

1.0 INTRODUCTION

Anvil Lake, Vilas County, is an approximate 357-acre mesotrophic seepage lake with a maximum depth of 30 feet (measured in 2014) and a mean depth of 19 feet (Figure 1.0-1). The lake harbors a high-quality native aquatic plant community with 37 native species, 22 of which have a coefficient of conservatism of 7 or higher. Anvil lake also contains a population of Vasey's pondweed (*Potamogeton vaseyi*), a native aquatic plant listed as special concern in Wisconsin due to its relative rarity. The lake has high water clarity, with an average summer Secchi disk depth of 12 feet.

The non-native, invasive aquatic plant Eurasian watermilfoil (*Myriophyllum spicatum*; EWM) was discovered in Anvil Lake in the summer of 2012 by Great Lakes Indian Fish and Wildlife Commission (GLIFWC) staff. After being made aware of GLIFWC's discovery, the Wisconsin

Department of Natural Resources (WDNR) completed a whole-lake aquatic plant point-intercept survey that same summer which confirmed additional occurrences of EWM within the lake's approximate 25-acre northern bay (North Bay). The Anvil Lake Association (ALA) contracted with Onterra, to map the EWM in Anvil Lake in August of 2012 with guidance from ALA volunteer monitoring locations. The 2012 WDNR point-intercept survey indicated that the EWM population was small, with a littoral frequency of occurrence of just 0.5%. Similarly, Onterra's 2012 mapping survey found that the EWM population was mainly isolated to North Bay and largely comprised of single-plant occurrences.

1.1 Historic AIS Management

Following discussions on how to manage the newly-discovered EWM population, the ALA elected to move forward with a non-herbicide control strategy. Since 2013, the ALA has been implementing traditional (non-mechanical) hand-harvesting using volunteers and professionally-operated diver-assisted suction harvesting (mechanical; DASH) to remove EWM from Anvil Lake. While these control efforts have likely slowed the pace of the spread and expansion of the EWM population, they have been unable to maintain or reduce the level of EWM in Anvil Lake. Professional monitoring surveys completed annually from 2012-2016 showed that most of the EWM expansion has occurred within North Bay. Sub-sample point-intercept survey data collected within North Bay showed that the occurrence of EWM increased from 4% to 57% from 2012-2016. The inability to maintain or reduce the level of EWM in Anvil Lake during this timeframe is an indication that the rate of expansion of the EWM population was exceeding the pace of removal efforts.

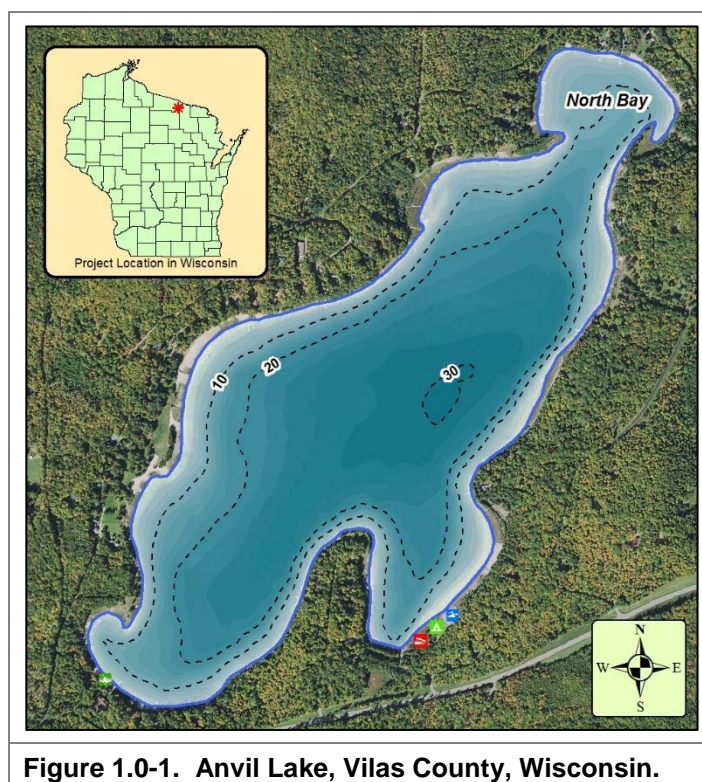


Figure 1.0-1. Anvil Lake, Vilas County, Wisconsin.

In 2014, the ALA was awarded a WDNR AIS-Education, Planning and Prevention (EPP) Grant to aid in funding a project aimed at updating the Anvil Lake comprehensive management plan developed in 2011. While the management planning update project involved the collection of a wide variety of data to gain a more holistic understanding of the Anvil Lake ecosystem, one of the primary objectives of the project was to reassess the ALA's EWM management strategy and develop a long-term monitoring and management strategy for AIS.

The management planning update project led to the development of a more aggressive EWM hand-harvesting control strategy for Anvil Lake. The strategy developed involved a three-year trial program from 2017-2019 to evaluate the effectiveness of using a combination of paid and volunteer DASH and traditional hand-removal implemented at a higher level of effort than what had been conducted from 2013-2016. The trial program proposed implementing a total of 350 hours of EWM harvesting each year with annual revisions being made to the amount of time allocated to DASH versus traditional hand-harvesting based on the level of EWM.

The ALA was awarded a WDNR AIS-EPP grant in 2016 to aid in funding the professional monitoring and control strategy development from 2017-2019. The ALA was also awarded a WDNR-Established Population Control (EPC) Grant in 2017 to aid in funding the hand-harvesting expenses from 2017-2019. The objective of this project is not to eradicate EWM from Anvil Lake as that is thought to be impossible with current tools and techniques. The objective of this project is to determine whether or not this increased level of hand-harvesting effort can reduce and maintain an EWM population to a level which exerts little to no detectable impact on the lake's ecology, recreation, and aesthetics. The DASH strategy employed on Anvil Lake in 2017 was unable to reduce the occurrence and density of EWM in North Bay, indicating the effort of 129 diver hours was unable to keep pace with the expansion of the EWM population.

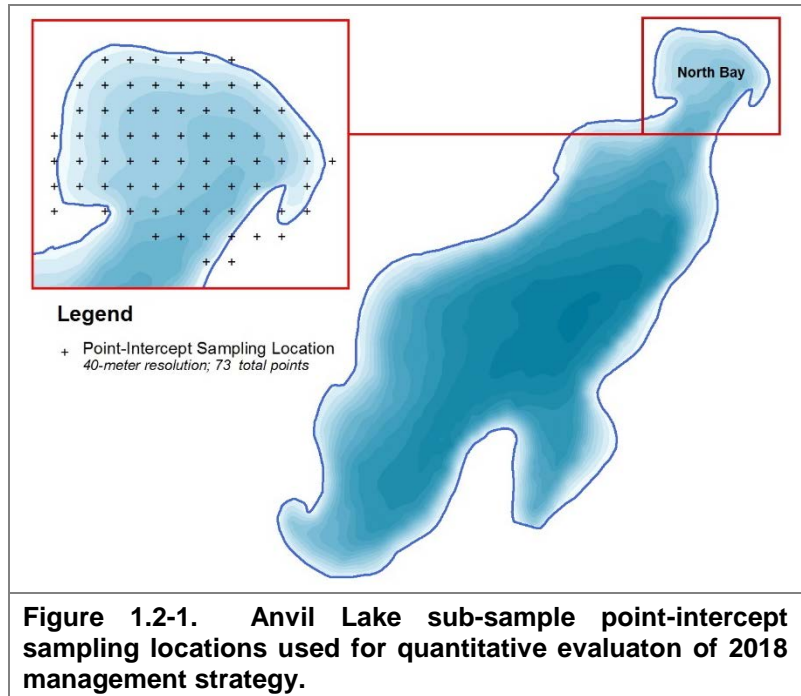
In addition to monitoring Anvil Lake's EWM population and developing control strategies, this project also includes continued monitoring of the lake's non-native curly-leaf pondweed (*Potamogeton crispus*; CLP) population from 2017-2019. Curly-leaf pondweed was discovered in Anvil Lake in 2013, and its population has since remained small. Continued monitoring of the CLP population will yield information on its dynamics in Anvil Lake and allow for active management techniques to be developed in the event the population expands. This report serves as the 2018 annual report for the 2017-2019 AIS monitoring and control project and discusses the monitoring and effectiveness of the AIS control efforts implemented in 2018.

1.2 AIS Monitoring Strategy

Eurasian watermilfoil population management programs incorporate both established qualitative (EWM mapping) and quantitative (sub-sample point-intercept survey) evaluation methodologies. Qualitative evaluation was completed using sub-meter GPS technology to map EWM locations with either 1) point-based or 2) area-based methodologies. 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*. Large colonies >40 feet in diameter were mapped using polygons (areas) and were qualitatively attributed a density rating based upon a five-tiered scale: *Highly Scattered* < *Scattered* < *Dominant* < *Highly Dominant* < *Surface Matting*. The EWM population in Anvil Lake was mapped in the late-summer of 2017 (pre-harvest), mid-June of 2018 (pre-harvest), and mid-September 2018 (post-harvest).

Qualitatively, the 2018 hand-harvesting effort would be considered successful if the EWM population exhibits a decrease in size (acres) and/or density from the late-summer 2017 survey (pre-harvesting) to the late-summer 2018 survey (post-harvesting). A decrease in density would be demonstrated by a reduction of at least one density rating (e.g. *dominant* to *scattered*). Although a June 2018 survey was conducted, the results of this survey are not representative of the EWM population at its peak biomass and thus a better comparison can be made between comparing the late-summer surveys.

Quantitative evaluation methodologies followed WDNR protocols in which point-intercept data were collected annually within the harvested areas of North Bay. In Anvil Lake, quantitative evaluation was made through the collection of data at 73 point-intercept sub-sample locations within North Bay (Figure 1.2-1). These sampling locations are a sub-set of locations used during whole-lake point-intercept surveys on Anvil Lake. At these locations, EWM and native aquatic plant species presence and rake-fullness were documented. This quantitative survey aims to determine if statistically valid differences in the occurrence of EWM and native aquatic plant species occur following hand-harvesting implementation. Quantitatively, the 2018 hand-harvesting effort would be considered successful if the sub-sample point-intercept survey data show a statistically valid (Chi-square $\alpha = 0.05$) reduction in the occurrence of EWM.



2.0 2018 EWM POPULATION MANAGEMENT STRATEGY

The ALA's *Comprehensive Management Plan for Anvil Lake* (January 2018) outlines criteria for initiating the various levels of hand-harvesting within Anvil Lake:

- Using EWM findings from the most recent Peak-Biomass Survey, professional ecologists will work with the ALA to delineate priority areas within the North Bay over the winter months. Those areas containing EWM populations of *dominant* density or greater would be targeted first by the DASH operations as they exert the greatest ecological strain and are the largest sources for future spread. Volunteer-based efforts using snorkelers would occur in the shallow margins of the lake.
- The isolated EWM occurrences outside of the North Bay would be categorized based upon the level of EWM within each area. Sites containing *small plant colonies* would be classified as areas requiring the greatest need for hand-removal, or primary focus sites, while areas containing *clumps of plants* and only *single or few plants* would be classified as secondary and tertiary focus sites, respectively.

Given the large, dense population of EWM in North Bay, it was not believed that DASH can achieve the original goal of reducing (or maintaining) the EWM population in North Bay. It was recommended that the aim of the project be re-directed from a goal of reducing the EWM population in North Bay to a project with the following objectives for 2018:

- Utilize DASH in the North Bay to maintain open lanes of navigation from shore to open water through dense areas of EWM
- Utilize DASH in areas of less dense EWM in southern portion of lake in an effort to reduce its expansion
- Utilize traditional hand-harvesting to harvest areas with small, initial infestations of EWM outside of North Bay.

2.1 2018 Early-season AIS Survey (Pre-Hand-Harvesting)

On June 13-14, 2018 Onterra ecologists conducted the Early-Season AIS (ESAIS) Survey on Anvil Lake. Field crews noted favorable conditions during the survey with mostly sunny skies and modest winds. This meander-based survey was conducted to locate and map areas of EWM so these data could be relayed to the ALA to finalize the hand-harvesting strategy. This provides the hand-harvesters with the most up-to-date and accurate information regarding locations of EWM within the lake. Approximately 30.7 acres of colonized EWM were mapped in Anvil Lake during the ESAIS survey (Map 1). The final DASH strategy included targeting three sites totaling 36.2 acres that encompassed the largest known areas of EWM in the lake. The entirety of North Bay was designated as a DASH hand-harvest area, allowing for lanes to be expanded or their locations to be adjusted as needed. The results of the ESAIS Survey were provided to the ALA in the form of electronic maps and the data were digitally formatted into a basemap that was loaded onto the association’s GPS unit for their use.

Although typically at its peak growth stage in early summer, no occurrences of CLP were located during the June 2018 ESAIS survey.

2.2 2018 ALA DASH & Hand-harvesting Activities

In 2018, the ALA invested a great amount of effort in managing the EWM population in the lake through a combination of DASH harvesting, traditional hand-harvesting and monitoring efforts.

Detailed records of the DASH harvesting efforts are required as a condition of the WDNR permit. A formal DASH summary report authored by the ALA is attached with this report in Appendix A. The ALA reported that the DASH unit was operated for 182.5 paid hours in 2018 which resulted in a total harvest of approximately 22,734 pounds of EWM from the permitted areas (Appendix A). Additional DASH efforts were logged by volunteers throughout the summer in the permitted areas. DASH efforts were largely focused in North Bay and the seven navigation lane

Table 2.2-1. Summary of DASH Efforts in Anvil Lake during 2018. Table derived from records submitted by the ALA.

Site	Dive Time (hours)	EWM Harvested (Lbs*)
A-18	9.0	864.5
B-18	-	-
C-18, 1	31.3	2667.8
C-18, 2	7.0	746.1
C-18, 3	74.3	8757.1
C-18, 4	45.8	5278.0
C-18, 5	3.5	220.8
C-18, 6	5.5	816.8
C-18, 7	12.3	1545.5
Totals	188.5	20897

locations that were prioritized as a part of the 2018 EWM management strategy. These navigational lanes are 15 feet wide and total approximately 0.6 acres in area and are displayed on the inset frame on Map 1. Of the seven nuisance lanes, the largest amount of time and harvest were reported to have occurred from the area of navigation lane # 3 identified as site C-18, 3 on Table 2.2-1. Navigation lanes #4 and #1 saw the next largest amount of effort followed by decreasing amounts of effort in lanes # 7, #2, #6 & #5. The ALA also developed a ‘dockside’ DASH methodology in 2018 that showed promising results. This method included bringing the DASH unit to the edge of a riparian dock and harvesting plants from the immediate vicinity of the dock which provided nuisance relief at the desired location.

Approximately nine hours of DASH harvesting were reported from site A-18 on the south end of the lake resulting in an EWM harvest of approximately 864 pounds (Table 2.2-1). No DASH efforts were documented as having occurred within site B-18 in 2018 although other means of EWM removal (without DASH) may have taken place in the site.

Additional removal efforts without the use of DASH likely occurred within site A-18 although these details of these efforts were not consistently recorded. In addition to DASH, ALA volunteers and paid divers also completed traditional hand-removal of EWM within and outside of the 2018 DASH permit areas. Harvest logs indicate that 434 hours of efforts were spent on a combination of DASH harvesting, monitoring efforts, and traditional hand-harvesting of EWM in Anvil Lake in 2018.

2.3 Post Hand-Harvesting Monitoring Results

Qualitative Monitoring Results (EWM Mapping Data)

On September 12, 2018, Onterra ecologists conducted the Late-Season EWM Peak-Biomass Survey on Anvil Lake to assess the hand-harvesting areas and map EWM throughout the lake. Like the ESAIS Survey, this survey is a meander-based survey of the lake’s littoral zone designed to locate and map occurrences of EWM. To evaluate the control strategy, comparisons between the 2017 late-summer EWM mapping survey (pre) and the 2018 late-summer EWM mapping survey (post) are most appropriate, as they represent the EWM population at its peak growth stage for the given year. The results of this survey are displayed on Map 2.

Site A-18: A highly scattered EWM colony, approximately 1.2 acres in size, was mapped in the southern end of Anvil Lake in the late-summer 2017 survey. This location was later designated as A-18 and was given high priority for removal efforts including DASH in 2018. Records indicate that approximately 9.0 hours of DASH time took place during the summer of 2018 during which 864.5 pounds of EWM was removed. Additional removal efforts that did not utilize DASH likely also were undertaken by ALA volunteers. The late-summer 2018 survey indicated that the overall size of the colony receded compared to 2017, however two scattered to dominant density colonies, totaling approximately 0.35 acres, remained present in the site (Figure 2.3-1). Point-based EWM occurrences that included single plants, clumps of plants or small plant colonies were also located within, and nearby site A-18 in the late-summer 2018 survey.

Site B-18: Site B-18 targeted the long and narrow EWM colonies that extend southward out of North Bay along the littoral zone. The majority of the EWM population in this area was of a highly scattered to scattered density in the late-summer 2017 survey. Minimal harvesting actions are reported to have occurred in site B-18 during 2018, and the late-summer 2018 survey indicated the EWM population to be approximately the same as in 2017 (Figure 2.3-2).

Site C-18: Site C-18 included the densest EWM colonies in Anvil Lake in North Bay. DASH activities in this site were focused on providing navigational lanes through the surface matted EWM out to deeper waters. The majority of the ALA DASH efforts in 2018 were spent on attempting to achieve this goal. The overall EWM population expanded further in North Bay between the 2017 and 2018 survey. Nearly the entire surface area of North Bay contains EWM and the 2018 survey indicates that the density of EWM in the deeper portions of the bay increased since 2017 (Figure 2.3-3). During the late-summer 2018 survey, some of the navigation lanes were able to be delineated and were most evident near lanes 4 and 7 where a small scattered area was separated from the surrounding surface matted plants (Figure 2.3-3). Records indicate that approximately 45.8 hours of DASH operations took place in lane 4 during the summer while 12.3 hours focused at lane 7 (Table 2.2-1). During the late-summer survey, no other obvious lanes were able to be delineated through the surface matting EWM as the EWM likely re-grew in these areas since harvesting activities last took place.

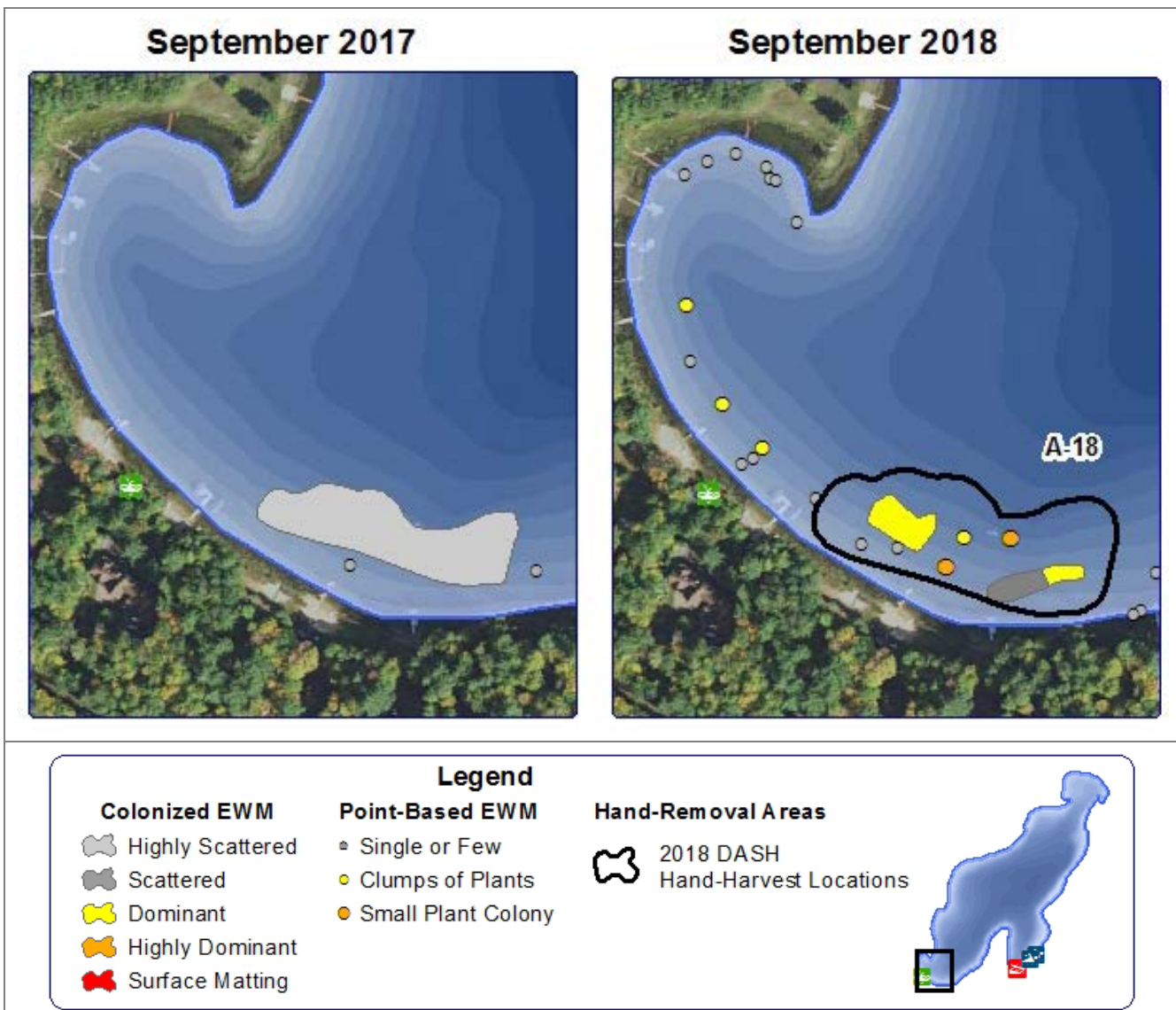
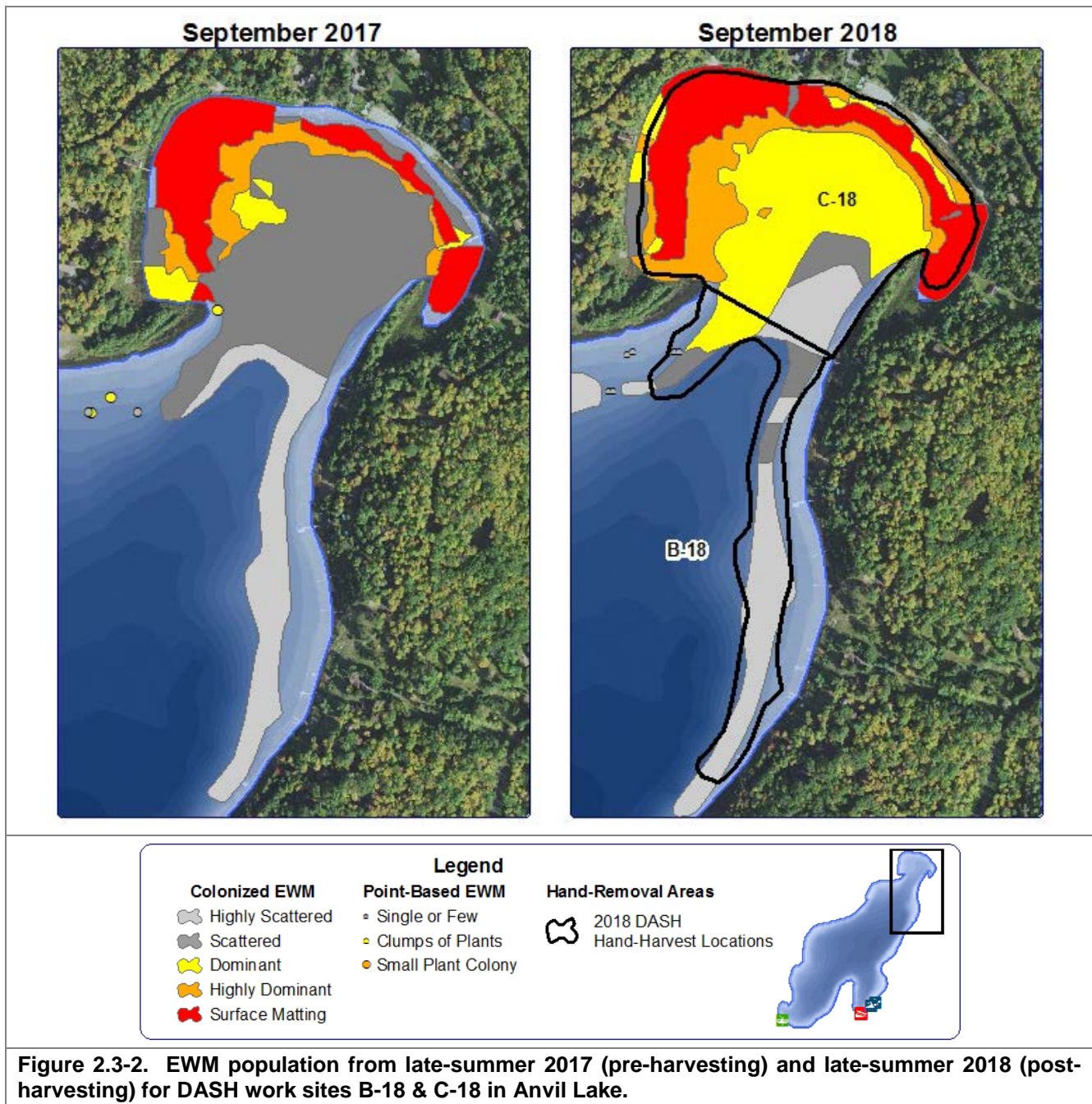


Figure 2.3-1. EWM population from late-summer 2017 (pre-harvesting) and late-summer 2018 (post-harvesting) for DASH work site A-18 in Anvil Lake.



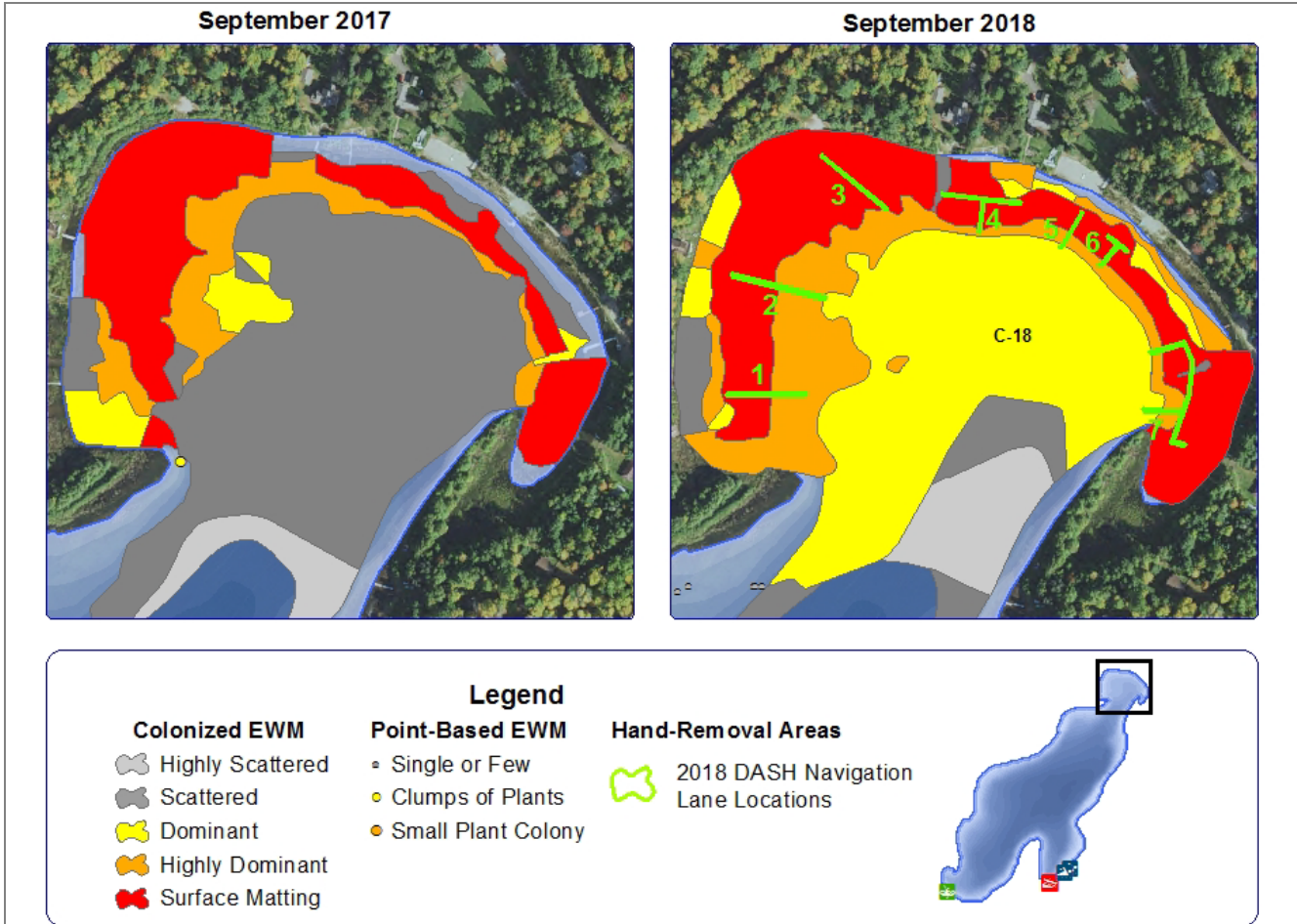


Figure 2.3-3. EWM population from late-summer 2017 (pre-harvesting) and late-summer 2018 (post-harvesting) for DASH navigation lane work sites in North Bay of Anvil Lake .

The 2018 Late-Season EWM Peak-Biomass survey showed that the EWM population continued to expand in the lake. The acreage of colonized EWM has increased from zero acres in 2012-2013 to 30.9 acres in 2017 and 33.1 acres in 2018 (Figure 2.3-4). Although the overall acreage of EWM increased by a relatively modest 2.2 acres between 2017-2018, more of the acreage in 2018 was of higher density ratings of dominant, highly dominant or surface matting (Figure 2.3-4). Of the 33.1 acres of colonized EWM mapped in 2018, approximately 70%, or 23.4 acres consisted of either dominant, highly dominant or surface matting densities. Most of the colonized acreage was present in North Bay and in the narrow bands of EWM extending southward out of North Bay into the main body of the lake. In recent surveys, the EWM population in a few other areas of the lake, including the southwest

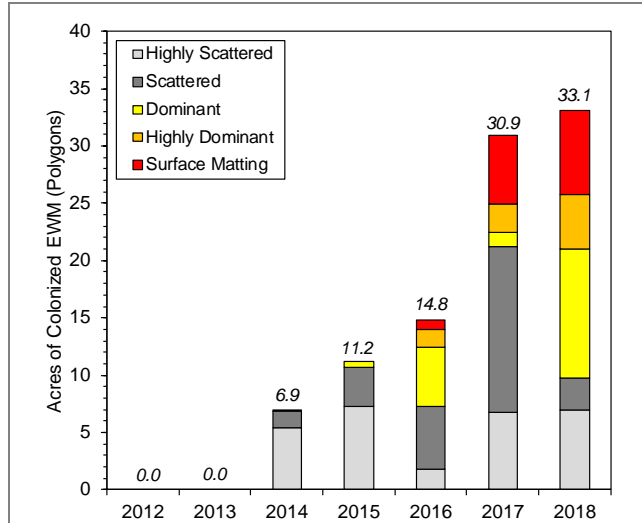


Figure 2.3-4. Anvil Lake acreage of colonized EWM (polygons) from 2012-2018. Created using data from 2012-2018 late-summer EWM mapping surveys.

end of the lake and in the bay near the boat landing, have been found to have formed colonies that contribute to the acreage totals for the lake (Map 2). It is important to note that Figure 2.3-4 displays only those EWM occurrences that were mapped with area-based (polygons) mapping methodologies. While EWM was present in 2012-2013, all occurrences in these surveys were represented by smaller point-based mapping methods such as single points or clumps of plants.

Quantitative Monitoring Results (Point-intercept Sub-Sample Data)

On September 12, 2018, Onterra ecologists also completed the sub-sample point-intercept survey within North Bay of Anvil Lake. These data show that EWM had a frequency of occurrence of 88.1% in 2018 and was the most frequently-encountered aquatic plant species during this survey (Figure 2.3-5, left frame). The 2018 EWM frequency represented a statistically valid 42% increase in frequency of occurrence since 2017. The point-intercept survey data indicate that the frequency of occurrence of EWM within North Bay has continued to increase over time.

At the management planning wrap-up meeting in August 2017, many Anvil Lake stakeholders indicated that they believed the expanding EWM population in North Bay was displacing native species, most notably large-leaf pondweed and wild celery. Since the EWM population’s rapid increase in frequency between 2015-2018, a few native aquatic plant species in North Bay have seen statistically valid reductions in their occurrence in recent years and are highlighted on Figure 2.3-5 (right frame).

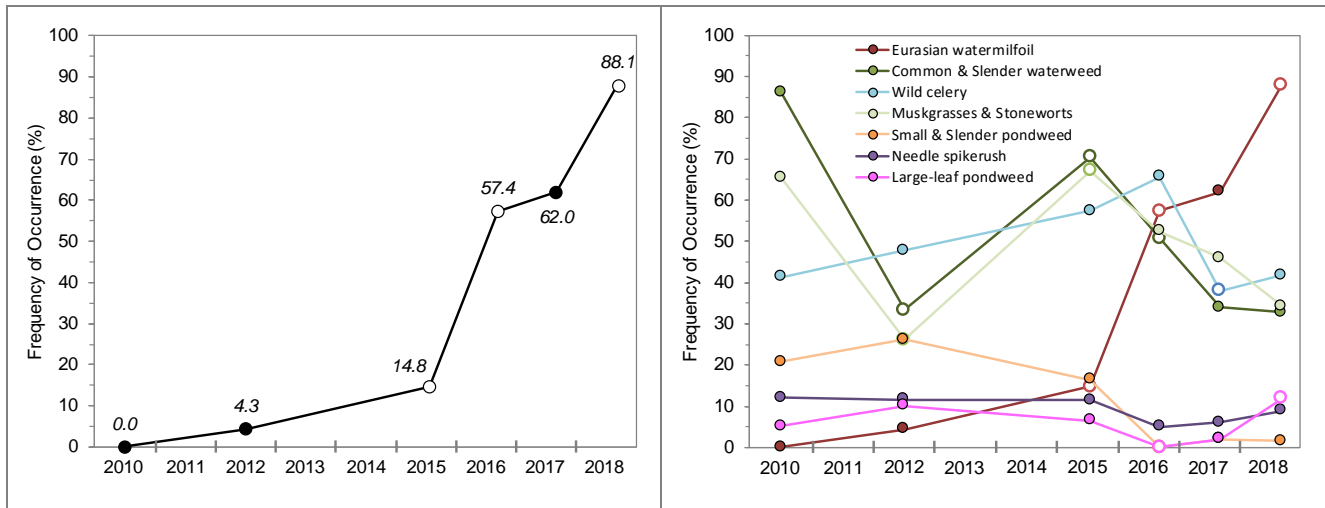


Figure 2.3-5. Frequency of occurrence of EWM (left frame) and select native aquatic plant species (right frame) within North Bay of Anvil Lake from 2010-2018. Open circle indicates statistically valid change in occurrence from previous survey (Chi-square $\alpha = 0.05$). 2010 N = 58; 2012 N = 69; 2015 N = 61; 2016 N = 61; 2017 N = 50, 2018 N = 67.

The sub-sample point-intercept data indicate that the frequency of large-leaf pondweed was lower in 2016-2017 than previous surveys but has since rebounded to 11.9% in 2018. Wild celery exhibited a statistically valid decrease in population between 2016-2017 and had a 41.8% occurrence in 2018.

The combined occurrences of muskgrasses and stoneworts as well as common and slender waterweed also exhibited a recent declining population trend over the past several years corresponding with the timeframe during which the EWM population increased substantially. It is difficult to determine if these

native species declines are the result of displacement from an expanding EWM population, bycatch during hand-harvesting, natural changes in environmental conditions, or a combination of these.

The point-intercept survey data from 2010, 2012, and 2015 indicate that the populations of large-leaf pondweed and small/slender pondweed were found in deeper areas of North Bay in 7 to 14 feet of water, while wild celery was found growing across all depths. The data from 2015-2018 indicate that these deeper areas of North Bay saw a largest increase in the occurrence of EWM. This adds weight to the idea that these reductions in native species occurrence may be the result of displacement from the expanding EWM population and not a result of bycatch from increased hand-harvesting efforts.

3.0 CONCLUSIONS AND DISCUSSION

In 2018, the EWM population in Anvil Lake continued to expand. The largest concentration of EWM continues to exist in the north end of the lake within North Bay. A few areas outside of North Bay have begun to show signs of EWM becoming established although aggressive hand-harvesting efforts conducted by the ALA has likely slowed this process. Colonized areas of EWM were documented in the southwest end of Anvil Lake within the 2018 DASH work site A-18 as well as extending lakeward out of North Bay in narrow bands. Lower density occurrences were located in many other littoral areas of the lake and often in deeper waters that require submersed cameras or underwater diving to locate. A few areas of concentrated single plants, clumps of plants, and small plant colonies may expand to form colonized areas in the future if no action is taken.

The ALA carried out an aggressive EWM hand-harvesting effort in 2018 that totaled well over 400 hours of documented volunteer time. The first priority of the 2018 harvesting strategy was to maintain open navigational lanes through the very dense and often surface matting EWM in North Bay. The late-summer mapping survey was able to show a decreased EWM density in two of the harvesting lanes, however the fine-scale nature of the harvesting lanes may not be well represented by the mapping methodology. A better determination of whether this objective was met in 2018 can be made by ALA members that observed the navigation lanes over the course of the growing season. If these lanes were maintained in a way that allowed for reasonable navigation by the individual users of the lanes over the course of the growing season, they would have met the goal of the strategy in those lanes. It is possible that the lanes were acceptably navigable for periods of time during the summer, such as immediately after DASH efforts took place.

The other main objective of the 2018 EWM management strategy included targeting site A-18 with DASH to limit expansion in this area of the lake and to hand-harvest other isolated occurrences around the lake outside of North Bay. The monitoring showed a reduction in the size of the main colony at site A-18, however numerous EWM occurrences were located within the site as well as in the proximity of the site during the late-summer 2018 survey. It is impossible to know what the EWM population would have been in the absence of the hand-harvesting efforts, however it is likely that harvesting efforts around the lake have slowed the expansion of EWM into additional areas.

The current grant funded project included a continuation of EWM management with a hand-harvesting control strategy in the final year of the project in 2019. Over the past two growing seasons the ALA has learned a lot about the capabilities of DASH and hand-harvesting as an EWM management tool on Anvil Lake. The management goals have been adjusted since the start of the project as a result of the expanding EWM population and as the ALA has gained experience. In 2019, the ALA will once again utilize a

hand-harvesting EWM management strategy that includes the use of DASH. A similar management strategy as was completed in 2018 is recommended once again for 2019. This includes the three bulleted points listed below:

- 1) Utilize DASH, including the ‘dockside’ harvesting method developed in 2018, in the North Bay to maintain open lanes of navigation from shore to open water through dense areas of EWM

After attempting this objective in 2018, the ALA should have a better understanding of the amount of effort required to accomplish this goal for 2019. Certain navigation lanes saw a much larger proportion of harvesting efforts than others in 2018 and the ALA may consider adjusting the 2019 lanes to include fewer multi-use lanes if desired. If the ALA is able to devote a smaller proportion of efforts in North Bay in 2019, then efforts may be devoted elsewhere in the lake to work towards the other management goals. The preliminary navigation lane design offered on Map 3 is the same as the 2018 lanes however they may be modified as needed to extend approximately from the end of riparian docks out to beyond the lakeward extents of the EWM mapped as highly dominant in 2018.

- 2) Utilize DASH in other areas of the lake in an effort to reduce EWM expansion or establishment in new locations

In order to maximize the potential uses of the DASH set-up, it is recommended that all of the known areas of concentrated EWM occurrences be included on the 2019 DASH permit. This will allow for the ALA to choose whether any given location is best suited for DASH or traditional harvesting. The permitting fees required by the WDNR for implementing DASH are capped at 10 acres (\$30/acre, \$300 total). No additional permitting costs are incurred for any acreage beyond 10 acres. A preliminary 2019 DASH control strategy is provided on Map 3 for consideration. The preliminary strategy includes ten DASH sites totaling 54.9 acres. These ten sites are further broken into first, second or third priority. The prioritization of these sites may be changed based on the ALA’s preferences; however, the initial reasoning is to give higher priority to sites that contain the largest concentrations of EWM outside of North Bay.

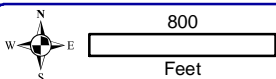
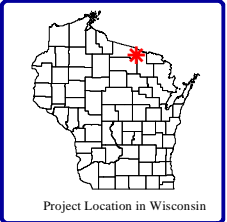
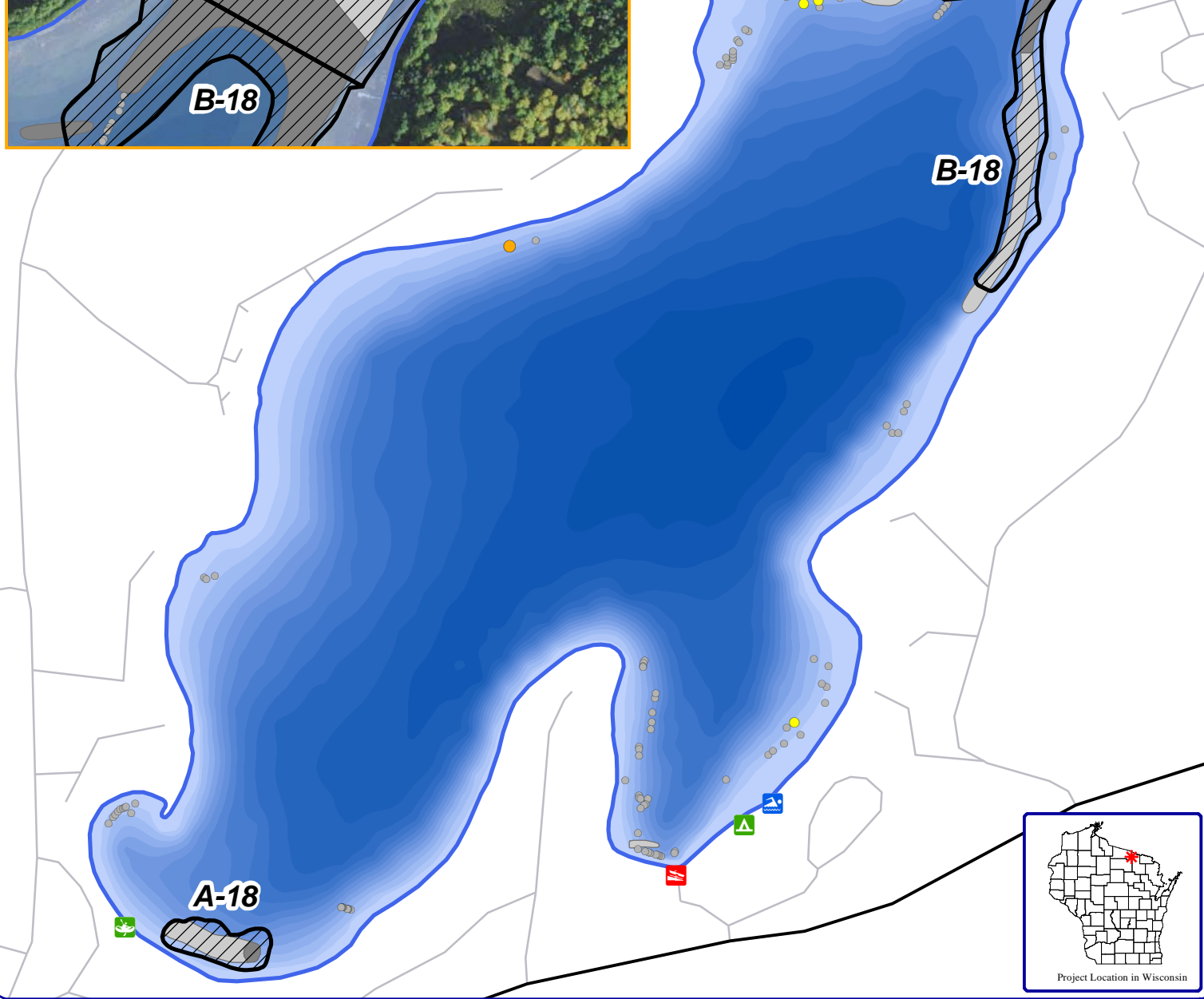
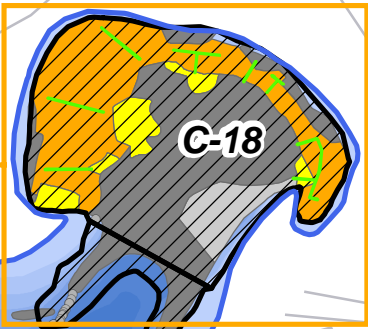
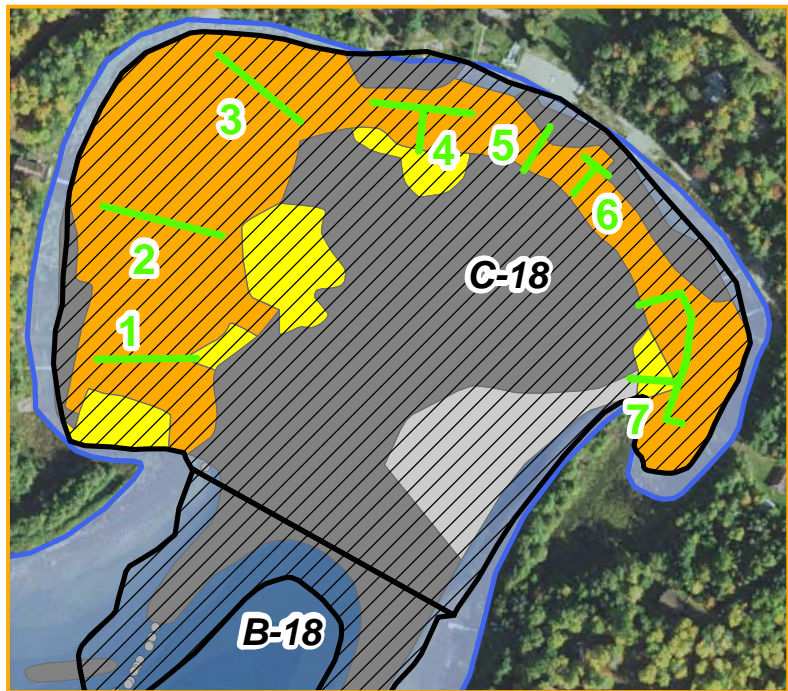
- 3) Utilize traditional hand-harvesting to harvest areas with small, initial infestations of EWM or in any areas where volunteers wish to work.

Traditional hand-harvesting efforts are encouraged once again for 2019. Areas in which the DASH operation is not suitable may be considered for traditional harvesting. Any EWM occurrences that are harvestable within the skill set of the volunteer may also be considered for removal. Preference for removing isolated plants outside of North Bay should be given as a part of meeting the goal of preventing EWM establishment elsewhere in the lake.

Onterra’s scheduled 2019 ESAIS Survey will provide an updated account of where these small EWM occurrences are located and will provide initial focus areas for the traditional hand-harvesters. A map containing the ESAIS survey results will be provided to the ALA for their use along with data for their Garmin GPS unit to aid in their hand-harvesting efforts.

The project includes a replicate whole-lake point-intercept survey in Year 3 (2019). This will allow a quantitative assessment of the control efforts, as well as an understanding if the native aquatic plant community has changed over this time period. The results of the 2019 point-intercept survey will be directly comparable to previous surveys.

Another component of this project will be the completion of a WDNR-approved stakeholder survey, sent to all ALA members and Anvil Lake property owners. The project's anonymous stakeholder survey would gather comments and opinions from lake stakeholders to gain important information regarding their understanding of the lake and thoughts on how it should be managed. This information would be critical to the development of a realistic plan by supplying an indication of the needs of the stakeholders and their perspective on the management of the lake. The survey will assess lake users in their level of support for various control techniques for EWM, including both non-herbicide and herbicide control strategies. The survey would be administered through a web-based platform and aspects facilitated by a contractor to ensure anonymity. A paper copy of the survey would be available by request for those without internet access. The survey design and administration methodology has been developed by the planners with guidance and approval from a WDNR Research Social Scientist.

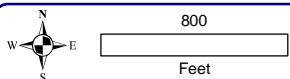
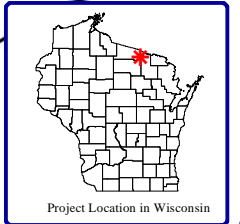
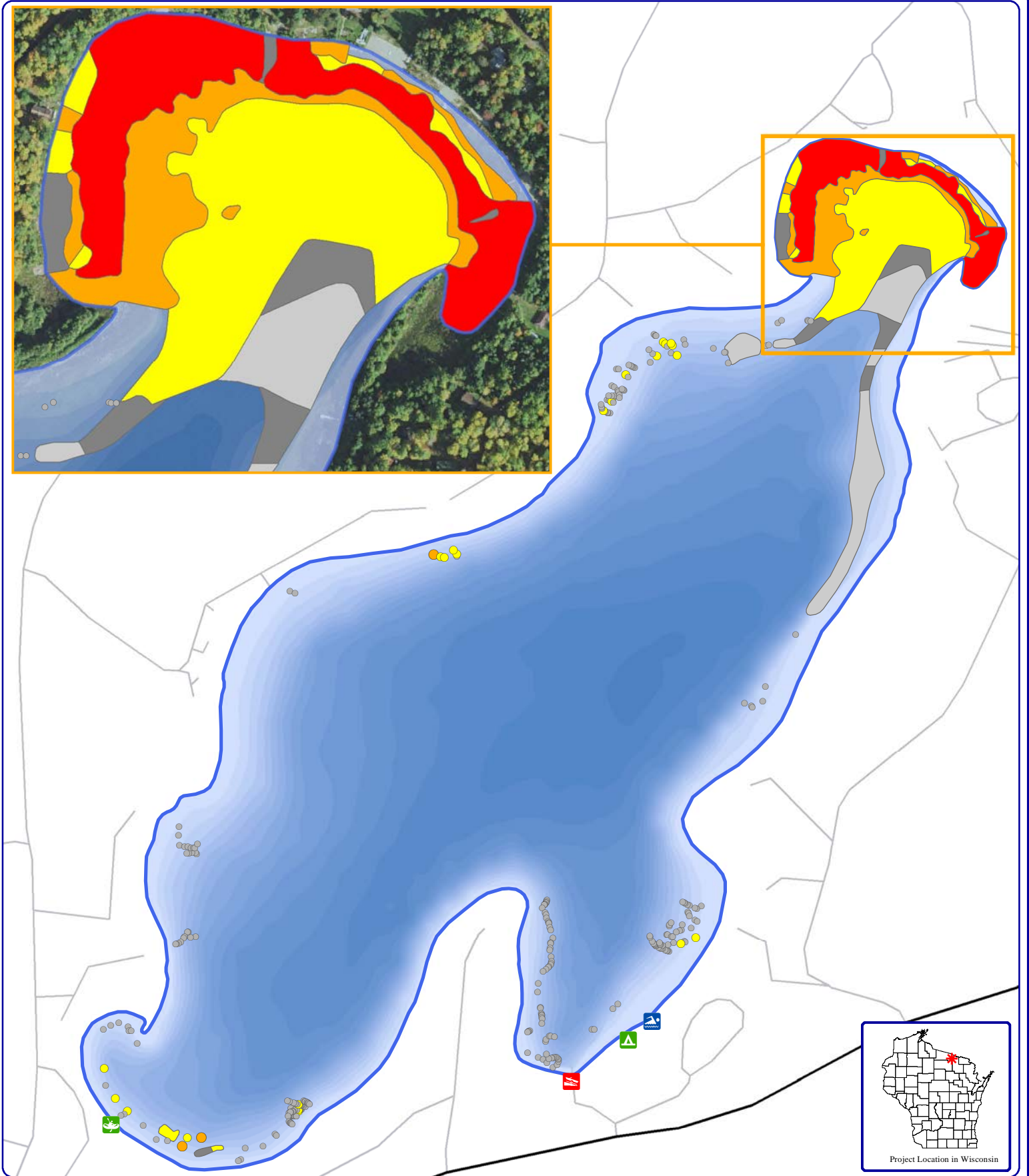
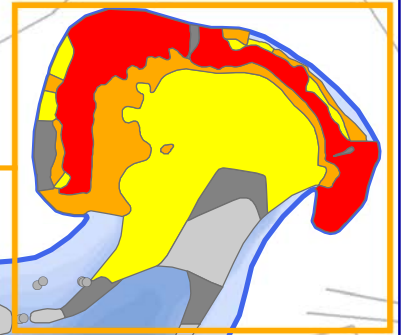
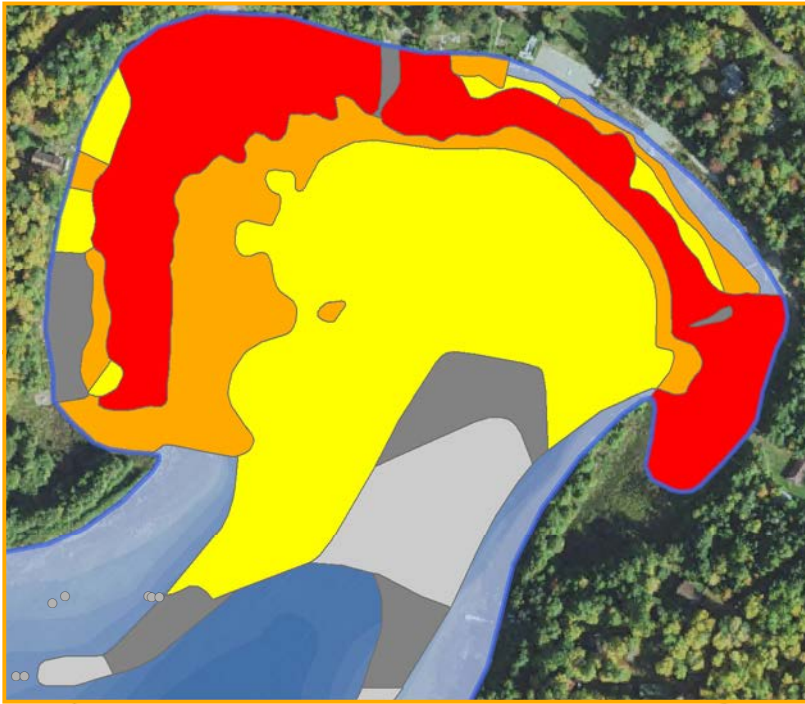


Onterra LLC
 Lake Management Planning
 815 Prosper Road
 De Pere, WI 54115
 920.338.8860
 www.onterra-eco.com

Sources:
 Roads & Hydro: WDNR
 Aquatic Plants: Onterra, 2018
 Orthophotograph: NAIP, 2017
 Bathymetry: Onterra, 2014;
 processed by C-Map USA
Map date: June 19, 2018 JLW
 File name: Anvil_EWM_June18.mxd

- Legend**
- Highly Scattered
 - Scattered
 - Dominant
 - Highly Dominant
 - Surface Matting (none found)
 - Single or Few Plants
 - Clumps of Plants
 - Small Plant Colony
 - 2018 DASH Hand-Harvest Locations
 - 2018 DASH Navigation Lanes (15' wide; 0.6 acres)

Map 1
 Anvil Lake
 Vilas County, Wisconsin
**June 2018 EWM
 Survey Results & Hand-
 Harvesting Strategy**



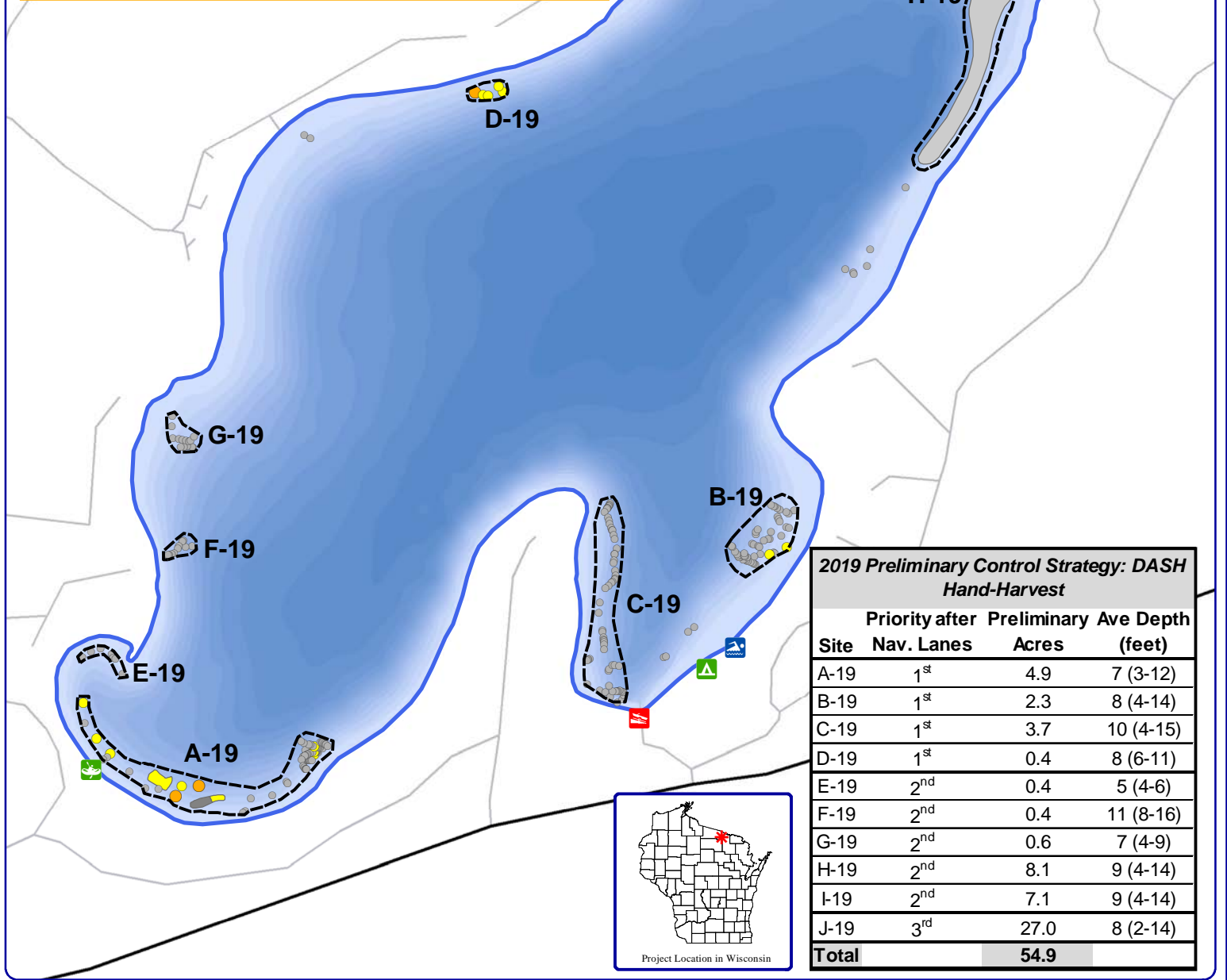
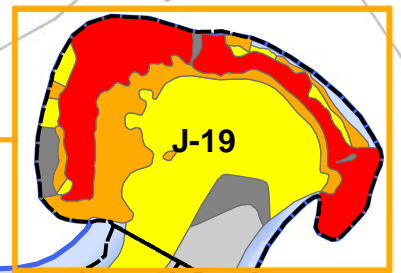
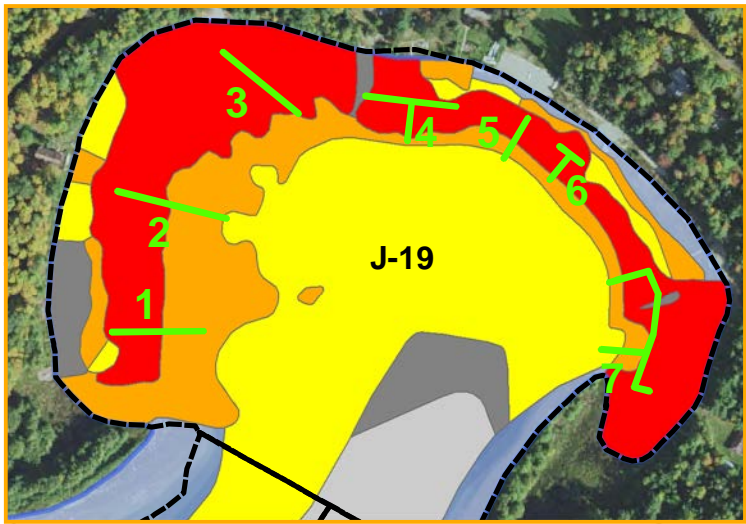
Onterra LLC
 Lake Management Planning
 815 Prosper Road
 De Pere, WI 54115
 920.338.8860
 www.onterra-eco.com

Sources:
 Roads and Hydro: WDNR
 Aquatic Plants: Onterra, 2018
 Orthophotograph: NAIP, 2017
 Bathymetry: Onterra, 2014;
 processed by Navico
 Map date: September 28, 2018 JLW

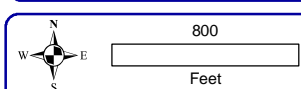
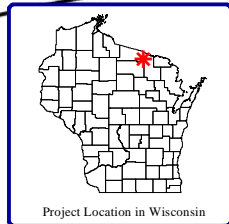
Legend

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

Map 2
 Anvil Lake
 Vilas County, Wisconsin
September 2018
EWM Survey Results



2019 Preliminary Control Strategy: DASH Hand-Harvest			
Site	Priority after Nav. Lanes	Preliminary Ave Depth (Acres)	Depth (feet)
A-19	1 st	4.9	7 (3-12)
B-19	1 st	2.3	8 (4-14)
C-19	1 st	3.7	10 (4-15)
D-19	1 st	0.4	8 (6-11)
E-19	2 nd	0.4	5 (4-6)
F-19	2 nd	0.4	11 (8-16)
G-19	2 nd	0.6	7 (4-9)
H-19	2 nd	8.1	9 (4-14)
I-19	2 nd	7.1	9 (4-14)
J-19	3 rd	27.0	8 (2-14)
Total		54.9	



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 Aquatic Plants: Onterra, 2018
 Orthophotograph: NAIP, 2017
 Bathymetry: Onterra, 2014;
 processed by Navico
 Map date: February 18, 2019 TWH

- Legend**
- Eurasian Watermilfoil (Sept. 2018)**
- Highly Scattered
 - Scattered
 - Dominant
 - Highly Dominant
 - Surface Matting
 - Single or Few Plants
 - Clumps of Plants
 - Small Plant Colony
 - 2019 Preliminary DASH Hand-Harvest Area
 - 2019 DASH Navigation Lanes (15' wide)

Map 3
Anvil Lake
 Vilas County, Wisconsin
2019 Preliminary Control Strategy v.1