

Roberts Lake

Forest County, Wisconsin

2018-2020 Final EWM Monitoring & Control Strategy Assessment Report

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1.0 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 1.0-1). 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.

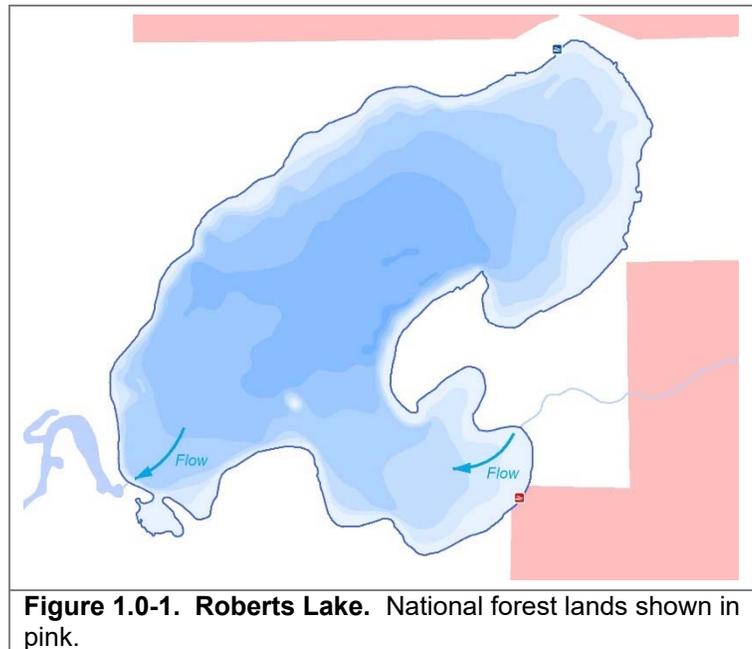


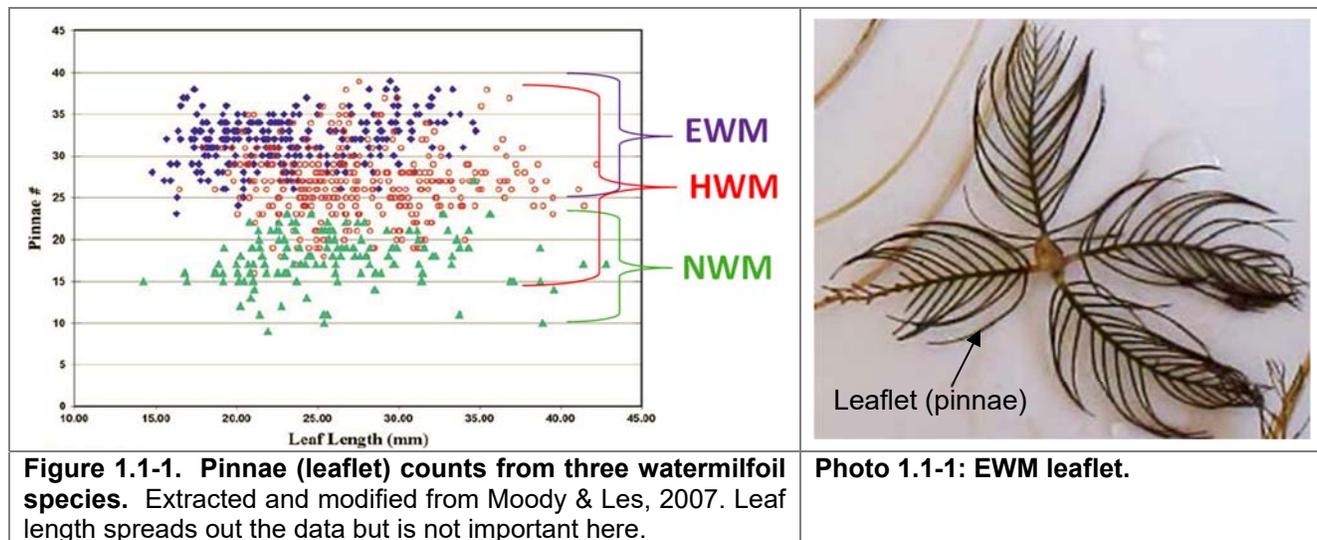
Figure 1.0-1. Roberts Lake. National forest lands shown in pink.

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 have been conducted on Roberts Lake from 2015-2020. Specific details of the activities were reported within each year's respective annual report. This report serves as the final deliverable for the Phase II AIS-EDR Grant which has provided funding for EWM monitoring and management from 2018-2020.

During the first year of the Phase II 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. The two sites that were targeted for DASH efforts in 2019 resulted in seasonal EWM suppression in the targeted areas. Due to the EWM expansion in 2019 and a greater understanding of the limited expectations of this management technique, the 2020 hand harvesting strategy was shifted to focusing harvesting efforts outside of the eastern portion of the lake which contained the most EWM. 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.

1.1 Invasive Watermilfoil Genetics

Photo 1.1-1 shows a cross-section of a whorl of four EWM leaves. One of the primary ways to distinguish between different species of watermilfoils is to count the number of leaflets on each leaf. As shown on Figure 1.1-2, northern watermilfoil (green triangles) typically have leaflet counts under 23 whereas EWM typically has leaflet counts over 25. Hybrid watermilfoil (HWM) leaflet counts overlap with both these ranges, making field identification difficult. While leaflet counts can be a relatively definitive way to differentiate between EWM and northern watermilfoil, this method is less definitive in distinguishing HWM from EWM and northern watermilfoil.



Field distinction between EWM and native watermilfoils in Roberts Lake have historically been difficult. Genetic analysis allows for accurate determination of watermilfoil species. A single representative plant sample was collected in 2015 and sent by Onterra to the Annis Water Resources Institute for DNA analysis. The sample was determined to be pure-strain EWM. 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. Without conducting an exhaustive and systematic study of watermilfoil genetics on Roberts Lake, it remains unknown what composition of the invasive watermilfoil population is HWM vs EWM. Within this report EWM and HWM will be referred to solely as EWM unless specifically noted.

2.0 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.

In 2015-2018, a pair of EWM mapping surveys were used to coordinate and monitor the hand-harvesting efforts in Roberts Lake (Figure 2.0-1). This allowed Onterra to find sufficient locations for the DASH efforts to be focused on and create prioritization. As the EWM population increased, the utility of completing the survey at the beginning of the season diminished as the prior years' Late Season EWM Mapping Survey already provides sufficient guidance for the hand harvesting efforts. The Early-Season AIS Survey was omitted during 2019 and 2020.

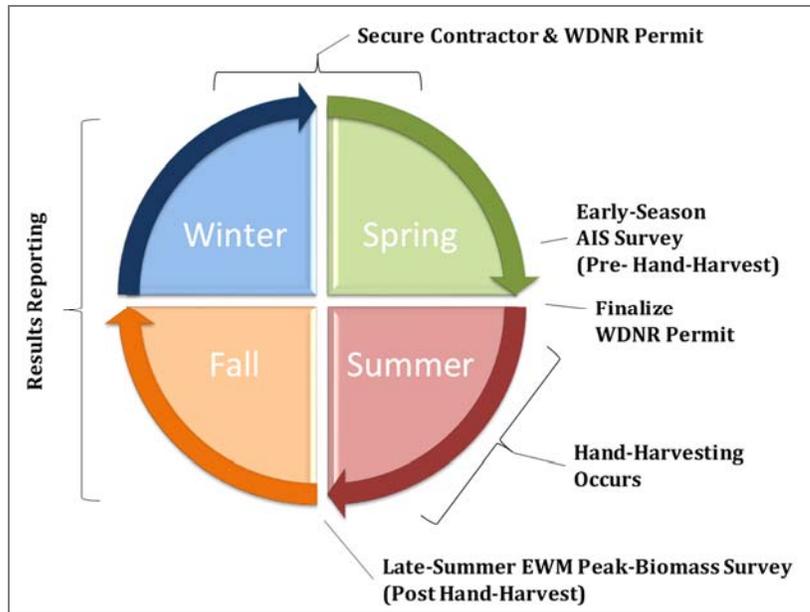


Figure 2.0-1. Project timeline diagram.

After the hand-harvesting is 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 previous year's Late-Summer EWM Mapping Survey.

3.0 2020 AQUATIC PLANT MONITORING RESULTS

3.1 Hand-Harvesting Management Actions

The September 2019 EWM Mapping Survey results (Map 1) was used to guide the professional hand harvesting efforts in 2020. The RLA contracted with Aquatic Plant Management, LLC (APM) to conduct hand-harvesting activities of EWM in 2020. Plant removal specialists from APM conducted traditional hand-harvesting (without DASH) on July 1, 2020 and July 20, 2020, spending a total of 11.5 combined diver hours actively hand-harvesting EWM within Roberts Lake and removing approximately 44.5 cubic feet of EWM (Table 3.1-1). Details of the professional hand-harvesting conducted in 2020 as reported by APM are included with this report as an Appendix.

Table 3.1-1. Roberts Lake 2020 professional hand-harvesting activities.

Location	Dive Time (Hours)	EWM Removed (Cubic feet)
N Shoreline	3.3	23.5
E Bay	3.7	10.0
E Point	1.6	8.0
W Shoreline	2.3	3.0
SW Bay	0.6	<1.0
Total:	11.5	44.5

Although no organized RLA monitoring efforts occurred during the summer of 2020, one member of the RLA board communicated with Onterra regarding a suspected new EWM occurrence in the US Forest Service bay of the lake. This EWM occurrence was located during the subsequent Late-Season EWM Mapping Survey and is displayed on Map 2.

3.2 Late-Summer EWM Mapping Survey Results

The Late-Summer EWM Mapping Survey was conducted on August 25, 2020 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 good conditions with mostly sunny skies and a slight breeze. Crews also noted the EWM was very easy to see even at the deeper depths of 13ft of water.

The results of the 2020 Late-Summer EWM Mapping Survey are displayed on Map 2. Overall, the survey results show a similar population of EWM population compared to the 2019 survey, 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 1.9 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 similar to where EWM had been documented in the 2019 survey.

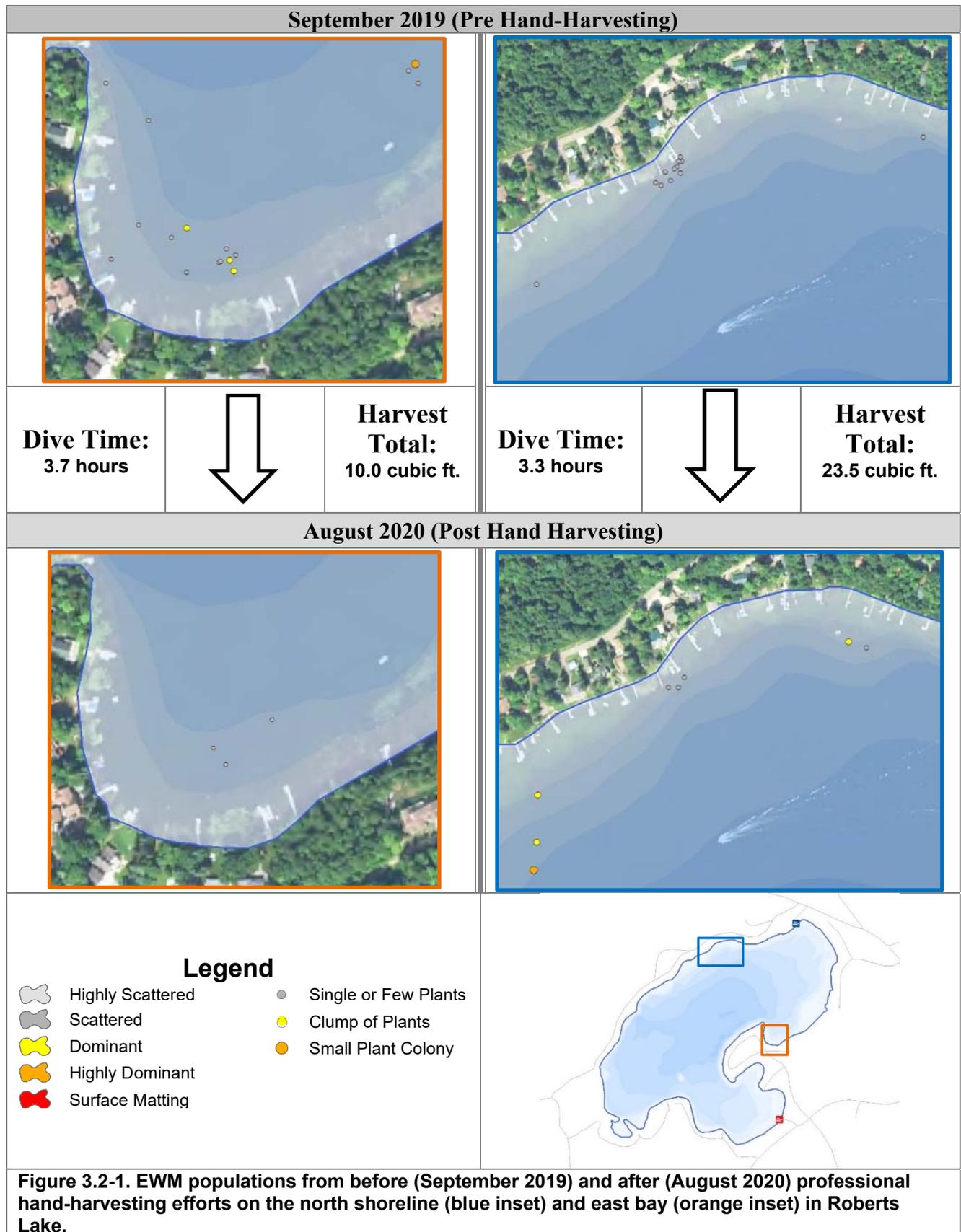
Professional Hand Harvesting Site Assessments

Traditional hand harvesting operations took place at five different locations throughout Roberts Lake. The naming convention of each site is consistent with Table 3.1-1. The two sites that contained the largest EWM populations and received the greatest amount of harvesting effort are highlighted in Figures 3.2-1 and 3.2-2 below.

The **north shoreline** hand-harvesting efforts of Roberts Lake totaled 3.3 hours and resulted in the harvest of 23.5 cubic feet of EWM (Figure 3.2-1). The EWM population showed mixed results in the point-based data recorded in August 2020 (Figure 3.2-1). Efforts on the north shore were successful in reducing the EWM population in some areas, however, three *clumps of plants* and a *small plant colony* point were also marked during the August 2020 survey in the same vicinity of the lake. The cluster of ten *single or few plant* occurrences found in 2019 was the primary focus of APM's hand harvesting efforts and divers likely did not travel far outside of this area. Within the area APM focused on there is a reduction and continued small population of EWM found in 2020.

The **east bay** harvesting efforts of Roberts Lake totaled 3.7 hours and resulted in the harvest of 10 cubic feet of EWM (Figure 3.2-1). The EWM population showed a decrease of abundance in point-based data recorded (Figure 3.2-1). Efforts in the east bay were sufficient to reduce the EWM population in the area with just three *single or few plants* occurrences marked during the August 2020 survey.

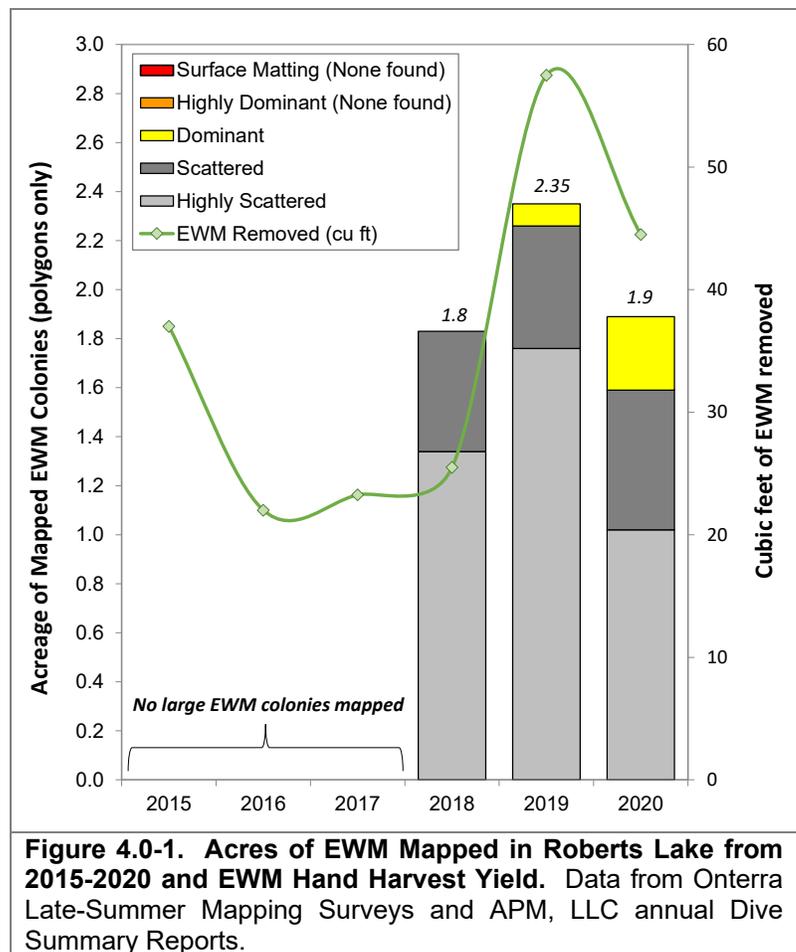
Modest harvesting efforts also took place targeting low-density EWM occurrences that were identified in the 2019 survey around Roberts Lake. The post-harvesting survey indicates that the EWM population remains low in these areas.



4.0 2015-2020 AQUATIC PLANT MONITORING RESULTS

Late-summer EWM mapping surveys have occurred annually on Roberts Lake from 2015-2020. Map 3 displays the EWM population progression in Roberts Lake spanning from 2017-2020. The mapping surveys indicate that the EWM population has expanded significantly within the northeast end of the lake, while the rest of the lake has been limited to small and isolated occurrences to date. The initial goal of the hand harvesting program during this project of maintaining the EWM population below levels requiring area-based mapping was not met, however; as the project progressed, the goal of the harvesting strategy evolved. The 2020 hand harvesting strategy of inhibiting EWM from populating new areas of the lake, should be considered successful. All areas where professional hand harvesting efforts took place either saw a reduction in EWM or were maintained at a low population in the area. Surveys conducted in 2020 showed the overall EWM population was of a similar footprint as the last survey conducted in 2019.

Figure 4.0-1 displays the acres of EWM mapped during the annual late-summer surveys. It is important to note Figure 4.0-1 only accounts for EWM occurrences which were mapped with area-based methods (polygons) and does not account for any occurrences mapped with point-based methods (*singles, clumps, small plant colonies*). As areas that are mapped with a collection of point-based methods increase in population, they become more appropriate for mapping with area-based methods and thus contribute to the acreage totals. During 2015 to 2017, only point-based mapping methods were used to categorize the EWM population as no large contiguous areas were present at that time. A total of 1.9 acres of EWM were mapped in Roberts Lake during the 2020 Late-Summer EWM Mapping Survey (Figure 4.0-1). Although the footprint of EWM over time has trended higher, at just 1.9 acres, the population is still considered modest lake-wide.



Hand-harvesting has also coincided with Late-Summer EWM Mapping Surveys in recent years. Harvesting efforts were increased in 2019 with the hope of an EWM population decrease in 2020. While overall slightly less acreage of EWM colonies were mapped in 2020, an increase in *dominant* colonies was found.

A total of 105.6 combined diver hours have been spent over the past six years and has yielded approximately 209.75 cubic feet of EWM harvest during that time span (Table 4.0-1). Initial hand harvesting efforts targeted the entire known EWM population in the lake, however as the population increased in the northeast end of the lake in particular, the harvesting strategy was modified to target isolated and smaller density occurrences around the remainder of the lake.

Table 4.0-1. Roberts Lake, 2015-2020 professional hand-harvesting activities.

Year	Dive Time (hr)	EWM Removed (cubic feet)
2015	12.8	37.0
2016	9.3	22.0
2017	13.0	23.3
2018	48.3	25.5
2019	10.8	57.5
2020	11.5	44.5
Total:	105.6	209.8

Professional DASH efforts near the Wild Rose Pub and Grill private boat landing in 2019 led to seasonal EWM population suppression in part of the site. This site was not targeted in 2020 as the hand harvesting strategy shifted towards targeting other smaller, more isolated EWM occurrences around the lake. The presence of two *dominant* EWM colonies that rebounded within the area where initial reductions were most evident during the September 2019 Survey demonstrate that the reductions in EWM in the site did not extend beyond the initial year during which the harvesting took place. This suggests that if hand harvesting is attempted in this site, it is likely to result in short-term reductions to the EWM population. A much greater amount of hand harvesting effort is likely necessary to achieve longer-term control in this site and alternative management strategies may be a more cost-effective technique worth investigating if this site is managed in the future.

5.0 CONCLUSIONS AND DISCUSSION

Over the course of this project, the RLA has learned a great deal about the applicability of a coordinated professional hand harvesting program in managing EWM in Roberts Lake. The RLA has gained insights as to the capabilities as well as the limitations of hand harvesting with or without the aid of DASH, as a tool to manage EWM. 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. It is believed that a theoretical herbicide treatment that targets the main EWM population in the northeast end of the lake could result in multiple years of reduced EWM depending on the herbicide that is selected. Herbicide use incurs risks, such as non-target impacts to valuable aquatic plant communities.

In some instances, the EWM population of a lake may plateau or reduce without conducting active management. Some lake groups decide to periodically monitor the EWM population, typically through a semi-annual point-intercept survey, but do not coordinate active management (e.g. hand-harvesting or

herbicide treatments). This requires that riparians tolerate the conditions caused by the EWM, acknowledging that some years may be problematic to recreation, navigation, and aesthetics. Individual riparians may choose to hand-remove the EWM within their recreational footprint, but most often the lake group chooses not to assist financially or with securing permits (only necessary if Diver Assisted Suction Harvest [DASH] is used).

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. The WDNR recommends lakes conducting management activities to have an up-to-date management plan, being no more than 5 years old. Having a current and approved plan makes the sponsor eligible for WDNR grants that implement an action, so long as that management action is specifically outlined within the plan. Within the Comprehensive Lake Management Plan will be an Implementation Plan section which would be developed to create a strategy to manage EWM on Roberts Lake. The plan would also incorporate “best management practices” for actions such as EWM management, which have evolved since the previous AIS-EDR projects.

The RLA may consider soliciting a professional hand harvesting contractor during 2021 with the intention of inhibiting EWM from establishing in new areas of the lake by targeting isolated and relatively low-density occurrences around the lake. The RLA would need to pay out-of-pocket for these services if no funds remain within the original grant budget. The August 2020 EWM mapping survey could be used to guide any potential hand harvesting efforts during 2021.

Onterra recommends that the RLA conduct periodic late-season EWM mapping surveys to understand the population dynamics of this species. The survey results may help determine if future hand-harvesting operations are having an impact on the population. The survey results may also allow an understanding of how the EWM population changes in absence of management.