 2019 but is lower priority.

Transect 11 – Young Phragmites growing scattered and moderate density throughout the unit. Low priority for treatment in 2019.

Transect 12 & Photo Point F – Aerial treatment around the Tailing Pond is recommended for 2019.

Photo Points A, B, C, D, and Sherwood Forest – Monitor in 2019, no spraying needed.

Perimeter Walks – Phragmites continues to spread along perimeters of treatment units. Monitor these areas and look for lateral spread of Phragmites.

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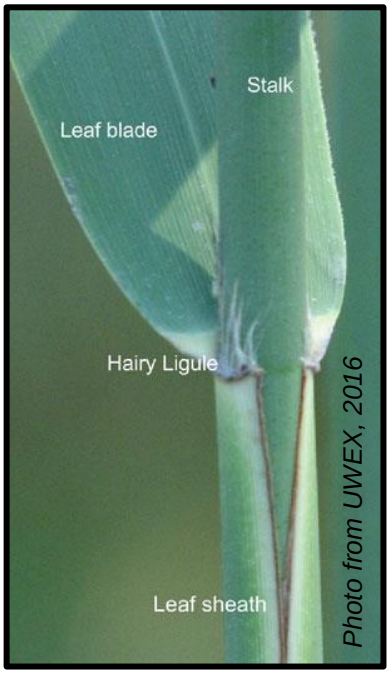
UWEX. 2016. University of Wisconsin-Extension. Wisconsin Horticulture, Bringing University Research to your Garden. https://hort.uwex.edu/articles/invhttp://dnr.wi.gov/topic/invasives/fact/Phragmites.htmlasive-Phragmites/. Accessed 11 January, 2016.

WDNR. 2016. Wisconsin Department of Natural Resources. Non-native Phragmites or Common reed (*Phragmites australis)*. http://dnr.wi.gov/topic/invasives/fact/Phragmites.html. Accessed 11 January, 2016.

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 walk 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.

Figure 13 - Stolon

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.

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*[2]. 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. A 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[2].

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