

Manitowish Waters Chain of Lakes
Vilas County, Wisconsin
Aquatic Plant Management Plan - Addendum
July 2026

Official First Draft

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Funded by: Manitowish Waters Chain of Lakes Association
North Lakeland Discovery Center
Wisconsin Dept. of Natural Resources
Town of Manitowish Waters

Acknowledgements

This management planning effort was truly a team-based project and could not have been completed without the input of the following individuals:

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Greg Holt	Angie Dombrowicki	Eleanor Butler	JoAnn Miller
Sue Austin	Tom Bernhardt	Mary Bowlus	Delp Schafer
Carla Hameister	Tom Kramer	Mike McKeon	Karen Dixon – Past President/Consultant

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Wisconsin Department of Natural Resources

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- B. CLP Management Records & Monitoring Results
- C. Agency and Public Comments on Official First Draft (*To be included in final version*)

1.0 INTRODUCTION

The Manitowish Waters Chain of Lakes consists of 10 lakes with three additional lakes located below the Rest Lake Dam (Figure 1.0-1). The waterbodies total over 4,200 acres located in and just east of the Town of Manitowish Waters in Vilas County. The chain is fed by a series of streams, including Papoose Creek, Rice Creek, Island Creek, the Manitowish River and Trout River. Downstream of the Rest Lake Dam, the Manitowish River runs into Iron County where it becomes one of two main tributaries that feed into the 13,500+ acre Turtle Flambeau Flowage.

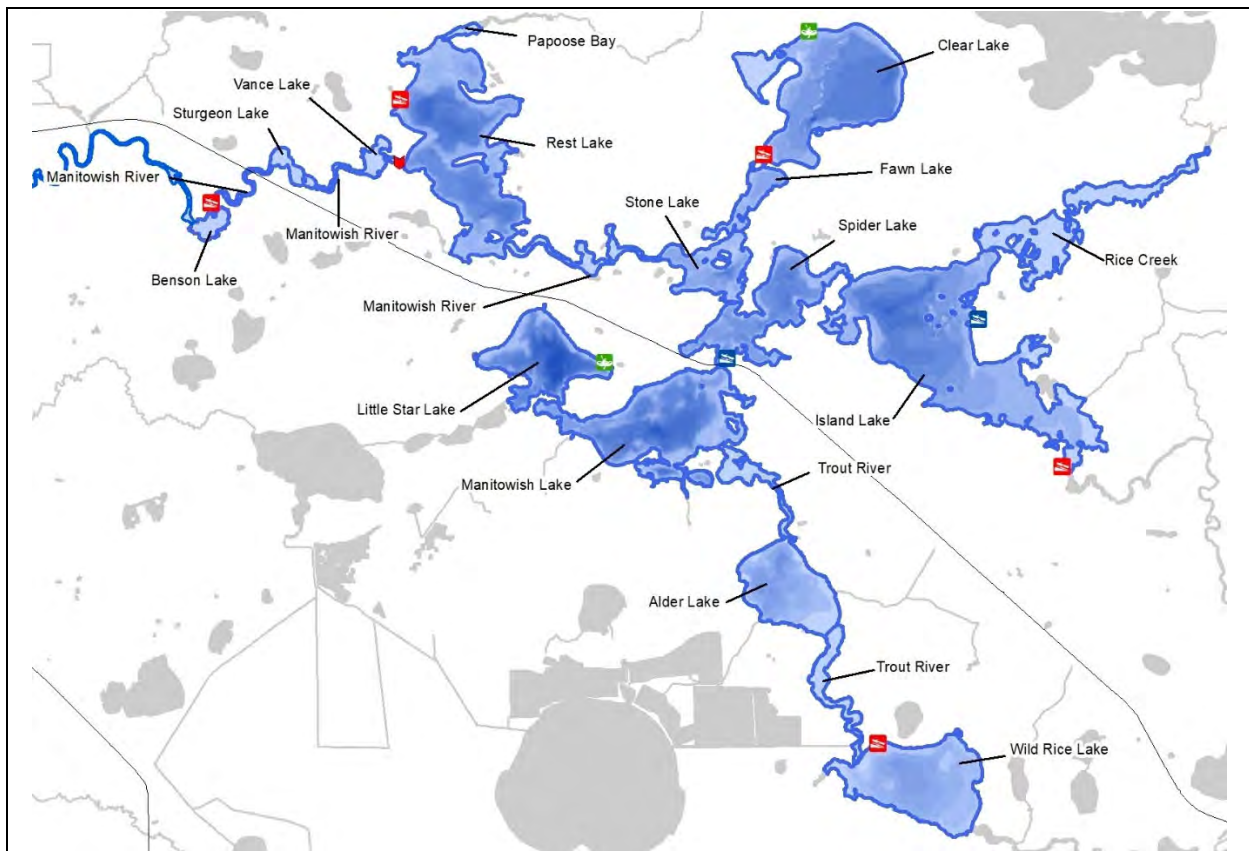


Figure 1.0-1. Manitowish Waters Chain of Lakes.

The chain's 2019 management plan called for continued water quality monitoring, consistent monitoring of AIS, and periodic vegetation monitoring. During 2023, Eurasian watermilfoil was confirmed within the Manitowish Waters Chain of Lakes for the first time. This prompted a rapid response by Manitowish Waters Lake Association (MWLA), NLDC (North Lakeland Discovery Center), WDNR, and other project partners to determine EWM's footprint within the system, conduct a series of informational meetings and educational outreach, and initiate aggressive manual removal efforts.

MWLA was awarded a WDNR Planning grant in February 2025 that included funding to update their Aquatic Plant Management Plan, specifically aspects relating to EWM management. The project resulted in the creation of MWLA's EWM management plan for the entire Manitowish Waters Chain of Lakes (*Manitowish Waters Chain of Lakes – Aquatic Plant Management Plan Jan. 2026*).

Subsequently, the MWLA, in partnership with NLDC applied for a WDNR planning grant in the fall 2025 cycle to obtain funding assistance to commence a project in spring 2026 to update the APM Plan in regards to curly-leaf pondweed management specifically. Having an updated CLP APM Plan will allow the MWLA to retain eligibility to apply for future AIS control grants through the WDNR surface water grant program. This document serves to provide an addendum to the January 2026 APM Plan, with updates to the implementation plan discussed in section 4.0 below.

2.0 STAKEHOLDER PARTICIPATION

Strategic Planning Meeting

On May 12, 2026, a strategic planning meeting took place at the Manitowish Waters Community Center. An invitation to attend the meeting was sent to MWLA Board members, NLDC staff, representatives from Lac du Flambeau Band of Lake Superior Chippewa Indians, and local Town officials. During the meeting, Todd Hanke, an aquatic ecologist with Onterra, LLC, presented material covering CLP best management practices, historical management on the Manitowish Waters Chain, monitoring methods, and management strategies and philosophies. A copy of the presentation slides from this meeting is included within Appendix A. Following the presentation, a discussion took place to review the content of the existing CLP-related management actions, and an outline of new CLP actions was developed.

Management Plan Review and Adoption Process

An Official First Draft of the APM Plan Addendum document will be provided to WDNR for agency review in summer 2026. Coinciding with the WDNR review of the draft plan, the draft will be made available via the MWLA's outreach and communication avenues for public comment for at least 21 days. A summary of the public and WDNR/agency comments that are received will be included within Appendix C.

3.0 CURLY-LEAF PONDWEED MONITORING & MANAGEMENT HISTORY

Curly-leaf pondweed (*Potamogeton crispus*; CLP) is a European exotic first discovered in Wisconsin in the early 1900's that has an unconventional lifecycle giving it a competitive advantage over our native plants. The plants begin growing almost immediately after, if not immediately before, ice-out and by early-summer they reach their peak growth. As they are growing, each plant produces numerous turions (asexual reproductive structures) which break away from the plant and settle to the bottom following the plant's senescence. The deposited turions lie dormant until autumn when they sprout to produce small winter foliage, and they remain in this state until spring foliage is produced. The advanced growth in spring gives the plant a significant jump on native vegetation. In certain lakes, CLP can become so abundant that it hampers recreational activities within the lake. In instances where large CLP populations are present, its mid-summer die-back can cause significant algal blooms spurred from the release of nutrients during the plants' decomposition. However, in some lakes, mostly in northern Wisconsin, CLP appears to integrate itself within the community without becoming a nuisance.



Photograph 3.0-1. Curly-leaf pondweed (*Potamogeton crispus*). Photo credit Onterra.

Like our native pondweeds, CLP produces alternating leaves along a long, slender stem. The leaves are linear in shape with a blunt tip, and the margins are wavy and conspicuously serrated (Photograph 3.0-1). The plants are often brownish/green in color.

Whole-lake point-intercept surveys have been completed on all the lakes comprising the Manitowish Waters Chain of Lakes over the course of time dating back to 2006 (Figure 3.0-1). The details specific aquatic plant studies that have taken place over time are compiled within numerous reports authored by Onterra or NLDC, often as a deliverable for a prior grant funded project. Data specifically from the point-intercept surveys can be viewed on the WDNR's aquatic plant explorer webpage <https://dnr-wisconsin.shinyapps.io/AquaticPlantExplorer/>. Any report that was generated as a part of a grant-funded project is available through the WDNR.

Point-intercept surveys have limited value in monitoring CLP populations due to the fact that much of the CLP population senesces early in the growing season prior to the mid-summer timing of when the point-intercept surveys are conducted. CLP has been documented on point-intercept surveys either directly on the survey rake or incidentally, with data available on the WDNR aquatic plant explorer webpage.

Table 3.0-1. Point-Intercept Surveys Completed on Manitowish Waters Chain of Lakes.

Lake	Point-Intercept Surveys
Alder	2014 (Onterra), 2024 (Onterra)
Benson	2017 (Onterra), 2026 (NLDC)
Clear	2013 (Onterra), 2023 (Onterra)
Fawn	2013 (Onterra), 2023 (Onterra)
Island	2011 (WDNR), 2022 (Onterra)
Little Star	2016 (Onterra), 2025 (NLDC)
Manitowish	2016 (Onterra), 2025 (Onterra)
Rest	2008 (WDNR) 2012 (Onterra), 2022 (Onterra)
Rice Creek	2012 (WDNR), 2023 (Onterra)
Spider	2012 (Onterra), 2022 (Onterra)
Stone	2017 (Onterra), 2026 (Onterra)
Sturgeon	2006 (WDNR) 2017 (Onterra), 2026 (NLDC)
Vance	2017 (Onterra), 2026 (NLDC)
Wild Rice	2008 (WDNR), 2014 (Onterra), 2024 (NLDC)

3.1 Curly-leaf Pondweed Monitoring

CLP has been monitored within the Manitowish Waters Chain of Lakes since discovery in 2010. The primary means of monitoring is through visual mapping surveys with GPS guidance that are conducted during the early summer. CLP has been identified within several lakes in the Chain including Rest, Stone, Spider, Fawn, Alder, Vance, and Island Lakes as well as within Rice Creek (Table 3.1-1).

In recent years, monitoring of the CLP population has been accomplished by a combination of Onterra ecologists or NLDC conducting early season mapping surveys. Onterra has surveyed known CLP lakes including Rest, Fawn, Stone, Spider, Island, and Rice Creek, while NLDC surveyed the remaining water bodies.

A representation of all CLP occurrences mapped during Onterra’s surveys since 2010 on the system is displayed on Figure 3.1-1. The footprint of the CLP population shows that some sites harbored CLP on multiple monitoring events such as Rice Creek, the channel between Spider and Island Lakes, Fawn Lake, and an area on the north end of Rest Lake. The footprint analysis also indicates that many littoral areas of the system have not been found to harbor CLP to date, including large portions of Island Lake and Rest Lake, where CLP is known to be present in other areas of those waterbodies.

Table 3.1-1. Year of CLP discovery on waterbodies within Manitowish Waters Chain of Lakes.

Lake Name	Year Discovered
Island Lake	2010
Rice Creek	2011
Spider Lake	2011
Stone Lake	2013
Manitowish Lake	2013
Manitowish River	2013
Rest Lake	2015
Fawn Lake	2017
Vance Lake	2022
Clear Lake	2023
Alder Lake	2025
Lower Trout River	2026

A significant CLP population was present within Rice Creek during several years of monitoring, but this site was not managed and has since shown a highly variable CLP population including little to no plants in recent years.

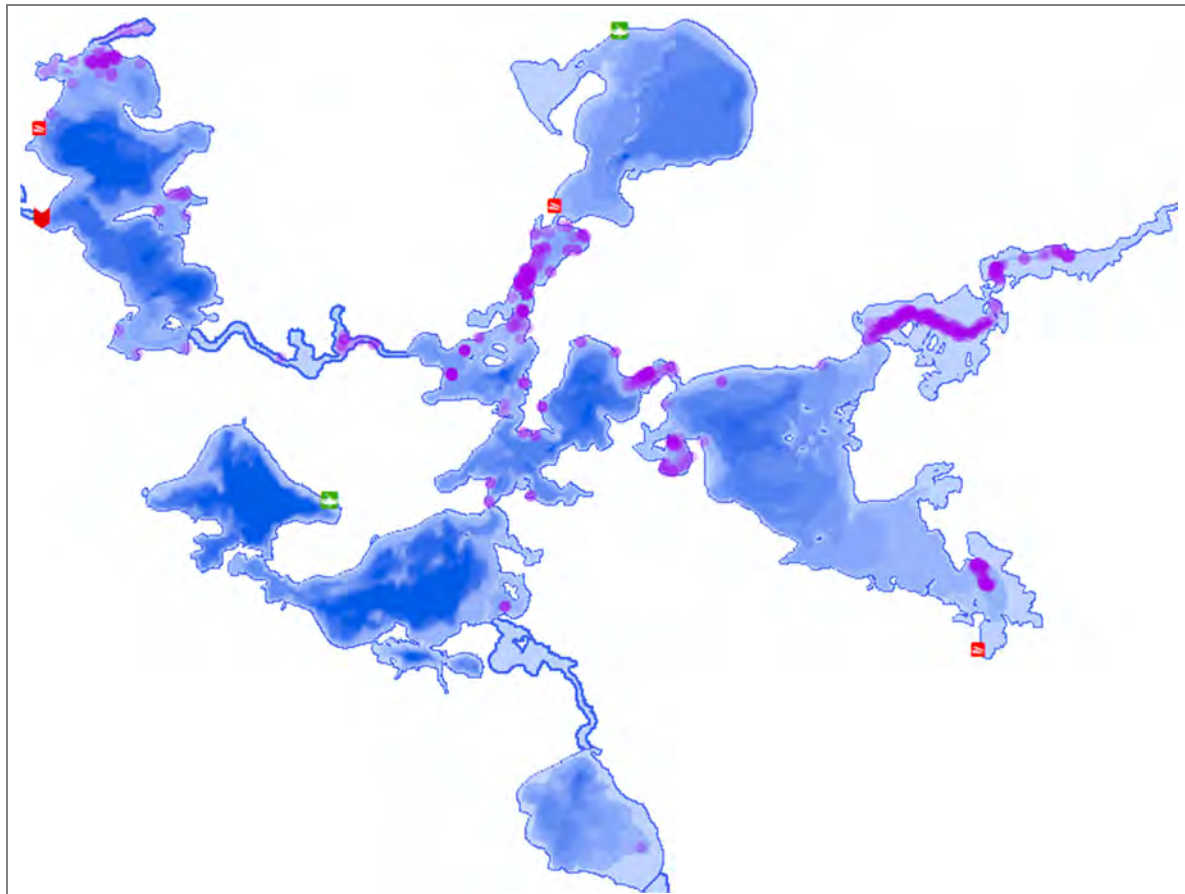


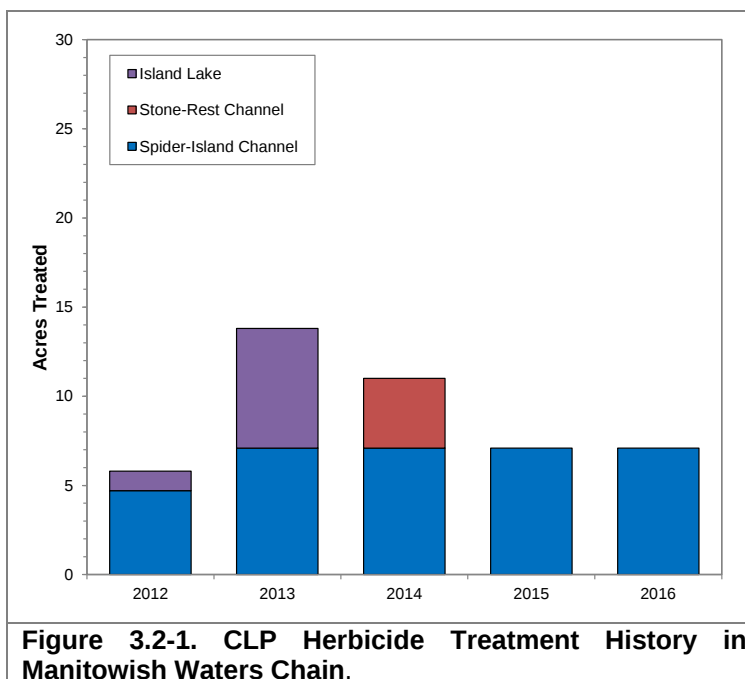
Figure 3.1-1. CLP Footprint in Manitowish Waters Chain. Data from Onterra CLP mapping surveys 2010-2025

Onterra's most recent CLP monitoring survey results from June 2025 are displayed on Map 1. Aside from a 1.6-acre colony in Fawn Lake, and a relatively small *scattered* density colony in Island Lake, the CLP population in the system was modest in 2025 and consisted mostly of individual plants or *clumps of plants*.

NLDC led CLP monitoring surveys on much of the system during 2026. Maps are contained within Appendix B that display the results of these surveys. A new population of CLP was encountered within the Lower Trout River during the 2026 monitoring.

3.2 Curly-leaf Pondweed Management History

After initial discovery, early populations were managed through a combination of manual removal efforts and herbicide treatments. Herbicide treatments occurred between 2012-2016 targeting colonized CLP populations within Island Lake, the channel connecting Spider & Island Lakes, and with the Manitowish River between Stone and Rest Lakes (Figure 3.2-1). These treatments were considered successful at the time with reduced CLP populations in the target areas. Herbicide management of CLP has not occurred in the system since 2016 as the population was relatively sparse and manageable through hand harvesting efforts.



Since 2017, the sole method of CLP management has been through manual removal efforts. Data from the early season mapping surveys is used to guide subsequent harvesting efforts and to assess the management strategy. Contracted professional harvesting has occurred each year since 2014 targeting CLP in the system, with recent years focused upon targeting a growing colony within Fawn Lake (Table 3.3-1, Appendix B). Approximately 630 cubic feet of CLP have been harvested from the Manitowish Waters Chain from 2014-2025 by professional contractors. The greatest amount of harvest from any one year occurred in 2025 during which 227 cubic feet of CLP was removed from Fawn Lake.

Year	Lakes Harvested	Diver Hours	CLP Harvest (cubic feet)
2014	Island, Stone	14	3
2015	Island	24	2
2016	Island	29	11
2017	Spider, Rest	24	13.4
2018	Spider, Fawn, Rest, Stone	24	10
2019	Fawn	19.7	158
2020	Fawn	13.3	10.5
2021	Fawn	12.4	94
2022	Fawn, Rest	11.9	23
2023	Fawn, Rest	11.8	12.5
2024	Fawn	13.2	65.5
2025	Fawn	12.3	227
Total		209	630

Table 3.3-1. CLP DASH History in Manitowish Waters Chain 2017-2025. Data compiled from Aquatic Plant Management, LLC Harvest Reports.

NLDC staff also conducts CLP harvesting around the Chain with most efforts targeted at relatively small or isolated occurrences. In many instances, NLDC staff will dive and removal individual CLP plants as they encounter them while conducting monitoring surveys. A summary of CLP harvesting activities from 2012 to current was compiled by NLDC staff and is included in Appendix B.

4.0 ADDENDUM TO AQUATIC PLANT MANAGEMENT PLAN

The Comprehensive Lake Management Plan for the Manitowish Waters Chain of Lakes was finalized in December 2019. The Aquatic Plant Management Plan (APM plan) aspects were updated in 2025 with the primary focus on the newly discovered Eurasian watermilfoil population in the system. The resulting APM plan, finalized in January 2026, led to the creation of two new management actions under Management Goal #4 as shown in Table 4.0-1 below. The 2025 APM Plan project did not include an update regarding CLP, and a subsequent project was initiated in spring 2026 to update that aspect of the MWLA's APM Plan.

The MWLA, in partnership with NLDC, and TAISP continues to follow the remaining goals outlined in the 2019 Comprehensive Plan and 2025 APM Plan for which the aquatic plant management related goals and actions are compiled within the table below. Note that each action has a corresponding description which provides details of each action included within its original plan but is not copied into Table 4.0-1.

Table 4.0-1. MWLA Management Goal #4 and Actions	
<u>Goal 4: Control Existing and Prevent Further Aquatic Invasive Species Establishment within the Manitowish Waters Chain of Lakes.</u>	
<u>*Action:</u>	Conduct curly-leaf pondweed Population Control on the Manitowish Waters Chain of Lakes using Hand Harvesting and Herbicide Spot Treatments
<u>Action:</u>	Monitor the curly-leaf pondweed population
<u>Action:</u>	Manage the curly-leaf pondweed population to mitigate localized negative impacts and to inhibit spread or establishment of new populations within the system
<u>Action:</u>	Continue control and monitoring efforts on other aquatic invasive species that pose a threat to the Manitowish Waters Chain of Lakes.
<u>Action:</u>	Investigate feasibility of alternative aquatic invasive species control methodologies for applicability to the Manitowish Waters Chain of Lakes.
<u>Action:</u>	Monitor the Eurasian watermilfoil population
<u>Action:</u>	Conduct Integrated Pest Management Program for EWM
2019 Comprehensive Plan 2025 Aquatic Plant Management Plan	
<i>*Modified as a part of the 2026 APM Plan Addendum</i>	

The Implementation Plan is a living document in that it will be under periodic review and adjustment depending on the condition of the lakes, the availability of funds, level of volunteer involvement, and the needs of the stakeholders.

As a part of the 2026 Aquatic Plant Management Plan addendum project, the MWLA specifically considered updates to Management Goal #4 from the Comprehensive Plan (Table 4.0-1). During the May 2026 planning meeting, two new actions were outlined specific to curly-leaf pondweed. The two newly created actions are added to the Manitowish Waters Chain of Lakes Management Goal #4 and replace the original first action from the 2019 Comp Plan (Table 4.0-1).

The CLP specific management actions outlined within this Addendum, paired with the other management goals and general nutrient management goals from the Comprehensive Management Plan (2019), and the 2025-2026 APM Plan, form the MWLA's Integrated Pest Management

strategy on the Manitowish Waters Chain of Lakes. Integrated Pest Management (IPM) is an approach to manage an issue that utilizes a combination of methods that are more effective when applied collectively as part of defined strategy than when conducted separately. Often, the goals and actions developed during an APM plan project are considered shorter-term management goals (~ 5 years) compared to longer-term management goals that may be incorporated into a Comprehensive Lake Management Plan. The MWLA continues to implement goals and actions listed under the 2019 Comp Plan and 2025 EWM APM Plan.

<u>Management Action:</u>	Monitor the curly-leaf pondweed population
Timeframe:	Annually, continuation of ongoing activity
Facilitator:	MWLA, NLDC
Description:	Curly-leaf pondweed mapping surveys will be conducted on portions of the Manitowish Waters Chain by NLDC each year as staffing and resources are available. In recent years, monitoring has been conducted through a combination of NLDC staff and professional mapping surveys by Onterra, LLC where NLDC focused on searching for new occurrences around the Chain where it was not known to be present already. Onterra's mapping surveys focused upon known CLP lakes and were used to direct hand harvesting efforts and monitor the efficacy of ongoing management actions. An Early-Season CLP Mapping Survey is a professionally conducted survey completed early growing season when CLP is at its anticipated peak growth stage, allowing for a true assessment of the extent of the population within the lake. For the Manitowish Waters Chain of Lakes, this survey would likely take place in June. This survey would include a complete meander survey of the lake's littoral zone by professional ecologists and mapping using GPS technology (sub-meter accuracy is preferred). A CLP monitoring strategy for each season will be developed annually to account for changing conditions and other ongoing projects on the Chain. Communications between MWLA, NLDC, and other partners will ensure this monitoring is completed as planned.

<u>Management Action:</u>	Manage the CLP population to mitigate localized negative impacts and to inhibit spread and establishment of new populations within the system
Timeframe:	Ongoing
Potential Grant:	WDNR AIS Established Population Control (EPC) Grant WDNR Early Detection & Response (EDR) Grant
Facilitator:	MWLA Board
Description:	The MWLA will employ differing management strategies for CLP depending on the size and location of the population. Established populations such as are present in Rice Creek have shown very high CLP populations at times in the past but have been very modest populations in more recent years in the absence of

active management. This type of site will not be given high priority for management.

CLP occurrences that are believed to be relatively new introductions around the system will be given consideration for a manual removal management strategy. The recent CLP finding in Alder Lake is an example of a newly found population that is being managed in an effort to inhibit the species from expanding in the area.

Manual Removal/ Diver Assisted Suction Harvesting (DASH)

Hand harvesting (including the use of DASH) will be the primary management technique throughout the Chain. Organized manual removal efforts will be undertaken by NLDC staff or contracted professionals. Manual removal efforts will primarily target low-density CLP occurrences around the Chain (single plants, clumps of plants), while larger colonies would be targeted for removal with DASH.

MWLA will consider the use of DASH methodology when the CLP population lends well to its use. This technique will be given consideration for use targeting CLP populations that are of a size or density that exceeds the NLDC staff's capacity to manage with manual removal techniques. At some population level, the use of DASH to manage CLP is scale limited, particularly when the size of the colony is multiple acres in size. In these situations, the use of DASH would shift to a nuisance relief perspective rather than solely population management. The CLP population in Fawn Lake has trended towards shifting to a nuisance relief management perspective as the population is too large to realistically target the entire population in a season.

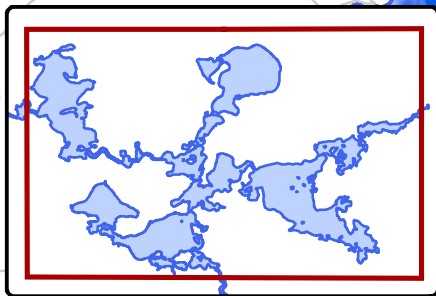
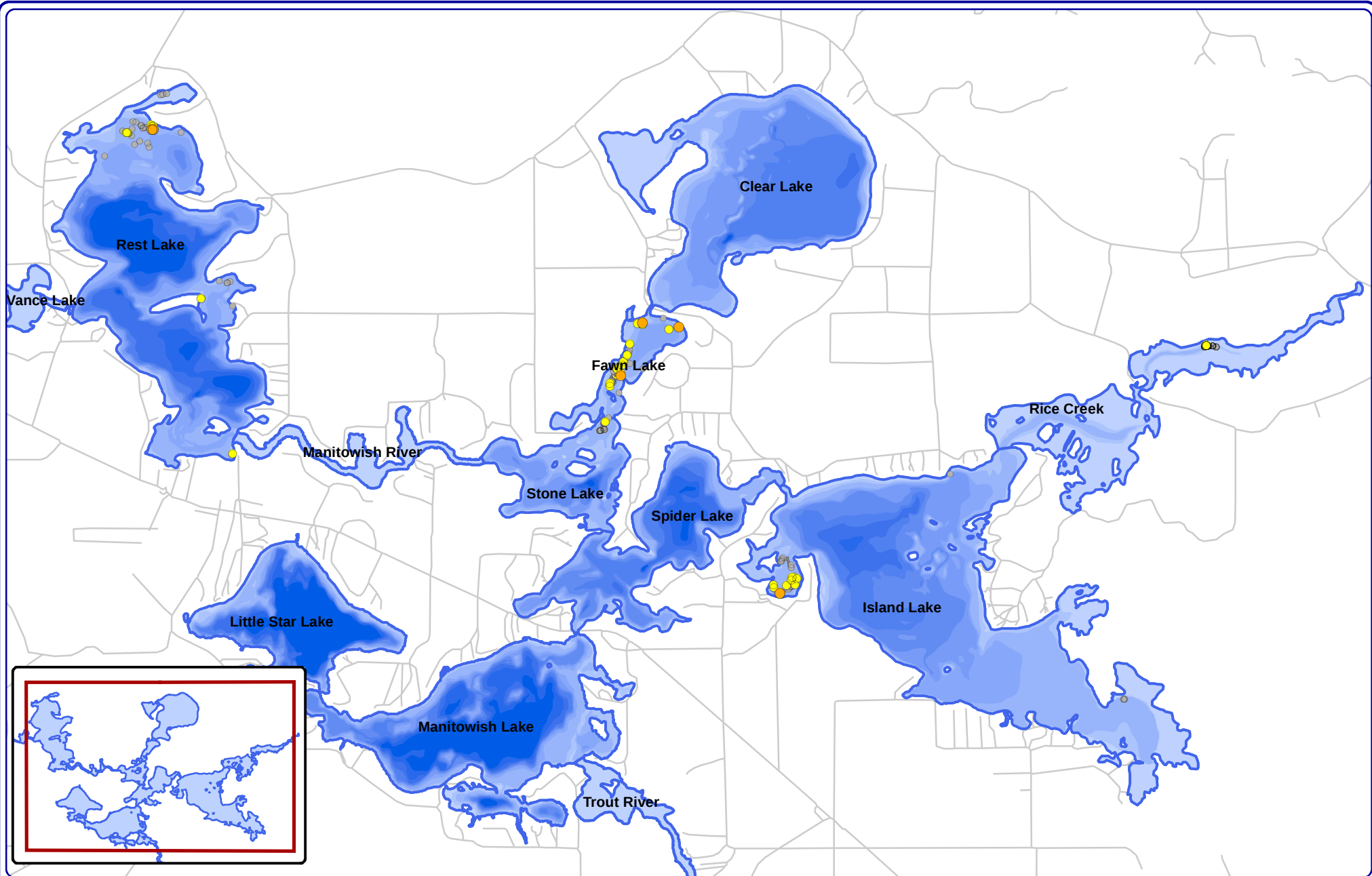
The NLDC owns a DASH boat that became operational in 2026. This vessel will be used to supplement the NLDC hand pulling efforts and professional DASH activities. The NLDC DASH boat will be a contracted service and operated by NLDC staff.

CLP mapping surveys would be used to guide the hand harvesting efforts with the most recent data available. If DASH is to be used, a permit application will be submitted to WDNR as early in the calendar year as practical including a map of the areas to be harvested, along with site characteristics.

Herbicide Treatment

During the planning meeting for this project, a review of BMP's for herbicide use in managing CLP was discussed. MWLA understands that herbicide management of an established CLP population generally consists of annual treatments for five or more years in the same site. Further, site characteristics such as size and water flow factor into whether herbicide treatments would be expected to reach required concentration exposure times to achieve CLP mortality rather than simply causing seasonal control or plant injury. At this time, MWLA does not plan to utilize herbicides to manage CLP in the Chain. If

	future conditions show that CLP populations increased to levels that cause ecological impacts through mid-summer nutrient inputs and contribute to more frequent mid-summer algae blooms, then MWLA would revisit the potential for herbicides and take the appropriate steps of updating their APM Plan accordingly.
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Sources:
 Roads and Hydro: WDNR
 Bathymetry: WDNR - digitized by Onterra
 Aquatic Plants: Onterra, 2025
 Map Date: 7-8-2025 TWH

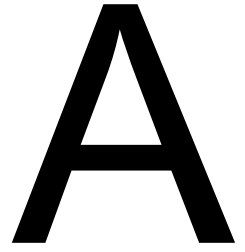


Project Location in Wisconsin

Legend

- CLP Survey: June 18, 23-25, 2025
- | | | | |
|--|------------------------|--|----------------------|
| | Highly Scattered | | Single or Few Plants |
| | Scattered | | Clump of Plants |
| | Dominant | | Small Plant Colony |
| | Highly Dominant | | |
| | Surface Matting (none) | | |

Map 1
 Manitowish Chain
 Vilas County, Wisconsin
June 2025
Curly-leaf Pondweed
Survey Results



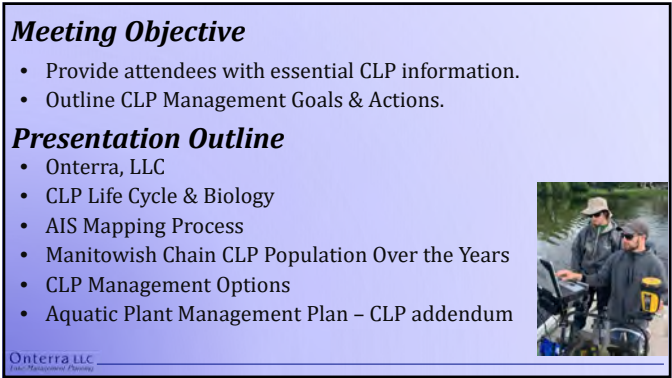
APPENDIX A



Planning Meeting Presentation Materials



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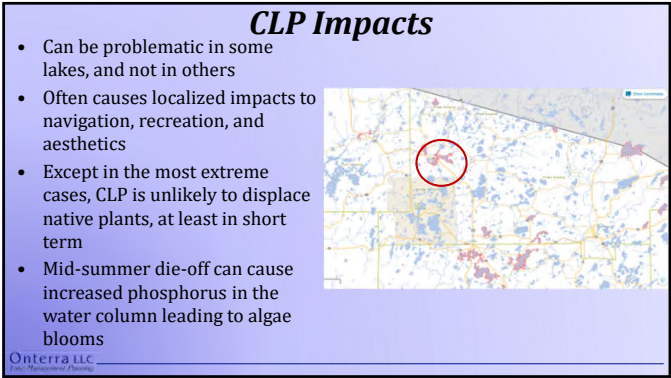
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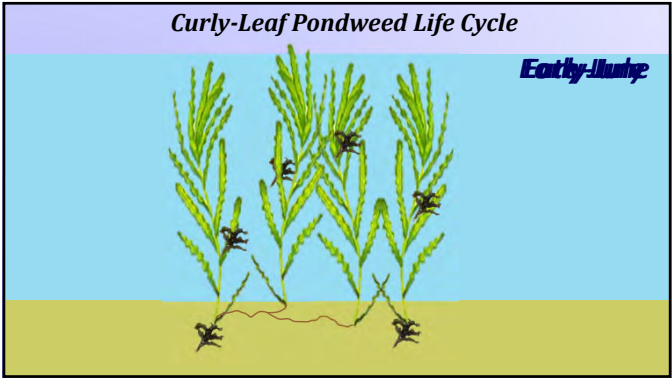
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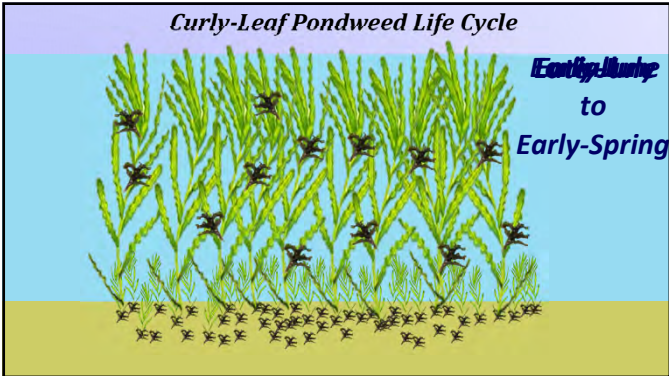
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Curly-Leaf Pondweed Life Cycle

Summary

- CLP is considered an annual with some perennial attributes
- It propagates via turions and rhizomes
- Each plant can produce tens of turions
- Turions can be created above and below the sediment
- Turions can remain viable in the sediment for at least 7-10 years
- Not all turions sprout plants the following year – some sprout years in the future
- Strong evidence that ice/snow cover impacts that year’s growth

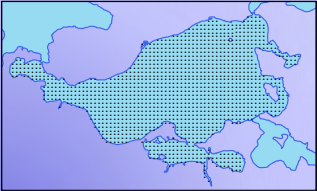
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Types of Aquatic Plant Surveys

Quantitative

- Point-Intercept Survey (timing)



Qualitative

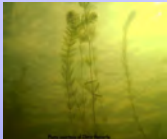
- AIS Mapping Surveys
- Fine-scale location accuracy
- Subjective designations



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9

Professional AIS Mapping



Point-Based Mapping

- Single or Few Plants
- Clumps of Plants
- Small Plant Colony



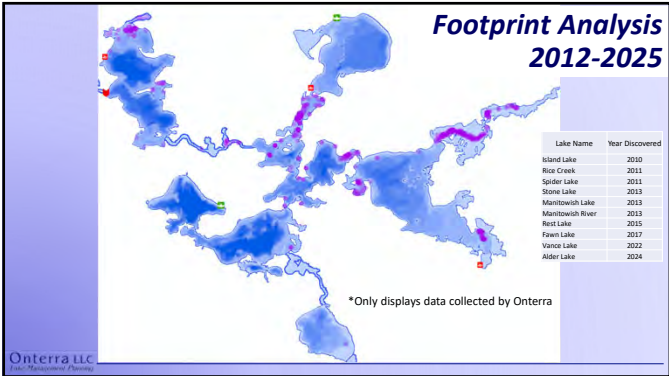
Polygon-Based Mapping

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting

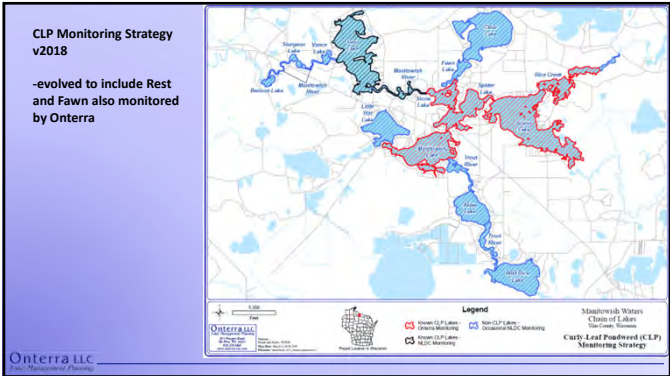
Impact Use

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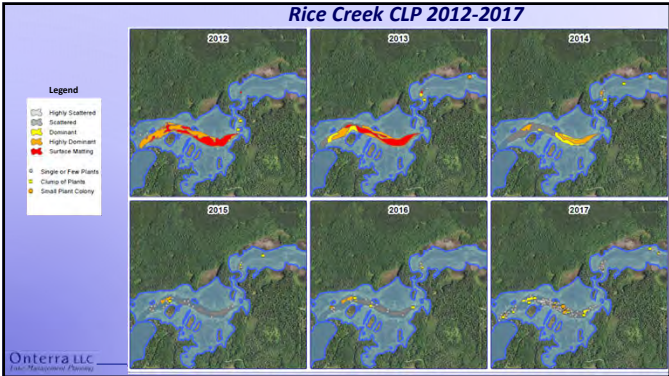
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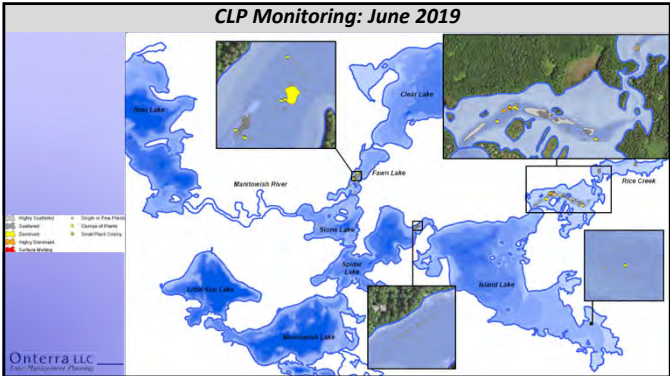
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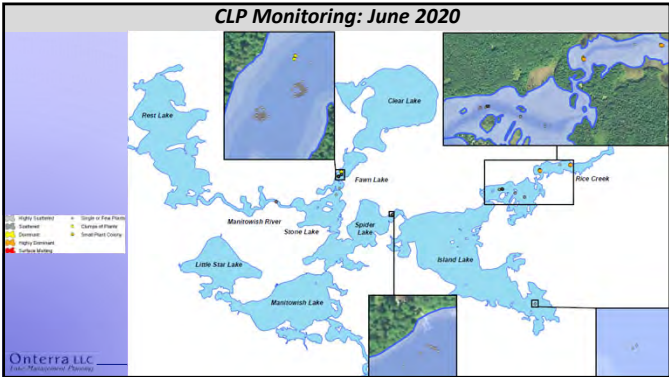
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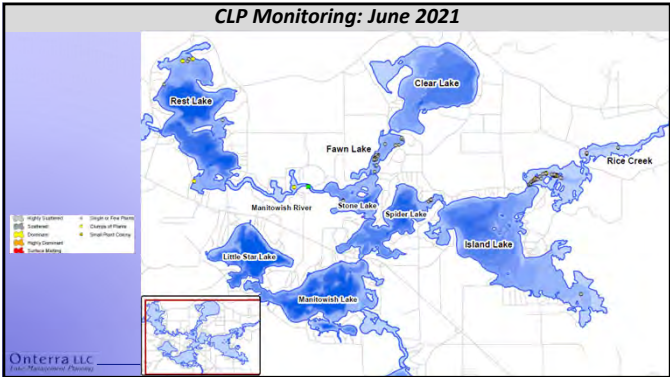
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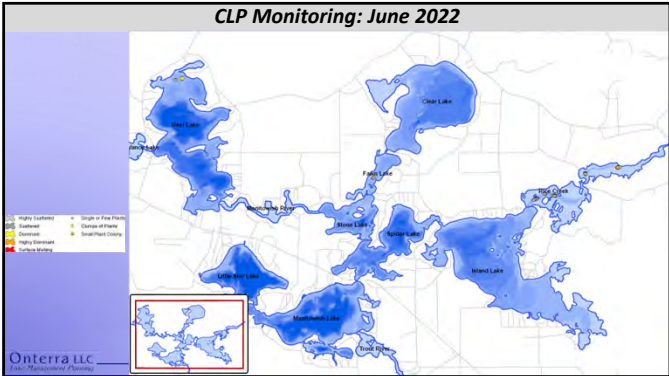
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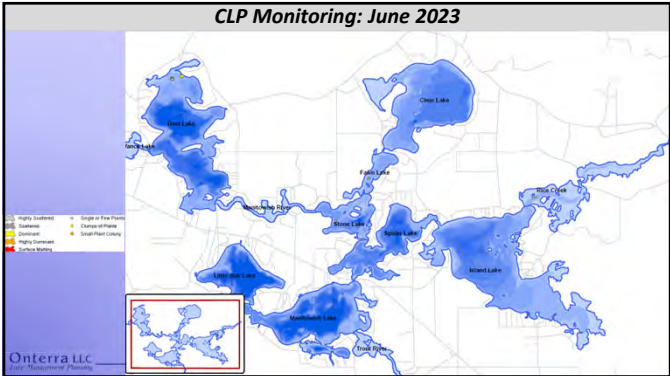
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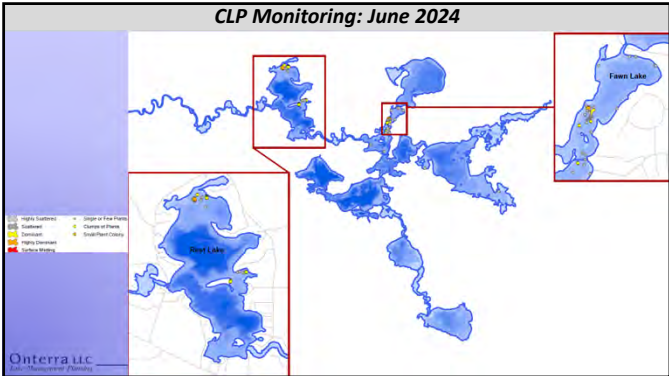
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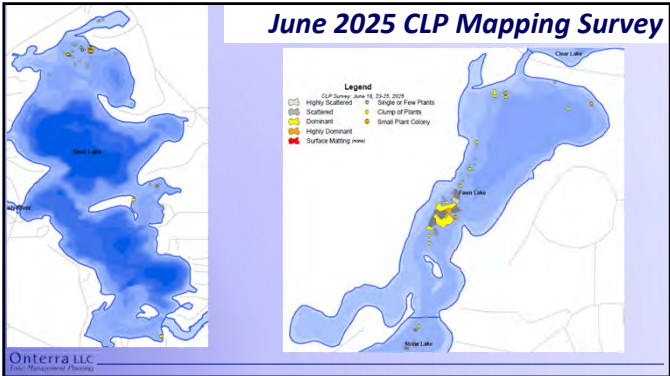
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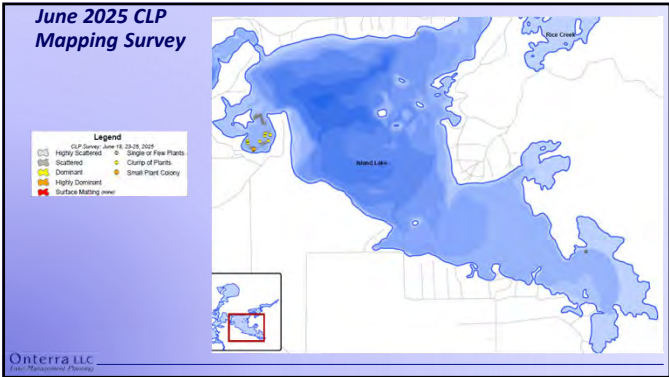
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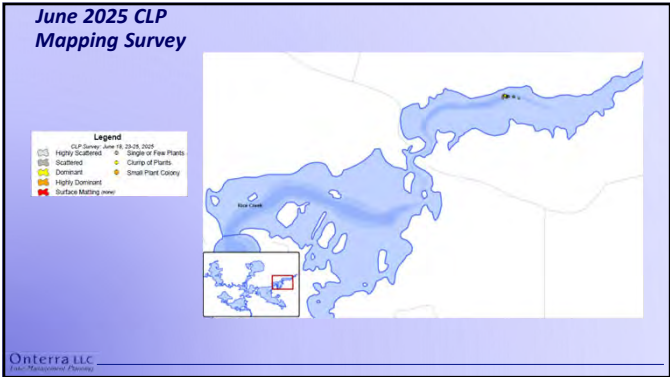
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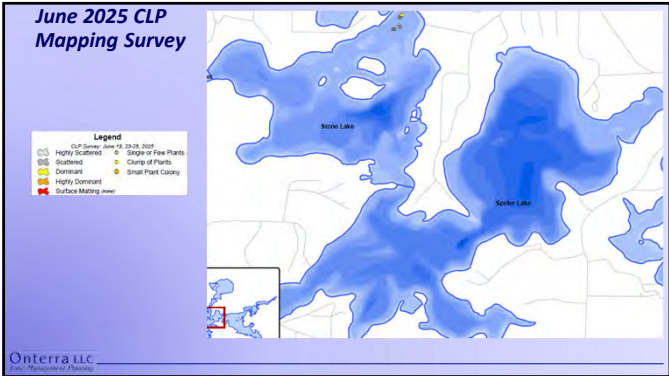
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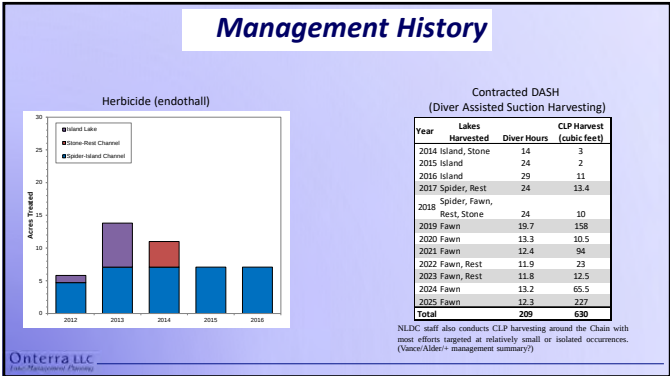
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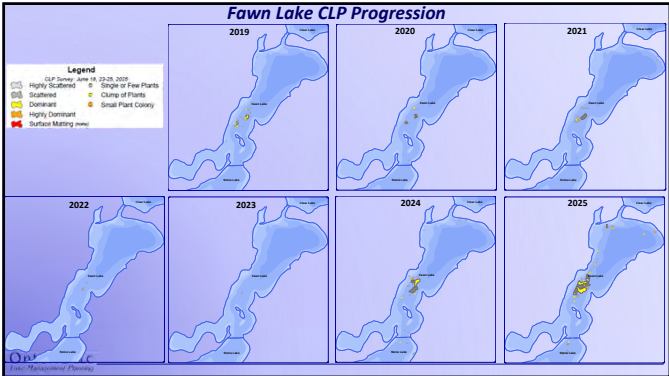
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AIS Management Perspectives

- No Coordinated Active Management (Let Nature Take its Course)**
 - Group does not organize or fund nuisance manual removal efforts
- Reduce AIS Population on a lake-wide level (Population Management – “Control”)**
 - Will not “eradicate” AIS
 - Early populations may be targeted with manual removal efforts, established populations may need to entertain herbicide treatment (risk assessment)
 - Set triggers (thresholds) of implementation and develop a tolerance of the AIS
 - May not be consistent with regulatory framework
- Minimize navigation and recreation impediment (Nuisance Control)**
 - Hand-harvesting alone is not able to accomplish this goal during high populations of AIS, herbicides and/or mechanical harvester may be required

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Aquatic Plant Management, LLC

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Control Strategy Philosophy

Diagram illustrating the control strategy philosophy. It shows a large, dense CLP (Cladophora) plant on the left, and a smaller, less dense plant on the right. A blue arrow labeled "Management" points from the large plant to the smaller one, indicating the goal of reducing CLP density.

- CLP responds well to herbicides (*easy to kill*)
- Management strategy requires repetition (*5-7+ years in a row*)
- Unless documented ecological impacts, established populations not targeted for lake-wide management
- Hand-harvesting is analogous to single treatment (*ineffective for established populations*)

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Hand-Harvesting

- Goal – to manage the CLP population or nuisance control**
 - Initial populations
 - Low density & isolated occurrences
 - Follow-up after treatments
 - In riparian footprint
 - Navigation lanes or small areas
- Population control requires CLP to be removed prior to turion formation.**
- Diver-Assisted Suction Harvest (DASH) can increase efficacy**
- Scale limitations, not for large or dense areas**
- Success expectation – population reduction in YOT, not elimination**
- Limitations**
 - Density of CLP & native plants, clarity of water
 - Sediment type, Obstructions

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Aquatic Plant Management, LLC

Photo Credit: Aquatic Plant Management, LLC

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Mechanical Harvesting

- Goal – to restore aspects of use and aesthetics**
- Cuts and removes CLP biomass; does not cause mortality**
- Suitable for large and dense CLP**
- Applied as clear-cutting or confined to lanes**
- Risk of bi-catch**
 - Native plants
 - Fish & amphibians
 - Insects, small animals

Onterra LLC
Aquatic Plant Management, LLC

Photo Credit: Aquatic Plant Management, LLC

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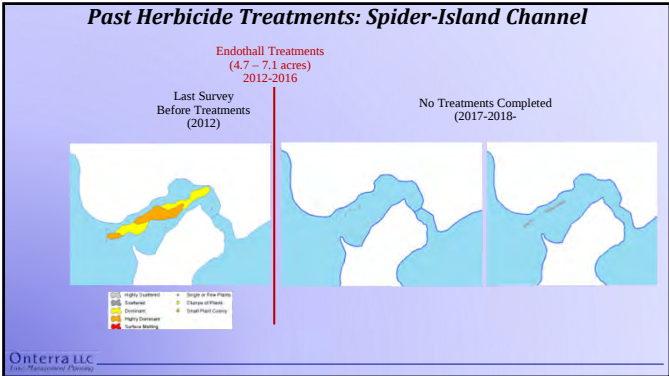
Herbicide Treatment

- Goal – CLP population control**
- Meet concentration & exposure times (CETs) for mortality**
 - Small (< 5 acres) spot treatments are often ineffective
 - Broad areas more effective
 - Protected areas more effective
 - Whole-lake/basin scale concepts
- Introduces greater need for risk assessment discussion**
 - Impacts to native plants, particularly wild rice and other sensitive species
 - Unknown impacts

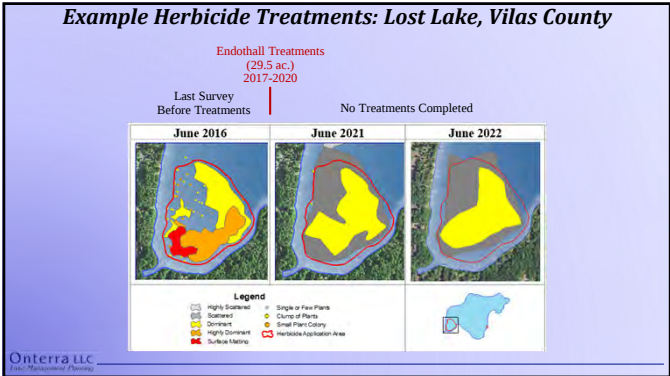
Onterra LLC
Aquatic Plant Management, LLC

Photo Credit: Schomck Aquatic, LLC

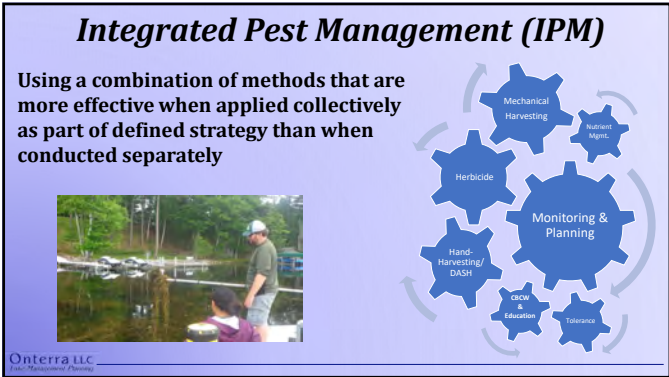
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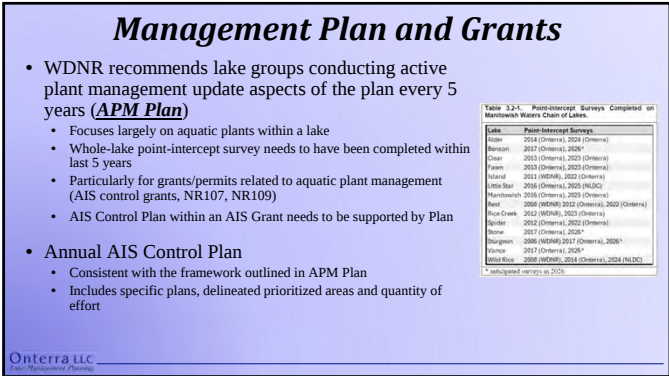
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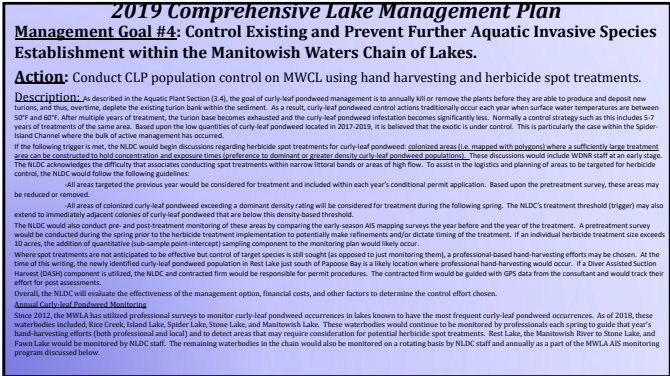
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Aquatic Plant Management Plan (Finalized Jan 2026)

- Focused on EWM
- included light content for CLP
- CLP plan not updated in that project- MWLA would continue to follow CLP guidance from Comp Plan

CLP APM Plan Update (Current project)

- Addendum to Jan 2026 Plan
- 21-day public comment period (new material/new Goals/Actions
- Seek formal agency review

Manitowish Waters Chain of Lakes
Site-Clean, Noxious
Aquatic Plant Management Plan
January 2026



Onterra LLC
Lake Management Planning

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Thank You
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Lake Management Planning



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Lake Management Planning

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B

APPENDIX B

CLP Management & Monitoring Materials



History of Curly Leaf Pondweed Management

2012-2016:

- NLDC hand harvested small populations of CLP on Manitowish, Spider, Stone, and Rest-Stone Channel.

2017:

- NLDC partnered with Aquatic Plant Management to manage CLP in Rest Lake and the Spider-Island Channel.
- NLDC discovered new populations on Fawn Lake. 16 hours were spent managing the two new populations.

2018:

- APM harvested 6 cubic feet of CLP on the Spider-Island Channel, .5 cubic ft on Spider, .5 cubic feet on Stone Lake, and 3 cubic feet on Rest and Fawn Lakes.
- 24 hours were spent by NLDC pulling CLP on Fawn Lake. APM pulled the remaining .5 cubic feet on Fawn Lake.

2019:

- Aquatic Plant Management spent three days on Fawn lake and removed 158 cubic feet of CLP.
- NLDC staff pulled 1 plant in Rest Lake, 20+ plants in 8 hours on Stone Lake, 20+ plants in 8 hours on the Spider-Island channel, 10+ plants in 3 hours on Island Lake.

2020:

- APM spent two days on Fawn Lake and removed 10.5 cubic feet of CLP using DASH.
- NLDC removed 20+ plants (in small clumps) in 8 hours On Island Lake, 20+ single and sparse plants in 6 hours on Spider-Island Channel, few scattered plants in small clumps in 4 hours, small clumps along northern and western part of Stone lake in 6 hours, small clumps in Rest-Stone channel in 3.5 hours.

2021:

- APM: Hand harvested and DASH, removed 94 cubic feet of CLP from Fawn Lake.

- NLDC: removed 20+ plants in small clumps in 8 hours on Island Lake, 10+ single, sparse plants in 6 hours on Spider-Island Channel, 50+ scattered plants in 9 hours on Fawn Lake, scattered plants in 3 hours on Stone Lake, small clumps of plants in 3.5 hours on Rest-Stone Channel, 20+ plants in single plants and clumps in 4 hours on Rest Lake.

2022:

- Approximately 4 cubic yards of CLP was removed from Fawn, Rest, and Island Lakes between NLDC and APM.
- NLDC: removed 20+ plants located in clumps on Island Lake, 10+ sparse plants on Spider-Island Channel, 50+ scattered plants on Fawn Lake, few scattered plants on Stone Lake, small clumps of plants on Rest-Stone Channel, 20+ plants on Rest Lake.
- CLP was detected for the first time on Vance Lake.

2023:

- NLDC focused CLP removal efforts on Stone and Fawn Lakes. Small populations in the channel between Rest and Stone were hand pulled. Sparse populations in Rest were also hand pulled.
- CLP was detected for the first time on Clear Lake.

2024:

- A new population of CLP detected on Clear Lake.
- NLDC surveyed Clear, Vance, Benson, and Sturgeon lakes for CLP.
- NLDC dedicated 8 hours to removal of CLP on Vance Lake and APM was contracted for 8 hours of hand pulling.

2025:

- NLDC conducted surveys on Vance, the Rest-Stone channel, Alder, Clear, Wild Rice, and Manitowish Lake.
- CLP not redetected in Clear Lake.
- CLP first detected on Alder Lake.
- CLP removal efforts were conducted on Alder, Fawn, Island, Rest, Spider, Stone and Vance Lakes.
- NLDC conducted hand pulling for 10 days throughout the chain. APM was contracted for DASH on Fawn and removed 227 cubic feet. APM was contracted to hand pull on Vance and removed 9.5 cubic feet.

2026:

- NLDC conducted CLP surveys on Alder, Clear, Fawn, Island, Manitowish, Rest, Rice Creek, Spider, Stone, Vance, and Wild Rice Lakes.
- NLDC pulled 1.4 cubic feet on Vance, 2 cubic feet on Alder, single plants on Island, single plants on Stone, and 1 cubic ft on the Rest-Stone Channel.
- NLDC completed two days of DASH on Rest Lake and removed 8.5 cubic feet. One day of DASH was completed on Alder with 3.5 cubic feet removed.
- APM removed CLP through DASH on Fawn Lake and hand pulled on Vance Lake.
- CLP first detected on the Lower Trout River.



Fawn Lake CLP Removal Report 2021

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Fawn Lake CLP Manual Removal Summary 2021

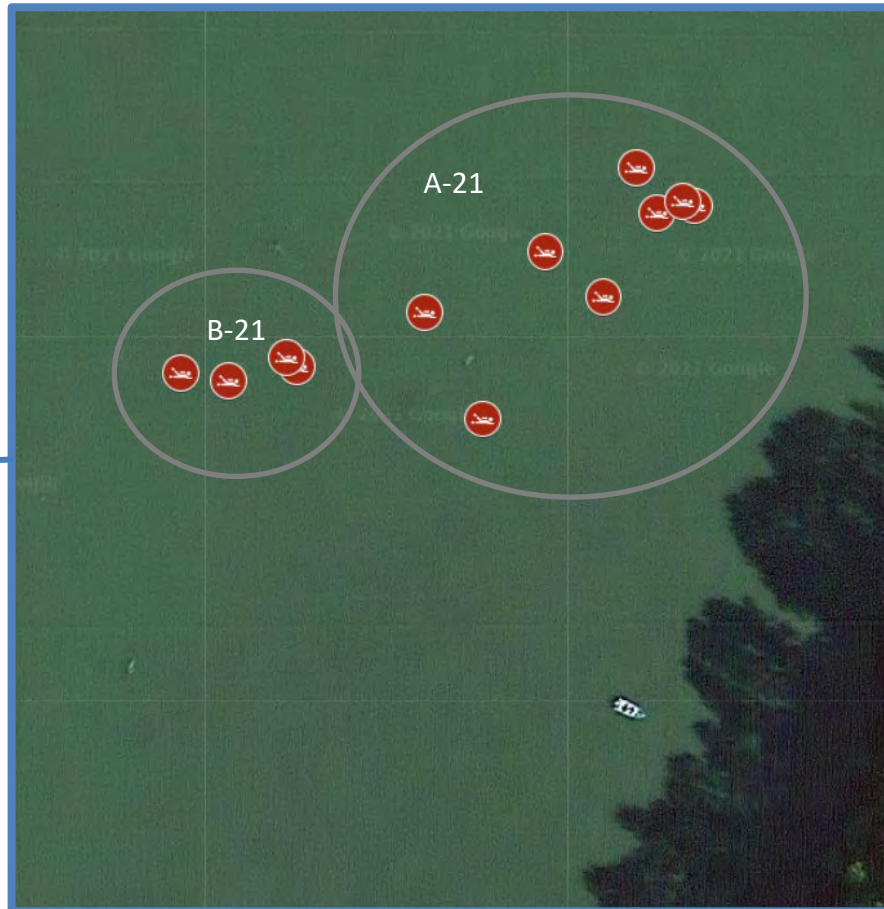
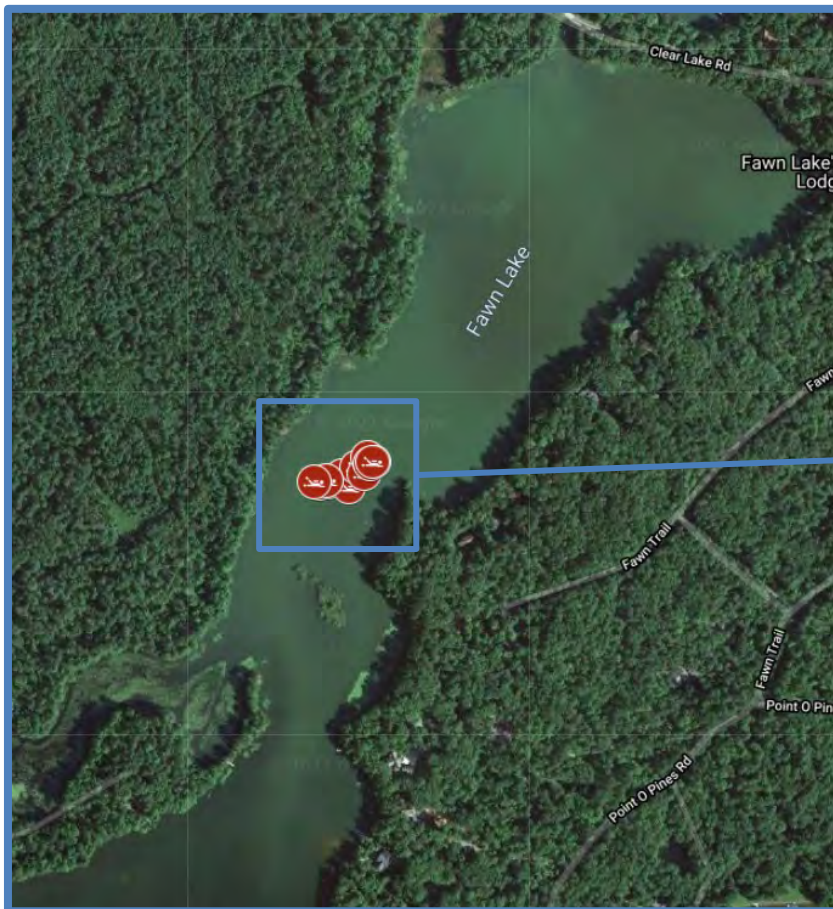
Dive Background: On June 18th and 22nd, Aquatic Plant Management LLC (APM) conducted 1 day of Diver Assisted Suction Harvesting (DASH) and 1 day of traditional hand harvesting for Curly Leaf Pondweed (CLP) on Fawn Lake in Vilas County, WI. The team focused their efforts at 2 sites in the center of the half of the lake, identified and mapped by Onterra LLC. In total APM was able to remove **94 cubic feet of CLP** from Fawn Lake.

Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
6/18/2021	Sunny	69	6.4	67.0
6/22/2021	Cloudy	69	6.0	27.0
Grand Total			12.4	94.0

Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
A-21	8.3	8	7.8	65.5
B-21	8.0	4	4.7	28.5
Grand Total	8.2	12	12.4	94.0

Dive Highlights and Recommendations: The APM dive teams spent most of their time at site A-21, which had more plants spread out over a larger area. DASH was an effective first pass at each site because the dive team was able to more easily target the small plant colonies and large clumps of plants. The second pass with the hand harvesting crew was able to target the remaining scattered plants in the dive area. The multi-pronged approach was an efficient way of targeting the two sites. Overall, Fawn Lake should take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the CLP population on the lake. Continued monitoring and management efforts are important to prevent the spread of CLP throughout Fawn Lake.

Map of Fawn Lake Dive Sites



Dive Site



Detailed Diving Activities

Date	Dive Location	Latitude	Longitude	Underwater Dive Time (hrs)	AIS Removed (cubic ft)	AIS Density	Avg Water Depth (ft)	Native Species	Native By-Catch	Substrate Type
6/18/2021	B-21	46.13318	-89.82748	0.83	6.0	Small Plant Colony	8.0	Pondweeds	1.0	Organic
6/18/2021	B-21	46.13316	-89.82761	0.58	4.5	Clumps	8.0	Pondweeds	1.5	Organic
6/18/2021	A-21	46.13325	-89.82724	0.67	10.0	Dominant	8.0	Pondweeds	1.5	Organic
6/18/2021	A-21	46.13311	-89.82713	0.92	9.0	Dominant	8.0	Pondweeds	1.5	Organic
6/18/2021	A-21	46.13333	-89.82701	1.00	11.0	Dominant	8.5	Pondweeds	1.0	Organic
6/18/2021	A-21	46.13327	-89.82690	0.83	10.0	Dominant	8.5	Pondweeds	1.5	Organic
6/18/2021	A-21	46.13344	-89.82684	1.00	10.5	Dominant	8.5	Pondweeds	1.0	Organic
6/18/2021	A-21	46.13339	-89.82673	0.58	6.0	Scattered	8.5	Pondweeds	1.0	Organic
6/22/2021	A-21	46.08001	-89.49615	1.08	3.0	Scattered	8.0	Pondweeds	0.0	Organic
6/22/2021	A-21	46.08020	-89.49604	1.67	6.0	Scattered	8.0	Pondweeds	0.5	Organic
6/22/2021	B-21	46.07974	-89.49640	1.58	9.0	Scattered	7.0	Pondweeds	0.5	Organic
6/22/2021	B-21	46.07977	-89.49636	1.67	9.0	Highly Scattered	9.0	Pondweeds	0.0	Organic



Manitowish Chain of Lakes CLP Removal Report 2022

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Manitowish Chain of Lakes CLP Manual Removal Summary 2022

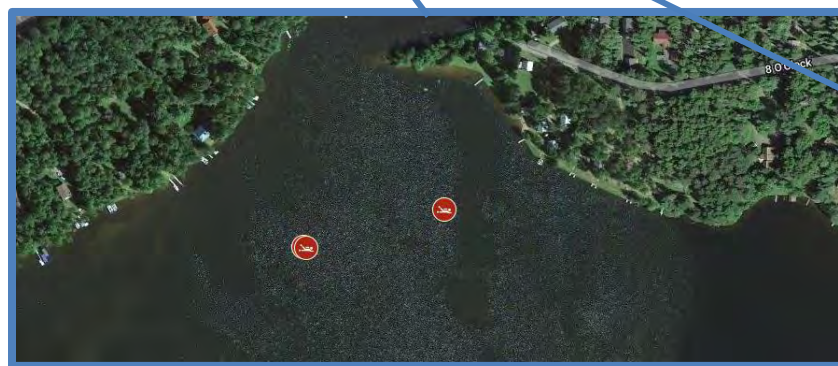
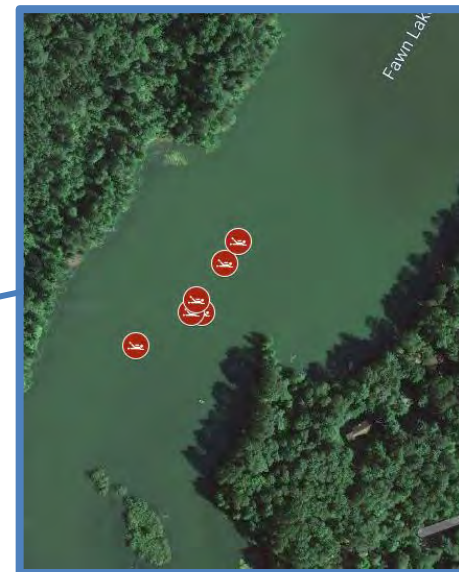
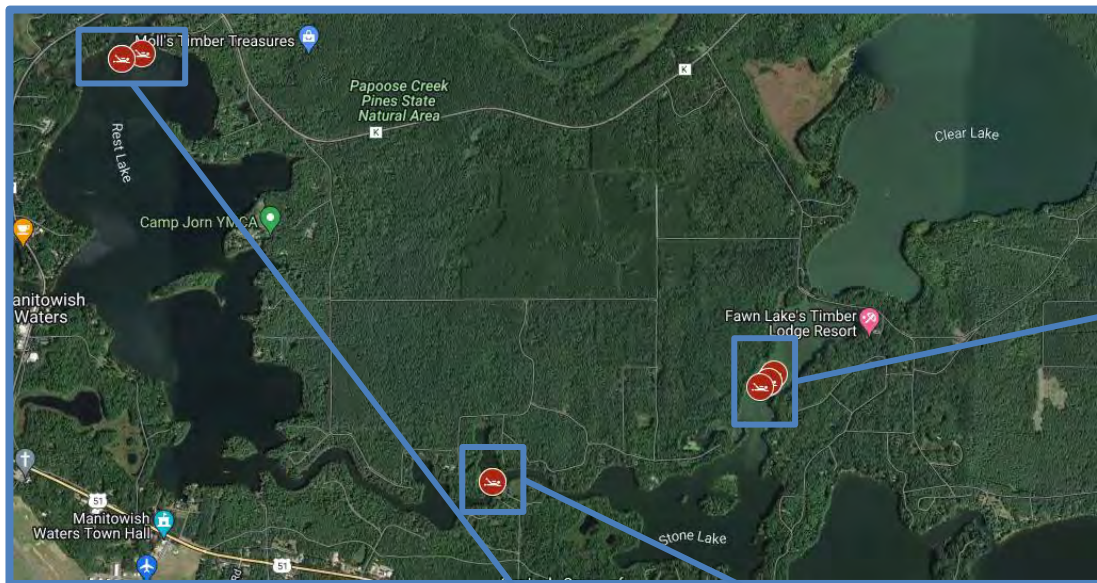
Dive Background: On June 20th, Aquatic Plant Management LLC (APM) conducted two (2) day of hand harvesting for Curly Leaf Pondweed (CLP) on the Manitowish Chain of Lakes in Vilas County, WI. The team focused their efforts at the sites in Fawn Lake, Rest Lake, and the channel connecting the lakes, as prioritized by the North Lakeland Discovery Center. In total APM was able to remove **23.0 cubic feet of CLP** from the Manitowish Chain of Lakes.

Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
6/16/2022	Partly Cloudy	69	6.6	15.5
6/24/2022	Sunny	74	5.3	7.5
Grand Total			11.9	23.0

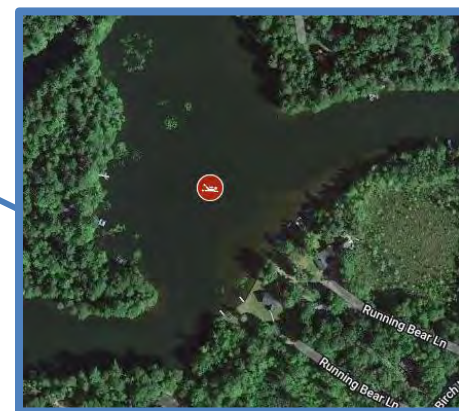
Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
Channel	10.0	2	1.9	3.5
Fawn - A21	7.3	3	5.2	8.0
Fawn - Singles N	6.5	1	1.3	3.5
Fawn - Singles S	7.5	1	0.7	1.5
Fawn - Unmapped Clump	7.0	1	1.1	3.0
Rest - Clumps	8.5	1	0.5	2.5
Rest - Singles	9.3	2	1.3	1.0
Grand Total	8.2	11	11.9	23.0

Dive Highlights and Recommendations: The dive team spent most of their time on Fawn Lake targeting a site from previous years' removal efforts called A21. The team did find and remove a small clump of plants north of the A21 that was not on the map from the survey. Overall, Manitowish Chain of Lakes should continue to take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the CLP population on the lake. Continued monitoring and management efforts are important to prevent the spread of CLP throughout Manitowish Chain of Lakes.

Map of Manitowish Chain of Lakes Dive Sites



Dive Site





Detailed Diving Activities

Date	Dive Location	Latitude	Longitude	Underwater Dive Time (hrs)	AIS Removed (cubic ft)	AIS Density	Avg Water Depth (ft)	Native Species	Native By-Catch	Substrate Type
6/16/2022	Fawn - Singles N	46.13372	-89.82662	1.25	3.5	Clumps	6.5	Pondweeds	0.5	Organic
6/16/2022	Fawn - A21	46.13337	-89.82686	2.25	5.0	Scattered	6.5	Pondweeds	0.5	Organic
6/16/2022	Fawn - Unmapped Clump	46.13387	-89.82648	1.08	3.0	Clumps	7.0	Pondweeds	0.5	Organic
6/16/2022	Rest - Clumps	46.15176	-89.87736	0.50	2.5	Clumps	8.5	Pondweeds	0.5	Organic
6/16/2022	Rest - Singles	46.15146	-89.87898	0.42	0.5	Single or Few	8.5	None	0.0	Organic
6/16/2022	Fawn - A21	46.13337	-89.82697	1.08	1.0	Highly Scattered	6.5	None	0.5	Organic
6/24/2022	Fawn - A21	46.13346	-89.82691	1.83	2.0	Highly Scattered	9.0	Pondweeds	0.0	Organic
6/24/2022	Rest - Singles	46.15145	-89.87895	0.92	0.5	Single or Few	10.0	None	0.0	Organic
6/24/2022	Channel	46.12787	-89.84910	1.33	3.0	Clumps	10.0	Pondweeds	0.5	Organic/Sand
6/24/2022	Channel	46.12787	-89.84910	0.58	0.5	Single or Few	10.0	Pondweeds	0.0	Organic/Sand
6/24/2022	Fawn - Singles S	46.13313	-89.82753	0.67	1.5	Highly Scattered	7.5	Pondweeds	0.5	Organic
Total	11			11.91	23.0					



Manitowish Chain CLP Removal Report 2023

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Manitowish Chain CLP Removal Summary 2023

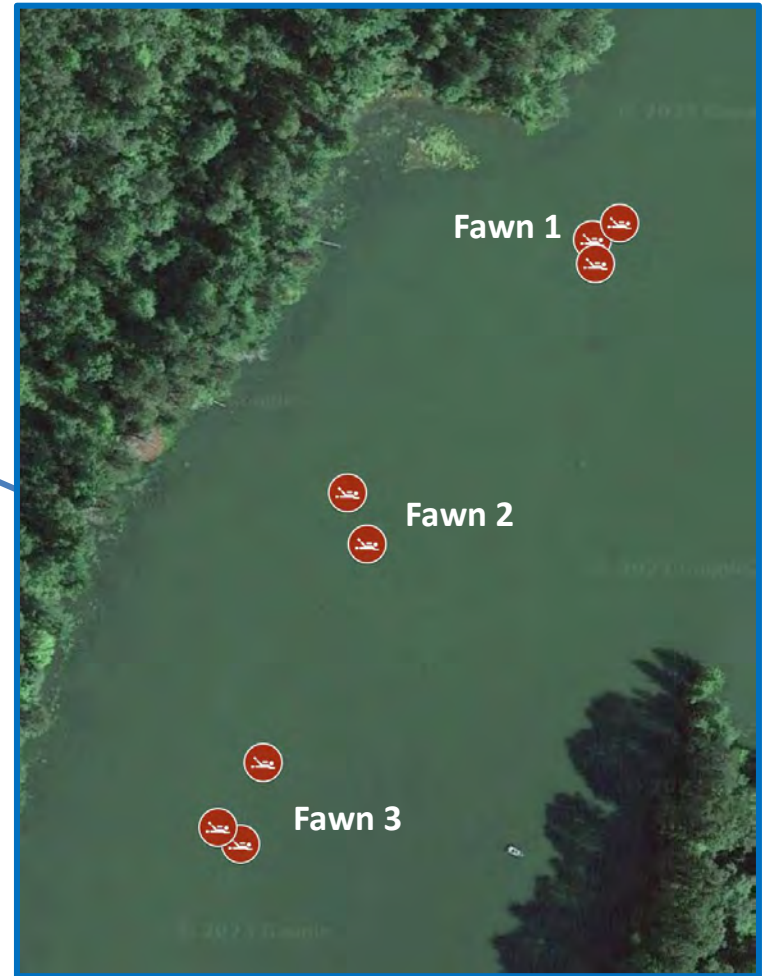
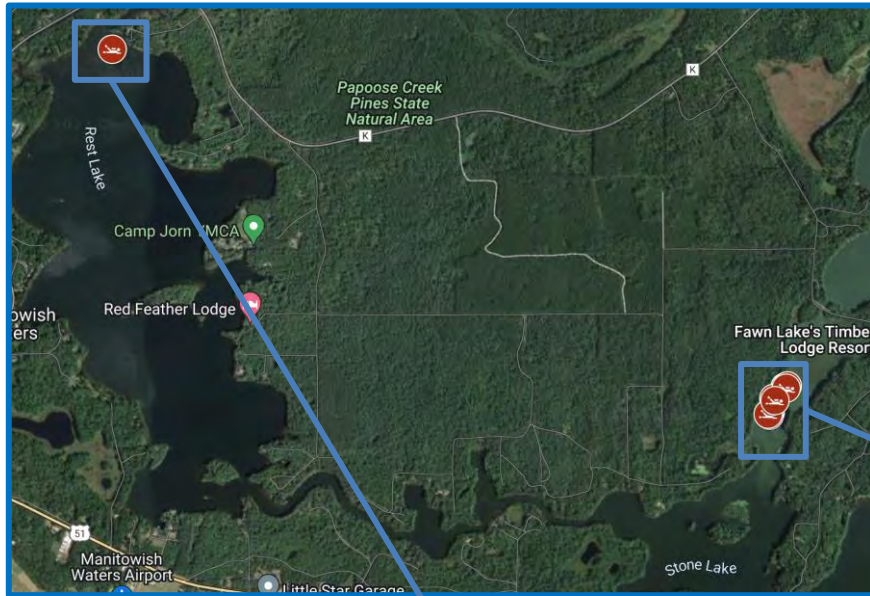
Dive Background: In late June Aquatic Plant Management LLC (APM) conducted two (2) days of Hand Harvesting for Curly Leaf Pondweed (CLP) on Fawn and Rest Lakes in Vilas County, WI. The team focused their efforts at four sites as prioritized by the North Lakeland Discovery Center. In total APM was able to remove **12.5 cubic feet of CLP** from Fawn and Rest Lakes.

Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
6/26/2023	Cloudy	68	6.0	2.5
6/27/2023	Sunny	66	5.8	10.0
Grand Total			11.8	12.5

Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
Fawn 1	6.7	3	5.3	4.0
Fawn 2	7.5	2	2.3	3.0
Fawn 3	8.0	3	2.1	3.0
Rest	7.0	1	2.3	2.5
Grand Total	7.3	9	11.8	12.5

Dive Highlights and Recommendations: The team spent the bulk of their time focusing on CLP in Fawn Lake in the northern section. Overall, the Manitowish Chain should continue to take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the CLP population on the lakes. Continued monitoring and management efforts are important to prevent the spread of CLP.

Map of Dive Sites





Detailed Diving Activities

Date	Dive Location	Latitude	Longitude	Underwater Dive Time (hrs)	AIS Removed (cubic ft)	AIS Density	Avg Water Depth (ft)	Native Species	Native By-Catch	Substrate Type
6/26/2023	Fawn 1	46.13424	-89.82658	1.83	0.0	None	5.0	Pondweeds	0.0	Organic/Sand
6/26/2023	Fawn 1	46.13428	-89.82648	1.00	0.0	None	9.0	Grasses	0.0	Organic/Sand
6/26/2023	Fawn 2	46.13362	-89.82745	1.75	2.0	Clumps	8.0	Grasses	0.5	Organic/Sand
6/26/2023	Fawn 3	46.13295	-89.82775	0.92	0.5	Clumps	8.0	Grasses	0.0	Organic
6/26/2023	Fawn 3	46.13275	-89.82783	0.50	0.0	None	10.0	Grasses	0.0	Organic
6/27/2023	Rest	46.15193	-89.87769	2.25	2.5	Clumps	7.0	Coontail	0.5	Organic
6/27/2023	Fawn 3	46.13279	-89.82791	0.67	2.5	Single or Few	6.0	Grasses	0.0	Organic
6/27/2023	Fawn 1	46.13418	-89.82657	2.42	4.0	Clumps	6.0	Grasses	0.0	Organic
6/27/2023	Fawn 2	46.13349	-89.82738	0.50	1.0	Single or Few	7.0	Grasses	0.0	Organic
Total	9			11.84	12.5					



Manitowish Chain CLP Removal Report 2024

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Manitowish Chain CLP Removal Summary 2024

Dive Background: In June, Aquatic Plant Management LLC (APM) conducted two (2) days of Hand Harvesting for Curly Leaf Pondweed (CLP) on the Manitowish Chain (Fawn Lake) in Vilas County, WI. The team focused their efforts at 5 sites as prioritized by the North Lakeland Discovery Center. In total APM was able to remove **65.5 cubic feet of CLP** from the Manitowish Chain.

Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
6/10/2024	Sunny	68	6.8	32.5
6/11/2024	Periods of rain	65	6.3	33.0
Grand Total			13.2	65.5

Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
Fn24clp001c	8.0	2	3.7	16.5
Fnc1p0041	8.5	1	1.1	6.0
Fnc1p0061	8.5	1	2.1	5.0
Fnc1p0071	8.0	1	3.2	16.0
Fnc1p008c	8.5	1	3.2	22.0
Grand Total	8.3	6	13.2	65.5

Dive Highlights and Recommendations: The dive team initially focused on/at a colony on the north end of prior years' dive sites (Fn24clp001c) where they removed 16.5 cubic feet of CLP. Next, they moved south targeting different points from the prior year. Overall, Manitowish Chain should continue to take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the CLP population on the lake. Continued monitoring and management efforts are important to prevent the spread of CLP throughout Manitowish Chain.

Map of Manitowish Chain Dive Sites





Detailed Diving Activities

Date	Dive Location	Latitude	Longitude	Underwater Dive Time (hrs)	AIS Removed (cubic ft)	AIS Density	Avg Water Depth (ft)	Native Species	Native By-Catch	Substrate Type
6/10/2024	Fn24clp001c	46.13447	-89.82647	1.50	6.0	Clumps	8.0	Pondweeds	0.0	Organic
6/10/2024	Fn24clp001c	46.13447	-89.82647	2.17	10.5	Clumps	8.0	Pondweeds	0.0	Organic
6/10/2024	Fnc1p007l	46.13363	-89.82746	3.17	16.0	Clumps	8.0	Pondweeds	0.5	Organic
6/11/2024	Fnc1p008c	46.13440	-89.82655	3.17	22.0	Highly Scattered	8.5	Grasses	1.0	Organic
6/11/2024	Fnc1p0061	46.13348	-89.82744	2.08	5.0	Highly Scattered	8.5	Grasses	1.0	Organic
6/11/2024	Fnc1p0041	46.13290	-89.82778	1.08	6.0	Highly Scattered	8.5	Grasses	1.0	Organic
Total		6		13.17	65.5					



Fawn Lake CLP Removal Report 2025

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Fawn Lake CLP Removal Summary

Dive Background: In June Aquatic Plant Management LLC (APM) conducted three days of Diver Assisted Suction Harvesting for Curly Leaf Pondweed (CLP) on Fawn Lake in Vilas County, WI. The team focused their efforts at one site as prioritized by the North Lake Discovery Center. In total APM was able to remove **227 cubic feet of CLP** from Fawn Lake.

Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
6/12/2025	Partly Cloudy	65	6.1	129.0
6/15/2025	Cloudy	64	3.3	21.0
6/17/2025	Cloudy	65	2.8	77.0
Grand Total			12.3	227.0

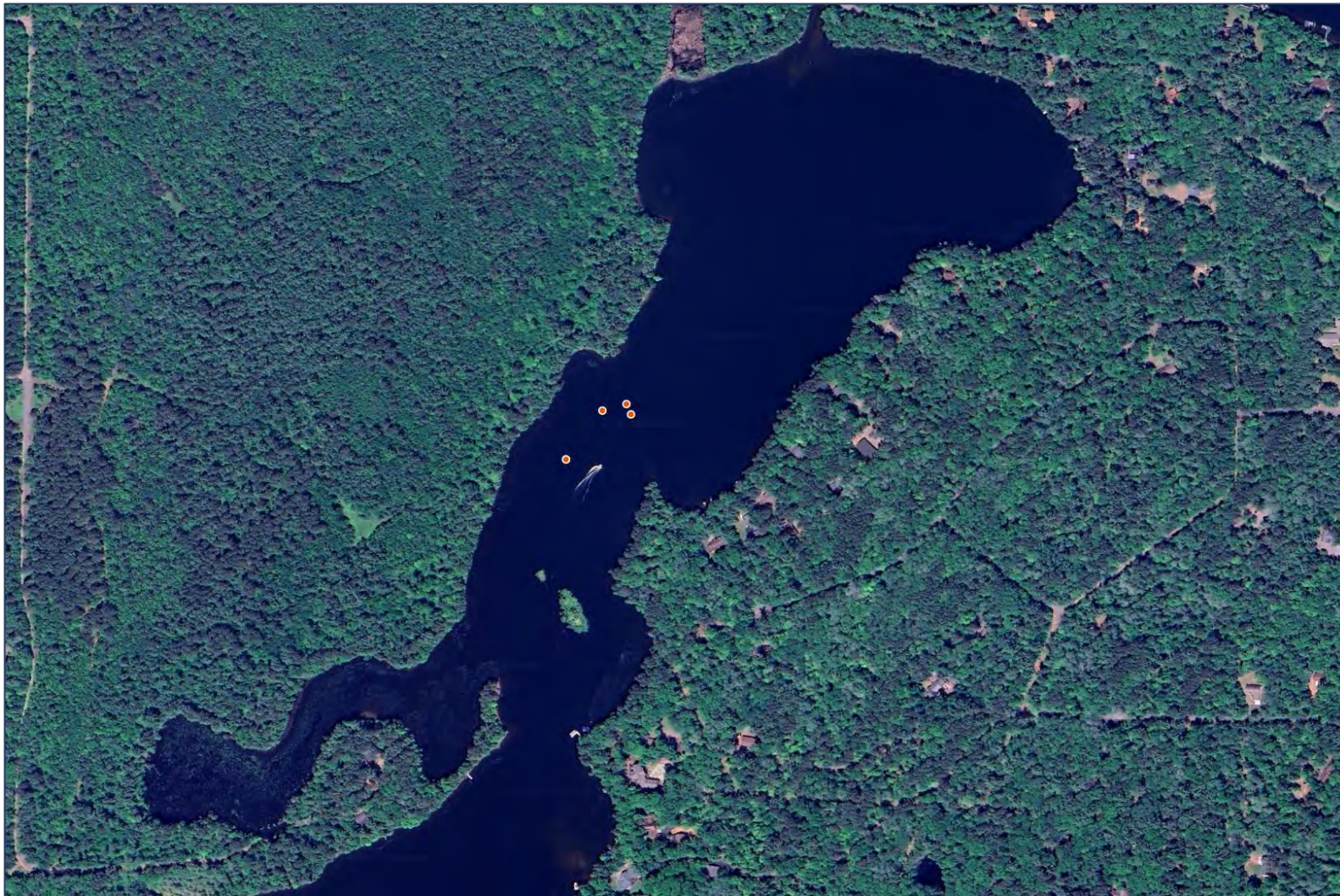


Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
F-25	9.6	5	12.3	227.0
Grand Total	9.6	5	12.3	227.0

Dive Highlights and Recommendations: The dive team focused their entire efforts at F-25, the CLP polygon in the center of the lake. The polygon was highly dominant and dominant CLP growth. Overall, Fawn Lake should continue to take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the CLP population on the lake. Continued monitoring and management efforts are important to prevent the spread of CLP throughout Fawn Lake.



Map of Fawn Lake Dive Sites





Detailed Diving Activities

Date	Dive Location	Latitude	Longitude	Underwater Dive Time (hrs)	AIS Removed (cubic ft)	AIS Density	Avg Water Depth (ft)	Native Species	Native By-Catch	Substrate Type
6/12/2025	F-25	46.13398	-89.82655	3.67	100.0	Highly Dominant	11.0	Coontail	1.0	Organic
6/12/2025	F-25	46.13387	-89.82648	2.42	29.0	Highly Scattered	10.0	Elodea	2.0	Organic
6/15/2025	F-25	46.13391	-89.82692	3.33	21.0	Dominant	11.0	Coontail	2.0	Organic
6/17/2025	F-25	46.13339	-89.82748	1.33	35.0	Dominant	8.0	Elodea	12.0	Organic/Sand
6/17/2025	F-25	46.13339	-89.82748	1.50	42.0	Dominant	8.0	Elodea	10.0	Organic/Sand
Total		5		12.25	227.0					

Alder Lake

Early Season Curly Leaf Pondweed Survey



0 0.07 0.15 0.3 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
June 3, 2026



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Clear Lake

Early Season Curly Leaf Pondweed Survey



0 0.1 0.2 0.4 Miles

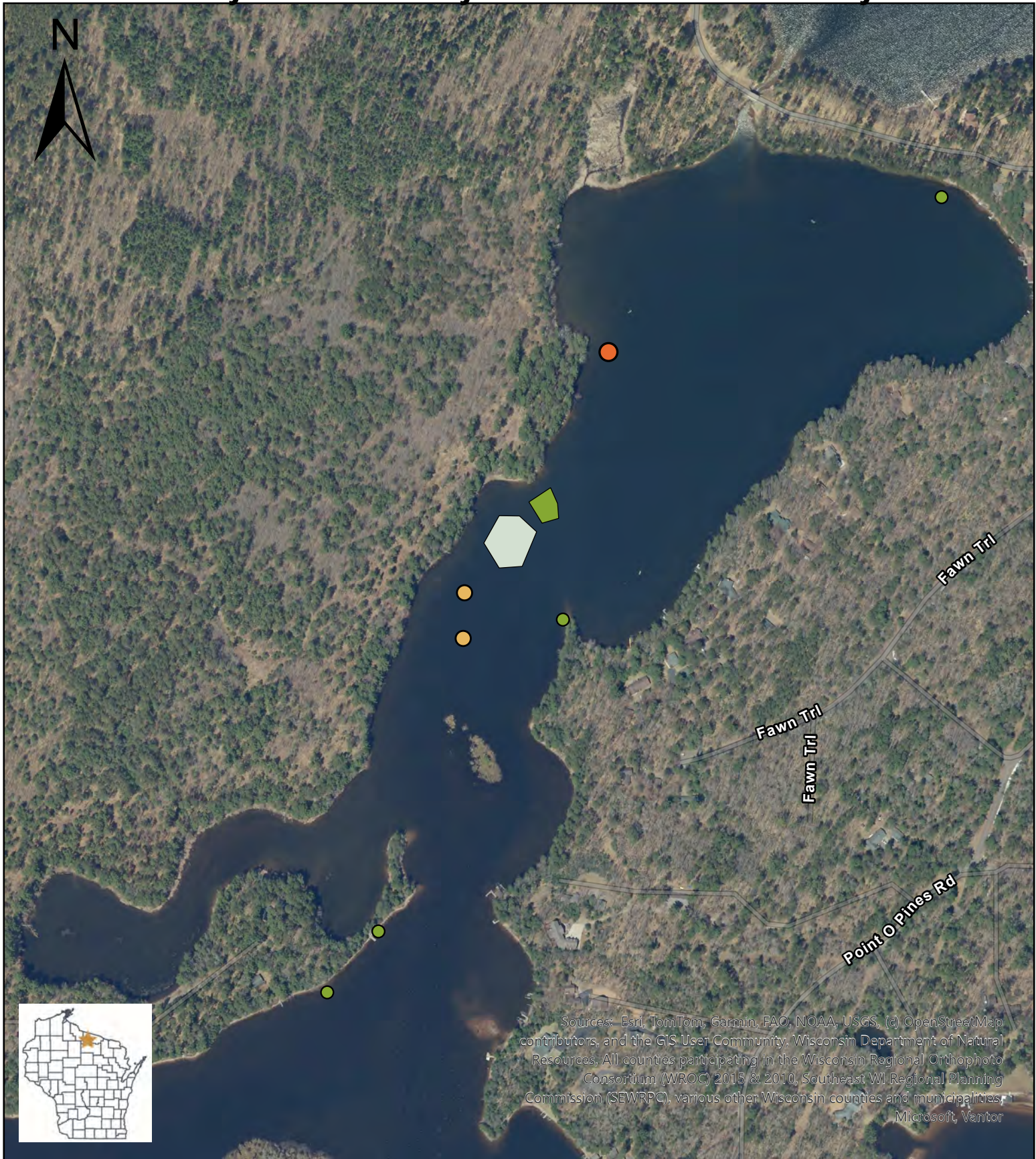
Town of Manitowish Waters
Vilas County, Wisconsin
June 4, 2026



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Manitowish Waters, WI
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Fawn Lake

Early Season Curly Leaf Pondweed Survey



0 0.05 0.1 0.2 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
May 28, 2026



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Island Lake

Early Season Curly Leaf Pondweed Survey



0 0.15 0.3 0.6 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
June 4, 2026

Legend

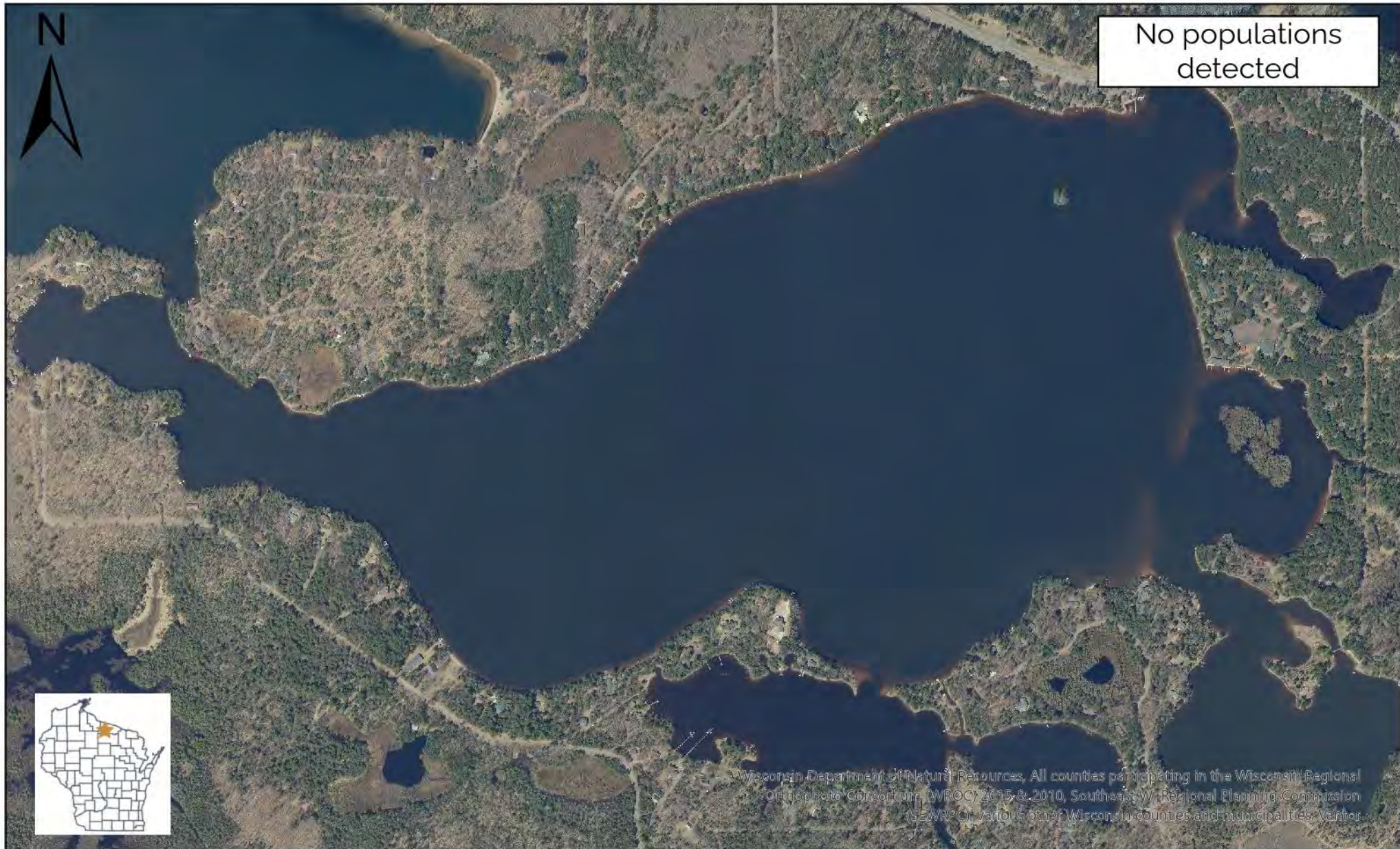
- | | |
|------------------|----------------------|
| Highly Scattered | Single or Few Plants |
| Scattered | Clumps of Plants |
| Dominant | Small Plant Colony |
| Highly Dominant | |
| Surface Matting | |



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Manitowish Lake

Early Season Curly Leaf Pondweed Survey



0 0.1 0.2 0.4 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
June 9, 2026

Legend

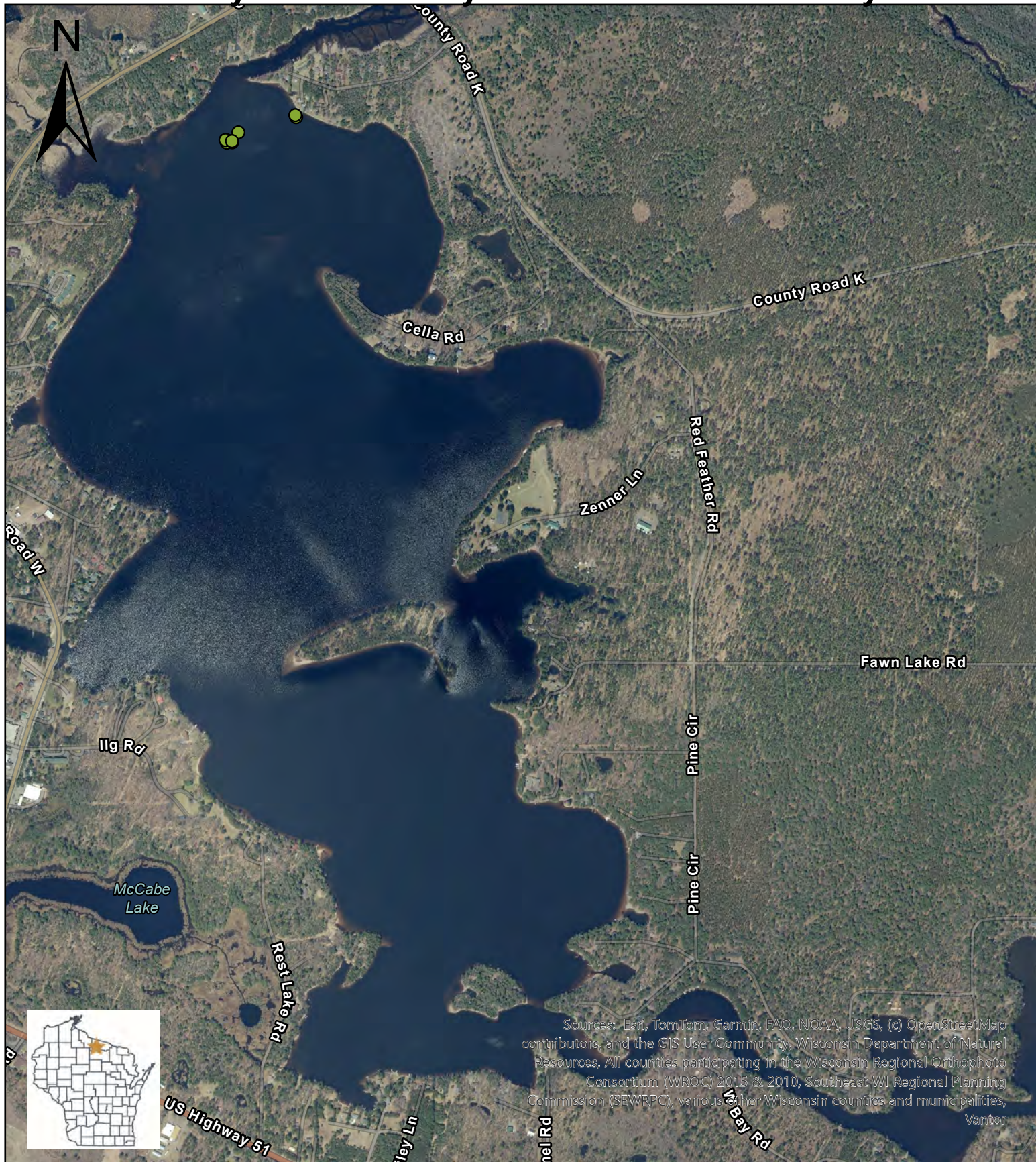
- | | |
|------------------|----------------------|
| Highly Scattered | Single or Few Plants |
| Scattered | Clumps of Plants |
| Dominant | Small Plant Colony |
| Highly Dominant | |
| Surface Matting | |

 **NORTH LAKELAND
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WOODS AND WATER

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Rest Lake

Early Season Curly Leaf Pondweed Survey



0 0.13 0.25 0.5 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
May 26 & 27, 2026



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Rice Creek Lake

Early Season Curly Leaf Pondweed Survey



Wisconsin Department of Natural Resources, All counties participating in the Wisconsin Regional Orthophoto Consortium (WROC) 2015 & 2010, Southeast WI Regional Planning Commission (SEWRPC), various other Wisconsin counties and municipalities, Vantor

0 0.1 0.2 0.4 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
June 11, 2026

Legend

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

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Spider Lake

Early Season Curly Leaf Pondweed Survey



0 0.1 0.2 0.4 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
June 9, 2026

Legend

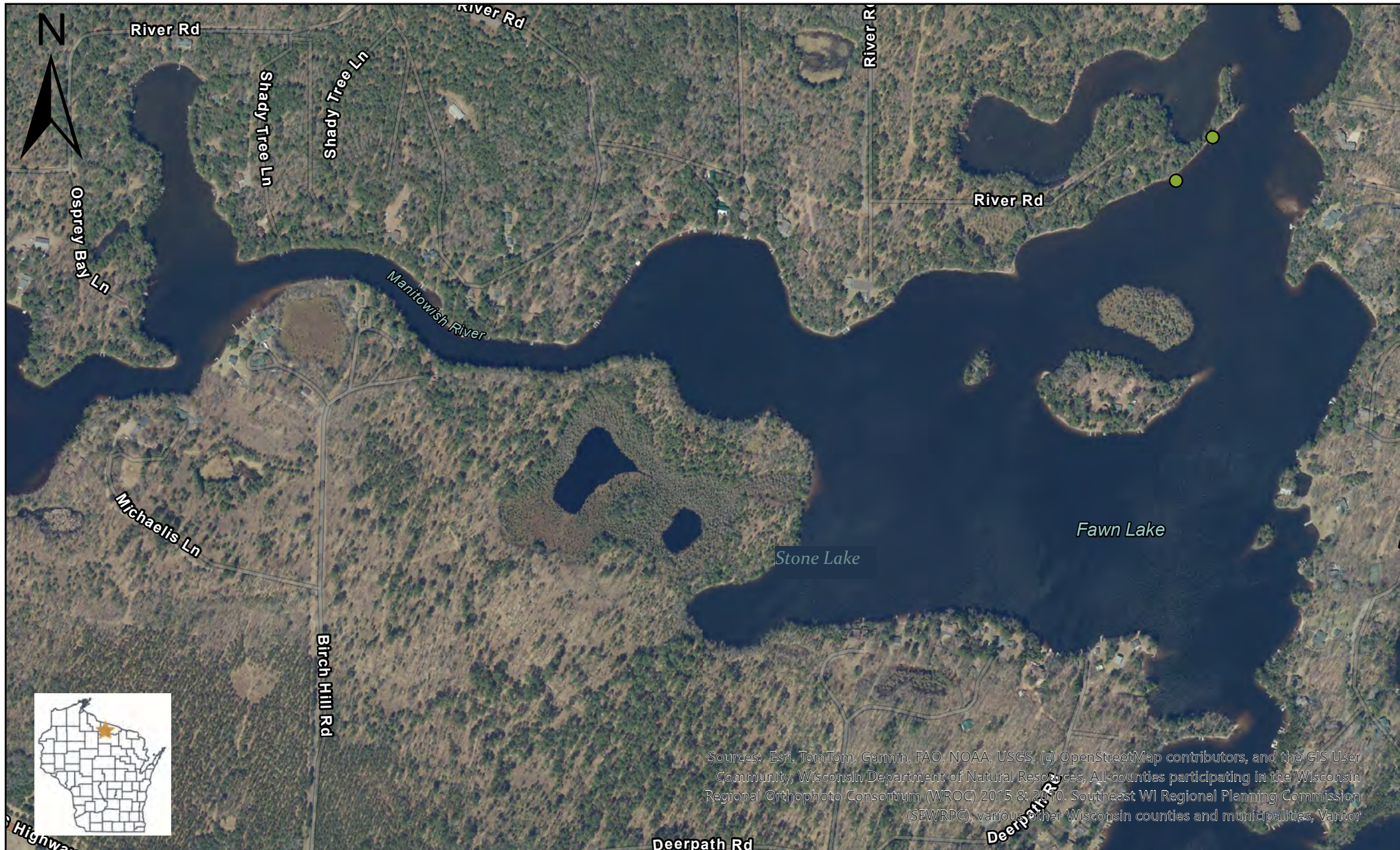
- | | |
|------------------|----------------------|
| Highly Scattered | Single or Few Plants |
| Scattered | Clumps of Plants |
| Dominant | Small Plant Colony |
| Highly Dominant | |
| Surface Matting | |

 **NORTH LAKELAND
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Stone Lake

Early Season Curly Leaf Pondweed Survey



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Wisconsin Department of Natural Resources, All counties participating in the Wisconsin Regional Orthophoto Consortium (WROC) 2015 & 2010, Southeast WI Regional Planning Commission (SEWRPC), various other Wisconsin counties and municipalities, Vantor

0 0.07 0.15 0.3 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
June 3, 2026

Legend



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Vance Lake

Early Season Curly Leaf Pondweed Survey



0 0.02 0.04 0.09 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
May 28, 2026

Wild Rice Lake

Early Season Curly Leaf Pondweed Survey



0 0.07 0.15 0.3 Miles

Town of Manitowish Waters
Vilas County, Wisconsin
June 6, 2026



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