1.0 INTRODUCTION

Archibald Lake, Oconto County, is a 392-acre two-basin seepage lake with a maximum depth of 58 feet and a mean depth of 17 feet (Figure 1.0-1). This oligotrophic lake has a relatively small watershed when compared to the size of the lake. The lake is listed as an Area of Special Natural Resource Interest (ASNRI) outstanding/exceptional resource water under NR 102. The Chequamegon-Nicolet National Forest (CNNF) borders much of the lake's eastern basin, in the form of the Cathedral Pines State Natural Area.

Photo 1.0-1. Archibald Lake, Oconto County.

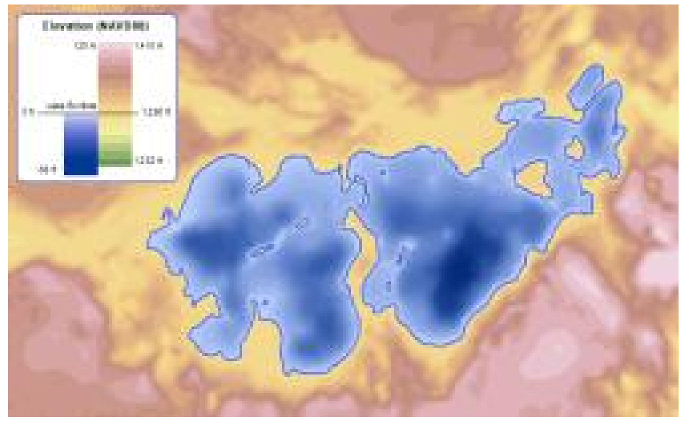


Figure 1.0-1. Archibald Lake elevation and bathymetry.

The primary citizen-based organization leading management activities on Archibald Lake is the Archibald Lake Association (ALA). Following the discovery of Eurasian water milfoil (*Myriophyllum spicatum*; EWM) in 2009, the ALA has been very pro-active in managing the EWM within Archibald Lake. A combination of spot herbicide treatments and manual removal of EWM has kept the EWM population to manageable levels.

1.1 Historic AIS Management & Planning

The Archibald Lake Comprehensive Management Plan was finalized in May 2018. Within the management planning process, specific goals and actions related to managing EWM were developed. One management action within the Plan is to "Conduct EWM Population Control Using Hand Harvesting and/or Herbicide Spot Treatment". If the following trigger is met, the ALA would consider conducting herbicide spot treatments: "colonized (polygons) areas where a sufficiently large treatment area can be constructed to hold concentration and exposure times." It is believed that these populations of EWM are too large to be controlled using hand-harvesting techniques. It is also likely that these areas may be too small for herbicides like 2,4-D to be effective, so they would likely need to be targeted with herbicides that require short exposure times.

The Management Plan also contained a management action to "Investigate and Study Alternative Management Methodologies." The ALA partnered with regional WDNR staff to investigate the potential for herbicide treatments with barrier curtains to target smaller areas of EWM than outlined within their Plan with 2,4-D. The ALA constructed a barrier curtain and conduct its first trial 2,4-D treatment with a barrier in 2020. This trial program expanded to three additional trial barrier 2,4-D treatments in 2021, and one in each of 2022 and 2023. The ALA has made great strides in its ability to implement barrier curtain treatments on Archibald Lake, with recent treatments resulting in EWM reductions lasting multiple seasons.

1.2. 2024 EWM Management Strategy

The ALA was awarded a WDNR AIS-Control grant in the fall 2023 cycle that provided funding assistance to implement the 2024 EWM management and monitoring strategy. As outlined in the *2023 Archibald Lake EWM Management & Monitoring Report* (Feb 23, 2024), the ALA's preliminary 2024 EWM management strategy included a combination of professional manual removal and herbicide spot treatments. The strategy targets the highest EWM occurrences in high-use areas.

Barrier Curtain 2,4-D Treatment

One site on the southwest end of the western basin of Archibald Lake was proposed for a barrier curtain treatment in 2024 (Map 1). This 2.2-acre site is situated in a location that can accommodate a barrier curtain and harbors areas of *scattered*, *dominant*, and *highly dominant* density EWM colonies. The application area design required approximately 550 linear feet of curtain to enclose the site. The proposed treatment included the use of liquid 2,4-D amine at the maximum dosing rate of 4.00 ppm.

ProcellaCOR Spot Treatment

One site along the southwestern shoreline of the western basin of the lake was proposed for ProcellaCOR spot-treatment in 2024 (Map 1). This 6.2-acre site would target the largest and densest known EWM colonies within Archibald Lake and overlaps with the 2022 ProcellaCOR treatment site. Due to its larger size and targeting an area in a semi-confined bay, the use of a barrier curtain was not proposed for this site. A dosing strategy of 6.0 PDU's was proposed after being confirmed by experts from SePRO, the manufacturer of ProcellaCOR. The proposed dosing rate is considerably higher than the 3.0 PDU's rate employed during the 2022 trial treatment to increase efficacy and longevity of the treatment.

Professional Manual Removal (DASH)

A budget of five days of manual removal, potentially with the assistance of Diver Assisted Suction Harvesting (DASH) equipment was included in the ALA's WDNR AIS Control Grant (ACEI-352-24) for 2024, with funding for up to 10 additional days from unused appropriations in ALA's previous AIS Control grant from the previous year (ACEI-319-23). Ultimately, the ALA focused attention on the two herbicide treatment strategies and did not implement the manual removal in 2024.

1.3 Pretreatment Confirmation and Refinement Surveys

Onterra ecologists completed the pretreatment confirmation and refinement survey of the proposed herbicide treatment sites on June 10, 2024. Objectives during the survey were to confirm the treatment area water depths, evaluate the growth stage of EWM and native plants, and to record water temperatures and pH readings. In addition, aquatic plant data was collected at a sub-sample point-intercept grid within the ProcellaCOR treatment site (B-24). During this visit, Onterra staff delivered the equipment and monitoring supplies related to the herbicide concentration monitoring efforts being completed by volunteers.

Photo 1.3-1. EWM plants observed during June 10, 2024 pretreatment survey on Archibald Lake. Photos by Onterra, LLC

Active EWM growth was confirmed on the plants, indicating they are at a proper stage for uptake ofherbicide. EWM was growing within a similar footprint as was delineated in the last mapping survey from late-summer 2023, noted as currently being slightly greater in density than when mapped. Native aquatic plants that were observed within the treatment sites included northern watermilfoil, variable leaved pondweed, and water celery.

Water temperatures in B-24 were 66-67°F throughout the water column (1-9 feet). The pH was measured at 8.1 at mid-depth in treatment site. The average depth of the treatment sites was confirmed to be consistent with the preliminary treatment strategy. No changes were made to the proposed treatment sites as a result of the pretreatment survey.

Onterra provided GPS coordinates to the ALA for the purposes of assisting the with the proper placement of the barrier curtain. The herbicide applications were completed on June 17, 2024 by Schmidt's Aquatic, LLC. The applicator noted southwest winds of 1-2 mph at the time of treatment and a surface water temperature reading of 68°F.

2.0 2024 MONITORING RESULTS

It is important to note that two types of surveys are discussed in the subsequent materials: 1) point intercept surveys and 2) EWM mapping surveys.

The point-intercept aquatic plant survey provides a standardized way to gain quantitative information about a lake's aquatic plant population through visiting predetermined locations using a rake sampler to identify all the plants at each location (Photograph 2.0-1). The survey methodology allows comparisons to be made over time, as well as between lakes. The point-intercept survey is most often applied at the whole-lake scale. The whole-lake point-intercept survey has been conducted on Archibald Lake in 2010, 2013, 2016, and 2022.

If a smaller area is being studied, a modified and finer-scale point-intercept sampling grid may be needed to produce a sufficient number of sampling points for comparison purposes. This sub-sample point intercept survey methodology is often applied over management areas such as herbicide application sites.

This type of sampling has been used during this project within all recent spot treatment sites and is used within this report to evaluate the 2024 herbicide management sites within Section 2.2.

While the point-intercept survey is a valuable tool to understand the overall plant population of a lake, it does not offer a full account (census) of where a particular species exists in the lake. EWM grows high in the water column, which can cause recreation and navigation impediments. This factor allows it to typically be mapped through surface observation. During an EWM mapping survey, the entire littoral area of the lake is surveyed through visual observations from the boat (Photograph 2.0-2). Field crews may 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*. Late-Season EWM mapping surveys have been conducted annually on Archibald Lake and are discussed in Section 2.3.

Photograph 2.0-1. Point-intercept survey on a WI lake. Photo credit Onterra.

Photo 2.0-2. EWM mapping survey on a Wisconsin lake. Photo credit Onterra.

2.1 2024 Barrier Curtain 2,4-D Treatment Site Monitoring

Subsample Point-Intercept Survey

The quantitative monitoring plan accompanying this treatment consisted of the comparison of subsample point-intercept surveys collected before and after treatment. WDNR staff collected these data and provided the data for inclusion in this report. The sampling grid consisted of 23 points spaced at 20- meter resolution and all were located within the direct area of herbicide treatment (Figure 2.1-1).

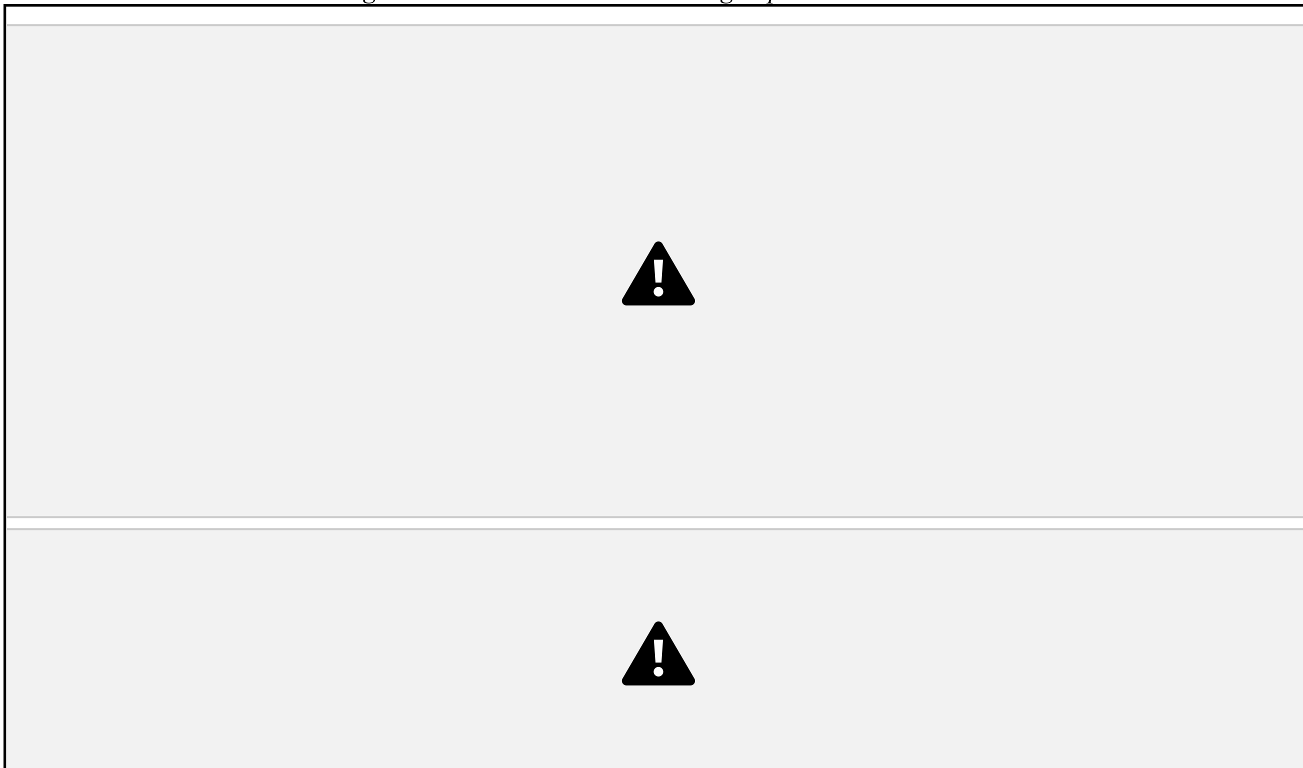


Figure 2.1-1. Frequency of occurrence of aquatic plants in site A-24 from June 2024 (Pretreatment), and August 2024 (Post treatment). n=23

The pretreatment subsample point-intercept survey was collected in late-May 2024 and the post treatment survey was conducted in August 2024. Eurasian watermilfoil populations were reduced to zero during the post treatment assessment, representing a statistically valid reduction. Of the broad leaved species present within this site, which are known to be more impacted by this chemistry, reductions in white-water lily and northern watermilfoil were observed. However, the sample size was too small for these reductions to be considered statistically valid. Wild celery and southern naiad were the only native species to have statistically valid population changes, both having population increases. Both these species emerge a little later in the growing season, which is why these species were not found during the late-May pretreatment survey but were plentiful during the late-season post treatment survey.

EWM Mapping Survey

Figure 2.1-2 highlights the EWM population within the 2024 barrier curtain site mapped before and after the spring 2024 2,4-D treatment. Prior to treatment, the site contained multiple colonies mainly consisting of *dominant* and *highly dominant* densities (Figure 2.1-2, left frame). During the summer after the treatment, eleven *single or few plants* occurrences were located within the treated area (Figure

2.1-2, right frame). The treatment met control expectations for the *year of treatment* and will be assessed during 2025 to understand whether EWM reductions extend through the *year after treatment*.

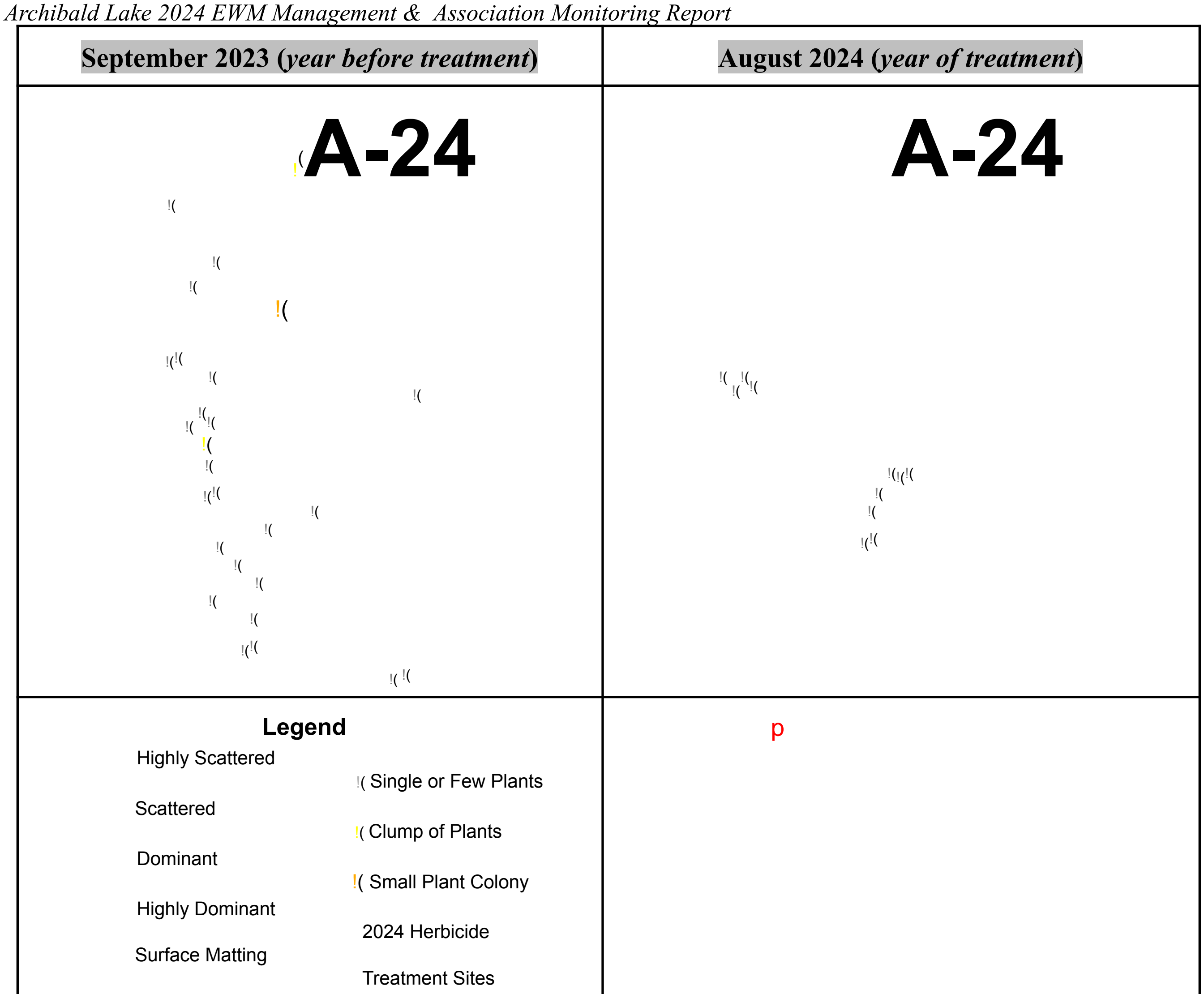


Figure 2.1-2. EWM populations from year before (September 2023) and after (August 2024) a 2,4-D treatment in Site A-24 in Archibald Lake.

Herbicide Concentration Monitoring

The herbicide concentration monitoring plan associated with the treatment was developed by Onterra and the WDNR, with the intent of gaining sufficient data to aid in understanding the concentrations of the herbicide 2,4-D that were achieved in the hours after treatment. The herbicide was applied as liquid 2,4-D amine, with herbicide concentration analysis occurring by the Wisconsin State Laboratory of Hygiene (WSLH) and reporting the results as 2,4-D acid equivalent (ae). A copy of the Herbicide

Concentration Sample Plan is included in Appendix A.

Four sites were monitored for the 2,4-D curtain treatment – 2 sites inside the curtain and 2 sites outside. Even though the herbicide is applied as 2,4-D amine, all the data is analyzed as acid equivalent (ae). The outside curtain treatment results had very little 2,4-D detected, whereas the in-curtain data started at around 2.5 ppm ae and decreased to around 0.6 ppm ae at 48 hours after treatment. Concentrations were maintained at 0.6 ppm ae until the curtain was removed at 72 HAT. Samples were collected only at a single even post curtain removal (24 hours after curtain removal), with very low levels being recorded.

Figure 2.1-3. Archibald Lake 2024 2,4-D Concentration Monitoring Results

Figure 2.1-4 shows the in-curtain average 2,4-D concentrations for the past 3 years that Onterra has been involved in the project. The data are all relatively similar, with differences in initial concentrations met and amount of 2,4-D reductions, presumably due to loss out of the curtained-off area or into wetland margins of the lake in that area.

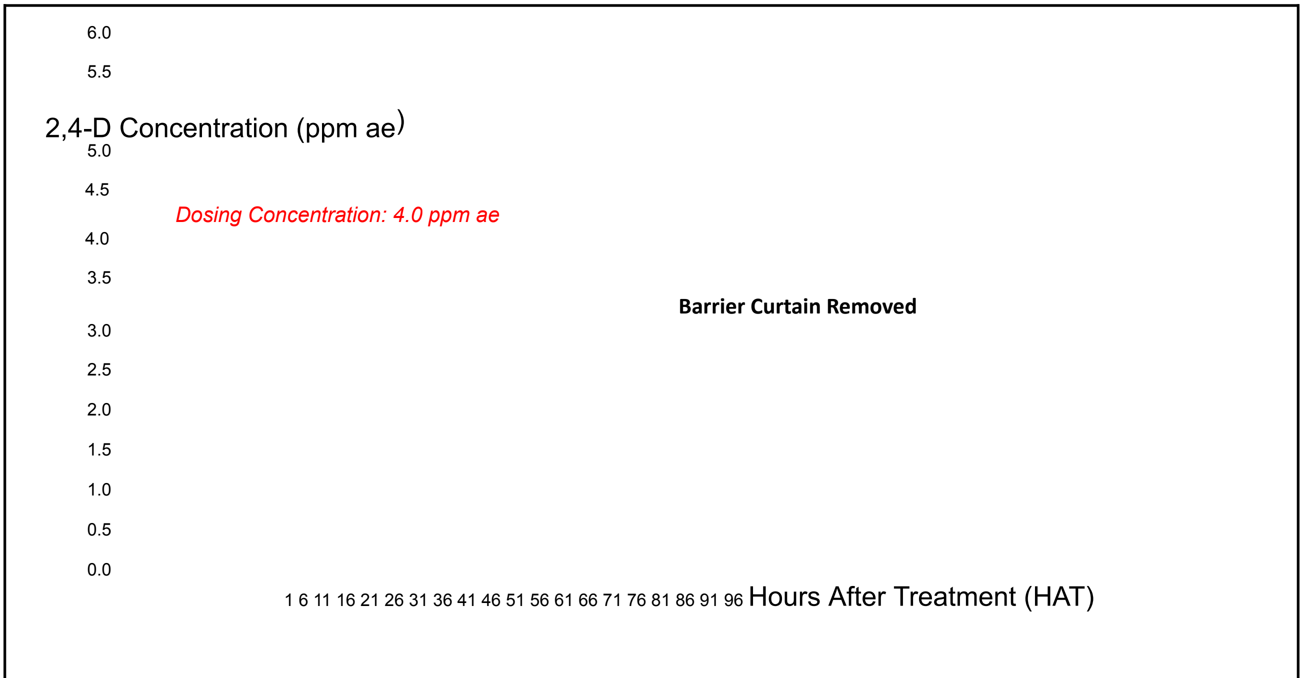


Figure 2.1-4. Archibald Lake 2022-2024 2,4-D Concentration Monitoring Results

2.2 2024 ProcellaCOR Treatment Site Monitoring

Subsample Point-Intercept Survey

A quantitative monitoring plan involved the collection of a total of 61 sub-sample point-intercept sampling locations contained within the herbicide application area (Figure 2.2-1). The quantitative assessment is completed through the comparison of the sub point-intercept survey from June 2024 (*pretreatment*) and late-season 2024 (*year of treatment*). This quantifies the change in the EWM population within the application area, comparing the pretreatment survey with a replicate survey in the late summer.

Two aquatic plant species exhibited statistically valid decreases when comparing *pretreatment* to the first post treatment monitoring interval approximately 4 months post treatment (*year of treatment*): EWM (-100%) and water stargrass (-85.7%). While water stargrass is a monocot, this species has shown some sensitivity to ProcellaCOR treatments. Northern watermilfoil is known to be highly impacted by ProcellaCOR treatments and this species was not found on the *year of treatment* post survey after being present on three sampling locations in the *pretreatment* survey.

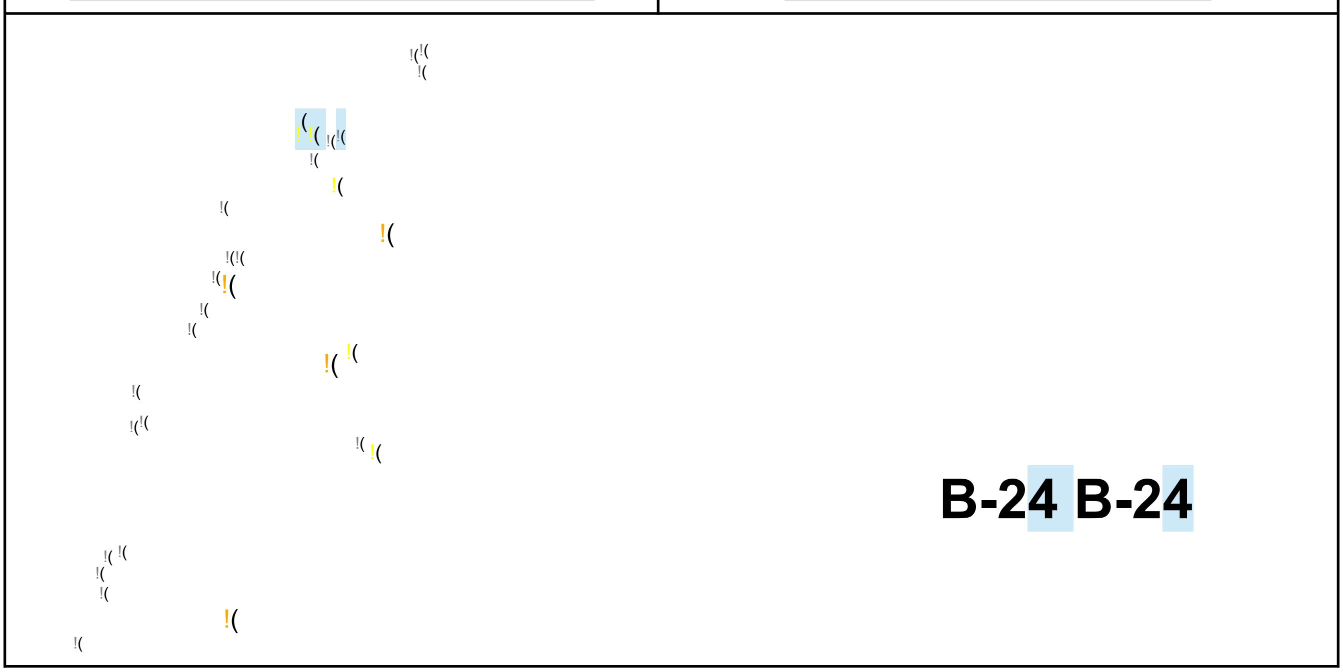
Wild celery and southern naiad exhibited a valid increase in occurrence, again likely due to these species emerging later in the growing season and after the June pretreatment survey took place. Most other native species in the survey did not show a statistically valid change in occurrence (Figure 2.2-1, Appendix B).

Figure 2.2-1. Frequency of occurrence of aquatic plants in site B-24 from June 2024 (Pretreatment), and August 2024 (Post treatment). n=61

EWM Mapping Survey

The 2024 ProcellaCOR treatment site targeted several colonized areas of EWM along with many point based occurrences in the site as well (Figure 2.2-2, left frame). Following treatment, no EWM was located within the treated area or the immediate vicinity (Figure 2.2-2, right frame). The treatment met EWM control expectations for the *year of treatment*, but will be evaluated in the *year after treatment* (2025) to understand whether extended control was achieved.

September 2023 (year before treatment)	August 2024 (year of treatment)



Legend

Highly Scattered

Scattered

Dominant

Highly Dominant

Surface Matting

!(Single or Few Plants

!(Clump of Plants

!(Small Plant Colony

2024 Herbicide Treatment Sites

Figure 2.2-2. EWM populations from year before (September 2023) and after (August 2024) a ProcellaCOR herbicide treatment in Site B-24 in Archibald Lake.

Herbicide Concentration Monitoring

The herbicide concentration monitoring plan associated with the treatment was developed by Onterra and the WDNR, with the intent of gaining sufficient data to aid in understanding the concentration exposure times of the herbicide in the hours and days after treatment. Samples were collected at two sites following treatment, each within the application area. Samples were collected at time intervals after treatment beginning at 2 hours after treatment (HAT), with additional samples collected at 4, 8, and 24 HAT as well as 2, 4, 7, and 14 days after treatment (DAT). Samples were collected by a volunteer member of the ALA and upon completion of the sampling, were shipped to EPL Bio Analytical Services in Niantic Illinois for analysis. The EPL Lab reports the concentration in parts per billion (ppb) of florpyrauxifen-benzyl (FPB), as well as florpyrauxifen acid (FP acid). A copy of the herbicide concentration monitoring plan is included as Appendix A.

FPB, the active ingredient in ProcellaCOR, was maintained within the application area at sufficient levels to impact EWM for the first two days after treatment. Each PDU/acre-ft is 1.926 ppb, so the application rate of 6 PDU/acre-ft in application areas is 11.6 ppb. Site A5 had much higher concentrations than A6, likely because it is located within a broader and more protected part of this site. By 2 Days after Treatment (DAT), the concentrations were uniform from both sampling sites in this bay. By 4 DAT, the concentrations hovered around the minimum detection limit, and were below detection limits by 7 DAT and all subsequent sampling intervals.

Figure 2.2-3. Florpyrauxifen-benzyl concentrations following a June 2024 ProcellaCOR herbicide treatment in Archibald Lake. Limit of detection = 0.15 ppb.

The primary breakdown product of FPB is florpyrauxifen acid (FP acid). FP 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.

After variable initial concentrations in the first 24 hours, there were near uniform acid metabolite concentrations at 2 DAT. At 4 DAT, FPB acid was at or slightly below minimum detection levels. FPB acid was below the minimum lab detection limits at 7 DAT and all subsequent monitoring intervals.

Figure 2.2-4. Florpyrauxifen acid concentrations following a June 2024 ProcellaCOR herbicide treatment in Archibald Lake.

2.3. Late-Summer EWM Mapping Survey

Late-Season EWM Mapping Surveys have been conducted annually on Archibald Lake using a consistent methodology by Onterra since 2020. Figure 2.3-1 displays the acres of EWM mapped during the annual late-season mapping surveys. It is important to note that Figure 2.3-1 only accounts for EWM that is mapped with area-based mapping (polygons) and does not account for any occurrences mapped with point-based attributes such as *single plants*, *clumps of plants*, or *small plant colonies*.

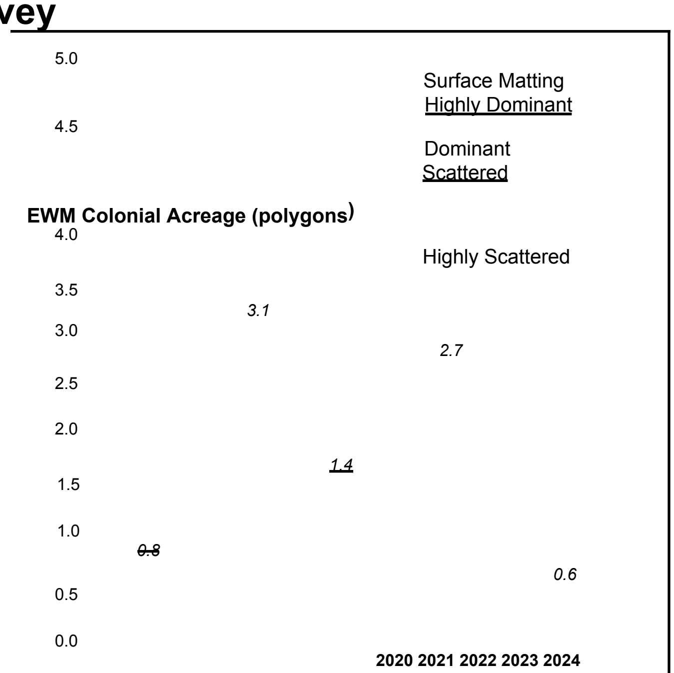


Figure 2.3-1. Archibald Lake acreage of colonized EWM (polygons) from 2020-2024. Created using data from Onterra late-summer EWM mapping surveys.

Onterra staff completed a Late-Season EWM Mapping Survey on Archibald Lake on August 26, 2024 (Maps 2-7). The entire littoral area the lake was included in the scope of the survey. Just 0.6 acres of colonized EWM was delineated around the lake, with most of the EWM population consisting of point-based occurrences such as *single plants*, *clumps of plants*, or *small plant colonies*.

The late-summer EWM mapping survey has been completed annually over the past five years, and the colonized EWM population has been limited to around 3 acres or less in each year. The colonized acreage delineated in 2024 represents the lowest total acreage since before 2020.

2.4 2023 Herbicide Treatment Sites: *Year After Treatment*

Extended monitoring of the 2023 herbicide treatment sites in Archibald Lake took place during 2024 to evaluate the treatment efficacy during the *year after treatment*. Both 2023 treatment sites showed initial decreases in the EWM population during the *year of treatment* with no EWM located in the treated area (Figure 2.4-1). The 2024 monitoring showed minimal EWM rebound in the sites. Just one EWM plant was marked within the 2,4-D site which confirms that this treatment met control expectations (Figure 2.4-1). The uncontained 2023 ProcellaCOR spot treatment site showed minimal EWM rebound as well with only relatively few single or few EWM plants occurrences present in the *year after treatment* survey (Figure 2.4-1). The 2023 ProcellaCOR treatment met lake managers control expectations with minimal EWM located in the site during the year after treatment.

September 2022 (*pretreatment*)	**September 2023 (*year of treatment*)**
!(!(!(!(!(	!(
August 2024 (*year after treatment*)	**Legend** Highly Scattered Scattered Dominant Highly Dominant Surface Matting !(Single or Few Plants !(Clump of Plants !(Small Plant Colony 2023 2,4-D Treatment Location
!(!(!(	p

Figure 2.4-1. EWM populations from year before (September 2022) and after (September 2023, August 2024) a 2,4-D treatment in Site B-23 in Archibald Lake.

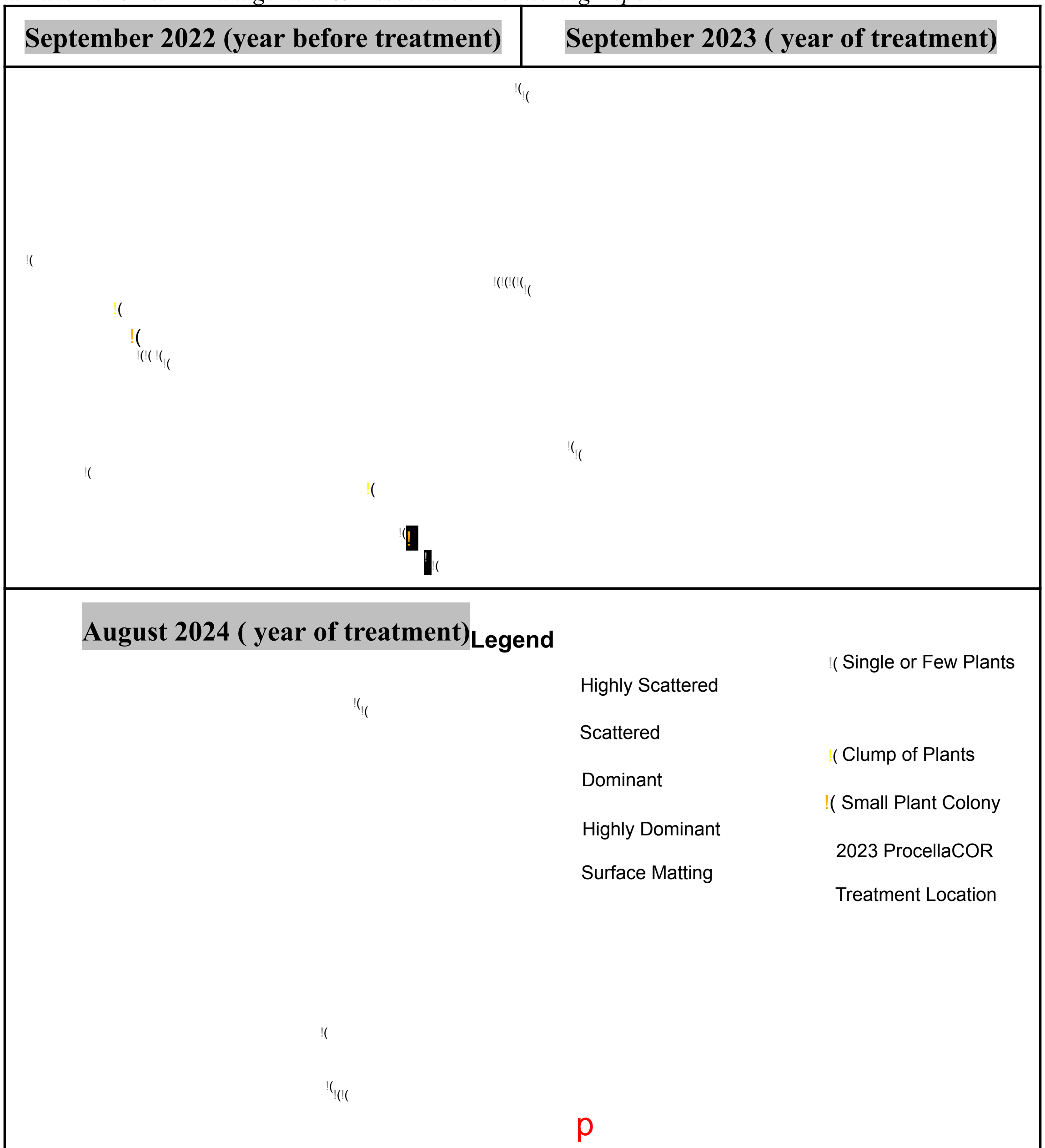


Figure 2.4-2. EWM populations from year before (September 2022) and after (September 2023, August 2024) a ProcellaCOR treatment in Site A-23 in Archibald Lake.

3.0 CONCLUSIONS & DISCUSSION

The 2024 barrier curtain 2,4-D treatment and uncontained ProcellaCOR spot-treatment both showed positive initial results with no EWM located in either site during the post-treatment late-summer EWM mapping survey. Native plant impacts were limited to a few species in the ProcellaCOR site while most species appear to have been unimpacted. Continued monitoring during 2025 will serve to understand whether these treatments meet the control expectation of there being little to no EWM in the sites during the year after treatment.

Extended monitoring of the 2023 herbicide treatment sites indicate that each site met control expectations with little to no EWM rebounding during the *year after treatment*.

4.0 2025 EWM MANAGEMENT & MONITORING STRATEGY

The ALA completed a project that resulted in an update of their *Aquatic Plant Management Plan* in 2023. An important component of this process allowed the ALA to objectively review their ongoing EWM management activities, outline appropriate thresholds of when specific control strategies warrant implementation, and establish measurable success criteria standards to monitor future control strategies.

The ALA's updated aquatic plant management plan includes an integrated pest management (IPM) strategy for EWM. The ALA's preference is for the use of herbicide spot treatments to gain multi-year EWM reductions. The use of manual removal techniques would be reserved for relatively low EWM populations such as following-up to remove rebounding plants after herbicide treatments. The ALA would consider herbicide spot treatments to target dense populations of EWM with preference to high use or high riparian frontage areas. Treatments using ProcellaCOR would be considered if target colonies have a size, shape, and location that are likely to hold sufficient CET's for an effective treatment. Sites smaller than approximately five acres would be considered for treatment with the aid of a barrier curtain.

The ALA amended their 2023 WDNR AIS-Control grant to implement the following EWM management and monitoring strategy. The ALA's 2025 EWM management strategy includes a combination of professional manual removal (includes DASH) and herbicide spot-treatments.

4.1 Integrated Pest Management Strategy: Hand Harvesting/DASH

The ALA intends to conduct at least four days of professional hand harvesting efforts during 2025. The preliminary 2025 strategy targets four sites around the lake where the EWM population is of a scale which this technique can be expected to be effective and are displayed on Map 8. Factors such as proximity to riparian piers, and other high use areas are also considered in determining the harvesting sites. Spatial data from the late-summer 2024 EWM mapping survey will be shared with the ALA's contracted firm to aid in guiding the 2025 hand harvesting activities. If DASH is being used, a WDNR permit is required.

4.2 Integrated Pest Management Strategy: Herbicide Spot Treatment

The ALA plans to build upon its success and experience with utilizing barrier curtains in recent years in completing two additional barrier curtain treatments in 2025. The 2025 strategy targets two similar areas of high density EWM in spots conducive for containment with a barrier curtain (Map 11). The ALA is seeking to evaluate the effectiveness of ProcellaCOR in this type of treatment design with one site utilizing ProcellaCOR and a second site utilizing 2,4-D. Few case studies currently exist in Wisconsin that couple ProcellaCOR with a barrier curtain and this project will provide valuable information about the efficacy of the technique.

2025 Barrier Curtain 2,4-D Treatment

One site on the east end of Archibald Lake is being considered for a barrier curtain treatment in 2025 (Map 9). This approximate 0.6-acre site is situated in a location that can accommodate a barrier curtain and harbors areas of *dominant*, and *surface matting* density EWM colonies. The application area design requires approximately 240 linear feet of curtain. The proposed treatment would utilize 2,4-D at the maximum dosing rate of 4.00 ppm.

2025 Barrier Curtain ProcellaCOR Treatment

One site located on the northeast end of Archibald Lake is being considered for a ProcellaCOR barrier curtain treatment in 2025 (Map 9). This 0.6-acre site utilizes a dosing strategy of 8.0 PDU's. Approximately 280 linear feet of curtain is required for this site.

4.3 2025 Monitoring Plan

Pretreatment Confirmation & Refinement Survey

Onterra ecologists will conduct a *Pretreatment Confirmation and Refinement Survey* prior to the herbicide application to verify application area extents and inspect the condition of the EWM colonies targeted for treatment through the use of a combination of surface surveys, rake tows, and submersible video monitoring. This meander-based survey would investigate for colonial expansion, reduced occurrence, growth stage of the EWM (and native plants), application area specifies (e.g. average depth & extents), and other aspects that would change the treatment plan. The survey will also include an investigation of water temperature and pH. During this visit, Onterra staff would provide supplies and training to volunteers for conducting herbicide concentration monitoring.

Following the *Pretreatment Confirmation & Refinement Survey*, an email-style report with map(s) of the survey results and finalized treatment plan would be provided to the ALA, WDNR, and other project partners for review prior to the treatment. Spatial data would be provided to the herbicide applicator in appropriate format. The chosen contractor, in conjunction with the ALA, will be responsible for completing appropriate permit-related documentation and deliverables to the WDNR.

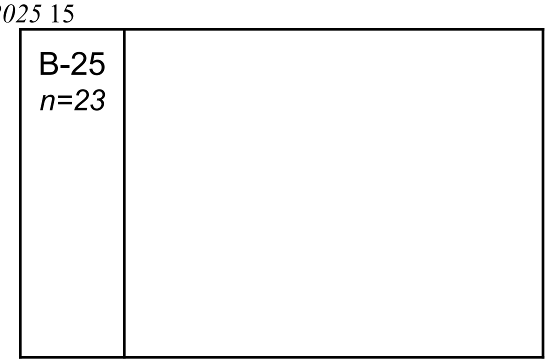
Quantitative Aquatic Plant Monitoring

Subsample point-intercept surveys would occur by Onterra *prior to treatment* (June 2025), *year of treatment* (Late Summer 2025), and *year after treatment* (Late-Summer 2026). The June 2025 pretreatment data will be collected during the Pretreatment Confirmation & Refinement Survey described above. A preliminary quantitative monitoring plan is displayed on Figure 4.3-1 that utilizes a 10-meter spacing and results in 23 sampling points within site B-25, and 24 sampling points within C-25.

Qualitative EWM Monitoring

A Late Season EWM Mapping Survey would be conducted towards the end of the growing season each year to produce the mapping data to document a census of the EWM population within the lake at the perceived peak growth stage.

Comparing these data to previous surveys will help lake stakeholders understand management outcomes.



C-25 *n*=24	

Figure 4.3-1. Quantitative monitoring plan for 2025 Herbicide Treatments. 10- meter spacing.

Herbicide Concentration Monitoring

This project includes herbicide concentration monitoring in association with the limno-curtain treatment consistent with other case studies being conducted around the state. Multiple samples would be collected at specified time intervals from inside and outside of the barrier, mostly focused on the first few days after treatment. ProcellaCOR and 2,4-D samples would be properly acidified and analyzed at the Wisconsin State Lab of Hygiene (WSLH).

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February 2025 16

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Arc 8

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Arc 9 !(

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Arc 11

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Arc 10
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Extent of Map on Right in Red

A-24

2024 Final EWM Control Strategy *2,4-D Spot Treatment w/in Limno Curtain*					
Site	**Acres**	**Avg Depth (ft)**	**Volume (acre-ft)**	**2,4-D Amine PPM ae**	**2,4-D Amine (gallons)**
A-24	2.2	8.0	17.6	4.0	50.0
Total	**2.2**		**17.6**		**50.0**

** Requires approximately 550 linear feet of curtain*

Curtain Control Point South Edge
Center

Lat Long
45.280490 -88.597288 45.280964 -88.597752 45.281336 -88.598824
")
A5
A6

2024 Final EWM Control Strategy *ProcellaCOR Spot Treatment*					
Site	Acres	Avg Depth (ft)	Volume (acre-ft)	PDU Rate (per acre-ft)	PDU Total
B-24	6.2	8.5	52.7	6.0	316
Total	**6.2**		52.7		316

")

Legend Map 1

815 Prosper Road De Pere, WI 54115 920.338.8860
k

Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra
Basemap: ESRI AGOL
Aquatic Plants: Onterra, 2023

2024 Herbicide Application Location

Herbicide Concentration ") Monitoring Location !(Curtain Control Point

Archibald Lake Oconto County, Wisconsin

Final 2024 EWM Treatment Strategy

www.onterra-eco.com Project Location in Wisconsin **Map Date:** June 11, 2024 - EJH

500 Feet

Legend

EWM Survey Results (August 26, 2024)

Map 2 (Series 1 of 6)

815 Prosper Road *De Pere, WI 54115* *920.338.8860*

k

Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024
Basemap:ESRI AGOL

Highly Scattered Scattered

Dominant

Highly Dominant

!(Single or Few Plants !(Clump of Plants !(Small Plant Colony

2024 ProcellaCOR Site 2024 2,4-D/Curtain Site 2023 ProcellaCOR Site

Archibald Lake

Oconto County, Wisconsin

2024 Late-Summer EWM Survey Results

www.onterra-eco.com

Map Date: October 3, 2024 - RMF 2023 2,4-D/Curtain Site

Project Location in Wisconsin

Surface Matting

p

500

Feet

Legend

EWM Survey Results (August 26, 2024)

Map 3 (Series 2 of 6)

815 Prosper Road De Pere, WI 54115 920.338.8860

k

Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024
Basemap:ESRI AGOL

Highly Scattered Scattered

Dominant

Highly Dominant

Single or Few Plants Clump of Plants Small Plant Colony

2024 ProcellaCOR Site 2024 2,4-D/Curtain Site 2023 ProcellaCOR Site

Archibald Lake

Oconto County, Wisconsin

2024 Late-Summer EWM Survey Results

www.onterra-eco.com

Map Date: October 3, 2024 - RMF 2023 2,4-D/Curtain Site

Project Location in Wisconsin

Surface Matting

500 Feet

Legend

EWM Survey Results (August 26, 2024)

Map 4 (Series 3 of 6)

815 Prosper Road *De Pere, WI 54115* *920.338.8860*

k

Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024
Basemap:ESRI AGOL

Highly Scattered Scattered

Dominant

Highly Dominant

Single or Few Plants Clump of Plants Small Plant Colony

2024 ProcellaCOR Site 2024 2,4-D/Curtain Site 2023 ProcellaCOR Site

Archibald Lake

Oconto County, Wisconsin

2024 Late-Summer EWM Survey Results

www.onterra-eco.com

Map Date: October 3, 2024 - RMF 2023 2,4-D/Curtain Site

Project Location in Wisconsin

Surface Matting

500 Feet

Legend

EWM Survey Results (August 26, 2024)

Map 5 (Series 4 of 6)

815 Prosper Road De Pere, WI 54115 920.338.8860

Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024
Basemap:ESRI AGOL

Highly Scattered Scattered
Dominant
Highly Dominant
Single or Few Plants Clump of Plants Small Plant Colony
2024 ProcellaCOR Site 2024 2,4-D/Curtain Site 2023 ProcellaCOR Site

Archibald Lake

Oconto County, Wisconsin

2024 Late-Summer EWM Survey Results

www.onterra-eco.com

Map Date: October 3, 2024 - RMF 2023 2,4-D/Curtain Site
Project Location in Wisconsin
Surface Matting

500 Feet

Legend

EWM Survey Results (August 26, 2024)

Map 6 (Series 5 of 6)

815 Prosper Road De Pere, WI 54115 920.338.8860

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Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024
Basemap:ESRI AGOL

Highly Scattered Scattered

Dominant

Highly Dominant

!(Single or Few Plants !(Clump of Plants !(Small Plant Colony

2024 ProcellaCOR Site 2024 2,4-D/Curtain Site 2023 ProcellaCOR Site

Archibald Lake

Oconto County, Wisconsin

2024 Late-Summer EWM Survey Results

www.onterra-eco.com

Map Date: October 3, 2024 - RMF 2023 2,4-D/Curtain Site

Project Location in Wisconsin

Surface Matting

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500 Feet

Legend

EWM Survey Results (August 26, 2024)

Map 7 (Series 6 of 6)

815 Prosper Road De Pere, WI 54115 920.338.8860

Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024
Basemap:ESRI AGOL

Highly Scattered Scattered

Dominant

Highly Dominant

Single or Few Plants Clump of Plants Small Plant Colony

2024 ProcellaCOR Site 2024 2,4-D/Curtain Site 2023 ProcellaCOR Site

Archibald Lake

Oconto County, Wisconsin

2024 Late-Summer EWM Survey Results

www.onterra-eco.com

Map Date: October 3, 2024 - RMF

2023 2,4-D/Curtain Site

Project Location in Wisconsin

Surface Matting

C-25

D-25

p

2025 Preliminary DASH Strategy

Site	Acres	Avg Depth (ft)
A-25	1.50	4.0
B-25	0.26	3.0
C-25	0.53	8.0
D-25	0.63	4.0
Total		

2.92

L

Map 8 egend

750

EWM Survey Results (August 26, 2024)

Feet

815 Prosper Road De Pere, WI 54115 920.338.8860 www.onterra-eco.com

Sources:
Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024 Basemap:ESRI AGOL
Orthophoto: NAIP, 2022
Map Date: Novembe 1, 2025 - EJH

k

Project Location in Wisconsin

Highly Scattered Scattered

Dominant

Highly Dominant Surface Matting

!(Single or Few Plants !(Clump of Plants !(Small Plant Colony

Preliminary 2025 Herbicide Treatment Site w/in Curtain

Preliminary 2025 DASH Site

eliminary DASH Strategy v1

2024 Preliminary EWM Control Strategy

ProcellaCOR Spot Treatment w/in Limno Curtain

Site	Proposed Acres	Avg Depth (ft)	Volume (acre-ft)	PDU Rate (per acre-ft)	PDU Total
B-25	0.6	5.5	3.3	8.0	26
Total	**0.6**		3.3		26

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Curtain Length (ft) 280

B-25

C-25

p

2025 Preliminary EWM Control Strategy
2,4-D Spot Treatment w/in Limno Curtain

Avg

Site Acres

C-25 0.6 5.5 3.3 4.0 9

Total 0.6 3.3 9.4

Curtain
Length (ft) 240

Legend Map 9

750

Feet

EWM Survey Results (August 26, 2024)

Archibald Lake

Sources:

k

Highly Scattered Scattered

!(Single or Few Plants !(Clump of Plants

Preliminary 2025 Herbicide Treatment

Oconto County, Wisconsin

815 Prosper Road De Pere, WI 54115 920.338.8860 www.onterra-eco.com

Roads and Hydro: WDNR
Bathymetry: Onterra, 2016
Aquatic Plants: Onterra, 2024 Basemap:ESRI AGOL
Orthophoto: NAIP, 2022
Map Date: Novembe 1, 2025 - EJH

Project Location in Wisconsin

Dominant

Highly Dominant Surface Matting

!(Small Plant Colony

Site w/in Curtain **2025 Preliminary Treatment Plan v2**

APPENDIX A

Herbicide Concentration Monitoring Sample Plan

- **2,4-D Sample Plan**
- **ProcellaCOR Sample Plan**

Archibald Lake, Oconto County (WBIC: 417400)
2024 Herbicide Sample Plan
Onterra, LLC

Archibald Lake, located in Oconto County, is a 392-acre seepage lake that has a maximum depth of 50 feet. Liquid 2,4-D is proposed to be applied to approximately 2.2 acres on the west end of the lake in spring of 2024 to control Eurasian watermilfoil. A barrier curtain will be used around the perimeter of the treatment area in an attempt to maintain desired herbicide concentration levels. Herbicide concentration sampling will be conducted in order to monitor the herbicide concentrations in the days following the application.

Water samples will need to be collected at the sites and depths listed below. Coordinates are in decimal degrees. Locations of each sampling site are displayed with green squares on the image below.

Archibald Lake Herbicide Sample Sites
Site Label Site Description Station ID Latitude Longitude Sample Depth
Arc 8 Outside of A-24 10058896 45.28097936 -88.5971887 Integrated (0-6 feet)
Arc 9 Outside of A-24 10058897 45.28148372 -88.59811412 Integrated (0-6 feet)
Arc 10 Inside of A-24 10058898 45.28052089 -88.59801477 Integrated (0-6 feet)
Arc 11 Inside of A-24 10058899 45.28078889 -88.59842783 Integrated (0-6 feet)

Typically, when structures are placed in a navigable waterway, a permit issued under NR 329, Wis. Adm. Code is required. However, when the temporary use of curtains is used to segregate invasive plant beds for chemical control, and is demonstrated to be a benefit to the public resource and protect the public rights in navigable waterways, the Department has made a determination to allow for the temporary placement of these structures without a NR 329 permit. Barriers must be placed no sooner than 24 hours before treatment and must be removed no later than 72 hours after treatment, not to exceed a total of 96 hours.

This sampling plan was created under the assumption the barrier curtain will be removed at the 72-hour after treatment limit. The table below separates the sampling intervals as either before or after curtain removal. Samples will need to be collected at nine total intervals. Five sampling intervals are scheduled to take place before curtain removal and are referred to as Hours After

Treatment (HAT). The remaining four sampling intervals are referred to as Hours After Curtain (HAC) and indicate the number of hours after the curtain has been removed. If a sample cannot be collected at the interval listed below, please collect the sample as soon as reasonably possible and record the change.

<table>
<tr><th colspan="5">Sampling Interval Matrix
(X indicates sample to be collected)</th></tr>
<tr><th>Interval</th><th colspan="2">Application Area A-24
Site Arc10 Site Arc11</th><th colspan="2">Outside Application Area
Site Arc8 Site Arc9</th></tr>
<tr><td colspan="5">Herbicide Application Complete</td></tr>
<tr><td>1 HAT</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
</table>

6 HAT	X	X	X	X
24 HAT	X	X	X	X
48 HAT	X	X	X	X
72 HAT	X	X	X	X
Barrier Curtain Removed				
3 HAC	X	X	X	X
6 HAC	X	X	X	X
12 HAC	X	X	X	X
24 HAC	X	X	X	X
HAT = Hours After Treatment, HAC = Hours After Curtain				

All water samples will be collected using a six-foot integrated sampler (Photo 1). A video tutorial demonstrating the proper sample collection methodology is available on Onterra's YouTube web page: click here

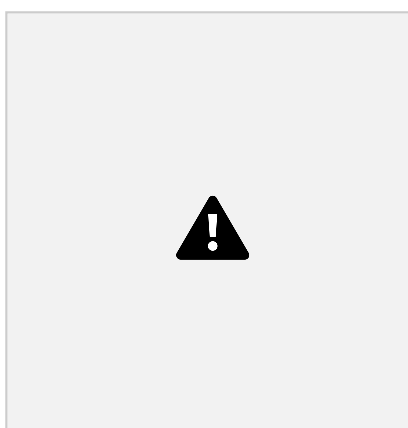

Photo 1. Six-Foot Integrated Sampler (top) & custom transfer bottle (Bottom).

Water is collected by pushing the integrated sampler straight down to an approximate depth of six feet; or in water less than six feet, down to approximately one foot above the bottom sediment. The sampler is brought to the surface and emptied into a customized mixing bottle by pushing open the stop valve of the integrated sampler. The mixing bottle should be given a brief stir to mix the contents, and then emptied from the mixing bottle into the appropriately labeled final 60 mL sampling bottle. Once in the final sampling bottle, the water sample must be completely preserved by adding 3-4 drops of sulfuric acid with an eye dropper.

Onterra will provide all of the necessary supplies to complete the sampling and provide training to volunteers collecting the samples. Onterra has a limited supply of GPS units, temperature probes, and integrated sampler devices available to loan out for the duration of the sampling upon request. All other materials including pre-labeled sampling bottles, datasheets and a shipping container will be provided.

While the samples are being collected, they should be kept cold and out of direct sunlight by keeping them in a small cooler on the boat. After collection, all samples should be stored in a refrigerator until shipping.

It is important to use a separate data sheet for each day that is monitored. Please fill out one data sheet for each sample interval and fill in the highlighted boxes. Store the preserved samples in a refrigerator. After the completion of the final sampling interval, please ship all of the samples and the data sheets to the Wisconsin State Lab of Hygiene (WSLH) within the insulated shipping box. Please review the attached Herbicide Sampling Handling Instructions for specific shipping instructions.

If you have any questions, please call or email one of the contacts listed below.

Project specifics, logistics and sampling methods	
Todd Hanke **Onterra, LLC** **thanke@onterra-eco.com** **Office (920) 338-8860**	
WDNR Support	
Brenda Nordin **WI DNR – Lakes Coordinator** **Brenda.Nordin@wisconsin.gov** **Office (920) 360-3167**	
Wisconsin State Lab of Hygiene	
Brandon Bongard **WI State Lab of Hygiene** **Brandon.Bongard@slh.wisc.edu** **Office (608) 890-1786**	

4/30/2024

Archibald Lake, Oconto County (WBIC: 417400)
2024 Herbicide Sample Plan
Onterra, LLC

Archibald Lake, located in Oconto County, is a 392-acre seepage lake that has a maximum depth of 50 feet. Florpyrauxifen-benzyl (ProcellaCOR™) is proposed to be applied to 6.2 acres in early summer 2024 to control Eurasian watermilfoil. Herbicide concentration sampling will be conducted in order to monitor the herbicide concentrations in the days following the application.

Water samples will need to be collected at the sites and depths listed below. Coordinates are in decimal degrees. Locations of each sampling site are displayed with green squares on the image below.

Archibald Lake Herbicide Sample Sites
Site Label Site Description Station ID Latitude Longitude Sample Depth
A5 application area B-24 10058894 45.278726 -88.597751 Integrated (0-6 feet)
A6 application area B-24 10058895 45.278182 -88.596465 Integrated (0-6 feet)

Please note that a single sample is to be collected before the treatment as a 'control' for the lab analysis. Please collect the pre-treatment sample at a time that is most convenient for the volunteer but as close to the treatment date as possible. After the herbicide application is completed, additional samples will need to be collected at eight different time intervals throughout the project and are listed in the table below. Sample collection intervals are listed either as Hours After Treatment (HAT) or Days After Treatment (DAT). Direct communication between the water sample collector and the herbicide applicator is necessary to ensure the collector is prepared to begin three hours after treatment is completed. If a sample cannot be collected at the interval listed below, please collect the sample as soon as reasonably possible and record the change.

Sampling Interval Matrix (X indicates sample to be collected)	
Interval	**Application Area**A5 A6

Pre-Treatment	X	
3 HAT	X	X
6 HAT	X	X
9 HAT	X	X
24 HAT	X	X
2 DAT	X	X
4 DAT	X	X
7 DAT	X	X
14 DAT	X	X
HAT = Hours After Treatment, DAT = Days After Treatment		

All water samples will be collected using a six-foot integrated sampler (Photo 1). A video tutorial demonstrating the proper sample collection methodology is available on Onterra's YouTube web page: click here

6 Feet **Photo 1. 6-foot Integrated sampling device constructed of PVC tubing.**

Due to the extremely low concentrations being measured at the laboratory (<1 part per billion), **it is very important to thoroughly rinse the integrated sampler device and the custom mixing bottle with the water from each sampling site upon arrival at the site**. Water is collected by pushing the integrated sampler straight down to a depth of six feet; or in water shallower than six feet, down to approximately one foot above the bottom sediment. The sampler is brought to the surface and emptied into a customized mixing bottle by pushing open the stop valve at the end of the integrated sampler (Photo 2). Water should be poured from the custom mixing bottle to triple rinse the clear glass bottle. After the clear glass bottle is triple rinsed, it is to be filled for a fourth time with the water from the custom mixing bottle and then carefully poured into the brown glass bottle which has a preservative solution already inside (Photo 3).

Please use a fine-tipped permanent marker to record the date and time the sample is collected on the sticker label of the brown glass bottle (Photo 4). The final sample (in the brown bottle) as well as the emptied clear glass bottle should be carefully placed back within the bubble wrapped pouch to protect from accidental breakage.

While the samples are being collected, they should be kept cold and out of direct sunlight by keeping them in a small cooler on the boat. After collection, all samples should be stored in a refrigerator until shipping.

5/6/2024

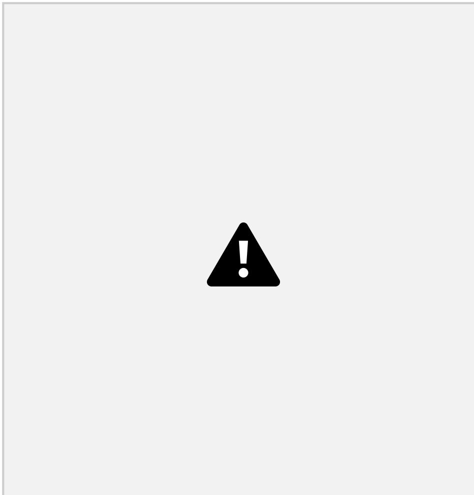	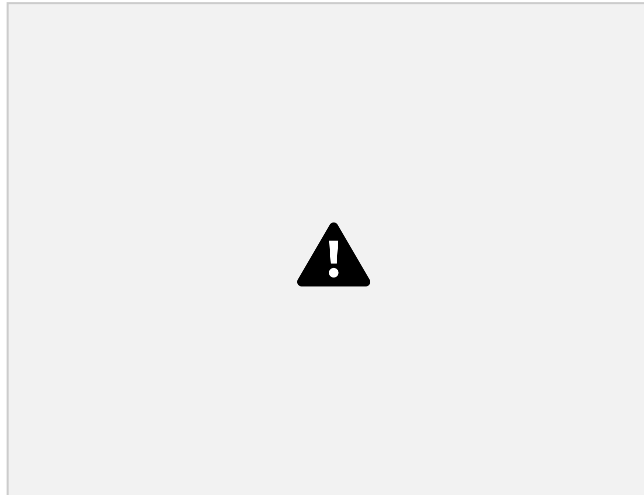
Photo 2. Emptying the water sample from the integrated sampler device into the custom mixing bottle.	**Photo 3. Clear glass mixing bottle and final brown glass bottle.**

Onterra will provide all of the necessary supplies to complete the sampling and provide training to the volunteer(s) collecting the samples. Onterra has a limited supply of handheld GPS units and integrated sampler devices available to loan out for the duration of the sampling upon request. All other materials, including sampling bottles with labels, a customized mixing bottle and necessary paperwork will be provided.

The entries written on the Chain of Custody (COC) forms must be consistent with the label codes on the sample bottles so that the laboratory can clearly match each sample with its corresponding information on the COC forms. Please ensure that each sample that is collected is labeled consistently with entries listed on the COC form including "*client sample site I.D*." Please fill out the following fields on the Chain of Custody forms (Photo 5):

- Sampler: (Volunteer Name)
- Client Sample Site I.D.: (example: A5 or A6)
- Date sample is collected

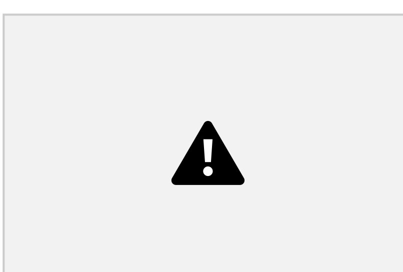	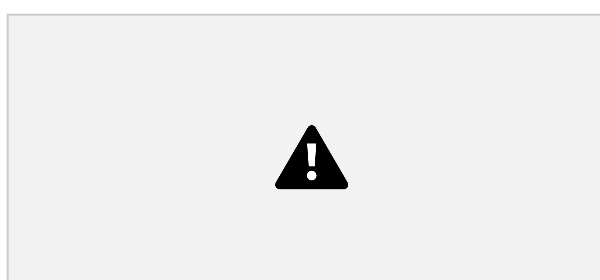
Photo 4. Sticker label on final brown sample bottle.	**Photo 5. Extracted section of Chain of Custody Form that must be filled to match the bottle sticker label.**

Shipping Instructions

1) When all sampling is complete, make sure all sample vials are placed in bubble wrap within the provided soft cooler.
2) Put an ice pack into the soft cooler. This can also be a frozen water bottle (contained in an unlabeled zip lock bag). Do not place loose ice in the cooler.
3) Find a cardboard box that will fit the soft cooler for transport. If needed, pack empty space with packing material so the soft cooler is secure within the cardboard box. 4) Place the completed Chain of Custody forms in the cardboard box.
5) Only ship Monday - Thursday. The lab will not be open to receive the samples on a Saturday.
6) We recommend utilizing *FedEx Standard Overnight* so the samples can be received the next day by the lab before 4:30PM (when the lab closes).
7) Shipping costs are expected to be $150-$200 for next day delivery.
8) Ship the cardboard box containing the soft-sided cooler bag, water samples, and Chain of Custody forms to the address below:

EPL Bio Analytical Services
9095 W. Harristown Blvd.
Niantic, IL 62551

If you have any questions, please reach out to one of the contacts listed below.

Project specifics, logistics and sampling methods	
Todd Hanke **Onterra, LLC** **thanke@onterra-eco.com** **Office Phone (920) 338-8860**	
WDNR Support	
Brenda Nordin **WI DNR – Lakes Coordinator** **Brenda.Nordin@wisconsin.gov** **Office (920) 360-3167**	

5/6/2024

APPENDIX B

Subsample Point-Intercept Aquatic Plant Survey Data

- **Pre/YOT of 2024 Sites**

Pre/YOT of 2024 Sites

Site A-24, n=23

Scientific Name	Common Name	LFOO (%)	
		Pretreatment	Post Treatment
Myriophyllum spicatum	Eurasian w atermilfoil	52.2	0.0
Elodea canadensis	Common w aterw eed	26.1	43.5
Vallisneria americana	Wild celery	0.0	87.0
Chara spp.	Muskgrasses	17.4	39.1
Potamogeton gramineus	Variable-leaf pondw eed	13.0	13.0
Potamogeton zosteriformis	Flat-stem pondw eed	4.3	21.7
Heteranthera dubia	Water stargrass	8.7	13.0
Najas guadalupensis	Southern naiad	0.0	17.4
Potamogeton illinoensis	Illinois pondw eed	4.3	4.3
Potamogeton epihydrus	Ribbon-leaf pondw eed	4.3	0.0
Nymphaea odorata	White w ater lily	4.3	0.0
Myriophyllum sibiricum	Northern w atermilfoil	4.3	0.0
Ceratophyllum demersum	Coontail	0.0	8.7
Potamogeton richardsonii	Clasping-leaf pondw eed	0.0	4.3
Nitella spp.	Stonew orts	0.0	4.3

Site B-24, n=61

Scientific Name	Common Name	LFOO (%)	
		6/10/2024	8/26/2024
Chara spp.	Muskgrasses	83.6	82.0
Vallisneria americana	Wild celery	34.4	68.9
Potamogeton gramineus	Variable-leaf pondw eed	23.0	37.7
Najas guadalupensis	Southern naiad	1.6	14.8
Potamogeton robbinsii	Fern-leaf pondw eed	4.9	11.5
Potamogeton amplifolius	Large-leaf pondw eed	8.2	8.2
Myriophyllum spicatum	Eurasian w atermilfoil	18.0	0.0
Heteranthera dubia	Water stargrass	11.5	1.6
Najas flexilis	Slender naiad	6.6	3.3
Potamogeton zosteriformis	Flat-stem pondw eed	6.6	1.6

Potamogeton richardsonii	Clasping-leaf pondw eed	0.0	4.9
Potamogeton natans	Floating-leaf pondw eed	1.6	3.3
Sagittaria sp. (rosette)	Arrow head sp. (rosette)	6.6	0.0
Nuphar variegata	Spatterdock	0.0	3.3
Potamogeton praelongus	White-stem pondw eed	4.9	0.0
Myriophyllum sibiricum	Northern w atermilfoil	4.9	0.0
Elodea canadensis	Common w aterw eed	1.6	1.6
Potamogeton strictifolius	Stiff pondw eed	0.0	1.6
Nymphaea odorata	White w ater lily	0.0	1.6