INTRODUCTION

Eurasian water milfoil (*Myriophyllum spicatum*; EWM) was first documented in Long Lake in 2000. Since 2008, the Long Lake of Phelps Lake District (LLPLD) has been actively managing and reducing the EWM population through strategically targeted herbicide spot treatments and hand-removal. With assistance from Onterra, the LLPLD was successfully awarded a Wisconsin Department of Natural Resources (WDNR) Aquatic Invasive Species (AIS) Established Population Control Grant in February 2013 to aid in funding the management of EWM within Long Lake from 2013-2017.

During the 2013 Late-Summer EWM Peak-Biomass Survey, Onterra ecologists located approximately 1.6 acres of colonized EWM within the lake. In order to build of the success of previous years' treatments, it was decided that an aggressive approach to EWM management would be initiated from 2013-2017. This strategy includes a treatment threshold (trigger) to initiate treatment in areas containing colonized EWM and adjacent areas of EWM mapped with point-based techniques, with areas containing *Small Plant Colonies* being targeted for treatment if possible. Using this rationale, approximately 26.6 acres of EWM were initially proposed to be treated in the spring of 2014 on Long Lake (Map 1).

In addition to the 26.6 acres of EWM to be treated with herbicide, approximately 0.72 acres were proposed to be targeted with professional hand-removal (Map 1). These proposed hand-harvesting areas contained very small, isolated colonies of *Dominant* and *Highly Dominant* EWM where herbicide applications likely would have been ineffective due to rapid dilution. The LLPLD utilized professional hand-harvesting in 2013, and the LLPLD and Onterra have been developing a more effective method of applying these control efforts.

2014 PROPOSED TREATMENT STRATEGY

Herbicides that target submersed plant species are directly applied to the water, either as a liquid or an encapsulated granular formulation. Factors such as water depth, water flow, treatment area size, and plant density work to dilute herbicide concentration within aquatic systems. Understanding concentration-exposure times are important considerations for implementing successful control strategies utilizing aquatic herbicides. Successful control of the target plant is achieved when it is exposed to a lethal concentration of the herbicide for a specific duration of time. Much information has been gathered in recent years, largely as a result of a joint research project between the WDNR, U.S. Army Engineer Research and Development Center (USAERDC), and private consultants. Based on their preliminary findings, lake managers have adopted two main treatment strategies; 1) whole-lake treatments, and 2) spot treatments.

Whole-lake treatments are those where the herbicide is applied to specific sites, but the goal of the strategy is for the herbicide to reach a target concentration when it equally distributes throughout the entire volume of the lake (or lake basin, or within the epilimnion of the lake or lake basin). The application rate of whole-lake treatments is dictated by the volume of water in which the herbicide will reach equilibrium with. Because exposure time is so much greater, effective herbicide concentrations for whole-lake treatments are significantly less than required for spot treatments. Whole-lake treatments are typically conducted when the target plant is spread throughout much of the lake or basin. Whole-lake herbicide treatment strategies have not been used on Long Lake.

Spot treatments, the strategy utilized on Long Lake, are a type of control strategy where the herbicide is applied to a specific area (treatment site) such that when it dilutes from that area, its concentrations are insufficient to cause significant effects outside of that area. Herbicide application rates for spot treatment are formulated volumetrically, typically targeting EWM with 2,4-D at 3-4.0 ppm acid equivalent (ae). This means that sufficient 2,4-D is applied within the *Application Area* such that if it mixed evenly with the *Treatment Volume*, it would equal 3-4.0 ppm ae. This standard method for determining spot treatment use rates is not without flaw, as no physical barrier keeps the herbicide within the *Treatment Volume* and herbicide dissipates horizontally out of the area before reaching equilibrium (Figure 1). While lake managers may propose that a particular volumetric dose be used, such as 3-4.0 ppm ae, it is understood that actually achieving 3-4.0 ppm ae within the water column is not likely due to dissipation and other factors.

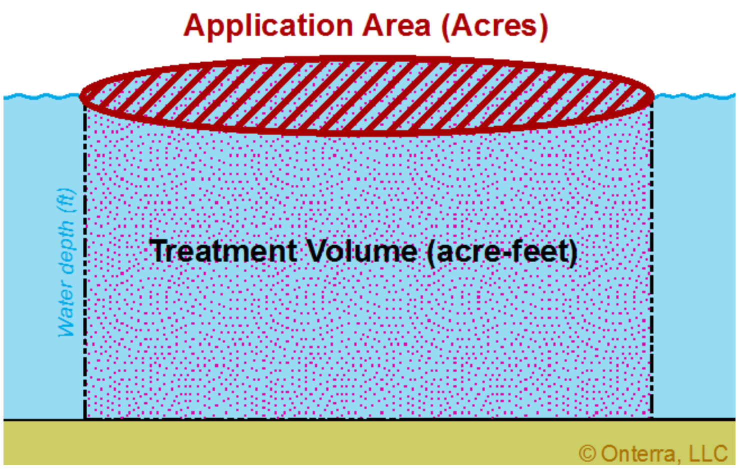


Figure 1. Herbicide Spot Treatment diagram.

Ongoing research clearly indicates that the herbicide concentrations and exposure times of large (> 5 acres each) treatment sites are higher and longer than for small sites. Research also indicates that higher herbicide concentrations and exposure times are observed in protected parts of a lake compared with open and exposed parts of the lake.

PRETREATMENT CONFIRMATION & REFINEMENT SURVEY

On June 3, 2014, Onterra ecologists conducted the EWM Spring Pretreatment Confirmation and Refinement Survey of Long Lake. During this survey, all the proposed treatment sites were visited along with areas treated in 2013 that were not proposed for retreatment. Sufficient EWM warranting treatment was confirmed in all of the originally proposed treatment areas. However, proposed treatment site E-13 was expanded slightly to encompass EWM observed outside of the proposed application area. From this survey, the final treatment acreage was increased slightly from the proposed 26.6 acres to 27.9 acres (Map 1).

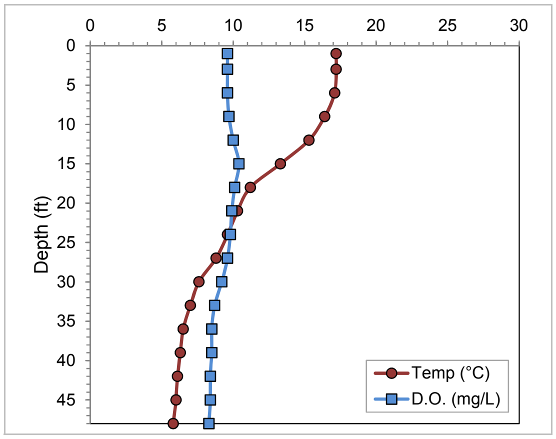


Figure 2. Pre-treatment temperature and dissolved oxygen profile collected on Long Lake. Data collected on June 3, 2014.

Similar to the treatments conducted in 2010-2013, the 2014 treatment strategy was proposed to be completed using a liquid formulation of 2,4-D (DMA IV ®). The LLPLD contracted with Clean Lakes, Inc. to conduct the herbicide treatment using their LittLine® NextGen Technology – an application system that reportedly minimizes herbicide diffusion by delivering the herbicide closer to the target plant's root system where plant biomass is greatest.

A temperature/dissolved oxygen profile indicated that the lake was beginning to stratify with near-surface temperatures in the low 60s°F and near-bottom temperatures in the low 40s°F (Figure 2). Dissolved oxygen was above 8.0 mg/L throughout the entire water column (Figure 2). Eurasian water milfoil pulled up on the rake during this early-June survey revealed that it was actively growing, and Onterra recommended that the treatment occur as soon as logistically possible. The treatment was conducted by Clean Lake's, Inc. on June 9, 2014. The applicator reported south winds of less than 1 mph at the time of application.

Wind speed and direction data were also obtained from a weather station in nearby Phelps, WI, approximately 2.5 miles from Long Lake (Figure 3). These data indicate that winds were predominantly southerly and ranged in speed from 1-2 mph during herbicide application. Over the next 14 hours following application, wind direction varied but remained relatively calm with speeds recorded at 1-3 mph. These data indicate that there was likely very little wind-driven water movement in Long Lake during and immediately after application that would have increased herbicide dissipation rates.

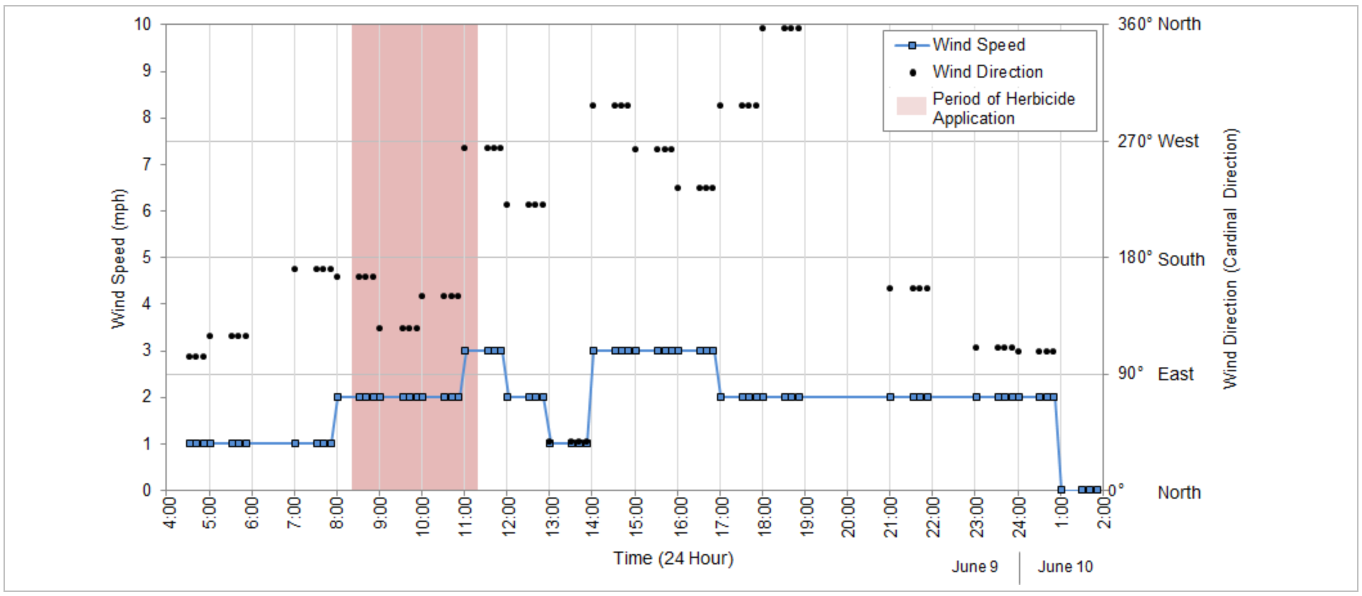


Figure 3. Wind speed and direction approximately 4 hours before and 14 hours after herbicide was applied to the Long Lake 2014 treatment areas on June 9, 2014. Graph created using data from Weather Underground Station

HAND-HARVESTING CONTROL METHODS

In 2014, the LLPLD contracted with Many Waters, LLC to conduct EWM hand-removal within the four selected areas using the Diver Assisted Suction Harvesting (DASH) program. The 2014 hand removal report from Many Waters, LLC can be found in Appendix A. Requiring a mechanical harvesting permit from the WDNR, the DASH program involves a SCUBA diver feeding EWM plants through a suction hose that delivers and filters the plants to a boat on the surface. The use of the DASH system allows divers to tackle larger, denser areas of EWM than they would be able to using just divers alone. Many Waters, LLC removed EWM from the four pre-determined locations over a period of five days in June, July, and August 2014. Table 1 displays the amount of EWM in pounds that was removed from each location. In total, 1,069 pounds of EWM were removed from these four areas.

Table 1. Amount of EWM removed from four hand-harvesting locations in Long Lake in 2014. Adapted from Many Waters, LLC 2014 (Appendix A).

Site	Total EWM (lbs)
W-14	404.0
X-14	529.5
Y-14	71.0
Z-14	65.0
Total	**1,069.5**

MONITORING METHODOLOGIES

The objective of an herbicide treatment strategy is to maximize target species (EWM) mortality while minimizing impacts to valuable native aquatic plant species. Monitoring herbicide treatments and defining their success incorporates both quantitative and qualitative methods. As the name suggests, quantitative monitoring involves comparing number data (or quantities) such as plant frequency of occurrence before and after the control strategy is implemented. Qualitative monitoring is completed by comparing visual data such as AIS colony density ratings before and after the treatments.

Quantitative Aquatic Plant Monitoring

Because the spot treatment strategy was utilized again on Long Lake in 2014, quantitative evaluation methodologies follow WDNR protocols in which point-intercept data are collected within treatment areas both the summer before and the summer immediately following the spring treatment. In Long Lake, quantitative evaluation was made through the collection of data at 43 (pre-treatment) and 58 (post-treatment) point-intercept sub-sample locations all located within the areas where herbicide was directly applied in (Figure 4). At each of these locations, EWM and native aquatic plant species presence and rake fullness were documented.

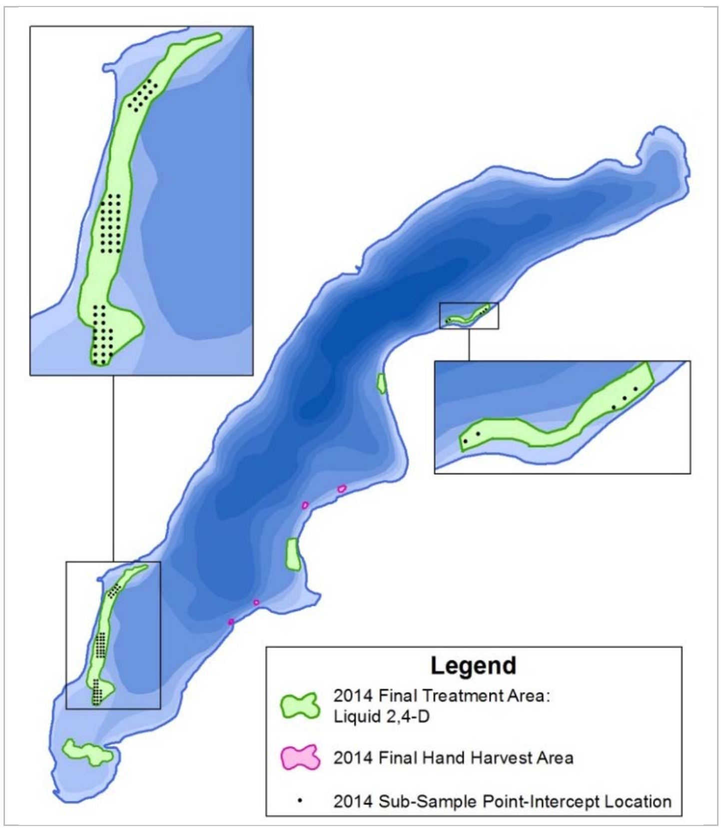


Figure 4. 2014 Quantitative treatment monitoring plan for Long Lake, Vilas County.

Comparing data collected before and after the treatment allows for a statistical comparison of aquatic plant occurrences and a quantitative determination of treatment efficacy within the herbicide application areas. Based upon a pre-determined success criterion, the 2014 herbicide treatment strategy would be deemed effective if the point-intercept data show that the EWM frequency of occurrence within the 2014 treatment sites decreased by at least a statistically valid 50% (α = 0.05). It is important to note that changes in aquatic plant frequencies following the herbicide treatment cannot be extrapolated to the lake-wide level, and can only be considered within the areas where herbicide was directly applied and the monitoring occurred.

Qualitative EWM Monitoring

Using sub-meter GPS technology, EWM locations were mapped the year prior to treatment (2013) in late-summer when EWM is at or near its peak growth, and in the late summer immediately following the treatment (2014). The EWM population was mapped by using either 1) point-based or 2) area-based methodologies. Large colonies >40 feet in diameter are mapped using polygons (areas) and were qualitatively attributed a density rating based upon a five-tiered scale from *Highly Scattered* to *Surface Matting*. Point-based techniques were applied to EWM locations that were considered as *Small Plant Colonies* (<40 feet in diameter), *Clumps of Plants*, or *Single or Few Plants* (Map 1 and 2).

Qualitative monitoring of herbicide treatments includes comparing spatial data reflecting EWM locations and densities during the peak-growth stages the summer before the treatment the summer immediately following the treatment. Based upon a pre-determined success criterion, an effective treatment would include a 75% reduction of EWM as demonstrated by a decrease in density rating (e.g. *Highly Dominant* to *Dominant*).

POST TREATMENT MONITORING RESULTS

Aquatic Plant Monitoring Results

Post-treatment surveys were completed by Onterra ecologists on September 10 and 11, 2014. Map 2 displays the results of the EWM Peak-Biomass Survey. As illustrated, EWM density and occurrence were reduced within all of the 2014 treatment areas and hand-removal areas. No EWM could be located within the largest treatment area, E-14. One hundred percent of the 1.6 acres of colonized EWM mapped in 2013 were reduced by at least one density rating following the 2014 treatment and hand-removal, exceeding the qualitative success criterion (75% of colonial acreage reduced). Not only were these colonized areas of EWM reduced in density, but they were also reduced in size: EWM colonial acreage was reduced from 1.6 acres in 2013 to 0.6 acres in 2014, representing a 99% decrease in EWM colonial acreage since 2009 (Figure 5).

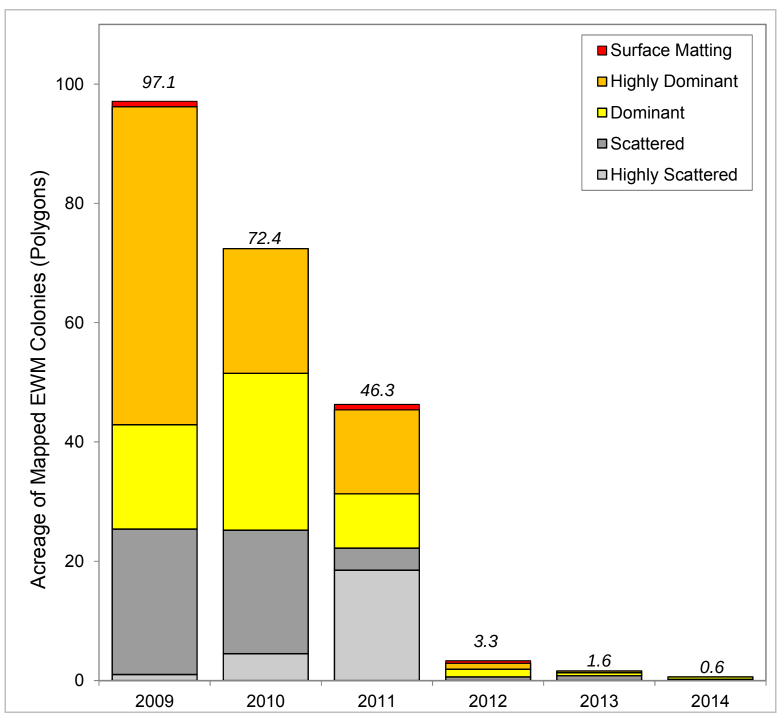


Figure 5. Acreage of mapped EWM colonies on Long Lake from 2009-2014.

During the late-summer of 2014, LLPA volunteers also collected GPS data reflecting EWM locations along their shorelines. For the most part, these data aligned with Onterra's results. During the 2015 Spring Pretreatment Confirmation and Refinement Survey, Onterra will visit all locations marked by the Shoreline Volunteers and assess if additions to the 2015 control strategy (i.e. hand-harvesting and/or herbicide application) are warranted. Onterra will enhance coordination of the shoreline volunteers in 2015 to ensure the volunteer data are provided to Onterra prior to the Late-Summer EWM Survey. This will allow Onterra to visit and confirm all locations marked by the volunteers at that time. A narrative of the 2014 volunteer-based efforts are included in Appendix B.

Figure 6 examines the level of control achieved within the professional hand-harvesting areas. These data suggest that the hand-harvesting efforts were effective at reducing a large amount of the EWM biomass within these sites.

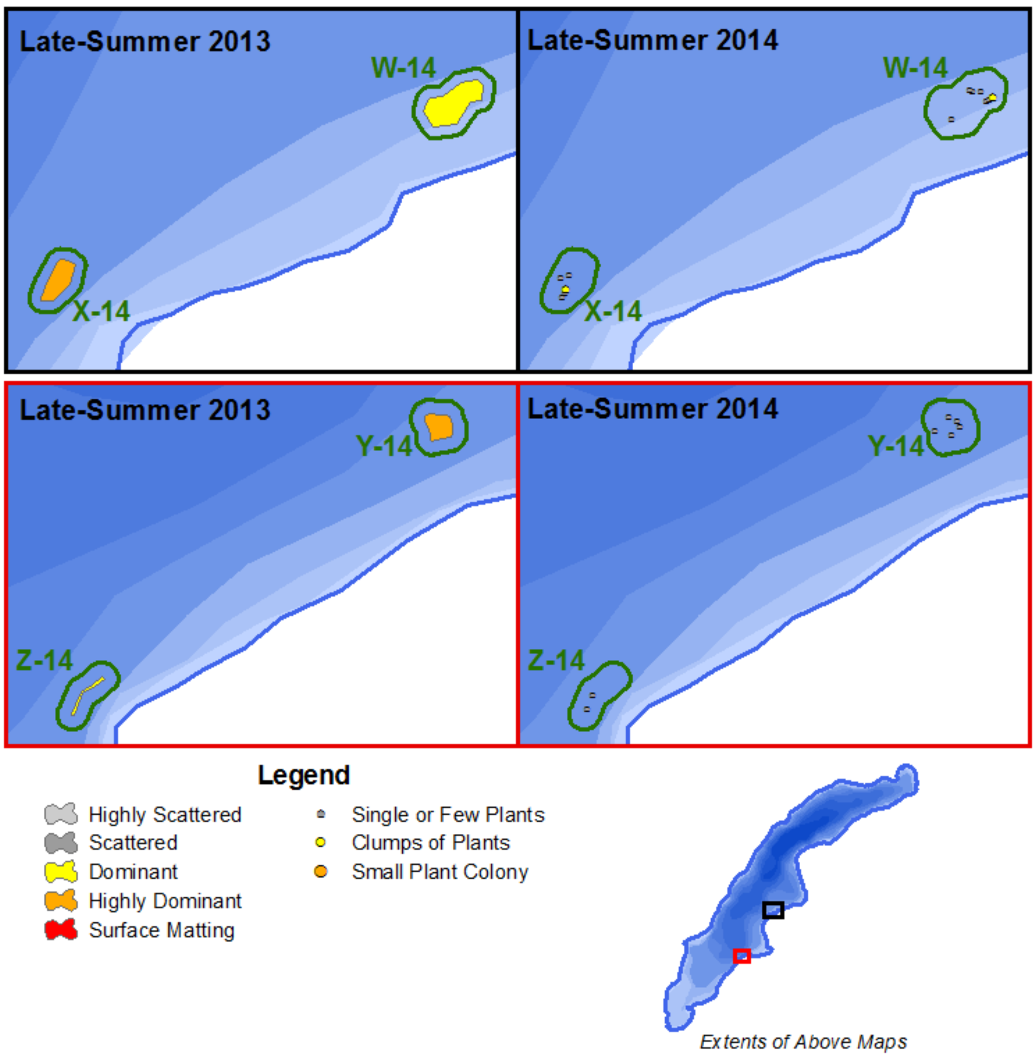


Figure 6. Qualitative EWM monitoring results of professional hand-harvesting areas.

As discussed, quantitative data were collected from 43 and 58 sub-sample point-intercept locations within 2014 treatment areas in the summer of 2013 (pre-treatment) and summer 2014 (post-treatment), respectively. Prior to treatment in the summer of 2013, approximately 9% of these locations contained

EWM. Following the treatment in 2014, 0% contained EWM, indicating a statistically valid reduction of 100% (Chi-square α = 0.05) which exceeds the quantitative success criterion of at least a 50% reduction in occurrence (Figure 6).

Data concerning native aquatic plant species were also collected at the sub-sample point-intercept locations within 2014 treatment areas. Figure 7 displays the frequency of occurrence of native aquatic plants within these areas before and after treatment. Common waterweed, slender naiad, small pondweed, and variable pondweed all exhibited statistically valid declines in their occurrence following the treatment. Unlike EWM, these four species are monocots and were not historically believed to be sensitive to dicot-selective herbicides like 2,4-D. However, emerging research by the WDNR, US Army Corps of Engineers (USACE), and consultants, is indicating that some of these species are prone to decline following these treatments. As discussed previously, the reduction of these plants can only be considered within the 2014 treatment areas where the herbicide was directly applied and cannot be extrapolated to the lake-wide level. The occurrences of the remaining 14 native aquatic plants were not statistically different from before and after treatment.

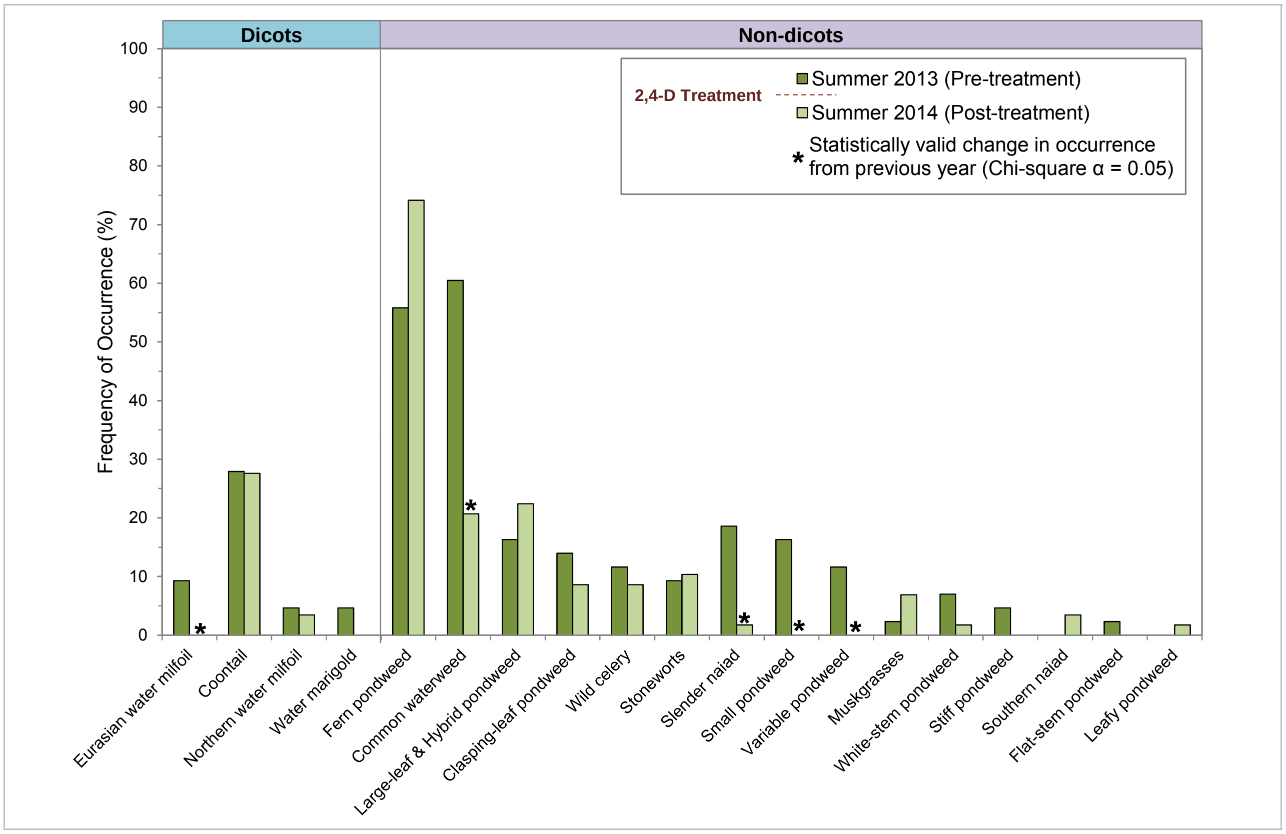


Figure 7. Long Lake 2013 pre- and 2014 post-treatment occurrence of aquatic plant species within 2014 treatment areas. Please note: Only those species with an occurrence of at least 5% in one of the two surveys are applicable for statistical analysis. Created using data from 2013 and 2014 sub-sample point-intercept surveys.

CONCLUSIONS AND DISCUSSION

The 2014 liquid 2,4-D spot treatments and hand-removal utilizing the DASH system were highly successful at reducing the occurrence of EWM within these areas; both the pre-determined qualitative and quantitative success criteria were exceeded. Impacts to the native aquatic plant communities within these areas were detected, as four species where found to decrease within the areas treated. In 2015, the LLPLD intend to continue their aggressive approach to EWM management in Long Lake incorporating both hand-harvesting and herbicide application strategies. Four sites containing *Dominant* EWM colonies were selected for herbicide control. Extended treatment area buffers were placed on these sites to help retain concentration and exposure times.

Emerging research is indicating that when these treatment areas fall below 5 acres, the treatment effectiveness hard to predict and often unsuccessful due to rapid herbicide dissipation. Because of this, a couple different herbicide strategies have been considered. One potential strategy is to target these areas with diquat, a contact herbicide traditionally used to control nuisance levels of aquatic plants. Of the aquatic herbicides commonly used, diquat requires the shortest exposure time to cause plant mortality, and for this reason has been used in a few spot treatment scenarios targeting EWM. However, diquat has a maximum application rate of 2 gallons per acre, and Onterra's experience has been shown that this herbicide strategy has not been expectations in deeper water treatment areas with higher water volume. Because most of the proposed 2015 treatment sites are relatively deeper, it is not recommended that diquat be the herbicide of choice.

The second strategy considered was to apply a combination of liquid 2,4-D and endothall to the 2015 treatment areas. It is believed that conducting a treatment using a combination of these herbicides has an additive or synergistic effect. This strategy has been shown to be effective in whole-lake treatment scenarios, but until 2014, its effectiveness in spot treatment scenarios had not been fully tested. A trial area of approximately 15 acres in Lake Metonga, Forest County was applied with a combination of liquid 2,4-D and endothall in 2014. This area was mainly comprised of *Highly Dominant* EWM prior to treatment, and preliminary results indicate that this treatment was highly effective at reducing EWM within this area. However, the treatment site on Lake Metonga was much larger than are being proposed for Long Lake; therefore treatment expectations may not be directly transferable. The four sites totaling 13.3 acres in Long Lake are proposed to be treated with a combination of liquid 2,4-D and endothall at application rates of 4.0 ppm acid equivalent (ae) and 1.5 ppm active ingredient (ai), respectively (Map 2).

Additionally, seven areas totaling approximately 3.8 acres are proposed to be targeted via hand-removal in 2015 (Map 2). These areas contain either very small, isolated colonies of EWM and/or EWM mapped with point-based techniques (e.g. *Small Plant Colonies*). Many Waters, LLC's implementation of DASH system in 2014 proved to be effective at removing these small, but dense colonies of EWM. The LLPLD is going to work with Many Waters, LLC to see if it is possible to increase their hours on Long Lake in 2015 to be able to remove EWM within these proposed areas. If they are unable to visit all seven of these proposed locations, Onterra will work with the LLPLD to prioritize areas for hand-removal.

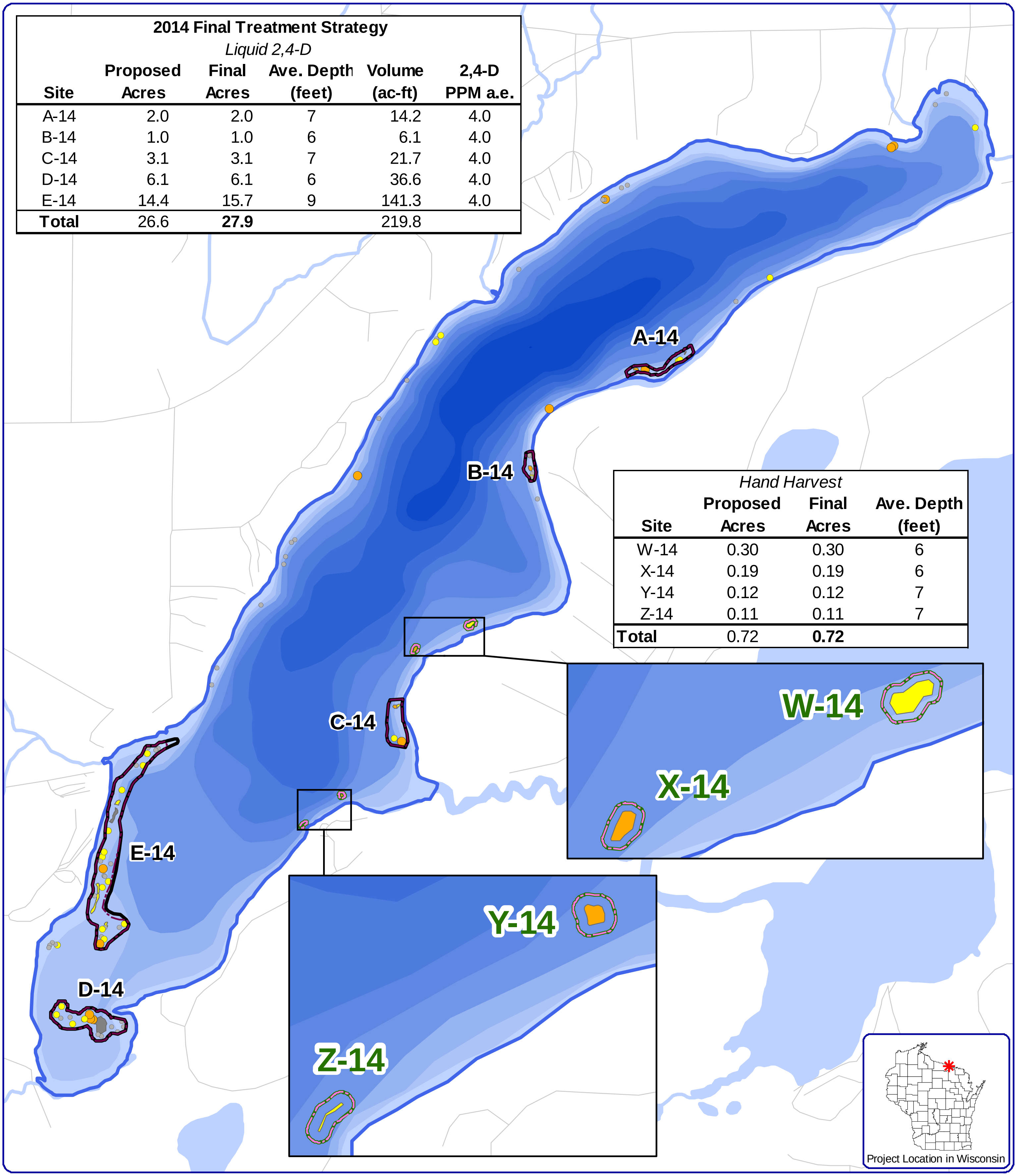
2014 Final Treatment Strategy

Liquid 2,4-D

Site	Proposed Acres	Final Acres	Ave. Depth (feet)	Volume (ac-ft)	2,4-D PPM a.e.
A-14	2.0	2.0	7	14.2	4.0
B-14	1.0	1.0	6	6.1	4.0
C-14	3.1	3.1	7	21.7	4.0
D-14	6.1	6.1	6	36.6	4.0
E-14	14.4	15.7	9	141.3	4.0
Total	26.6	**27.9**		219.8	

Hand Harvest

Site	Proposed Acres	Final Acres	Ave. Depth (feet)
W-14	0.30	0.30	6
X-14	0.19	0.19	6
Y-14	0.12	0.12	7
Z-14	0.11	0.11	7
Total	0.72	**0.72**	



N
W E
S
1,700
Feet

Legend

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting
- Single or Few Plants
- Clumps of Plants
- Small Plant Colony
- 2014 Proposed 2,4-D Treatment Strategy
- 2014 Final 2,4-D Treatment Strategy
- 2014 Proposed Hand-Removal Strategy
- 2014 Final Hand-Removal Strategy

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Sources:
Roads, Hydro, and Bathymetry: WDNR
Aquatic Plants: Onterra, 2013
Map Date: December 9, 2014
Filename: Map1_LongV_T2014_Perm1.mxd

Map 1

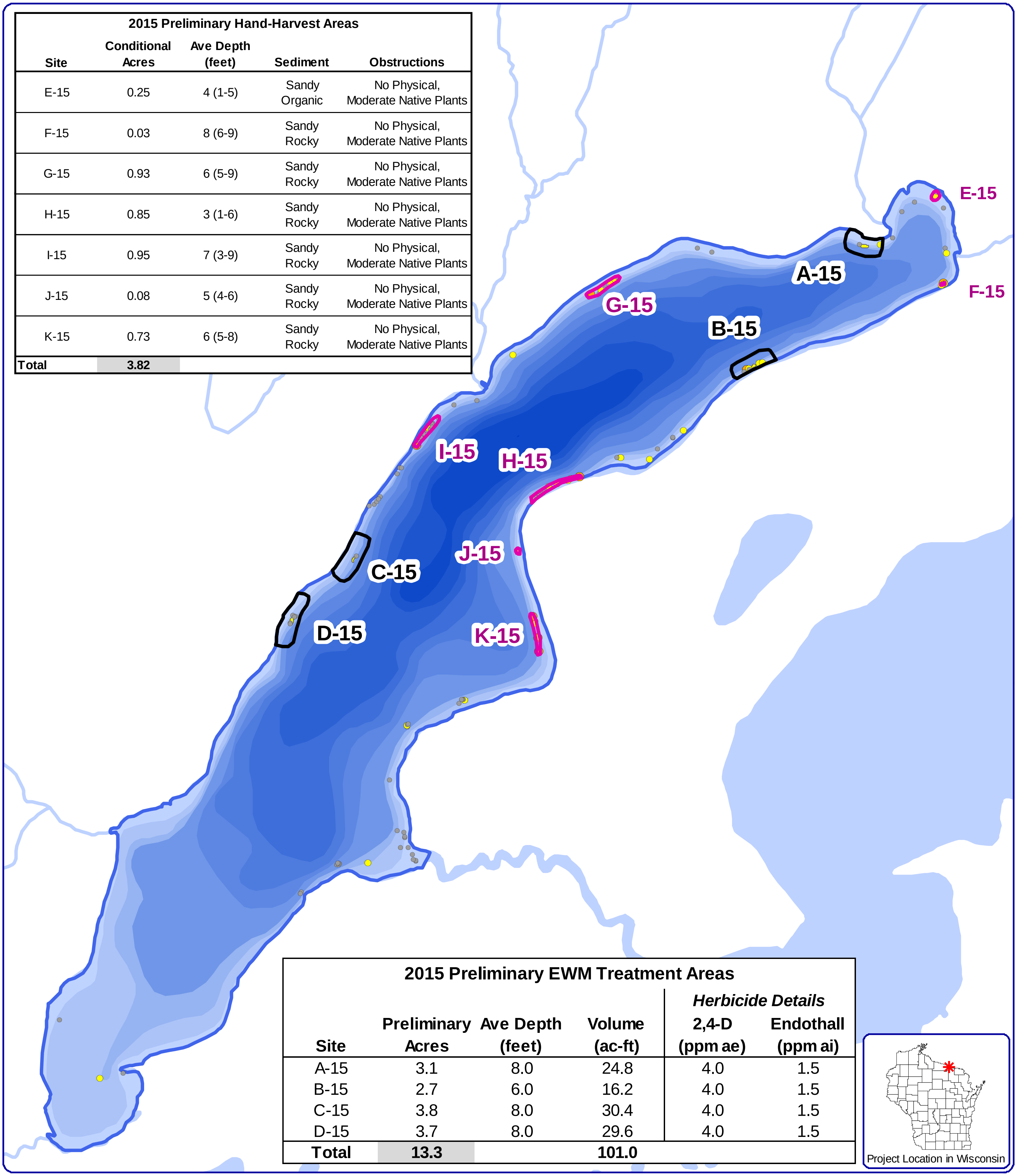
Long Lake

Vilas County, Wisconsin

2013 EWM Locations & 2014 Final Treatment Areas

2015 Preliminary Hand-Harvest Areas

Site	Conditional Acres	Ave Depth (feet)	Sediment	Obstructions
E-15	0.25	4 (1-5)	Sandy Organic	No Physical, Moderate Native Plants
F-15	0.03	8 (6-9)	Sandy Rocky	No Physical, Moderate Native Plants
G-15	0.93	6 (5-9)	Sandy Rocky	No Physical, Moderate Native Plants
H-15	0.85	3 (1-6)	Sandy Rocky	No Physical, Moderate Native Plants
I-15	0.95	7 (3-9)	Sandy Rocky	No Physical, Moderate Native Plants
J-15	0.08	5 (4-6)	Sandy Rocky	No Physical, Moderate Native Plants
K-15	0.73	6 (5-8)	Sandy Rocky	No Physical, Moderate Native Plants
Total	3.82			



2015 Preliminary EWM Treatment Areas

Site	Preliminary Acres	Ave Depth (feet)	Volume (ac-ft)	Herbicide Details: 2,4-D (ppm ae)	Herbicide Details: Endothall (ppm ai)
A-15	3.1	8.0	24.8	4.0	1.5
B-15	2.7	6.0	16.2	4.0	1.5
C-15	3.8	8.0	30.4	4.0	1.5
D-15	3.7	8.0	29.6	4.0	1.5
Total	13.3		101.0		

N
W E
S
1,600
Feet

Legend

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting
- Single or Few Plants
- Clumps of Plants
- Small Plant Colony
- 2015 Preliminary Hand-Removal Areas

Map 2

Long Lake

Vilas County, Wisconsin

2014 EWM Locations & 2015 Preliminary Control Strategy

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www.onterra-eco.com

Sources:
Roads, Hydro, and Bathymetry: WDNR
Aquatic Plants: Onterra, 2013
Map Date: December 9, 2014
Filename: Map2_LongV_EWM_T2015_Prelim1.mxd

A

APPENDIX A

Management of Eurasian Watermilfoil (*Myriophyllum spicatum*) using Diver Assisted Suction Harvesting – Many Waters, LLC

2527 Lake Ottawa Road

Iron River, MI 49935

906.284.2198

Management of Eurasian Watermilfoil (*Myriophyllum spicatum*) using Diver Assisted Suction Harvesting

Long Lake, Vilas County, WI - 2014

Final Reporting

Date: 9.17.2014

Submitted To:

The Long Lake of Phelps Lake District

Wisconsin Department of Natural Resources

Submitted By:

Many Waters, LLC

2527 Lake Ottawa Road

Iron River, MI 49935

Contact:

Bill Artwich: billartwich@gmail.com, 906.367.3206

Barb Gajewski: barb@manywatersconsulting.com, 715.617.4688

Introduction

The Long Lake of Phelps Lake District solicited the services of Many Waters, LLC to utilize their Diver Assisted Suction Harvesting (DASH) program to manage for Eurasian watermilfoil (EWM) from Long Lake, located east of the Town of Phelps in Vilas County, WI. DASH is a mechanical process and requires a mechanical harvesting permit (Form 3200-113 (R 3/04)) from the Wisconsin Department of Natural Resources (WDNR) is required. The District submitted and received a Mechanical Harvesting Permit from the WDNR to utilize DASH. (Permit ID # MNOR-64-14-03). Onterra, LLC selected DASH sites and provided mapping information.

Dive Methods

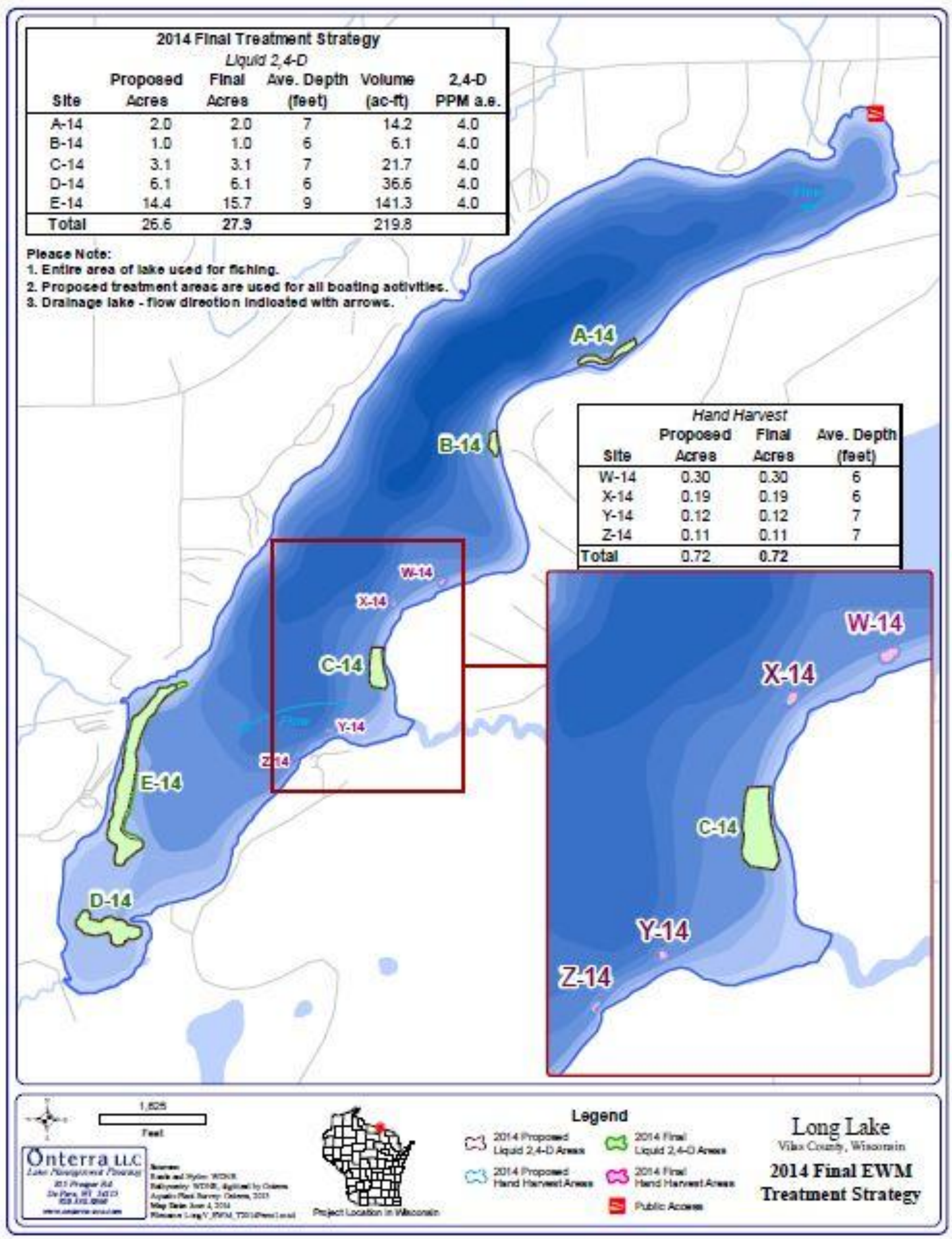
Diver Feeding EWM Plant into Suction Hose

While using DASH, a diver typically will begin by locating a EWM plant from the surface, and then descend next to the plant while also lowering the nozzle. The diver works along the bottom by using a fin pivot, kneeling on the bottom, or hovering above the bottom at a distance where the root mass of the plant is within hands reach. The diver will either feed the top of the plant into the hose first and then uproot the plant or uproot the plant and feed it root wad first into the hose. It is very important that the diver shake the root wad to remove as much sediment as possible before getting the root wad near the nozzle. Shaking the root wad away from the nozzle helps maintain visibility for the diver and minimizes debris and sediment in the holding bins. Once a plant is fed into the nozzle, the diver will carefully watch the plant and look for any fragments. If a fragment is found, the fragment is caught by hand and fed into the nozzle.

Work sites that have dense monotypic beds of EWM, as is the case for some sites on Long Lake, the initial DASH efforts are quite simple. The diver will descend adjacent to the bed and begin hand pulling or harvesting systematically across the bed to dismantle the bed. Once the majority of the bed is removed, a more systematic approach follows to target remaining clustered, scattered or outlier plants in the work site. As part of our method for covering a work area while using DASH (or divers alone), a grid pattern is used. A diver will start at either the port or starboard side of the boat and work to and from the boat perpendicular to the direction the boat is facing. For example, if the boat were facing north and the diver starts on the port side, the diver would begin to head west. The diver will continue to work perpendicular to the boat until reaching the end of the suction hose. The diver then works back to the boat on a new transect line. Distance between each transect is dictated by visibility, density of EWM, and obstructions. This process is repeated on the opposite side and in front of the boat. Depending on the site, once the diver has adequately covered the area, which the suction hose can reach, they will signal the deckhand to let out more anchor line or determine that the boat needs re-positioning

Once plants reach the surface, a hose dispenses the plant material into a series of screened bins located on the boat. These bins capture the plants and allow the water to drain out back into the lake. Plants on deck are sorted into two categories: the targeted invasive plant and native vegetation. A wet weight of both the invasive plant and all native species combined is taken. Plants are placed in sealable containers or bags for transport to the dumping site. The dumping site is a pre-determined site upland, away from any water body.

Figure 1: 2014 DASH Work Areas (Onterra, 2014)



Results and Summary

Table 1: DASH Efforts

Date	Location	Size (acres)	Ave. Depth (ft)	DASH Boat Location (NAD 83)		Dive Time (hrs)	EWM (lbs*)	Native (lbs*)	Percent Bi-Catch	Total (lbs*)
				Lat	Long					
6/24/2014	W-14	0.30	6	46.06171	89.02082	2.0	171.5	7.0	~4	178.5
6/26/2014	W-14	0.30	6	46.06176	89.02111	5.25	181.5	9.0	~5	190.5
	X-14	0.19	6	46.06080	89.02390	1.25	42	~0.5	~1	42.5
6/30/2014	***	***	***	***	***	***	***	***	***	***
7/2/2014	X-14	0.19	6	46.06083	89.02384	2.75	425	10.0	~2	435
	Y-14	0.12	7	46.05560	89.02776	0.75	7.0	1.0	~14	8
7/3/2014	Y-14	0.12	7	46.05561	89.02752	2.5	54.0	1.5	~2	55.5
	Z-14	0.11	7	46.05455	89.02967	1.75	51.0	9.0	~17	60
8/7/2014	W-14	0.30	6	46.06178 (beginning)	89.02077 (beginning)	2.25	51.0	4.0	~7	55
	W-14	0.30	6	46.06168 (end)	89.02108 (end)					
	X-14	0.19	6	46.06168	89.02108	1.5	62.5	1.0	~1	63.5
	Y-14	0.12	7	46.05556	89.02773	1.0	10.0	~.5	~5	10.5
	Z-14	0.11	7	46.05453	89.02989	0.75	13.0	1.0	~7	14
						21.75	**1068.5**	**46.5**	**~4**	**1115.0**

* Wet weight ***No DASH Efforts

Table 2: DASH Summary Per Site

Site ID	Dive Hours	Total EWM (lbs)
W-14		404.0
X-14		529.5
Y-14		71.0
Z-14		65.0

June 24th 2014 Weather- sunny, 70˚ F, light north wind

DASH work initiated on W-14. The harvester anchored along the central eastern side of the work area and faced north. Two hours of dive time removed 171.5 pounds of EWM. Non-target native bi-catch included *P. amplifolius, P. robbinsii, E. canadensis, N. guadalupensis, Chara sp., V. americana* and *C. demersum*. Overwhelming, the primary bi-catch observed was *C. demersusm*.

Auxin symptoms observed on EWM, primarily those located along the edge of denser EWM locations. A large thunderstorm pushed through and ceased DASH efforts for the remaining of the day.

June 26th 2014 Weather-sunny, 65˚F, light north-northeast wind

Anchoring along the eastern portion along the western edge facing east, DASH work continued on W-14. Five and a quarter dive hours removed 181.5 pounds of EWM.

DASH work continued on X-14, where the harvester was centrally positioned working north. One and a quarter-hours of dive time at X-14 harvested 42 pounds of EWM. Non-target bi-catch remained similar as observed on June 24th but also included *P. praelongus*.

June 30th 2014 Weather-partly sunny, winds 20 mph out of the south-southwest with gust to 35 mph

Anchors unable to hold position due to wind. No DASH efforts took place.

July 2nd 2014 Weather- overcast, 50˚F, northwest wind 5-10 mph

Anchoring in a central portion facing north, DASH efforts continued on X-14. Two and three quarter dive hours removed 425 pounds of EWM from X-14. Non-target bi-catch included *E. canadensis, N. guadalupensis, C. demersum* and *P. gramineus*. Primary bi-catch observed was *P. gramineus*.

Harvester was centrally positioned in Y-14 facing west south-west. Three quarters of one dive hour in Y-14, harvested 7 pounds of EWM. Non-target bi-catch included *P. robbinsii, C. demersum* and *E. canadensis*, with the primary bi-catch observed being *C. demersum*.

Auxin symptoms observed on *Myriophyllum* species at both work sites. More of the EWM present began to weep over, which was not observed in previous visits.

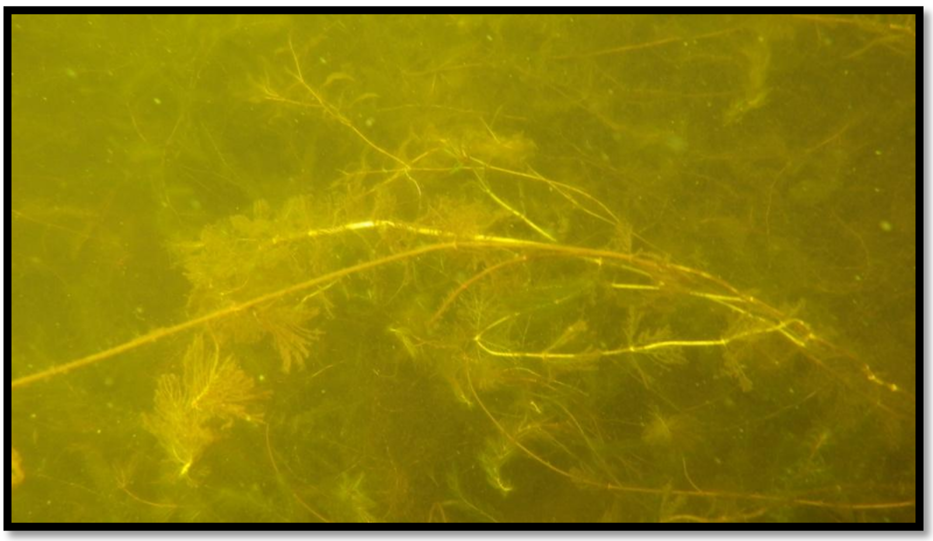
July 3rd 2014 Weather-mostly cloudy, 50˚F, light wind

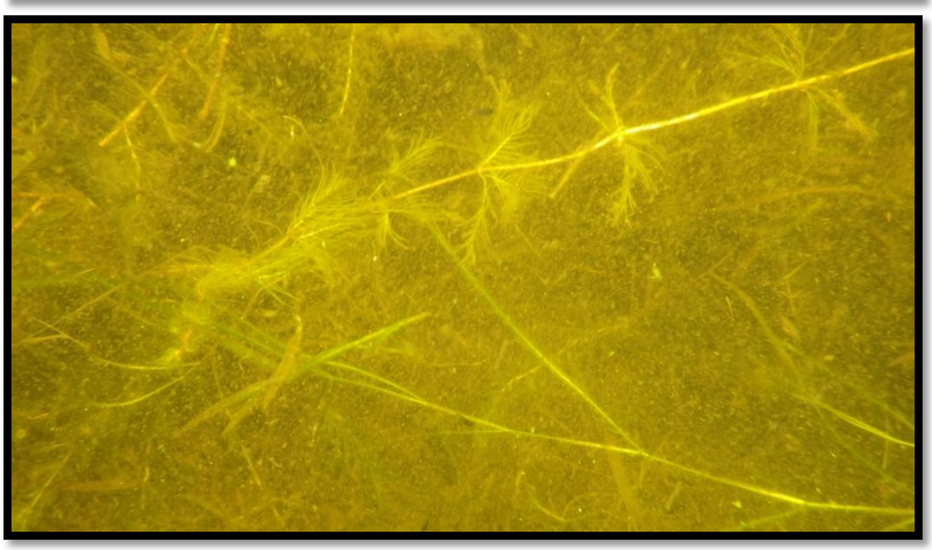
Harvesting efforts began by returning to Y-14. Boat was positional outside of the work area along the eastern side and faced west into the work area. Two and a half hours of dive time removed 54 pounds of EWM. Primary non-target native bi-catch was *C. demersum* but *V. ameriana, P. richarsonsii, E. canadensis, P. gramineus, B. beckii* and *N. guadalupensis* was also observed.

Harvesting efforts continued into Z-14. The boat was positioned along the eastern edge of the work area facing west. One and three quarter hours of dive time removed 51 pounds of EWM.

Auxin symptoms to EWM evident. Most plants remaining in Y-14 and Z-14 were lying on the lakebed and intermixing with native vegetation. A decision was made to return to complete harvesting work later in the growing season to allow for a better chance to harvest re-growth of impacted plants.

Photos of EWM taken on July 3rd at Y-13





August 7th 2014 **Weather-sunny, 75˚F, winds north-northeast at 5 mph**

Dash efforts included return visits to each location. At W-14, the harvester worked a transect line starting from the north eastern portion of the work area working south west. Two and a quarter dive hours harvested 51 pounds of EWM at W-14. At X-14, the harvester anchored facing north and 1.5 dive hours harvested 62.5 pounds of EWM. At Y-14, the harvester anchored facing north and 1 dive hour harvested 10 pounds of EWM. At Z-14, the harvester anchored facing northeast and in three quarters of a dive hour harvested 13 pounds of EWM. Non-target native bi-catch species remained similar to those observed in previous efforts.

B

APPENDIX B

Long Lake of Phelps Lake District 2014 Activities and Accomplishments

Long Lake of Phelps Lake District
P.O. Box 202
Phelps, WI 54554

December, 14, 2014

Re: Long Lake of Phelps Lake District 2014 Activities and Accomplishments

In addition to the successful EWM Treatment, the following activities were completed:

- Through the Clean Boats Clean Water Program 240 hours were completed with 268 boats being inspected and 468 people being contacted about the CBCW Program.
- Conducted Water Chemistry tests once per month from June thru September. Recorded water temperature and dissolved oxygen levels at multiple depths down to 90 feet. This16 hours of activity was done by two riparian volunteers.
- Two volunteers (16 hours) conducted 8 Water Clarity (Secchi) readings over a period of 4 months.
- All of the above data was entered by volunteers on the WDNR Website.
- Nine riparian owners volunteered to adopt a portion of Long Lake and spent over 30 hours over the period of 4 months looking EWM and other aquatic invasive species. Using a GPS device all findings were identified and that data was given to Onterra to incorporate in their mapping process.
- At the July 2014 annual meeting of the Long Lake of Phelps Lake District, the attendees were given a presentation on the result of the 2013 EWM Treatment and how the District is progressing in its objective to reduce and contain EWM.