

1.0 INTRODUCTION

Berry Lake, Menominee and Oconto Counties, is a 209-acre seepage lake with a maximum depth of 27 feet and a mean depth of 8 feet (Photo 1). This mesotrophic lake has a relatively small watershed when compared to the size of the lake. Berry Lake contains 42 native plant species, of which southern naiad is the most common plant. Eurasian water milfoil (EWM), later confirmed also having hybrid EWM (HWM) has been present in Berry Lake in 2007. Numerous control efforts have targeted the EWM population within Berry Lake since discovery, including volunteer-based hand-harvesting efforts, spot herbicide treatments (2007, 2008, 2010, 2011), and a large-scale eastern basin 2,4-D treatment in 2012.



Photo 1. Berry Lake, Vilas County.

1.1 Historic AIS Management & Planning

After unexpectedly decreasing in 2015, the HWM population trended higher in Berry Lake in 2016 and 2017 prompting the BLPOA to implement a whole lake 2,4-D treatment 2018 (Figure 1). The HWM population showed signs of rebound since the 2018 whole-lake 2,4-D treatment in some parts of Berry Lake where the HWM footprint has historically been located. The BLPOA began an Integrated Pest Management (IPM) HWM management strategy in 2019 through a coordinated professional hand harvesting program and a ProcellaCOR™ spot treatment in the eastern basin in 2020. HWM occurrences in the western basin have exceeded levels that can be managed with hand-harvesting, so the BLPOA has designed a project to plan and monitor a ProcellaCOR spot treatment in this basin during 2022 as well as hand-harvesting on more scale-appropriate HWM populations within the lake.

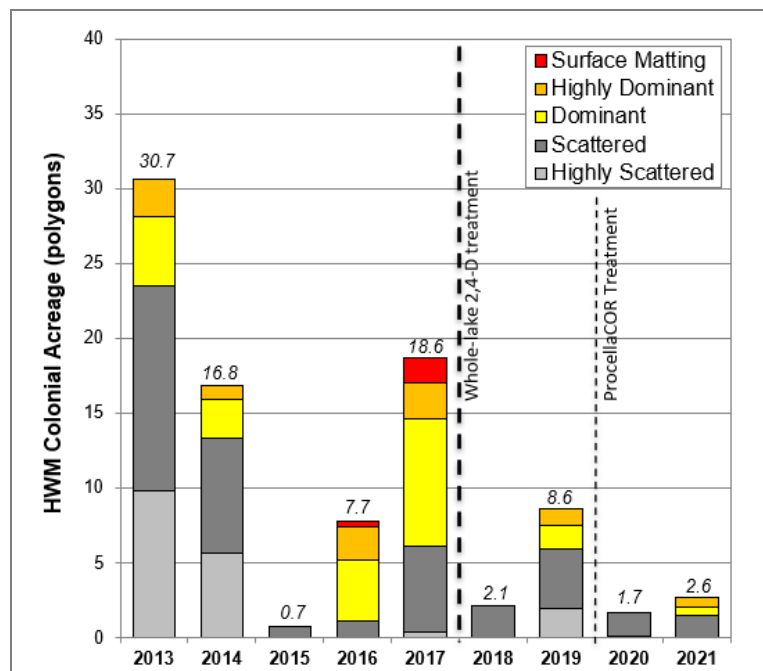


Figure 1. Acreage of mapped EWM colonies on Berry Lake from 2013-2021.

2.0 2021 LATE-SUMMER EWM PEAK-BIOMASS SURVEY RESULTS

Onterra conducted a 2021 Late-Summer EWM mapping survey to assess the current HWM population and to provide the necessary information for discussing and planning a potential 2022 herbicide treatment. The HWM mapping survey offers a full account (census) of where a particular species exists in the lake. During the HWM mapping survey, the entire littoral area of the lake is surveyed through visual observations from the boat (Photo 2). Field crews supplement the visual survey by deploying a submersible camera along with periodically doing rake tows. The HWM 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 AIS locations that were considered as *small plant colonies* (<35 feet in diameter), *clumps of plants*, or *single or few plants*.

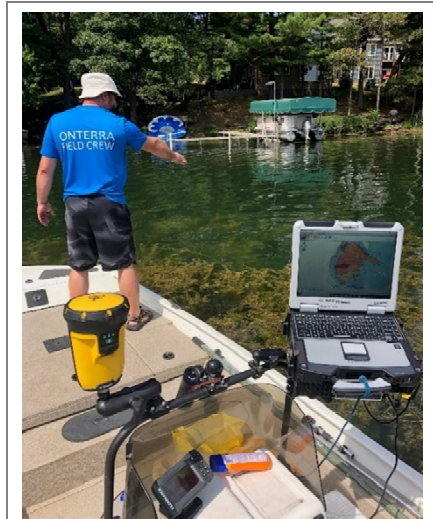


Photo 2. EWM mapping survey on a Waushara County, WI lake.
Photo credit Onterra.

The Late-Summer HWM Peak-Biomass Survey was conducted on August 3, 2021 to qualitatively assess the peak growth (peak-biomass) of the HWM population throughout the lake and to consider management options for the following year. The entire littoral zone of Berry Lake was systematically meandered and HWM populations were mapped by using the same methodology described above. Survey crews supplemented the survey with a submersible camera when applicable to investigate priority locations including areas that were in deeper water depths. Conditions during the late-summer survey were noted as excellent with mostly sunny skies and calm winds. The majority of the HWM population could be observed visually from the bow of the survey boat.

The results of the late-summer survey are displayed on Map 1 indicating that HWM was exhibiting *dominant* and *highly dominant* conditions in the western basin of the lake. Please note that some plants within a *highly dominant* HWM colony are at the surface, but the *surface matting* designation is reserved for when the entire area has HWM at the surface. Individual HWM occurrences were also noted by the boat landing.

3.0 2022 HWM MANAGEMENT AND MONITORING STRATEGY

Within the approved *Comprehensive Management Plan* for Berry Lake (March 2015), the BLPOA outlined a management goal to “Control Existing and Prevent Further Aquatic Invasive Species Infestations within Berry Lake.” The BLPOA has been initiating this management action, starting with a 2018 whole-lake 2,4-D treatment, followed by an IPM program of hand-harvesting/DASH and spot/basin-wide herbicide treatments. More information on the evolving IPM Plan can be found in the *2020 HWM Monitoring & Control Strategy Assessment Report*.

The BLPOA’s evolved management strategy includes targeting HWM populations that are *dominant or greater in density* with herbicide treatment strategies. These strategies would consider basin-wide or whole-lake approaches when applicable.

3.1 2022 HWM Management Strategy

Following subsequent conversations with Onterra and the WDNR, the BLPOA has chosen to pursue an herbicide spot treatment targeting the highest HWM concentrations in the western basin. Building off their successful 2020 ProcellaCOR™ treatment, the BLPOA will implement a similar strategy in 2022. Monitoring surrounding the 2020 treatment indicated that creeping bladderwort (*Utricularia gibba*) was the only native aquatic plant species to show a statistically valid decrease in occurrence between pre- and post treatment surveys. Creeping bladderwort is a very small, free-floating species that is susceptible to wind driven water movement and is most common in shallow waters, often amongst floating-leaf plant communities. All remaining native species were statistically unchanged in occurrence between the two surveys with the exception of southern naiad (*Najas guadalupensis*) and Illinois pondweed (*Potamogeton illinoensis*) which exhibited a statistically valid increase in occurrence. The WDNR's fact sheet on this chemistry can be found here:

<https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=164039981>

Lake managers continue to learn how to successfully implement this form of treatment after being registered for use in Wisconsin only a couple of years ago. ProcellaCOR™ has a high sediment/organic binding affinity (Koc) and relatively short persistence (half-life of > 6 days), so it is thought to stay where applied better than other chemistries. However; in many of the treatment Onterra has monitored, HWM impacts have been observed extending outside of the application area (i.e through herbicide dissipation), as this chemical has shown activity at even low concentrations and exposure times.

In 2020, predictive calculations indicate that the active ingredient in ProcellaCOR™ would have dissipated in the eastern basin to a concentration of 0.67 ppb. This concentration was sufficient to impact the HWM throughout this basin. The preliminary 2022 strategy has the potential to reach 0.24 ppb. Therefore, the impacts are predicted to extend out from the application area, but it is unclear how far the impacts will extend. Onterra has observed basin-wide EWM reductions from this concentration, but it is unclear if the presumably harder HWM will be impacted to the same levels as those case studies.

3.2 2022 Monitoring Strategy

Please note that the BLPOA applied for a WDNR AIS Control Grant during the November 1 cycle to assist with funding their 2022 management strategy and 2022-2023 monitoring program. Both quantitative and qualitative surveys are incorporated into the BLPOA's HWM management and monitoring strategy. These data will be collected *prior to treatment*, *year of treatment*, and *year after treatment*. Onterra believes comparing data from *prior to treatment* to the *year after treatment* allows for the best assessment of the treatment outcome. Many treatment impacts during the *year of treatment* may be short-lived, so understanding how populations stabilize during the *year after treatment* is important within evaluations.

Qualitative HWM Monitoring

A Late Season AIS (LSAIS) Survey would be conducted during approximately September of each year to produce the mapping data to document a census of the HWM population within Berry Lake at the perceived peak growth stage. Comparing these data to previous surveys will help lake stakeholders understand management outcomes. The HWM mapping data are also valuable to direct follow-up management, such as contracted hand-harvesting, aimed to maintain the gains made.

Quantitative Aquatic Plant Monitoring

A preliminary quantitative monitoring plan is being considered for this trial treatment site in which a total of 35 sub-sample point-intercept sampling locations are contained within the four trial treatment sites (Figure 2). The quantitative assessment would be completed through the comparison of the sub point-intercept survey from mid-June 2022 (*year of pre-treatment*), 2022 (*year of post-treatment*), and 2023 (*year after treatment*). The 2022 herbicide treatment is planned for roughly the middle of June. This slight delay in implementation will allow the pretreatment sub-sample point-intercept survey to take place after many native plants have emerged from winter dormancy.

Due to the relatively small size of the treatment site, 35 sub-sampling locations can be contained within these sites even at the narrowest point-spacing Onterra typically applies (20 meters). This number of sample points is relatively low for statistically-valid conclusions to be made. Continued discussions with the WDNR will determine if the quantitative monitoring strategy is worth delaying the treatment a few weeks to implement.

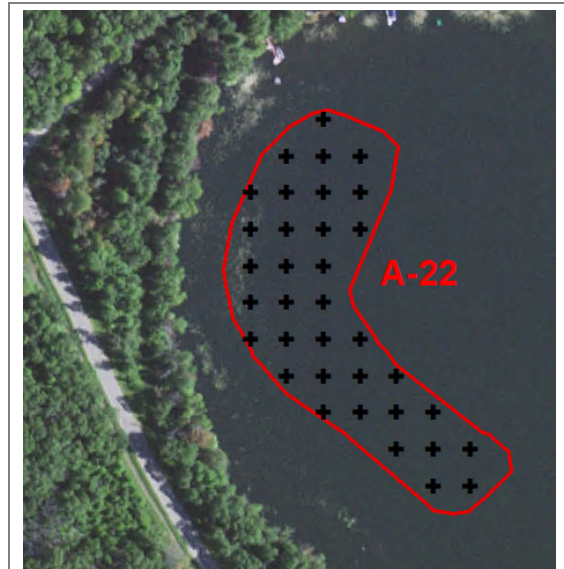


Figure 2. Berry Lake Quantitative Monitoring Plan for Proposed 2022 Herbicide Treatments. 20m spacing, n=35.

Herbicide Concentration Monitoring

BLPOA volunteers would collect herbicide concentration monitoring during the hours/days following treatment following a sampling regime created through collaborative efforts of the WDNR and Onterra. The focus of last year's (2021) monitoring structure mainly investigated herbicide concentrations within the first few days of treatment, but is likely to expand to a few sampling intervals at weeks after treatment in 2022. BLPOA volunteers would also collect temperature profiles following the treatment, ensuring that the lake remained mixed during the period of active herbicide concentrations.

Whole-Lake Point-Intercept Survey

Additional aquatic plant monitoring is planned in 2023 through the completion of a whole-lake point-intercept survey. The whole-lake point-intercept survey will be valuable in assessing the lake-wide aquatic plant population and results are compared to previous or future surveys to monitor aquatic plant populations in the lake. The last point-intercept survey on Berry Lake took place in 2020.

3.3 Integrated Pest Management Planning

Hand-harvesting would occur as an Integrated Pest Management tool, mainly targeting rebounding HWM. This could occur in both 2022 and 2023, but anticipation of this effort is more likely for 2023. The BLPOA would focus hand-harvesting/DASH as a mechanism for following up after areas are targeted with herbicide treatment. Based on the lessons learned by the 2022 trial treatments, the BLPOA will investigate implementing additional herbicide treatments in future years.