#### **1.0 INTRODUCTION**

La Motte Lake is an approximate 182-acre seepage lake with a maximum depth of 72 feet located in Menominee County, Wisconsin. (Figure 1.0-1). Eurasian watermilfoil (EWM) was discovered in La Motte Lake during the fall of 2021 by Menominee County staff. No mapping was completed, but the colony was estimated to be approximately 1/2 acre. The La Motte Lake Association (LMLA) contracted with Onterra, LLC to conduct studies aimed at understanding the extent of the



EWM population in the lake and form an appropriate course of action for management going forward.

With assistance from Onterra, in May 2022, the LMLA successfully applied for an Aquatic Invasive Species Early Detection Response Grant (AIS-EDR) through the Wisconsin Department of Natural Resources (WDNR). This grant provides funding assistance for EWM monitoring and management activities from 2022-2024.

#### 2.0 2021 EWM MANAGEMENT AND MONITORING STRATEGY

A pair of EWM mapping surveys were used to coordinate and monitor the EWM management efforts in La Motte Lake. During the EWM mapping survey, the entire littoral area of the lake is surveyed through visual observations from the boat (Photograph 2.0-1). Field crews supplement the visual survey by deploying a submersible camera along with periodically doing rake tows. The EWM population is mapped using sub-meter GPS technology by using either 1) point-based or 2) area-based methodologies. Large colonies >40 feet in diameter are mapped using polygons (areas) and are 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*.

An Early Season AIS Survey is employed with the purpose of determining an appropriate management strategy for the summer and providing the spatial data to guide the management efforts. The Late-Summer EWM Mapping Survey is typically conducted after most or all management efforts have been completed in



Photograph 2.0-1. EWM mapping survey on a Wisconsin Lake. Photo credit Onterra.

order to evaluate the control strategy. The late-summer survey also provides an opportunity to follow up with additional management efforts following the survey if applicable. Additionally, the late-summer mapping survey is used to determine an initial management strategy for the following year.

#### 3.0 EARLY-SEASON AQUATIC INVASIVE SPECIES SURVEY (ESAIS)

Onterra ecologists completed the Early-Season AIS Survey on June 17, 2022. While EWM is usually not at its peak growth at this time of year, the water is typically clearer during the early summer allowing for more effective viewing of submersed plants, and EWM is often growing higher in the water column than many of the native aquatic plants at that time of year. A Secchi disk measurement of 14.5' was recorded during the survey indicating high water clarity.

The results of the survey are displayed on Map 1. A relatively modest EWM population was documented during the survey and included several isolated *clumps of plants* or *single or few plants* occurrences. One colonized area of EWM was delineated on the northwest end of the lake. This colony was approximately 40' x 80' in area or 0.07 acres and described as highly dominant in density.

Based on the results of the early season survey, a hand harvesting management approach was determined to be an appropriate EWM management strategy to employ during 2022.

#### 4.0 HAND-HARVESTING ACTIVITIES

The LMLA contracted with Aquatic Plant Management, LLC in 2022 to conduct professional hand harvesting activities targeting the known EWM population. Onterra provided the spatial data from the recent ESAIS survey to the contracted hand harvesting firm to guide the hand removal efforts. Divers from APM conducted hand harvesting with the use of Diver Assisted Suction Harvesting (DASH) on six days during 2022. Efforts initially focused on known EWM occurrences identified during the June ESAIS survey. The dominant colony on the west end of the lake received the greatest amount of harvesting effort with 20.7 underwater dive hours resulting in a harvest of 238.5 cubic feet of EWM (Table 4.0-1). Subsequent harvesting efforts took place following Onterra's Late-Summer EWM Mapping Survey detailed below. In total, 530 cubic feet of EWM was reportedly harvested during the course of the removal efforts. Additional details of the professional harvesting actions are included in a summary dive report created by APM, LLC as Appendix A.

able extracted from APM, LLC EWM Removal Report – Appendix A).						
Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)		
E Bay	1.5	1	0.9	0.5		
E HD Colony	13.3	6	13.0	283.5		
N Bay	10.0	1	0.9	2.0		
Point	7.0	1	0.3	0.5		
S Shoreline E Bay	15.0	1	0.7	0.5		
SW Bay	10.0	1	1.2	4.5		
W D Colony	10.9	19	20.7	238.5		
Grand Total	11.0	30	37.7	530.0		

Table 4.0-1, Summary of 2022 DASH/ Professional Hand Harvesting Activities in La Motte Lake.



#### 5.0 LATE-SUMMER EWM MAPPING SURVEY RESULTS

The Late-Summer EWM Mapping Survey was conducted on September 2, 2022 to qualitatively assess the hand harvesting efforts as well as to understand the peak growth (peak-biomass) of the EWM population throughout the lake. The entire littoral zone of La Motte Lake was meandered and any EWM occurrences were mapped by using the same methodology as the ESAIS survey described above. The survey crew noted mostly sunny skies and light winds during the survey.

The results of the survey are displayed on Map 2. A *dominant* EWM colony was mapped in the same location as the June survey in the northwest end of the lake. Another colonized area was located during the survey in approximately 8-10 feet of water on the eastern end of the lake. This *highly dominant* colony was approaching the waters' surface and measured 140' in diameter and approximately 0.17 acres. A *small plant colony* was also marked in the southwest corner of the lake, and several isolated *single or few plants* occurrences were mapped elsewhere around the lake. Locations in which EWM was encountered during the August 2022 whole-lake point-intercept survey are also displayed on the map.

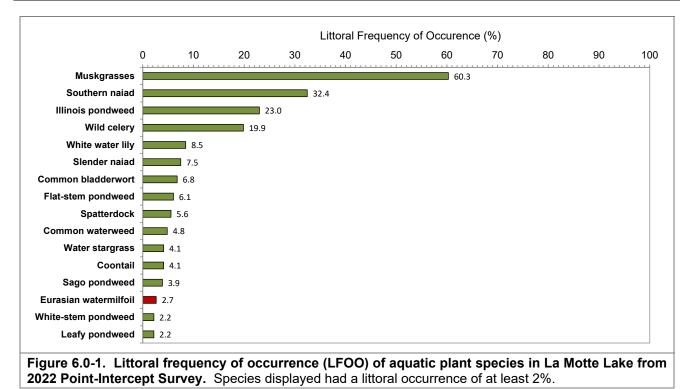
Following the late-summer survey, divers from APM conducted two days of DASH harvesting that targeted the *highly dominant* EWM colony. These efforts took place on September 12-13 and resulted in a harvest of 283.5 cubic feet of EWM over the course of 13 hours of underwater dive time (Table 4.0-1, Appendix A). Onterra provided the spatial data from the late-summer survey to APM to guide the harvesting efforts.

#### 6.0 WHOLE-LAKE POINT-INTERCEPT SURVEY

The point-intercept method as described Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010 (Hauxwell, et al., 2010) was used to complete the whole-lake point-intercept survey on La Motte Lake in 2022. Based upon guidance from the WDNR, a point spacing (resolution) of 30 meters resulting in 809 sampling locations was used. At each point-intercept location within the *littoral zone*, information regarding the depth, substrate type (soft sediment, sand, or rock), and the plant species sampled along with their relative abundance on the sampling rake was recorded. This study is included within AIS grants to provide baseline information about the aquatic plant community in the lake.

Onterra ecologists conducted the whole-lake point-intercept survey on August 12, 2022. Figure 6.0-1 displays the littoral frequency of occurrence of individual aquatic plant species from the 2022 point-intercept survey. Only species which had a littoral frequency of occurrence of at least 2% are displayed. A total of 33 native species were documented in the survey as well as one non-native species: Eurasian watermilfoil. EWM was located at 11 sampling locations resulting in an occurrence of 2.7%.





#### 7.0 CONCLUSIONS AND DISCUSSION

Professional EWM monitoring surveys in 2022 documented a modest population in La Motte Lake with most of the occurrences mapped with point-based techniques described as *single plants, clumps of plants*, or *small plant colonies*. Two relatively small, but dense colonized areas of EWM were located during the mapping surveys including a site on the northwest end of the lake and on the eastern end of the lake. Professional hand harvesting efforts prioritized the known colonized areas of EWM during 2022 with additional efforts taking place on many of the smaller, more isolated occurrences as well. These efforts are instrumental in inhibiting EWM from becoming established or expanding in new areas of the lake. The mapping surveys indicate that the small colonized EWM site on the northwest end of the lake was reduced by one density rating following the harvesting efforts (i.e. *highly dominant* to *dominant*). Harvesting efforts that took place after the completion of Onterra's Late-Summer Mapping survey have not been evaluated, but are expected to have resulted in suppressing the growth of the targeted colony.

#### 7.1 2023 EWM Management Strategy Development

The LMLA Board reviewed an earlier draft of this report and met with Onterra ecologists to understand the EWM management options available to them. The following EWM management strategy reflects the decision made by the LMLA in terms of their 2023 EWM management strategy. The LMLA plans to pursue an integrated pest management strategy in 2023 that will include an herbicide spot treatment as well as coordinated hand harvesting/DASH.

#### Hand Harvesting/Diver Assisted Suction Harvesting (DASH)

Much of the known EWM population in La Motte Lake is conducive to a coordinated hand harvesting strategy to for 2023. The results of Onterra's Late-Summer 2022 EWM mapping survey will serve to guide hand harvesting efforts in 2023 including the application for a DASH permit. Hand harvesting



alone would be unlikely to be able to target all known EWM in the lake during 2023 without substantial efforts. In an effort to more efficiently target the entire EWM population during 2023, the LMLA is pursuing an herbicide spot-treatment during 2023 that would target the largest/densest colony of EWM in the lake while devoting hand harvesting efforts to smaller, more isolated EWM occurrences around the lake.

All known EWM occurrences in the lake, other than the population being targeted with herbicides, will be considered for hand harvesting efforts in 2023. The LMLA will communicate with their contracted DASH firm to understand the estimated amount of effort likely needed to target the EWM population being considered for this management technique in 2023.

Understanding expectations associated with a hand harvesting management approach is important for lake groups like the LMLA to understand. In Onterra's experience monitoring hundreds of hand harvesting sites around the state, the EWM population in La Motte Lake will not be eradicated with this or likely any other management strategy. *Highly dominant* EWM colonies typically require a lot of effort to remove a high amount of biomass present in these sites. At current levels, a realistic goal may be to reduce the population in targeted areas and inhibit expansion in other areas of the lake. Targeted sites will likely require subsequent harvesting efforts to address remnant EWM plants that escaped detection or were incompletely harvested during initial harvesting activities. Regular professional or volunteer monitoring for remnant EWM plants or new occurrences around the lake is instrumental in ensuring that any hand harvesting strategy is efficient and working towards meeting EWM management objectives.

#### Herbicide Spot-Treatment

Herbicide tends to dissipate out of small treatment sites quicker than large sites. Evolving Best Management practices for spot-treatments involves considering an herbicide with reportedly short concentration and exposure time requirements. Onterra recommends the LMLA investigate the potential to use florpyrauxifen-benzyl for a spot-treatment in 2023.

The active ingredient florpyrauxifen-benzyl is sold exclusively by SePRO under the tradename ProcellaCOR<sup>TM</sup>. This herbicide has largely been used in spot treatment scenarios, but has recently been adopted as a whole-lake treatment option on a number of Wisconsin lakes. Onterra has monitored over 50 ProcellaCOR<sup>TM</sup> treatments in Wisconsin since 2019 with data analysis related to herbicide concentration monitoring and native aquatic plant impacts being investigated in the majority of treatments. Analysis of these data have allowed lake managers to better understand the ways in which the herbicide dissipates or mixes within a lake in the hours and days after application. Additionally, aquatic plant monitoring data provides insights as to which native species are typically impacted with ProcellaCOR<sup>TM</sup> treatments. The WDNR's fact sheet on this chemistry can be found here: *https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=332109305* 

Lake managers continue to learn how to successfully implement this form of treatment after being registered for use in Wisconsin only a few years ago. ProcellaCOR<sup>TM</sup> is in a new class of synthetic auxin mimic herbicides (arylpicolinates) with short concentration and exposure time (CET) requirements compared to other systemic herbicides. Uptake rates of ProcellaCOR<sup>TM</sup> into EWM were two times greater than reported for triclopyr (Haug 2018) (Vassios et al. 2017). The active ingredient of ProcellaCOR<sup>TM</sup>, florpyrauxifen-benzyl, is primarily degraded by photolysis (light exposure), with some



microbial degradation. The active ingredient is relatively short-lived in the environment, with half-lives of 4-6 days in aerobic environments and 2 days in anerobic environments (WSDE 2017). Preliminary research suggests that florpyrauxifen-benzyl may have a different or quicker breakdown pattern in waters with high pH and high biomass of aquatic plants.

The primary breakdown product of florpyrauxifen-benzyl is florpyrauxifen acid. Florpyrauxifen acid has been shown to persist in the lake longer than the active ingredient. This chemical metabolite is reported to have activity as an herbicide on aquatic plants, albeit to a lower degree than the active ingredient. It is unclear at this time the exact role that the acid metabolite may play in contributing to EWM reductions, particularly in areas not located directly within the herbicide application area.

Onterra's experience monitoring ProcellaCOR<sup>TM</sup> treatments indicates that EWM control has been high with almost no EWM being located during the summer post treatment surveys. Some treated sites have shown EWM population recovery two-years after treatment, while most other sites have demonstrated three years and counting of continued EWM reductions to-date. A few projects failed to meet control expectations, presumably as a result of the sites being too small to maintain sufficient CET's.

Native aquatic plant monitoring data indicates that watermilfoils are highly susceptible to ProcellaCOR<sup>TM</sup> with frequency of occurrences typically reduced to 0% in the year of treatment with little to no sign of recovery during the year after treatment. Water stargrass, water marigold, and coontail are also known to be impacted by treatment, but not a significantly as watermilfoils. Pondweed species appear to be largely unaffected by this herbicide, with some lakes having large increases in species, such as clasping-leaf pondweed, during the years following treatment. Muskgrasses, common waterweed, and wild celery are common within the La Motte Lake and these species are not believed to be particularly susceptible to ProcellaCOR<sup>TM</sup>. Onterra's experience is that adjacent populations of floating-leaf species (i.e. water lilies) may initially shows signs of herbicidal stress such as leaf twisting (epinasty), but typically rebound a few weeks after treatment including in intentional whole-lake treatment scenarios.

A proposed ProcellaCOR<sup>TM</sup> herbicide spot treatment design is displayed on Map 3. The 1.6-acre site was constructed by applying a buffer around the primary EWM colony that is being targeted. The manufacturer of the herbicide (SePRO) recommends a dose of 8.0 prescription dose units (PDU's) in association with the proposed treatment. The maximum application rate of this formulation of ProcellaCOR<sup>TM</sup> is 25 PDU.

When WDNR grant funds are being used, the WDNR may require additional monitoring aspects of an herbicide treatment such as herbicide concentration monitoring and pre/post quantitative aquatic plant monitoring. Because of the small size of this treatment area, it is not possible to get meaningful pre and post treatment data in the form of a modified sub-sample point-intercept grid.

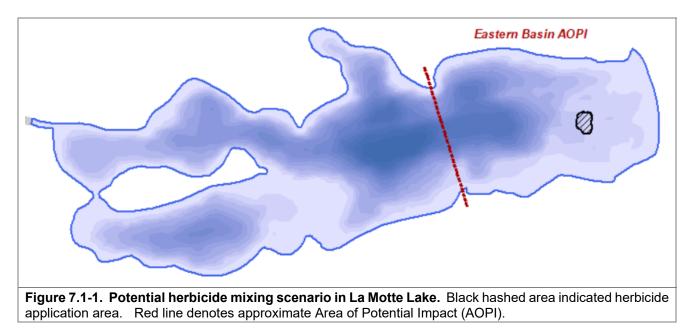
It would be possible to gain an understanding of the concentrations of herbicide at different locations and time intervals after treatment. This type of monitoring would require volunteers from the LMLA to collect water samples from specific locations in the lake at several pre-determined time intervals after treatment. These data would serve to understand what herbicide concentrations were achieved. This type of monitoring may cost \$3,000 or more, so continued discussion with WDNR will determine



whether or not this type of monitoring would be required in association with a potential ProcellaCOR<sup>™</sup> treatment in 2023.

Designing an herbicide management strategy also considers the potential lake-wide herbicide concentrations as the product dissipates and reaches a whole-lake equilibrium concentration. At the proposed application rates, a theoretical lake-wide epilimnetic florpyrauxifen-benzyl concentration of 0.09 ppb is calculated. In other lakes around the state, Onterra has employed intentional whole-lake target florpyrauxifen-benzyl concentrations of 0.5-0.6 ppb and have seen lake-wide or basin-wide impacts at approximately above 0.25ppb. This means that along with the upfront high concentration in the application area, the entire lake will reach an equilibrium concentration that at an extended exposure could have the potential to impact EWM and sensitive native species throughout the entire lake. However, measured whole-lake concentrations of florpyrauxifen-benzyl typically fall a little short of predicted levels as the herbicide converts into its acid metabolite form (florpyrauxifen acid) during the time it takes to mix evenly within the lake. The theoretical whole-lake concentration of 0.09 with this treatment design falls below levels currently thought to result in lake-wide impacts to EWM or susceptible native aquatic plants.

Figure 7.1-1 also considers an area of potential impact (AOPI) of the eastern end of the lake, meaning that if the herbicide mixed within the volume of water within this area of the lake, a calculation AOPI-wide concentration of 0.31 is possible. This concentration is unlikely to be met given that the AOPI is not well defined within a protected bay for example. However, under the correct low-wind conditions, there may be a period of sustained low herbicide concentration in the eastern bay before complete dissipation throughout the entire lake takes place.



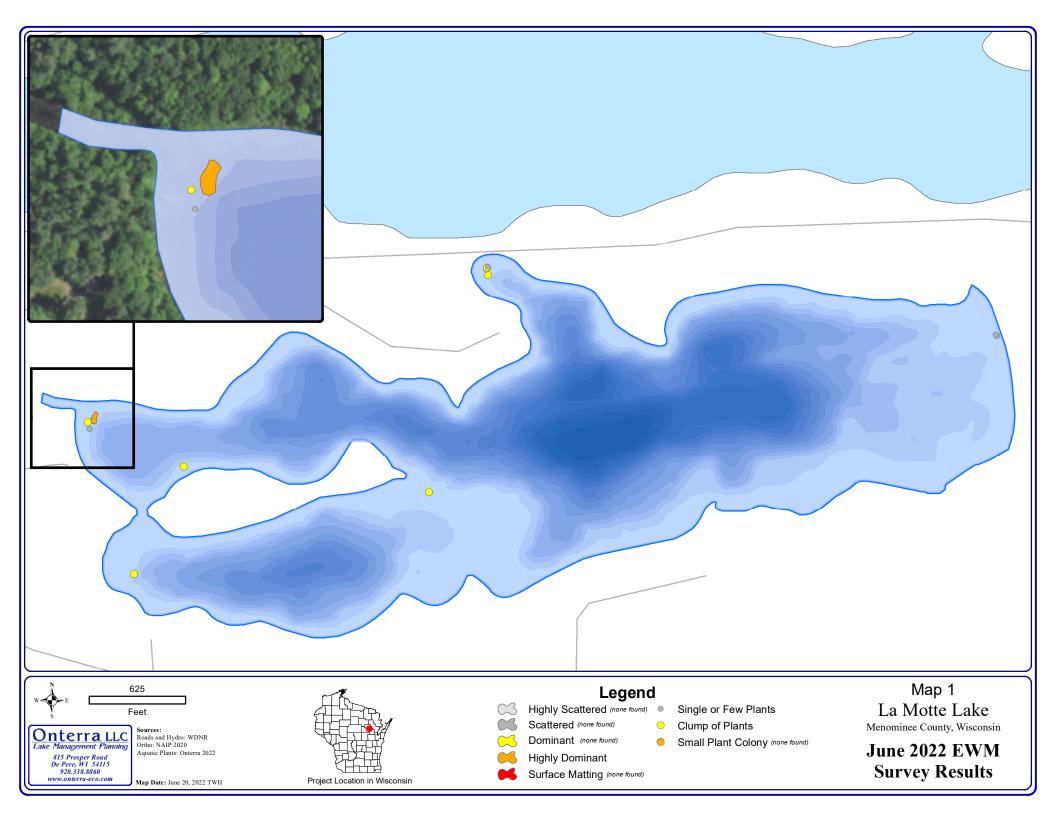
Onterra has not prescribed spot-treatments with ProcellaCOR<sup>TM</sup> for a site as small in size as is being considered for La Motte Lake due to the uncertainty of meeting CET's necessary to result in plant mortality; however, small spot-treatments have occurred in the state with seemingly favorable results observed during the *year of treatment*. It is unknown in this treatment scenario if a higher dosing rate

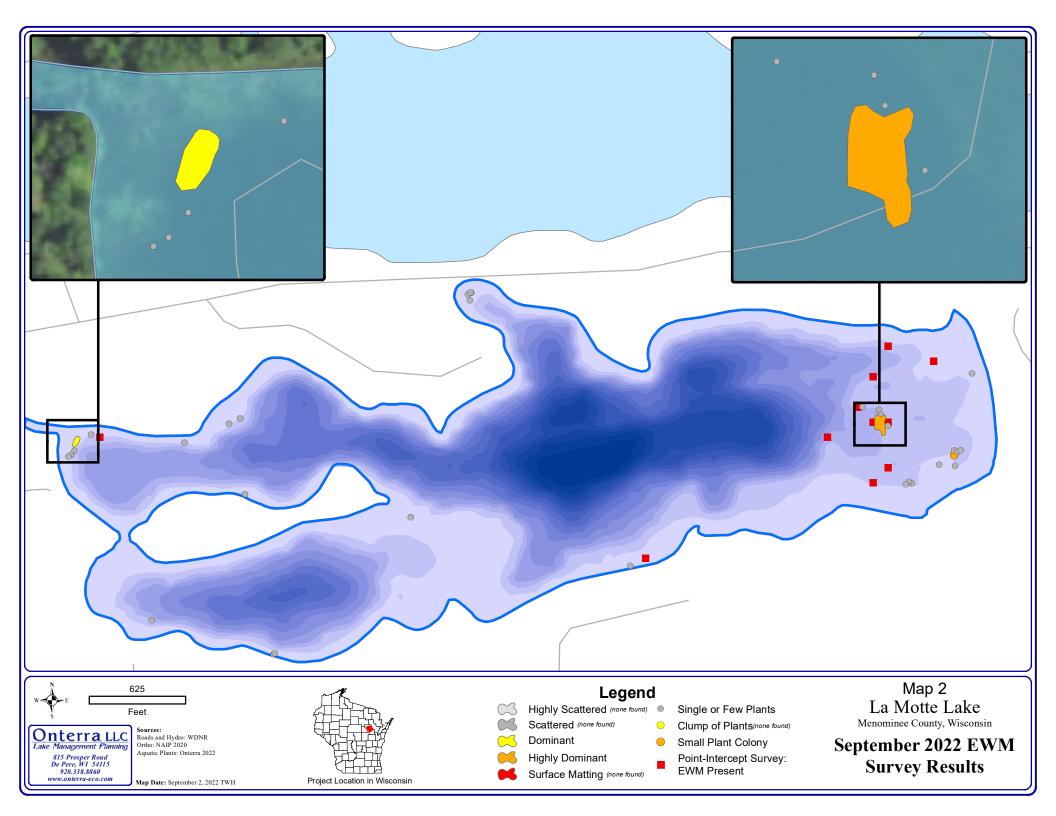


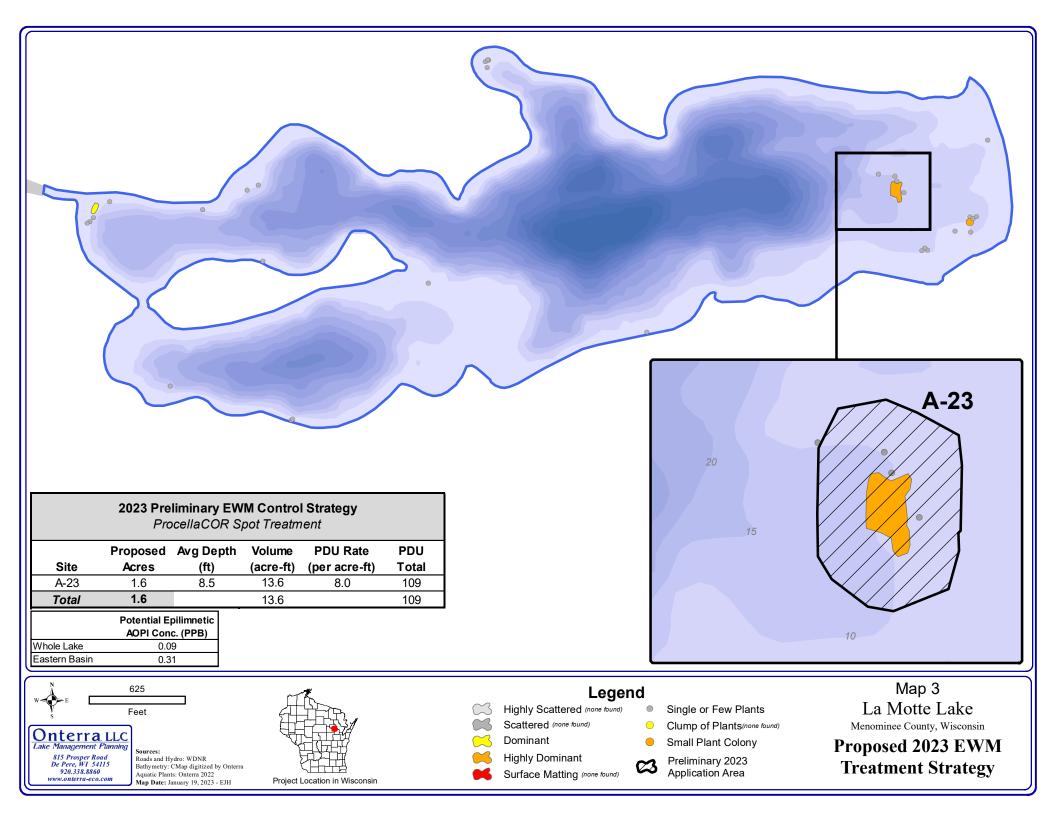
(8.0 PDU's) coupled with the possibility of some AOPI-level mixing concentration will be sufficient to result in EWM control.

The small size and exposed/off-shore nature of the largest EWM colony on La Motte Lake makes it a difficult scenario to hold sufficient herbicide CETs to result in multi-year control. Some lake groups have attempted to "contain" the herbicide in place with the use of barrier curtains. The majority of research trials that have typically taken place in Wisconsin utilized an economical-priced herbicide like 2,4-D and areas already contained by a bay or shoreline were chosen to minimize the amount of curtain material needed. Using a barrier to contain a relatively deep and off-shore treatment site like that being considered for La Motte Lake would be a challenge even for the most experienced lake group in deploying curtains Barrier curtains are typically not transported from one lake to another as a cautionary step to not inadvertently transport invasive species such as zebra mussel veligers, etc.









# A

**APPENDIX A** 

LaMotte Lake EWM Removal Report 2022 – Aquatic Plant Management LLC



## LaMotte Lake EWM Removal Report 2022

PO Box 1134 Minocqua, WI 54548



**Dive Background:** In July, August, and September, Aquatic Plant Management LLC (APM) conducted six (6) days of Diver Assisted Suction Harvesting (DASH) for Eurasian Watermilfoil (EWM) on LaMotte Lake in Menominee County, WI. The team focused their efforts at five sites as prioritized by the LaMotte Lake District. In total APM was able to remove **530.0 cubic feet of EWM** from the LaMotte Lake.

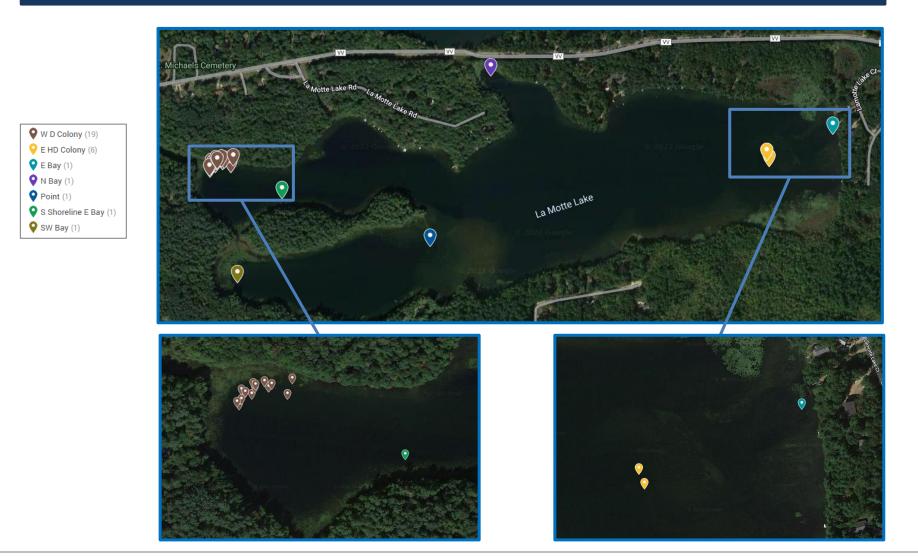
Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
7/22/2022	Sunny	78	5.9	90.0
7/25/2022	Sunny	78	5.7	80.0
8/4/2022	Sunny	78	6.8	32.5
8/5/2022	Sunny	78	6.3	44.0
9/12/2022	Rain	72	6.8	150.0
9/13/2022	Sunny	72	6.3	133.5
Grand Total			37.7	530.0

Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
E Bay	1.5	1	0.9	0.5
E HD Colony	13.3	6	13.0	283.5
N Bay	10.0	1	0.9	2.0
Point	7.0	1	0.3	0.5
S Shoreline E Bay	15.0	1	0.7	0.5
SW Bay	10.0	1	1.2	4.5
W D Colony	10.9	19	20.7	238.5
Grand Total	11.0	30	37.7	530.0

**Dive Highlights and Recommendations:** The dive team spent the bulk of their time at the two significant EWM colonies on the eastern and western portion of the lake. Overall, LaMotte Lake should continue to take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the EWM population on the lake. Continued monitoring and management efforts are important to prevent the spread of EWM throughout LaMotte Lake.



## Map of LaMotte Lake Dive Sites



#### Aquatic Plant Management LLC



## **Detailed Diving Activities**

Date	Dive Location	Latitude	Longitude	Underwater Dive Time (hrs)	AIS Removed (cubic ft)	AIS Density	Avg Water Depth (ft)	Native Species	Native By- Catch	Substrate Type
7/25/2022	W D Colony	44.88540	-88.61302	1.17	6.0	Single or Few	6.5	Grasses	2.0	Organic
7/25/2022	W D Colony	44.88546	-88.61298	1.08	12.5	Clumps	6.0	Grasses	4.0	Organic
7/25/2022	W D Colony	44.88557	-88.61298	1.08	19.5	Dominant	8.0	Grasses	3.0	Organic
7/25/2022	W D Colony	44.88552	-88.61282	1.00	9.0	Dominant	10.5	Grasses	1.0	Organic
7/25/2022	W D Colony	44.88559	-88.61277	1.33	33.0	Highly Dominant	11.0	Coontail	3.0	Organic
7/22/2022	W D Colony	44.88554	-88.61292	1.83	28.5	Highly Dominant	7.0	Grasses	3.0	Organic
7/22/2022	W D Colony	44.88554	-88.61292	1.33	28.0	Highly Dominant	7.0	Grasses	2.0	Organic
7/22/2022	W D Colony	44.88554	-88.61292	1.08	18.0	Highly Dominant	7.0	Grasses	3.0	Organic
7/22/2022	W D Colony	44.88554	-88.61292	0.92	13.5	Highly Dominant	7.0	Grasses	1.5	Organic
7/22/2022	W D Colony	44.88543	-88.61305	0.75	2.0	Scattered	10.0	Grasses	0.5	Organic
8/4/2022	N Bay	44.88798	-88.60290	0.92	2.0	Clumps	10.0	Northern Milfoil	0.5	Organic
8/4/2022	SW Bay	44.88271	-88.61204	1.17	4.5	Small Plant Colony	10.0	Grasses	0.5	Organic
8/4/2022	Point	44.88363	-88.60507	0.25	0.5	Single or Few	7.0	None	0.0	Organic
8/4/2022	S Shoreline E Bay	44.88485	-88.61042	0.67	0.5	Single or Few	15.0	None	0.0	Organic
8/4/2022	E Bay	44.88650	-88.59056	0.92	0.5	Single or Few	1.5	None	0.0	Organic
8/4/2022	W D Colony	44.88552	-88.61226	1.00	13.0	Highly Dominant	15.0	Elodea	0.5	Organic
8/4/2022	W D Colony	44.88552	-88.61226	1.83	11.5	Highly Dominant	15.0	Elodea	0.5	Organic
8/5/2022	W D Colony	44.88560	-88.61256	1.67	10.5	Highly Dominant	14.5	Grasses	0.5	Organic
8/5/2022	W D Colony	44.88560	-88.61256	2.00	23.5	Highly Dominant	15.0	Coontail	0.5	Organic
8/5/2022	W D Colony	44.88563	-88.61251	0.50	2.5	Dominant	11.0	Coontail	0.5	Organic
8/5/2022	W D Colony	44.88566	-88.61262	0.83	2.5	Highly Scattered	15.0	Coontail	0.5	Organic
8/5/2022	W D Colony	44.88564	-88.61280	0.58	1.5	Highly Scattered	15.0	Coontail	0.5	Organic
8/5/2022	W D Colony	44.88562	-88.61276	0.33	1.0	Highly Scattered	14.0	0	0.0	Organic
8/5/2022	W D Colony	44.88569	-88.61219	0.42	2.5	Clumps	13.0	Grasses	0.5	Organic
9/12/2022	E HD Colony	44.88568	-88.59285	3.67	75.0	Highly Dominant	14.0	Grasses	0.0	Organic
9/12/2022	E HD Colony	44.88568	-88.59285	3.08	75.0	Highly Dominant	14.0	Grasses	0.0	Organic
9/13/2022	E HD Colony	44.88583	-88.59293	1.92	42.0	Highly Dominant	13.0	Coontail	0.5	Organic
9/13/2022	E HD Colony	44.88583	-88.59293	1.83	48.0	Highly Dominant	13.0	Coontail	0.5	Organic
9/13/2022	E HD Colony	44.88583	-88.59293	1.58	30.0	Highly Dominant	13.0	Coontail	0.5	Organic
9/13/2022	E HD Colony	44.88583	-88.59293	0.92	13.5	Highly Dominant	13.0	Coontail	1.0	Organic
Total	30			37.66	530.0					

#### Aquatic Plant Management LLC