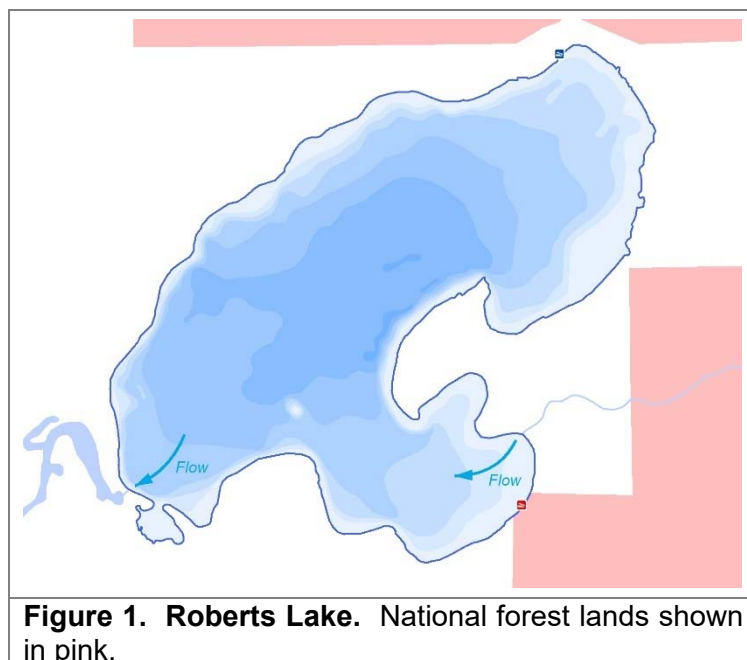


## INTRODUCTION

Roberts Lake, Forest County, is a 435-acre drainage lake with an average depth of 17 feet and a maximum depth of 32 feet (Figure 1). Eurasian water milfoil (*Myriophyllum spicatum*; EWM) was first discovered in Roberts Lake in 2015 by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC). Upon this discovery, Roberts Lake Association, Inc. (RLA) contacted Onterra, LLC to conduct studies aimed at understanding the extent of the EWM population in the lake and form an appropriate course of action going forward. The RLA, with assistance from Onterra, successfully applied for an Aquatic Invasive Species Early Detection Response Grant (AIS-EDR) through the Wisconsin Department of Natural Resources (WDNR) in December 2015.



**Figure 1. Roberts Lake.** National forest lands shown in pink.

The EWM population in Roberts Lake was found to be relatively low during the August 2015 survey and professional hand-harvesting efforts were determined to be the most appropriate method for control. Professional hand-harvesting efforts were conducted in 2015-2018 (Table 1). These efforts have contributed to a sustained relatively low EWM population within Roberts Lake since detection. Specific details of the activities were reported within each year's respective annual report.

**Table 1. Summary of professional hand-harvesting activities in Roberts Lake from 2015-2018.**

	Dive Time (hr)	EWM Removed (cubic feet)
2015	12.75	37.00
2016	9.25	22.00
2017	13.00	23.25
2018	6.99	25.50

Field distinction between EWM and native watermilfoils in Roberts Lake have historically been difficult. During the fall of 2018, Onterra staff collected three milfoil plant specimens from Roberts Lake near the Wild Rose private boat launch and submitted them for DNA analysis testing at Montana State University. The lab DNA analysis confirmed the specimens to be hybrid watermilfoil (HWM), a cross between EWM and northern watermilfoil. Within this report EWM and HWM will be referred to solely as EWM unless specifically noted.

The RLA successfully applied for a Phase II AIS-EDR Grant which provides funding for EWM monitoring and management from 2018-2020. While eradication is not feasible, keeping the population contained to low occurrences will reduce the potential of the EWM population rapidly increasing to levels that could cause ecosystem impacts and user conflicts (i.e. recreation, navigation, aesthetics). At the end of the project, the goal is to maintain the low EWM population documented in 2018, including no colonized areas of EWM (i.e. mapped with polygon-based methods). The project budget includes \$4,000 of professional hand-harvesting each year, but may require a revised distribution of these funds depending on the results of the annual monitoring.

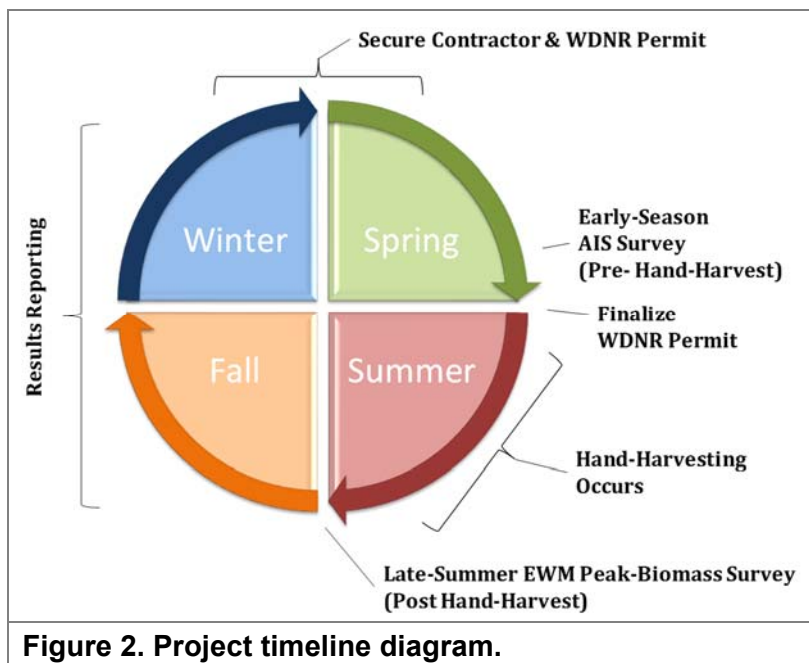
During the first year of the project in 2018, monitoring showed an increase in the EWM population in Roberts Lake compared to previous surveys, despite the harvesting efforts. Based on the EWM population identified in September 2018, traditional harvesting coupled with the use of Diver Assisted Suction Harvesting (DASH) were determined to be an appropriate management technique for 2019. A preliminary strategy for hand harvesting was developed which targeted all areas of known EWM with work areas divided up into two sites that totaled 2.6 acres (Map 1). Isolated EWM occurrences along the northern shoreline of the lake were given first priority for removal efforts in an effort to inhibit EWM from becoming established in new areas of the lake. This report discusses the monitoring and hand-harvesting control activities that were completed during the second year (2019) of this three-year project.

## 2019 EWM MANAGEMENT AND MONITORING STRATEGY

Professional hand-harvesting firms can be contracted for hand-harvesting and can either use basic snorkeling or scuba divers, whereas others might employ the use of a Diver Assisted Suction Harvest (DASH) which involves divers removing plants and feeding them into a suctioned hose for delivery to the deck of the harvesting vessel. The DASH system is thought to be more efficient than manual removal alone as the diver does not have to go to the surface to deliver the pulled plants to someone on a boat. The DASH system also is theorized to cause less fragmentation, as the plants are immediately transported to the surface using the suction hose.

Typically, a pair of EWM mapping surveys are used to coordinate and monitor the hand-harvesting efforts (Figure 2). An Early Season AIS Survey was not included within the scope of this grant funded project, however is sometimes employed with the purpose of refining the preliminary hand harvesting strategy. Instead, the September 2018 EWM Mapping Survey results were used to guide the hand harvesting efforts in 2019.

After the hand-harvesting was completed, Onterra ecologists conducted the Late-Summer EWM Mapping Survey, the results of which serve as a post-harvesting assessment of the hand-removal efforts. The hand-removal program would be considered successful if the density of EWM within the targeted areas was found to have decreased from the 2018 Late-Summer EWM Mapping Survey to the 2019 Late-Summer EWM Mapping Survey.



**Figure 2. Project timeline diagram.**

## HAND-HARVESTING MANAGEMENT ACTIONS

The RLA contracted with Aquatic Plant Management, LLC (APM) to conduct hand-harvesting activities of EWM in 2019. Plant removal specialist from APM conducted traditional hand-harvesting and DASH activities on July 8, 2019 and July 26, 2019, spending a total of 10.77 combined diver hours actively hand-harvesting EWM within Roberts Lake and removing approximately 57.50 cubic feet of EWM (Table 2). Removal efforts were initially directed at the isolated known EWM occurrences consisting of *clumps of plants* or *single or few plants* at B-19 before moving on to the additional three *single or few plant* occurrences on the north west shoreline. Remaining harvesting efforts were then directed towards the *scattered* and *highly scattered* colonies within site A-19. Details of the professional hand-harvesting conducted in 2019 as reported by APM are included with this report as an Appendix.

**Table 2. Roberts Lake 2019 professional hand-harvesting activities.**

Location	Crew Dive Time (hr)	EWM Removed (cubic feet)
A-19	8.01	52.00
B-19	1.92	4.50
NW Shoreline	0.84	1.00
<b>Total</b>	<b>10.77</b>	<b>57.50</b>

## RLA SURVEILLANCE MONITORING

Members of the RLA have been trained in AIS identification and conducted AIS surveillance monitoring. Should the RLA discover a new EWM, or suspected EWM occurrence in the course of the monitoring, a GPS point would be taken and the spatial data would be relayed to Onterra prior to completing the late-summer EWM mapping survey.

During 2019, RLA volunteers reported spending 221 hours of surveillance from boats, kayaks or by wading and snorkeling searching for EWM during the growing season. Additional volunteer time was spent on communication, educational activities, as well as coordinating with, and providing assistance to the professional hand harvesting firm in 2019. Volunteers identified a suspected colony of EWM off the northern shores of Roberts Lake during the course of their summer monitoring efforts. The location of the suspected EWM colony was provided to Onterra and it was determined that the location in question was likely the *clump of plants* that was identified during the late-summer 2018 survey and was within site B-19 of the 2019 hand harvesting strategy.

## LATE-SUMMER EWM MAPPING SURVEY RESULTS

The Late-Summer EWM Mapping Survey was conducted on September 20, 2019 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 Roberts Lake was meandered and EWM observed 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*. During the survey, the field crew noted excellent conditions with mostly sunny skies and nearly no wind.

The results of the 2019 Late-Summer EWM Mapping Survey are displayed on Map 2. Overall, the survey results show an increase in the EWM population compared to past surveys, with the largest

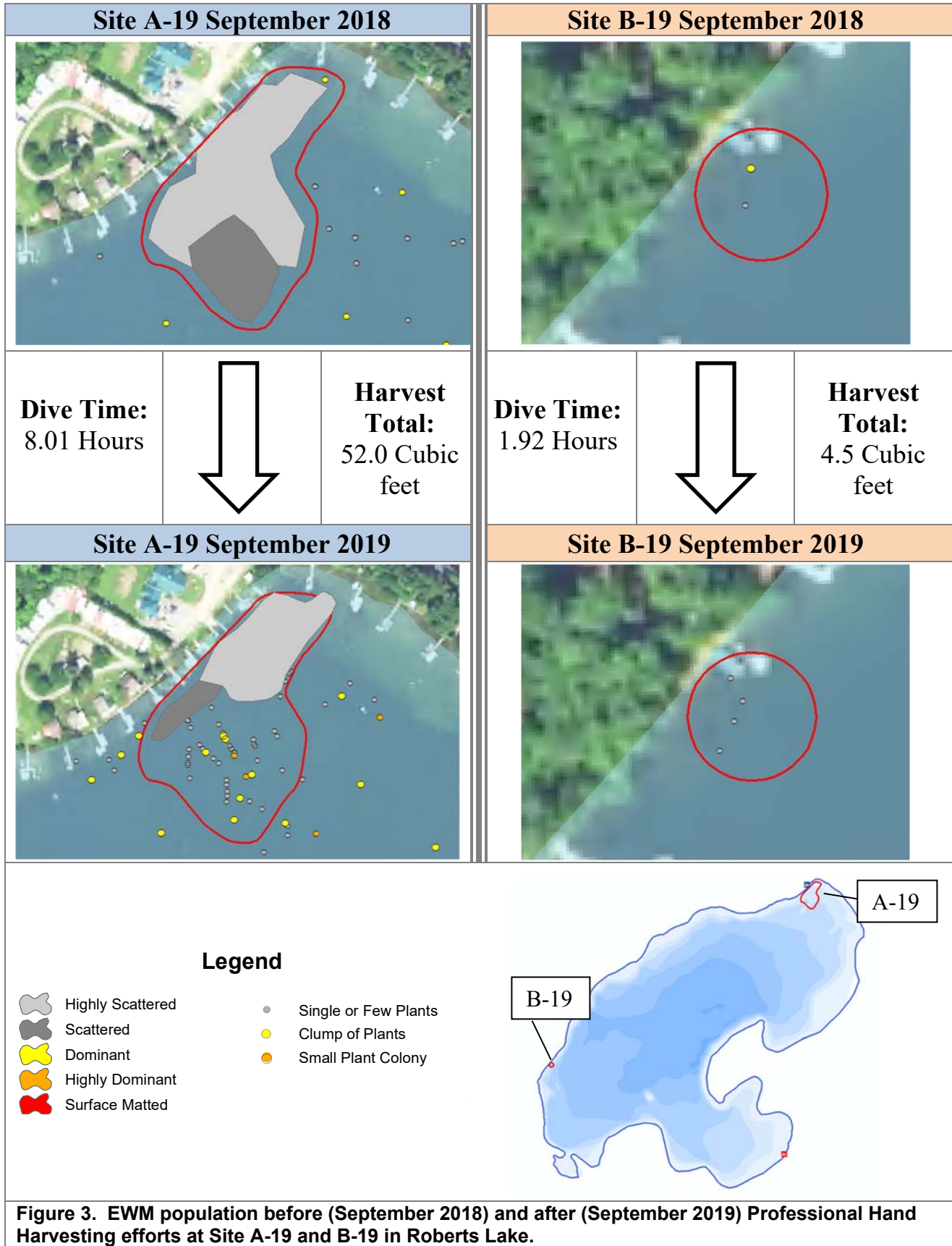
concentration of EWM residing in the area near the Wild Rose Pub & Grill access and the northeast shoreline. Colonized areas of EWM totaled approximately 2.3 acres and consisted of *highly scattered*, *scattered*, and *dominant* densities. A number of *single or few plants*, *clumps of plants*, and *small plant colonies* were also located in the northeast portion of the lake.

Several isolated EWM occurrences were found around Roberts Lake in areas where EWM had not been documented in previous surveys. Among the new sites were several *single or few plants* and *clumps of plants* south of the main EWM population on the northeast side of the lake (Map 3). Isolated *single or few plants* were located near shore areas along the western shoreline and in a number of locations along the northern shoreline as well (Map 3).

### **Professional D.A.S.H. Site Assessments**

**Site A-19:** Harvesting efforts in Site A-19 totaled 8.01 hours and resulted in the harvest of 52 cubic feet of EWM (Table 2). The EWM population showed a decrease in size in the *scattered* and *highly scattered* colonies (Figure 3). Efforts in site A-19 were sufficient to reduce the EWM population in the part of the site, however, additional effort was needed to achieve a greater level of control.

**Site B-19** Site B-19 was given first priority for professional hand harvesting services. The site contained a *single or few plants* and a *clump of plants* occurrence at the time of the September 2018 survey. Harvesting efforts in the site totaled 1.92 hours and resulted in the harvest of 4.5 cubic feet of EWM. The Late-Summer 2019 EWM Mapping Survey indicated a few *single or few plants* remained in the site and the previously identified *clumps of plants* was no longer present (Figure 3).



**Figure 3. EWM population before (September 2018) and after (September 2019) Professional Hand Harvesting efforts at Site A-19 and B-19 in Roberts Lake.**

## CONCLUSIONS AND DISCUSSION

Surveys conducted in 2019 showed the EWM population had expanded compared to previous years and has begun to populate new sites around the lake. The main increase in EWM population has been in the northeast end of the lake where the population has progressed to form colonized areas in addition to an increasing number of *small plant colonies* and *clumps of plants* in that area of the lake (Map 3). The 2019 hand-harvesting efforts yielded the largest amount of EWM (57.50 cubic feet) since 2015 (37.0 cubic feet), however the expansion of the EWM population in Roberts Lake has outpaced the rate at which it can be harvested.

Separating EWM from HWM occurrences in Roberts Lake with confidence would only be possible through conducting a costly and intensive study that includes DNA analysis. Field observations during the 2019 surveys suggested that HWM is more prevalent near the private access in the northeast end of the lake, while most occurrences around the lake were thought to be EWM. It is important that any hand harvesting efforts recognize HWM rather than confusing it with the morphologically similar and native northern watermilfoil.

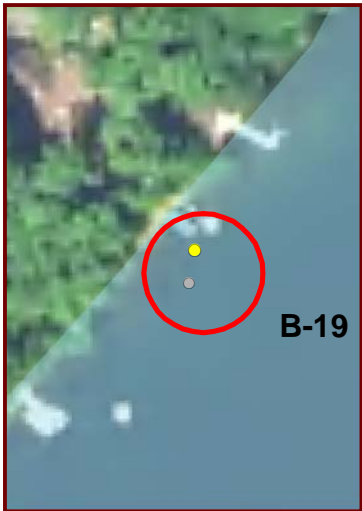
### **2020 EWM Management Strategy**

It is not feasible for the RLA to target the entire EWM population in Roberts Lake with hand harvesting, and thus prioritizing where the efforts are most beneficial is necessary. Similar to last year's strategy and given the limited funds available, the RLA may consider prioritizing any hand harvesting efforts towards the isolated, low-density occurrences around the lake rather than attempting to harvest EWM from within the largest concentrated area on the northeast end of the lake. This strategy would serve to reduce EWM expansion elsewhere around the lake and keep it from establishing new areas. A coordinated professional harvesting effort on the scale of 2-3 days may be sufficient in order to target all of these isolated EWM occurrences based on the population mapped during September 2019. It is believed that these isolated and low-density occurrences could be managed with traditional hand harvesting efforts without the need for DASH.

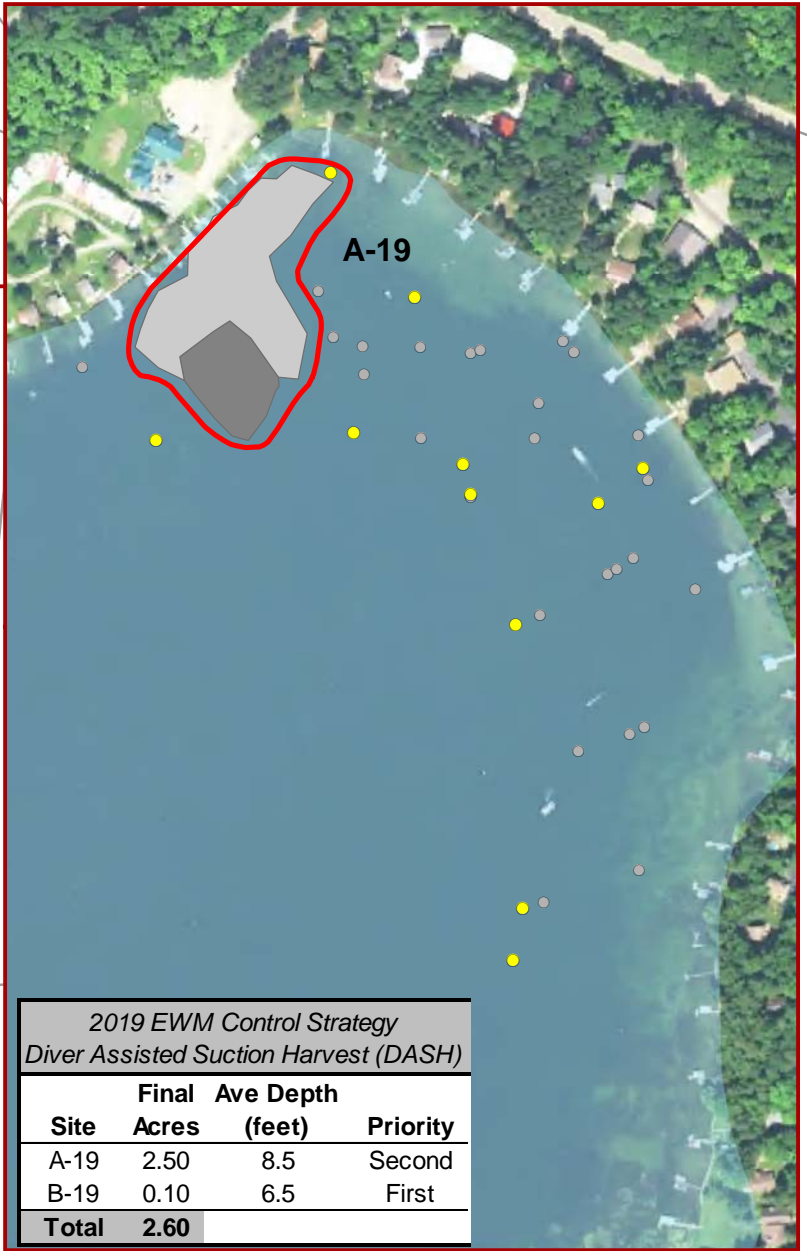
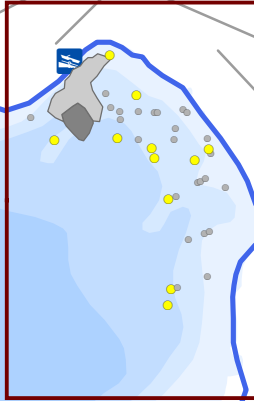
Within the Phase II AIS-EDR Grant Budget, a total of \$12,585 was included for professional hand-harvesting costs (\$4,195 x 3 years). The RLA will need to consider their remaining available resources in relation to the expectations associated with a professional hand harvesting effort in managing EWM in Roberts Lake in 2020. As a part of the project, the current plan is for a single professional EWM monitoring survey to be completed by Onterra in the late-summer of 2020. This survey will serve to assess the EWM population around the lake and evaluate any sites that were specifically targeted with hand harvesting.

If the RLA wishes to manage a larger proportion of the EWM population in Roberts Lake, hand harvesting alone would be cost prohibitive and other forms of management such as herbicide treatment, would need to be considered. Herbicide use to manage EWM/HWM has not occurred to date in Roberts Lake, and if the RLA wanted to explore this option, a significant level of planning, education, and monitoring would need to occur.

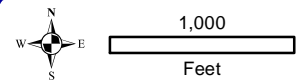
The RLA would benefit from completing a Comprehensive Lake Management Plan which would result in a holistic understanding of Roberts Lake as well as to serve to develop a short and long-term EWM/HWM management and monitoring strategy, including if and when any active EWM management activities would be considered for implementation.



B-19



A-19



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Sources:  
Roads and hydro: WDNR  
Aquatic Plants: Onterra, 2018  
Orthophotography: NAIIP, 2018  
Map Date: June 13, 2019 TWH  
File Name: RobertsForest\_EWM\_2019\_DASH\_Final.mxd



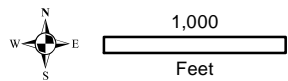
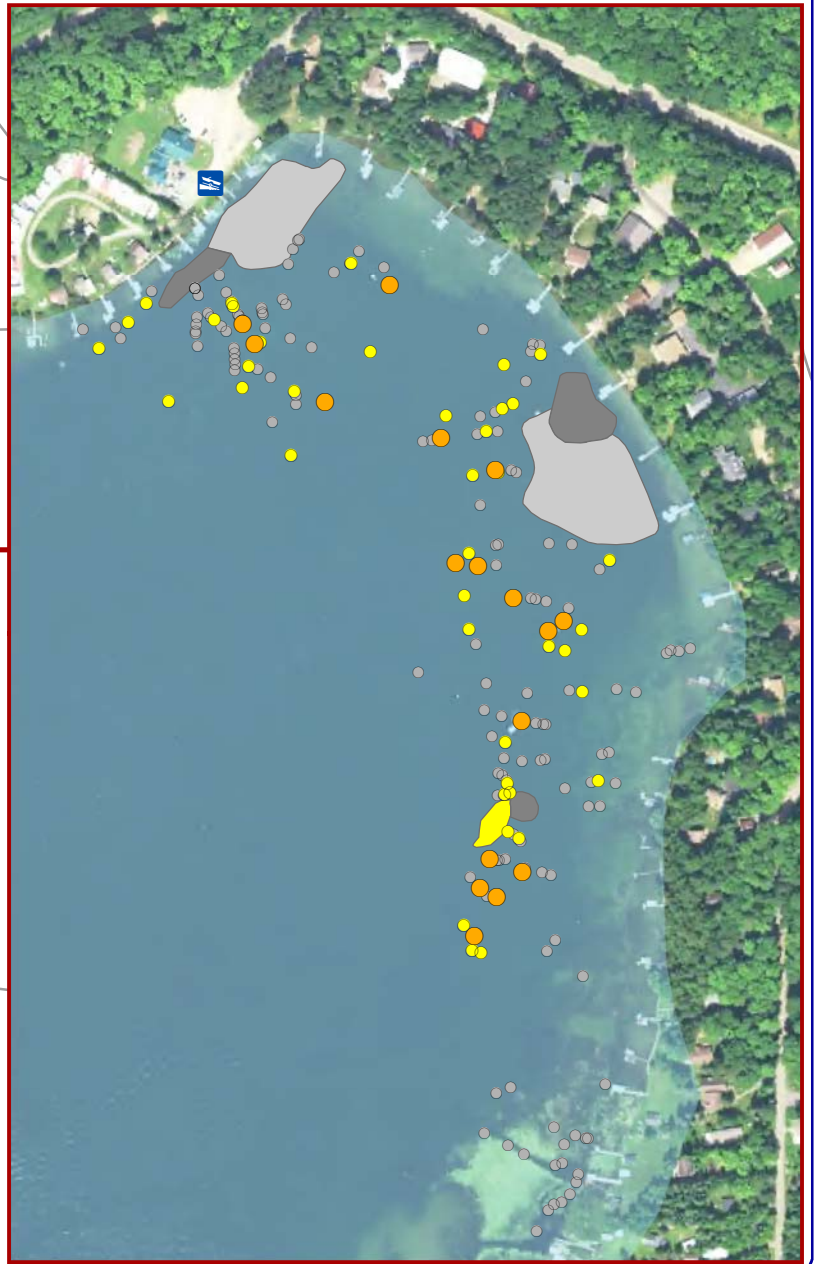
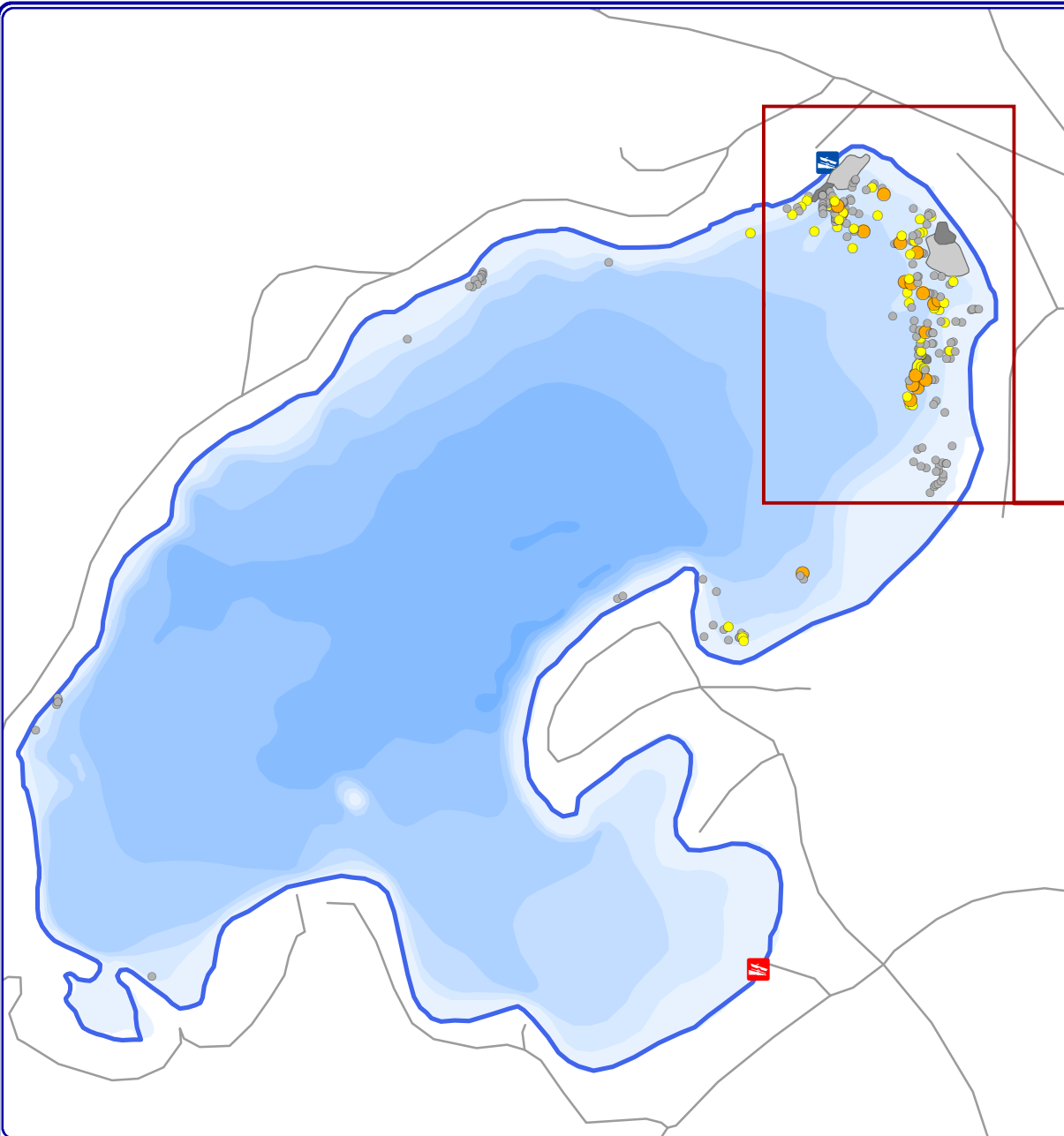
Project Location in Wisconsin

**Legend**

- Highly Scattered
- Scattered
- Dominant (none found)
- Highly Dominant (none found)
- Surface Matting (none found)
- Single or Few Plants
- Clump of Plants
- Small Plant Colony
- 2019 Final DASH Site

Map 1  
Roberts Lake  
Forest County, Wisconsin

**September 2018 EWM Survey  
Results & 2019 Hand  
Harvest Strategy**



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Sources:  
 Roads and hydro: WDNR  
 Aquatic Plants: Onterra, 2019  
 Orthophotography: NAIP, 2018  
 Map Date: October 21, 2019 AMS  
 File Name: RobertsForest\_EWM\_Sept19.mxd



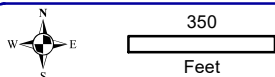
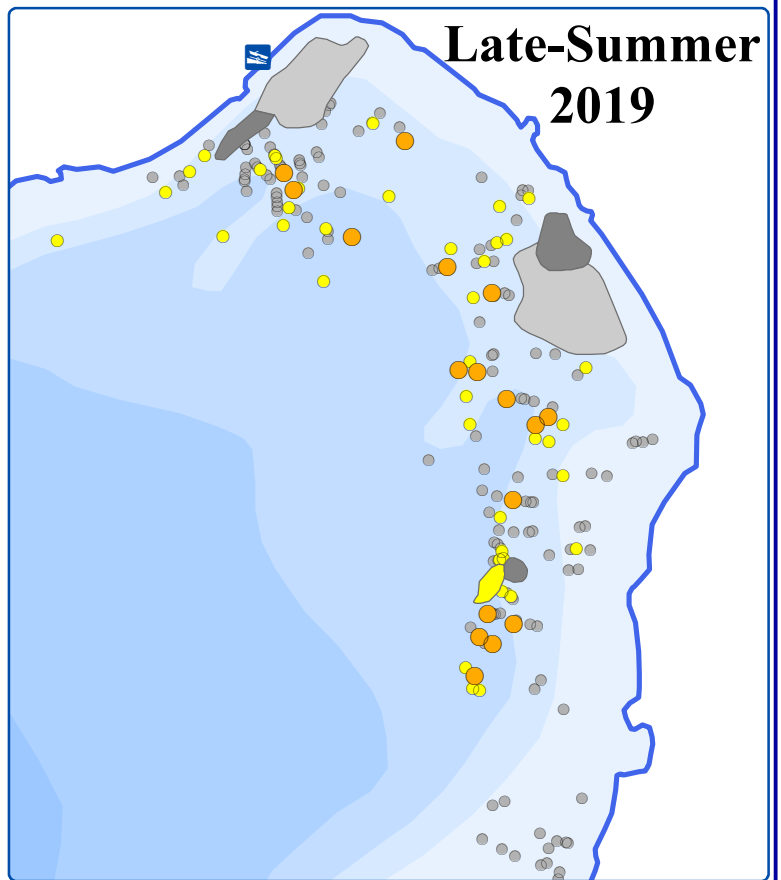
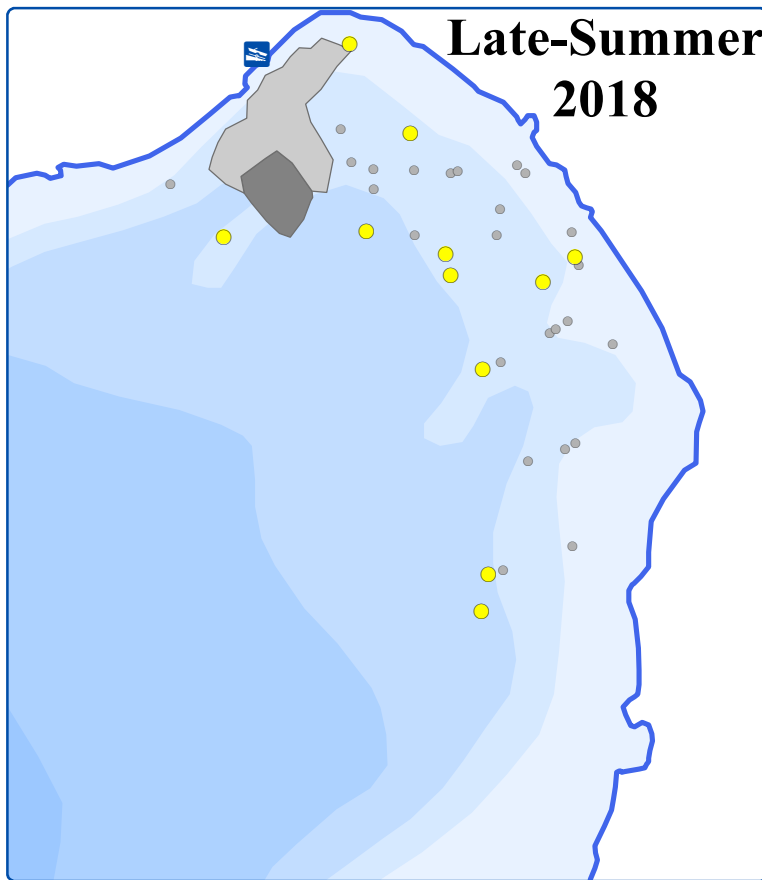
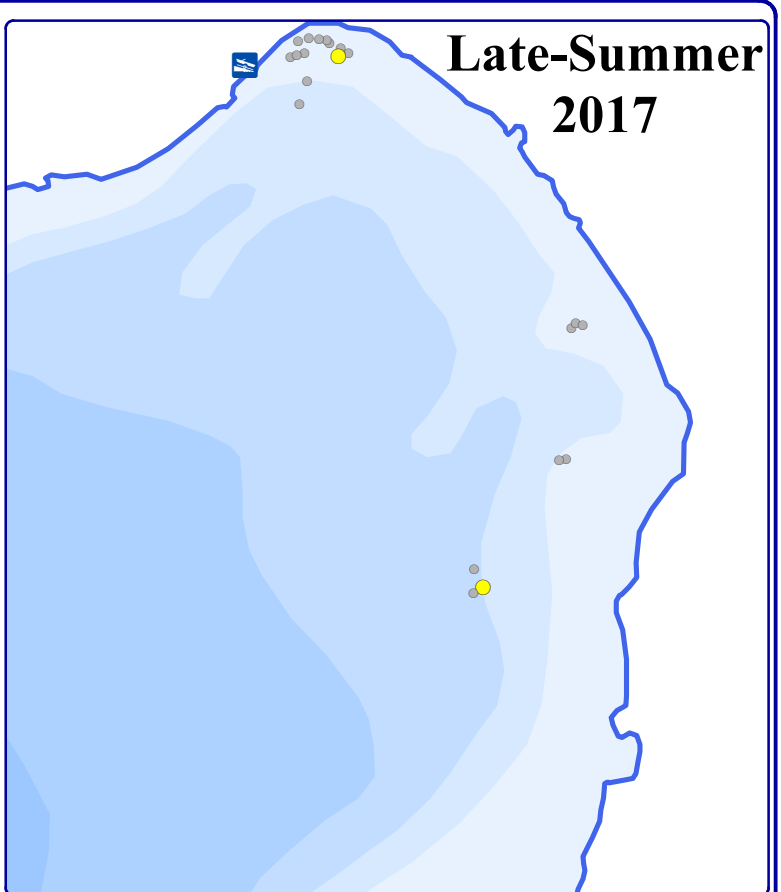
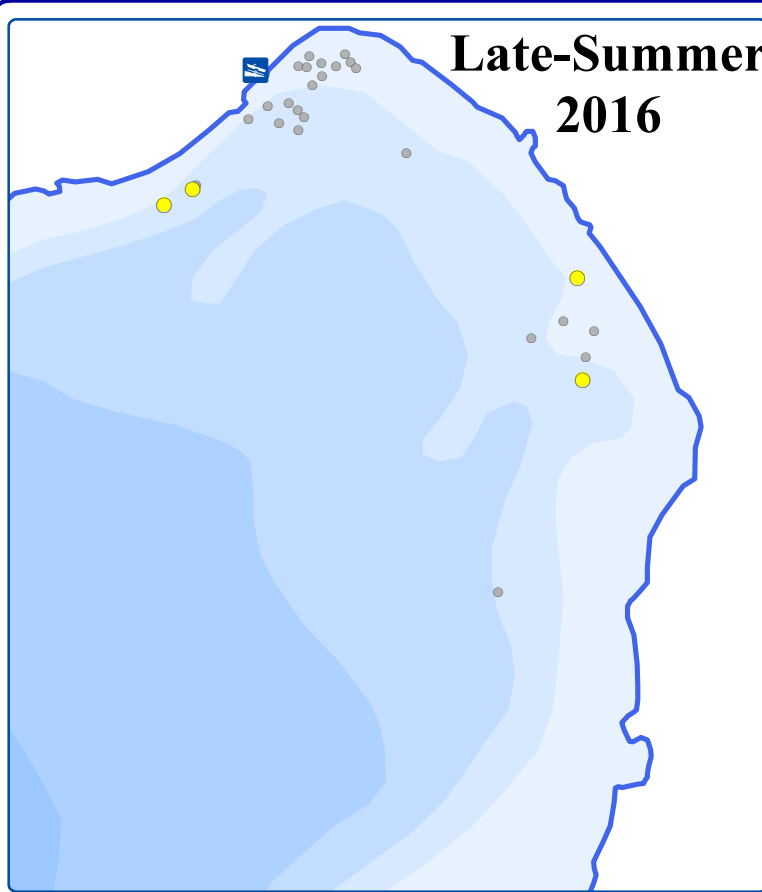
Project Location in Wisconsin

**Legend**

- |  |                                     |  |                      |
|--|-------------------------------------|--|----------------------|
|  | Highly Scattered                    |  | Single or Few Plants |
|  | Scattered                           |  | Clump of Plants      |
|  | Dominant                            |  | Small Plant Colony   |
|  | Highly Dominant <i>(none found)</i> |  |                      |
|  | Surface Matting <i>(none found)</i> |  |                      |

Map 2  
 Roberts Lake  
 Forest County, Wisconsin  
**September 2019 EWM  
 Survey Results**





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 www.onterra-eco.com

Sources:  
 Roads and Hydro: WDNR  
 Bathymetry: WDNR, Digitized by Onterra  
 Plant Survey: Onterra, 2016-2019  
 Map Date: March 4, 2020 - TWH



#### Legend

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting
- Single or Few Plants
- Clumps of Plants
- Small Plant Colony

Map 3  
 Roberts Lake  
 Forest County, Wisconsin  
**2016 - 2019 EWM  
 Survey Results**

# A

## APPENDIX A

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**Aquatic Plant Management, LLC EWM Treatment Report 2019**



# Roberts Lake EWM Treatment Report 2019

PO Box 1134 Minocqua, WI 54548

# Roberts Lake EWM Treatment Summary 2019

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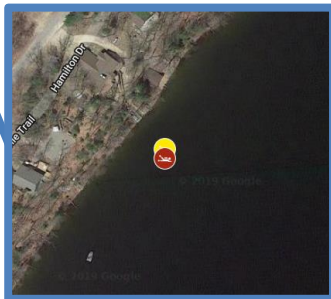
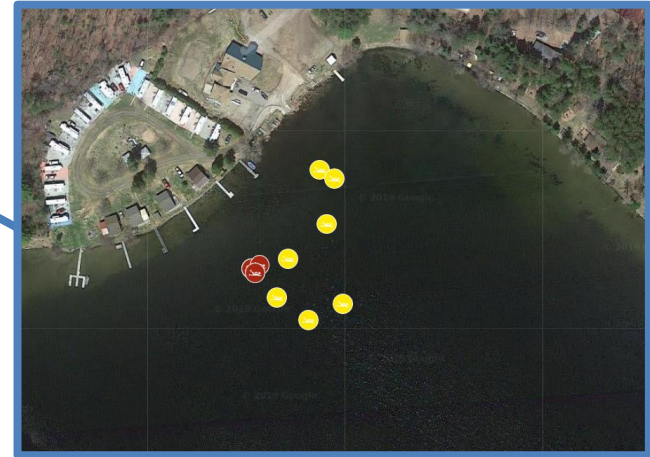
**Summary:** On July 8<sup>th</sup> Aquatic Plant Management LLC (APM) conducted Diver Assisted Suction Harvesting (DASH) of Eurasian Watermilfoil (EWM) on Roberts Lake in Forest County, WI. Subsequently on July 26<sup>th</sup> APM conducted traditional hand harvesting services. Utilizing maps and GPS coordinates provided by Onterra LLC, the DASH team initially focused their removal efforts on the clumps of plants at site B-19 before shifting to the scattered plants at site A-19. In total on July 8<sup>th</sup> the DASH team removed 38 cubic feet of EWM. Upon returning to Roberts lake on July 26<sup>th</sup>, the hand harvesting team initially started at B-19 before moving down the northwestern shoreline at select locations. The hand harvesting team ended their day at site A-19. With the 38 cubic feet removed by the DASH team, and the 19.5 cubic feet removed by the hand harvesting team, in total APM was able to remove **57.5 cubic feet of EWM** from Roberts Lake.

## Conditions:

- 7/8/19: Weather was sunny with an air temperature of 81 degrees; water temperature was 74 degrees with a 6.0 foot clarity reading from the Secchi disk
- 7/26/19: Weather was cloudy including periods of rain with an air temperature of 66 degrees; water temperature was 76 degrees with a 4.5 foot clarity reading from the Secchi disk

**Recommendations:** Given the relatively scattered nature of the EWM population on Roberts Lake, a two pronged DASH and hand harvesting approach is most effective for manual removal efforts on Roberts Lake. DASH was most efficient at removing the bulk of the EWM mass from the denser locations, then the follow-up effort with hand harvesting was better suited to deal with the more scattered plants remaining at sites A-19 and B-19 as well as the NW shoreline. Continued monitoring and management efforts are important to prevent proliferation of EWM throughout Roberts Lake.

# Map of Roberts Lake Dive Sites



HH Dive Site



DASH Dive Site

# Detailed Diving Activities

## EWM DASH Results:

Date	Dive Location	Latitude	Longitude	Time Under-water	AIS CF Removed	AIS Density	Avg Water Depth	Native By-Catch (CF)	Native Species	Native Density	Substrate Type
7/8/19	B-19	45.45507	-88.79974	0.92	4.0	Medium	9.5	0.00	None	Low	Gravel
7/8/19	A-19	45.46331	-88.78118	0.67	4.5	Low	12	0.50	Coontail	High	Organic
7/8/19	A-19	45.46317	-88.78100	0.5	7.5	Low	12	0.50	Coontail	High	Organic
7/8/19	A-19	45.46314	-88.78054	0.67	4.5	Low	12.5	1.00	Chara	High	Organic
7/8/19	A-19	45.46306	-88.78078	0.58	3.0	Low	12.5	0.50	Chara	High	Organic
7/8/19	A-19	45.46336	-88.78092	0.5	3.0	Low	12	1.00	Chara	High	Organic
7/8/19	A-19	45.46353	-88.78065	0.75	7.0	Low	6	1.00	Coontail	High	Organic
7/8/19	A-19	45.46379	-88.78070	0.42	3.0	Low	6	<0.5	Chara	High	Organic
7/8/19	A-19	45.46375	-88.78060	0.25	1.5	Low	6	<0.5	Coontail	High	Organic
<b>Total</b>					<b>38.0</b>						

# Detailed Diving Activities

## EWM Hand Harvesting Results:

Date	Dive Location	Latitude	Longitude	Time Under-water	AIS CF Removed	AIS Density	Avg Water Depth	Native By-Catch (CF)	Native Species	Native Density	Substrate Type
7/26/19	B-19	45.45503	-88.79974	1	0.5	Low	8	<0.5	Pondweeds	Low	Gravel
7/26/19	NW Shoreline	45.46071	-88.79262	0.42	0.0	Low	5	0.00	None	High	Organic/Sand
7/26/19	NW Shoreline	45.46126	-88.79133	0.17	0.5	Low	5.5	0.00	None	High	Organic/Sand
7/26/19	NW Shoreline	45.46225	-88.78929	0.25	0.5	Low	4	<0.5	Northern Milfoil	High	Organic/Sand
7/26/19	A-19	45.46331	-88.78118	0.83	3.5	Low	3.5	<0.5	Northern Milfoil	High	Organic
7/26/19	A-19	45.46333	-88.78112	1.92	5.5	Medium	3.5	<0.5	Northern Milfoil	High	Organic
7/26/19	A-19	45.46329	-88.78115	0.92	9.0	Medium	3.5	<0.5	Northern Milfoil	High	Organic
<b>Total</b>					<b>19.5</b>						