Horseshoe Lake Property Association, Inc.
Horseshoe Lake
Washburn County

2023 Horseshoe Lake, Washburn County EWM Diver Removal/DASH Project
Grant# ACEI31623
Interim Progress Report
March 15, 2023-December 31, 2023
Prepared by: Edward Wink, Treasurer, Horseshoe Lake Property Association, Inc.

Table of Contents

INTRODUCTION

This report discusses all activities conducted by members of the Horseshoe Property Association, the Association's contractors, Lakes Education and Planning Services, LLC, Endangered Resources Services, Aquatic Plant Management, LLC during the period of the grant. Horseshoe Lake in Washburn Country has been infested with Eurasian water milfoil (EWM) for many years since it was first discovered in 2011. The Association has managed EWM with the help of both of its contractors, grant funding from the Wisconsin Department of Natural Resources (WDNR) and volunteer members. Between 2011 and 2022 EWM has been managed with a combination of physical and diver removal and aquatic herbicides (2011, 12, 16, 18, 19, and 21). Three different herbicides have been used: diquat (2011), granular and liquid 2,4D (2012, 16, & 18), and ProcellaCOR (2019 & 21). The last two chemical treatments using ProcellaCOR have been extremely successful with no EWM found in the treated areas to date (Fall 2022). Unfortunately, EWM has been in the lake long enough to be considered "spread through the whole lake" and shows up in past and new areas very regularly.

INTERIM PROGRESS REPORT

The new APM Plan for Horseshoe Lake takes a scenario-based approach to EWM management, meaning that any amount of EWM can and should be managed at any time albeit with different methods depending on the circumstances that present themselves. During 2022, dozens of individual plants, small clumps, and a larger patch of EWM were mapped in Horseshoe Lake. Late in the summer of 2022, a new larger patch was located on the east shore of the east basin. These plants were managed in 2022 with diver removal. Later in September more wide spread plants were raked and removed by Endangered Resource Services. However, it was expected that more EWM would be located in 2023 than was located in 2022, making it difficult to remove it with snorkeling, rake removal, and divers alone. Given the effectiveness of removal during 2022 and the low level of infestation, the Association planned to use diver removal and DASH to manage EWM in 2023 with the help of its AIS-Small-Scale Population Control Grant. Every year, multiple meandering shoreline surveys were conducted to look for infestations of EWM. Water quality samplings were taken for a number of years. Water clarity and temperature data were collected in 20223 as well.

Within two weeks of ice out on April 29th and 30th, volunteers conducted water clarity and temperature readings. Phosphorous water samples were taken on both the east and west basins and sent to the Wisconsin State Laboratory of Hygiene for analysis. Late in May 2023, Lake Education and Planning Services conducted surveys of the areas where EWM has been found in the past. A number of EWM plants were discovered primarily in the northeast shoreline of the east basin. These plants were removed by a diver. In May, June, July, August, and September water clarity and temperature readings were taken by volunteers in both basins. All of this data was entered into the SWIMS database. In June, July, and August phosphorous and chlorophyl samples were taken in both basins of Horseshoe Lake and the samples were sent to the Wisconsin State Laboratory of Hygiene for analysis and to report the results to the Wisconsin Department of Natural Resources.

Early in May our volunteer who monitors the decontamination station, made certain all the tools were on the station and put the sprayer with a fresh solution of bleach in a protective bucket at the decontamination station. During the entire summer, this volunteer monitored the decontamination station and put new bleach solutions in the sprayer every two weeks. In August, the brush and reaching pole were stolen. A new brush and reaching pole were purchased and place at the station.

In June, Lake Education and Planning Services (LEAPS) sent a diver and boat operator to Horseshoe Lake to survey the lake for EWM. They spent four and a half hours on the lake. They removed all the EWM they could find along the northeast corner of the east

basin and a few plants in the channel between the basins. LEAPS reminded the Board to have the residents continue to watch for fragments or any new beds of EWM. The Board sent an email to the residents urging them to monitor their shorelines for EWM fragments and to be watchful for EWM on their boat rides around the lake. Any sightings were to be reported with photos to the Board.

At the annual meeting of the Horseshoe Lake Property Association with the Board of Directors and resident members, Dave Blumer, Lake Education and Planning Services, conducted and educational session to talk about Aquatic Invasive Species, primarily about EWM. He encouraged residents to monitor their shoreline periodically and to report any findings to the Association Board. Photos of any plants are very helpful. He also reported to the residents about the activities of his company to remove EWM by diver removal.

In July, Matt Berg, Endangered Resource Services, LLC, conducted a meandering shoreline survey of Horseshoe Lake. He was careful to survey areas of previous treatment in 2019 and 2021. He found individual EWM plants in the northwest flats of the east basin near the channel and scattered plants along the north shore of the east basin. He removed a single EWM plant on the peninsula on the southeast part of the east basin directly north of the boat landing. On the east side of the east basin midway along that shore he found a large patch of EWM that was too large to remove by rake or by diver removal. This is the same patch that was discovered in the fall of 2022. Despite LEAPS work to control this patch, Matt Berg recommended removal of these plants using DASH. Manual removal might do more harm than good. Matt provided shape files, EWM location way points, and a map for the Association and Aquatic Plant Management, LLC for DASH removal.

The Association applied for a permit to harvest EWM plants on Horseshoe Lake using DASH. The Wisconsin Department of Natural Resources approved our permit. The Association contracted with Aquatic Plant Management, LLC to use DASH on the lake to remove EWM plants in the east basin using a Eurasian water-milfoil plant removal map provided by Matt Berg. This map was sent to Aquatic Plant Management to help the divers find the area of infestation. The DASH removal was scheduled for August 18, 2023. On the 18th, it was sunny, and the lake was calm with a light breeze making it easier for the dive team to locate EWM plants. Two volunteers spent five hours on the lake following the DASH team to remove floating EWM fragments that surfaced after the dive team harvested the plants. One volunteer was on a pontoon and the other was on a kayak.

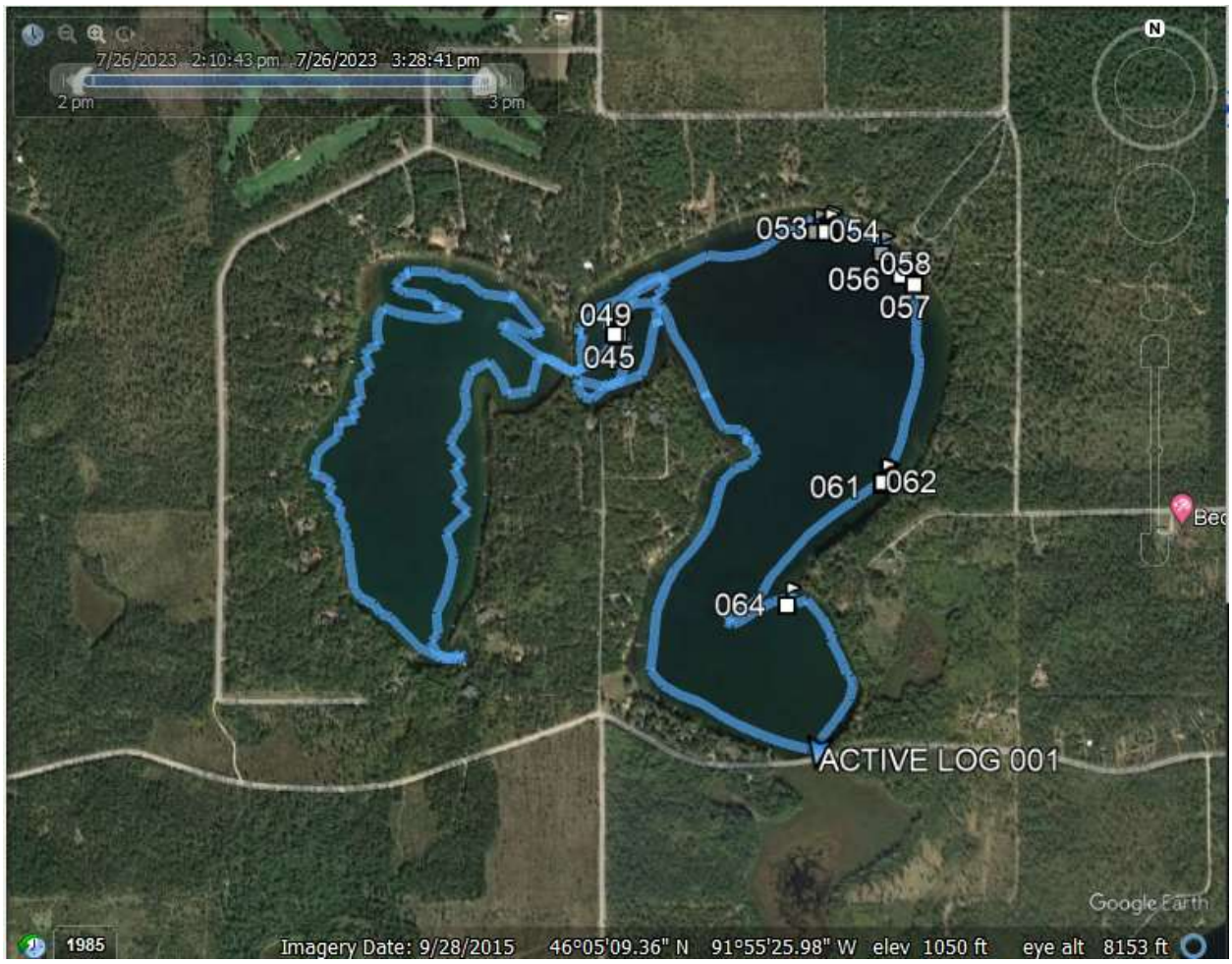

Figure 1: Endangered Resource Services' meandering shoreline survey on July 26, 2023

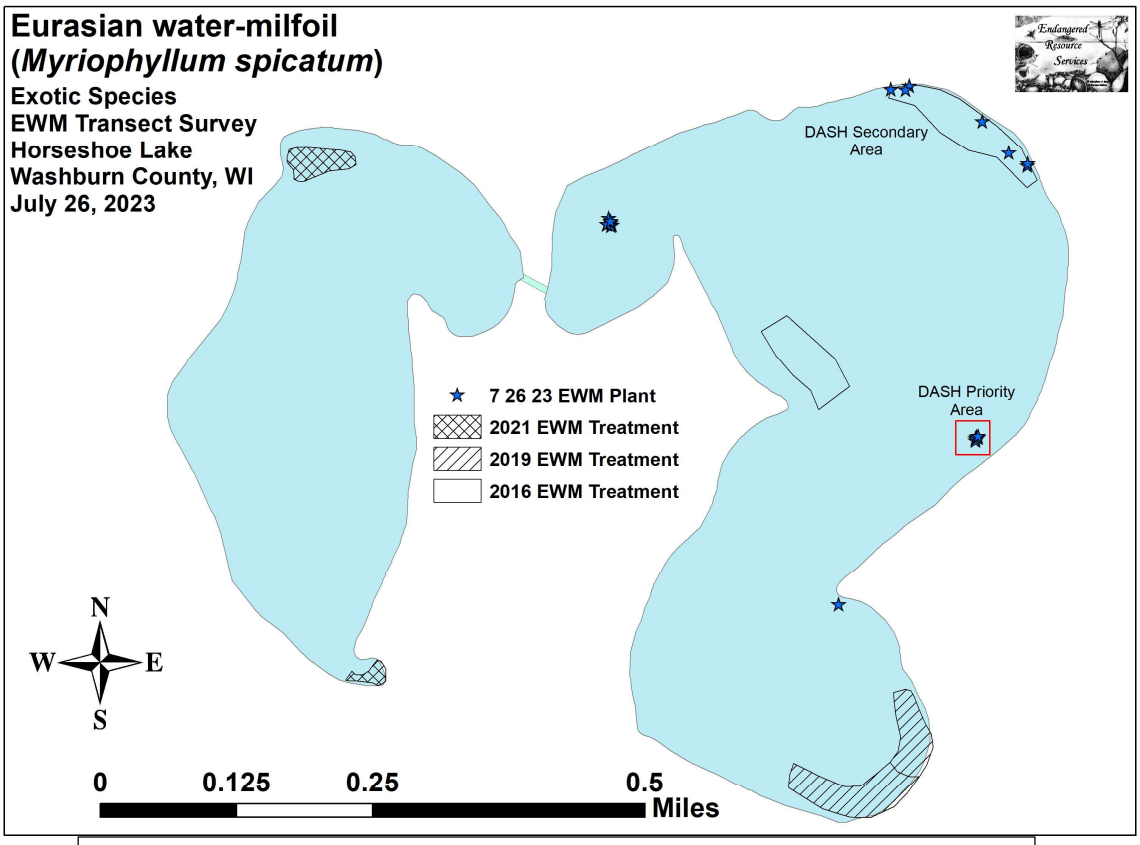

Figure 2: Matt Berg's map that was provided to Aquatic Plant Management

On July 26th, a volunteer, who monitors Zebra mussel sampler plates, sent an email to the Board with pictures of a snail found on his sampler plate. The pictures were sent to our contractors, Matt Berg, Endangered Resource Services, LLC and Dave Blumer, Lake Education and Planning Services. Dave Blumer responded that a snail would not ordinarily be a concern, but the sample should be checked by an expert to see if it was a New Zealand Mud Snail as they are present in the waters along Lake Superior and in the Duluth harbor he thought. The board member then sent the pictures to Lisa Burns, Washburn County Conservation Coordinator. She agreed with Dave Blumer that the sample was not a Zebra Mussel or New Zealand Mud Snail, but it might be another invasive, a Faucet Snail although she thought it was a native pond snail. She reached out to other experts, and they responded that the sample was not a Zebra Mussel or any other invasive species. It is likely a species of Physa snail which are pretty common across the state and tend to have a moderately transparent shell.

During the remainder of August, volunteers continued to collect Secchi disk and temperature readings in both basins. Final phosphorous and chlorophyl samples were collected and mailed to the Wisconsin State Laboratory of Hygiene. On September 4th,

Matt Berg conducted a meandering shoreline survey of the Lake taking special care to survey the areas where DASH was done in August. He did not find any plants in the West basin in areas where treatment was done in 2021. A few plants were found in the area east of the channel and sixty-seven plants were found along the north shore of the East basin in the area where DASH worked. This area has been treated multiple times in the past. He also found a few plants in the area on the east central side of the East basin where there was a sizable patch the last two years. Berg found a small dense patch on the north side of the point on the East side of the east basin. This is a new location with EWM infestation. The recurrence of EWM is disappointing after all the efforts at controlling it this summer.

In August, September, and October, volunteers conducted their monitoring of the zebra mussel sampler plates and removed them for storage for the winter. The volunteer, who monitored the decontamination station for the summer season, put the tools and sprayer into storage for the winter.

The Horseshoe Lake Property Association Board of Directors will be interested in the presence of EWM in the lake next spring. The Board has already signed a contract with Endangered Resource Services to conduct meandering shoreline surveys to determine the size of EWM infestations.

Appendix 1): Eurasian Water-milfoil Meandering Littoral Zone Surveys
Horseshoe Lake
Washburn County, Wisconsin-2023
Endangered Resource Services, LLC

Eurasian Water-milfoil (*Myriophyllum spicatum*)
Meandering Littoral Zone Surveys
Horseshoe Lake (WBIC: 2470000)
Washburn County, Wisconsin

EWM plants raked out on the north shoreline 7/26/23

Continued low water levels and calm survey conditions 9/4/23

Project Initiated by:
The Horseshoe Lake Property Owners Association, Lake Education and Planning Services, LLC and the Wisconsin Department of Natural Resources

EWM raked out near the channel 9/4/23

Surveys Conducted by and Report Prepared by:
Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
July 26 and September 4, 2023

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

INTRODUCTION:

Horseshoe Lake (WBIC 2470000) is a 177-acre seepage lake in north-central Washburn County, Wisconsin in the Town of Minong (T42N R12/13W S25, 30-31, and 36). It reaches a maximum depth of 21ft in the northeast corner of the eastern basin and has an average depth of approximately 7ft (WDNR 2023). Secchi disc readings from 2014-2023 have averaged 10.8ft in the west basin and 13.4ft in the east basin. This suggests the lake is mesotrophic in nature with good to very good water clarity (WDNR 2023). The lake's bottom substrate is predominately sand along the shoreline, but this gradually transitions to sandy muck at most depths over 6ft (Sather et al. 1971). The only organic muck occurs in the tiny "nook" bay on the southeast end of the lake's west basin (Figure 1).

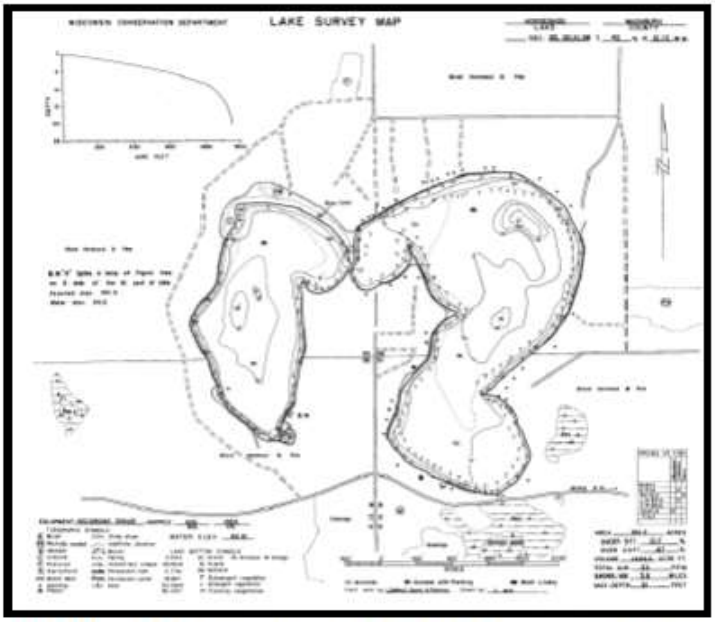

Figure 1: Horseshoe Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) is an exotic invasive plant species that is a growing problem in the lakes and rivers of northwestern Wisconsin. Present in nearby Nancy Lake since 1991, the Minong Flowage since 2002, and Gilmore Lake since 2009, EWM was first found in Horseshoe Lake in May 2011. Under the direction of Lake Education and Planning Services, LLC (LEAPS), the Horseshoe Lake Property Owners Association (HLPOA) has conducted herbicide treatments to control EWM in 2011, 2012, 2016, 2019, and 2021. They have also authorized annual meandering shorelines surveys of the lake to look for surviving/new EWM plants/beds since 2013. These surveys have helped to rapidly identify and manage pioneer beds thus limiting the need for large-scale or annual treatments. During the 2021 September posttreatment shoreline survey, we found and rake removed just 14 individual EWM plants – all in the east basin. Unfortunately, in August 2022, a new bed was discovered on the eastern shoreline of the east basin. Because it was small, it was decided to use manual removal in 2022 and recheck the bed during the regular shoreline surveys in 2023. This report is the summary analysis of our two surveys conducted on July 23 and September 4, 2023.

METHODS:

EWM Littoral Zone Rake Removal and Bed Mapping Surveys:

During the July and September surveys, we searched along the lake's entire shoreline spacing successive transects close enough that our field of view overlapped from one transect to another. We paid special attention to the areas around docks as this is where Eurasian water-milfoil brought in on props is most likely to establish. We also spent extensive time motoring around, through, and between the 2016, 2019, and 2021 treatment areas to look for surviving EWM as well as revisiting all the areas we found EWM in during the 2022 surveys. When isolated EWM plants were found and time allowed, we used a telescopic rake to remove them by their roots and logged the location with a GPS waypoint. We also took extra care to gather any fragments that broke off of the plants. If we found a "bed" where we estimated that EWM made up >50% of the plants and was generally continuous with clearly defined borders, we motored around the perimeter of the area and took GPS coordinates at regular intervals. We also estimated the rake density range and mean rake fullness of the bed (Figure 2), the range and mean depth of the bed, whether it was canopied, and the impact it was likely to have on navigation (**none** – easily avoidable with a natural channel around or narrow enough to motor through/**minor** – one prop clear to get through or access open water/**moderate** – several prop clears needed to navigate through/**severe** – multiple prop clears and difficult to impossible to row through). These data were then mapped using ArcMap 9.3.1, and we used the WDNR's Forestry Tools Extension to determine the acreage of each bed to the nearest hundredth of an acre.

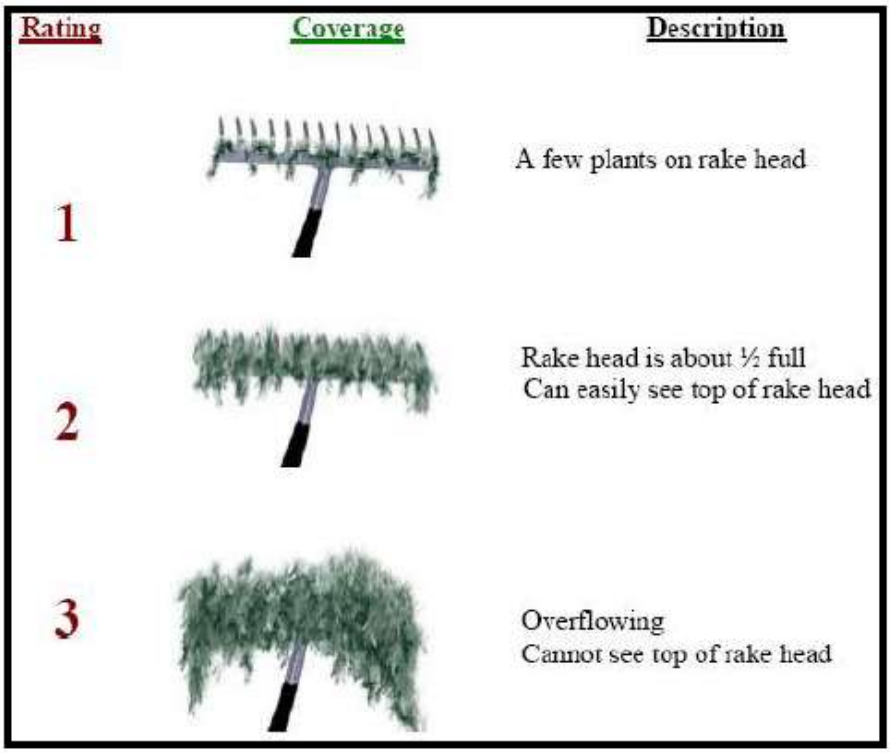

Figure 2: Rake Fullness Ratings

RESULTS AND DISCUSSION:

July EWM Rake Removal and Bed Mapping Survey:

After a winter with heavy snow that helped refill the lake, the summer drought saw continuous declines in water levels. Clarity on July 26th was very good, and we felt confident we could see down approximately 7-8ft. In total, we looked for evidence of Eurasian water-milfoil along transects that covered over 8.3km (5.2 miles) (Figure 3).

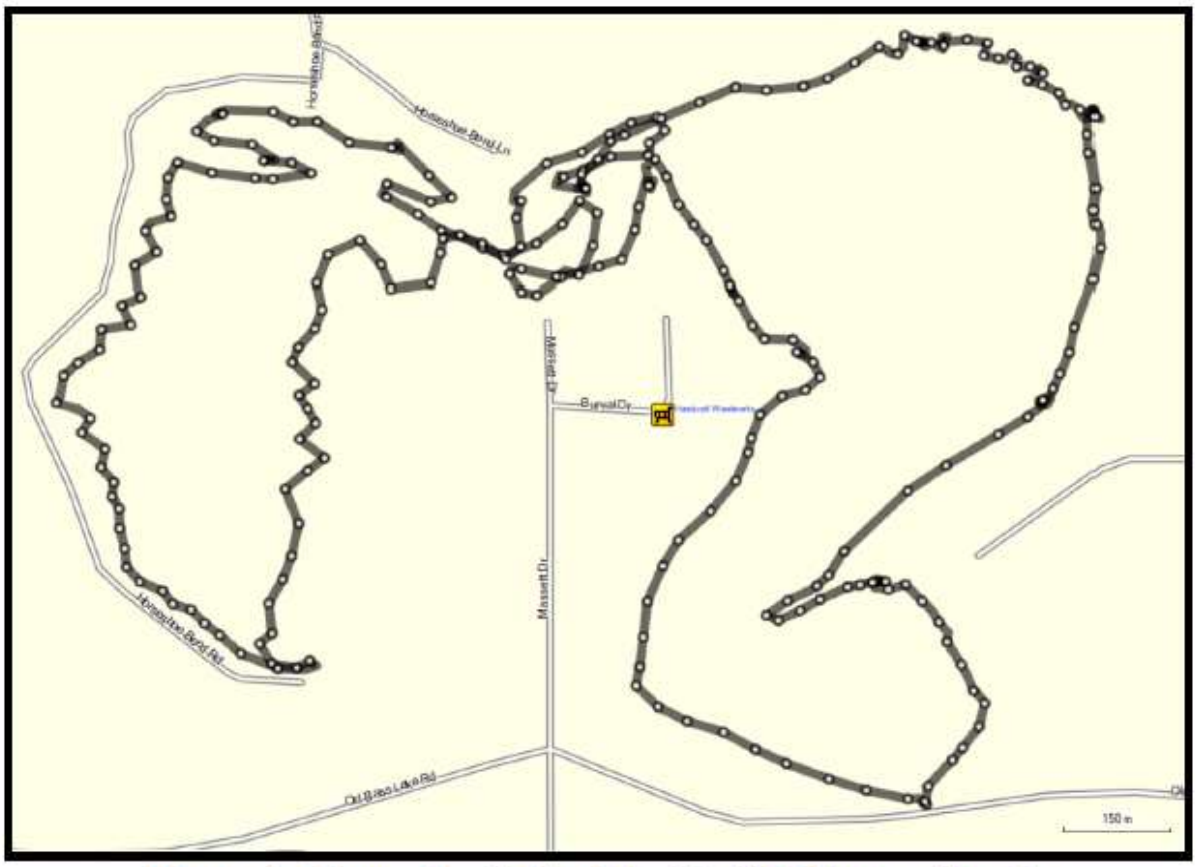

Figure 3: Horseshoe Lake July 26, 2023 Survey Tracks

We again found no evidence of EWM in the 2019 treatment area in the southeast bay of the east basin or the 2021 treatment areas in the west basin. However, a single EWM plant was rake removed on the north shore of the southeast bay directly north of the landing, seven scattered plants were rake removed in the flat northeast of the narrows, and seven additional plants were removed along the north-central and northeast shorelines of the east basin. Unfortunately, despite previous rake and dive removal efforts, the bed located in late summer 2022 on the eastern shoreline had regrown to the point rake removal or single diver removal was not feasible (Figure 4) (Appendix I). Because of this, on August 18th, a DASH removal occurred at each of the four locations with known EWM (Figure 5).

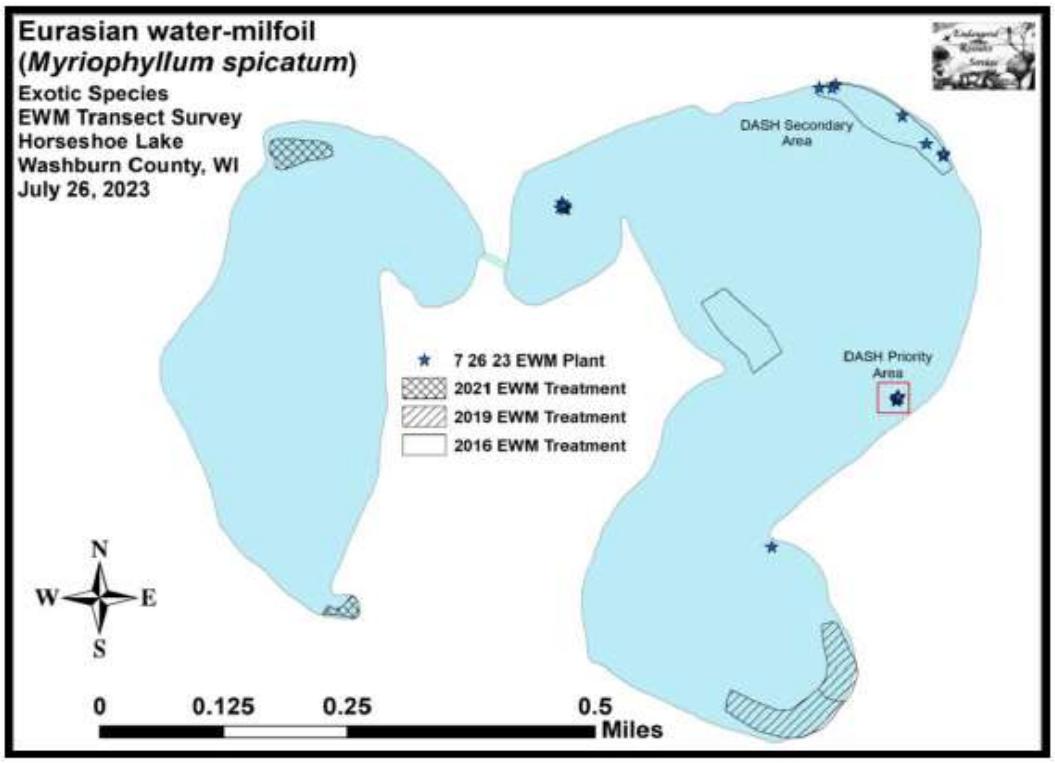

Figure 4: Horseshoe Lake July 26, 2023 EWM Bed Map

Figure 5: Horseshoe Lake August 18, 2023 EWM DASH Removal Map

September EWM Rake Removal and Bed Mapping Survey:

On September 4th, we returned to the lake to again look for surviving Eurasian water-milfoil. We noted a further drop in water levels, and, because of low winds and continued good clarity, we found we could see down approximately 7-8ft. In total our search transects covered 19.0km (11.8 miles) (Figure 6).

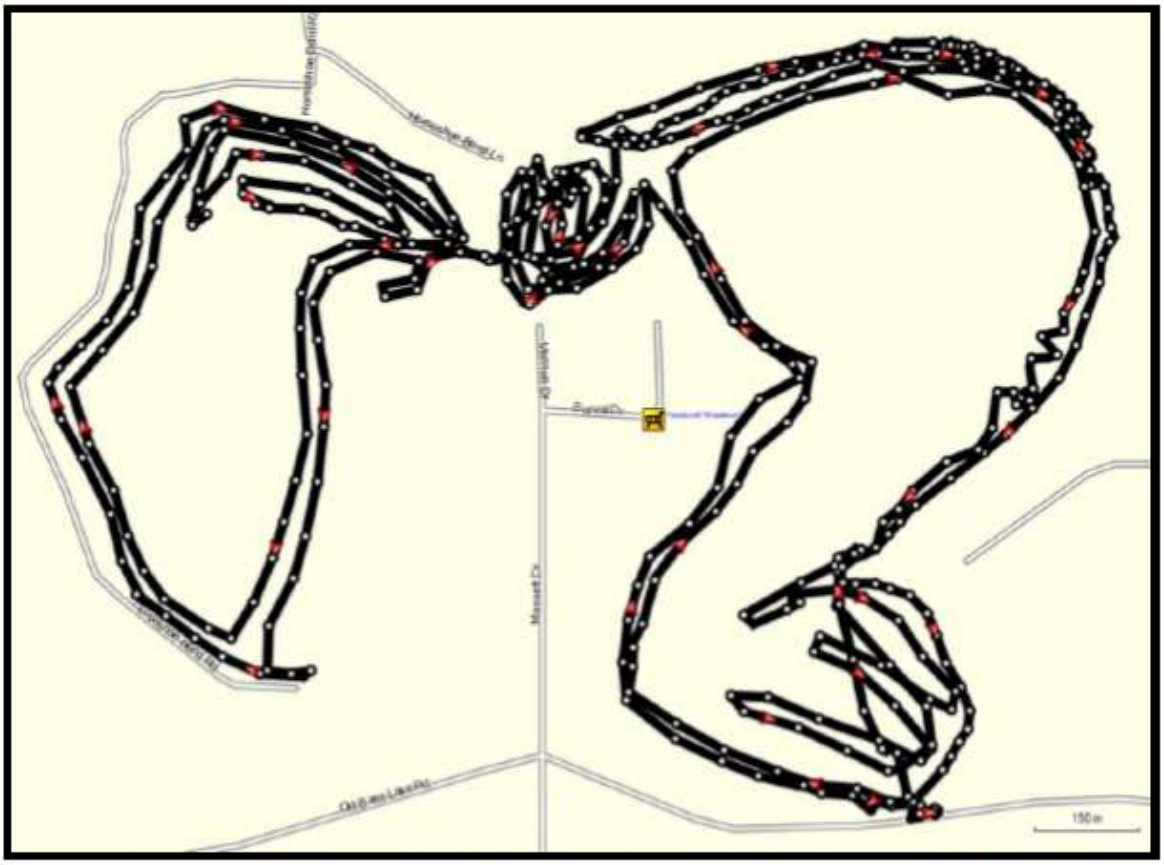

Figure 6: Horseshoe Lake September 4, 2023 Survey Tracks

We again found no evidence of EWM anywhere in the 2021 treatment areas in the west basin. However, we did find two pioneering single-stemmed plants in the 2019 treatment area in the east basin just west of the public boat landing. We also found surviving EWM in all areas where the DASH crew worked in August. In the shallow flat just east of the channel to the west basin, we rake removed five plants. Along the north shoreline, we found a sharp uptick in EWM levels as we logged 67 individual plants scattered throughout the area. We also noted many were multi-stemmed, nearing canopy, and actively fragmenting. In the small eastern shoreline bed where the DASH crew focused their efforts, we found only a small handful of plants. Unfortunately, as we moved further south along the shoreline, we discovered another small but dense bed that was previously unmapped (Figure 7) (Appendix I).

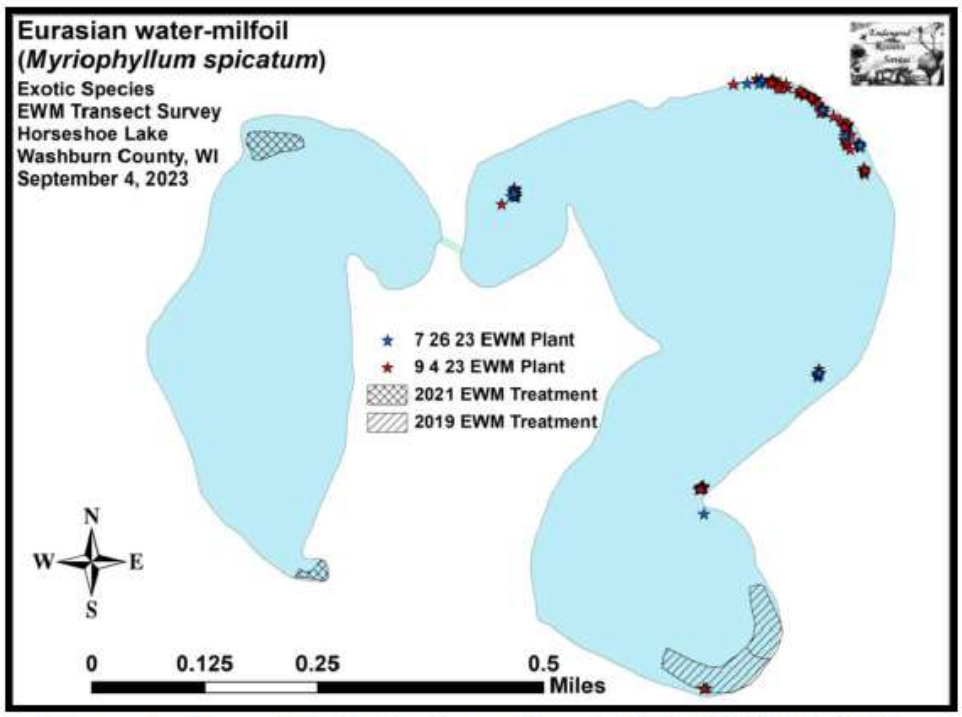

Figure 7: Horseshoe Lake September 4, 2023 EWM Bed Map

CONSIDERATIONS FOR MANAGMENT:

Manual removal has largely kept Eurasian water-milfoil in check since the last chemical treatment in 2021. However, despite DASH removal at all known EWM sites in August, plants continued to spread, and, especially along the northeastern shoreline, thicken. Because of this, the HLPOA and LEAPS requested we generate polygons of potential management areas for 2024 (Figure 8). Collectively, these four areas totaled 4.95 acres (Table 1).

Table 1: Late Summer Eurasian Water-milfoil Bed Mapping Summary
Horseshoe Lake – Washburn County, Wisconsin
September 4, 2023

Bed #	2023 Acreage	Rake Range/ Mean	Depth Range/ Mean	Canopied	Navigation Impairment	Field Notes
Bed 1	1.06	<<<1-1; <<<1	4-6; 5	Near	None	Scattered plants.
Bed 2	2.53	<<<1-2; 1	2-10; 6	Near	Low	Clusters w/ satellites.
Bed 3	0.52	<<<1-1; <<<1	4-8; 6	No	None	Scattered plants.
Bed 4	0.83	<<<1-3; 1	2-8; 6	Near	Low	Scattered dense microbeds.
Total Acres	**4.95**					

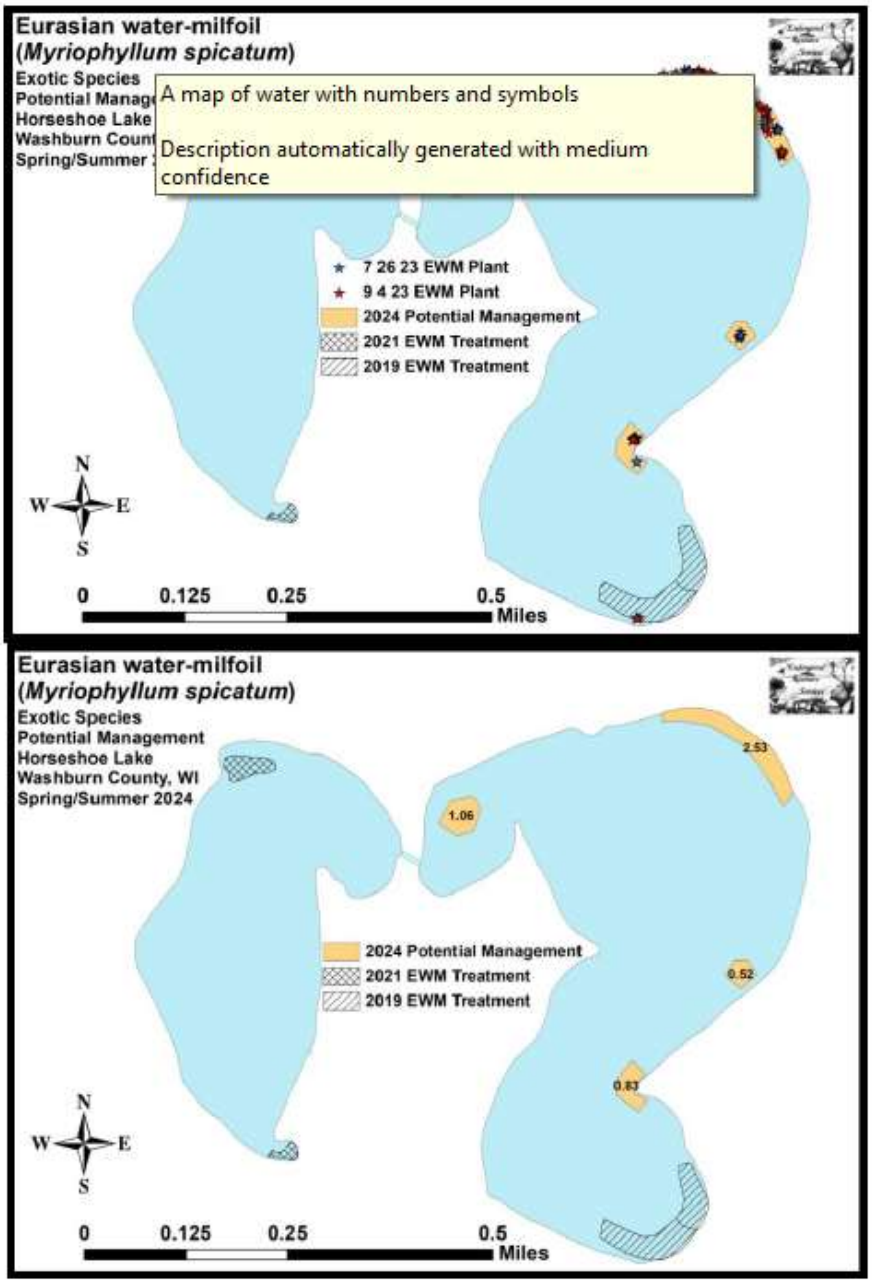

Figure 8: Potential 2024 Management Areas

As in the past, we continue to encourage lake residents to be on the lookout for any signs of Eurasian water-milfoil. If they discover a plant they even suspect may be EWM, we strongly encourage them to **immediately** contact Matthew Berg, ERS, LLC Research Biologist at 715-338-7502 for identification confirmation. If possible, a specimen, a jpg, and the accompanying GPS coordinates of the location should be included so the plants can be manually removed as soon as possible. Texting pictures from a smartphone is actually ideal as it allows for immediate feedback. Likewise, we are happy to identify ANY plant a lake resident finds that they may want identified.

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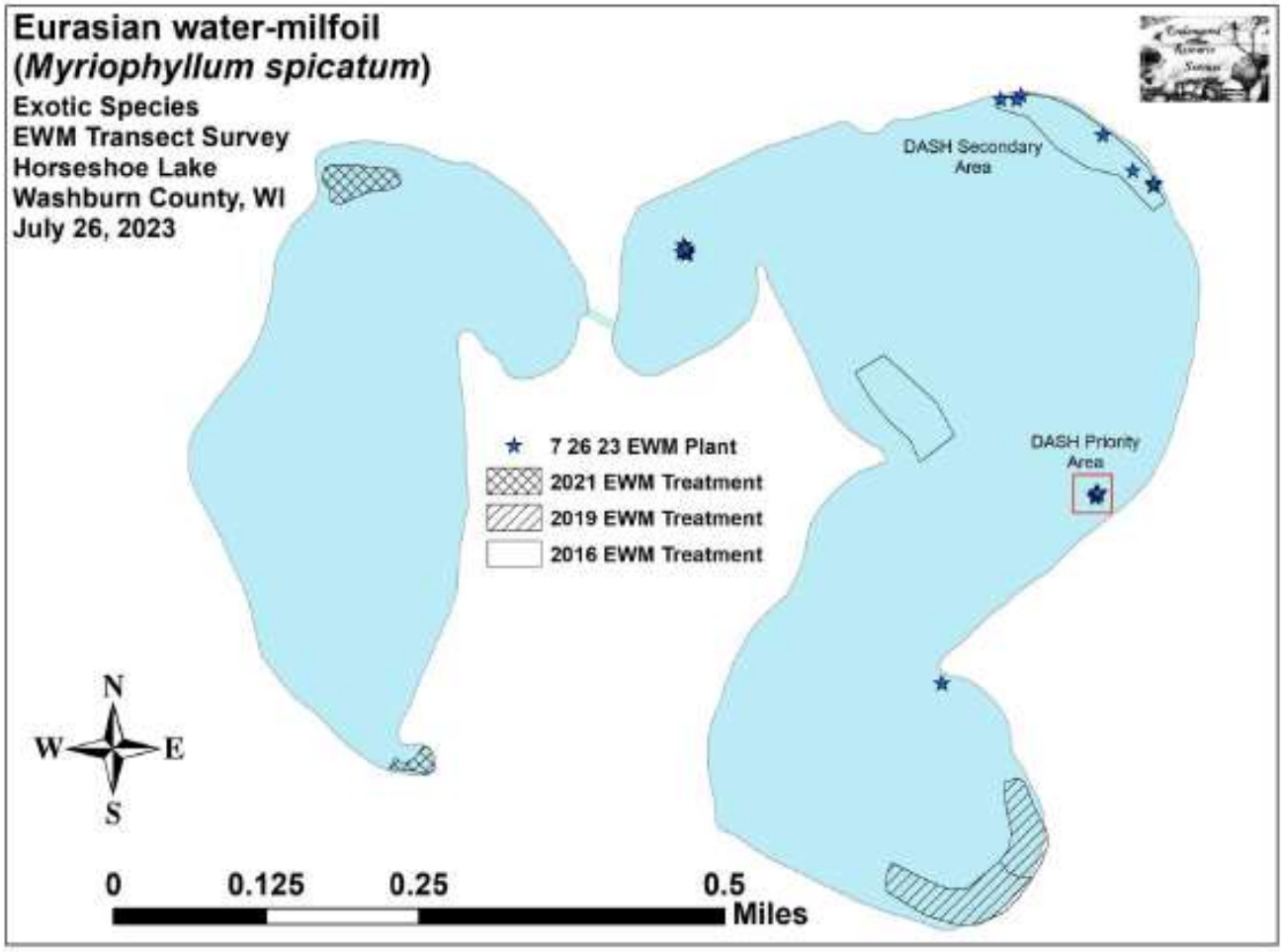
Appendix I: 2023 EWM Rake Removal, Bed Maps, and Consideration for Future Management


Eurasian water-milfoil
(Myriophyllum spicatum)
Exotic Species
EWM Transect Survey
Horseshoe Lake
Washburn County, WI
July 26, 2023
DASH Secondary Area
DASH Priority Area
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2021 EWM Treatment
2019 EWM Treatment
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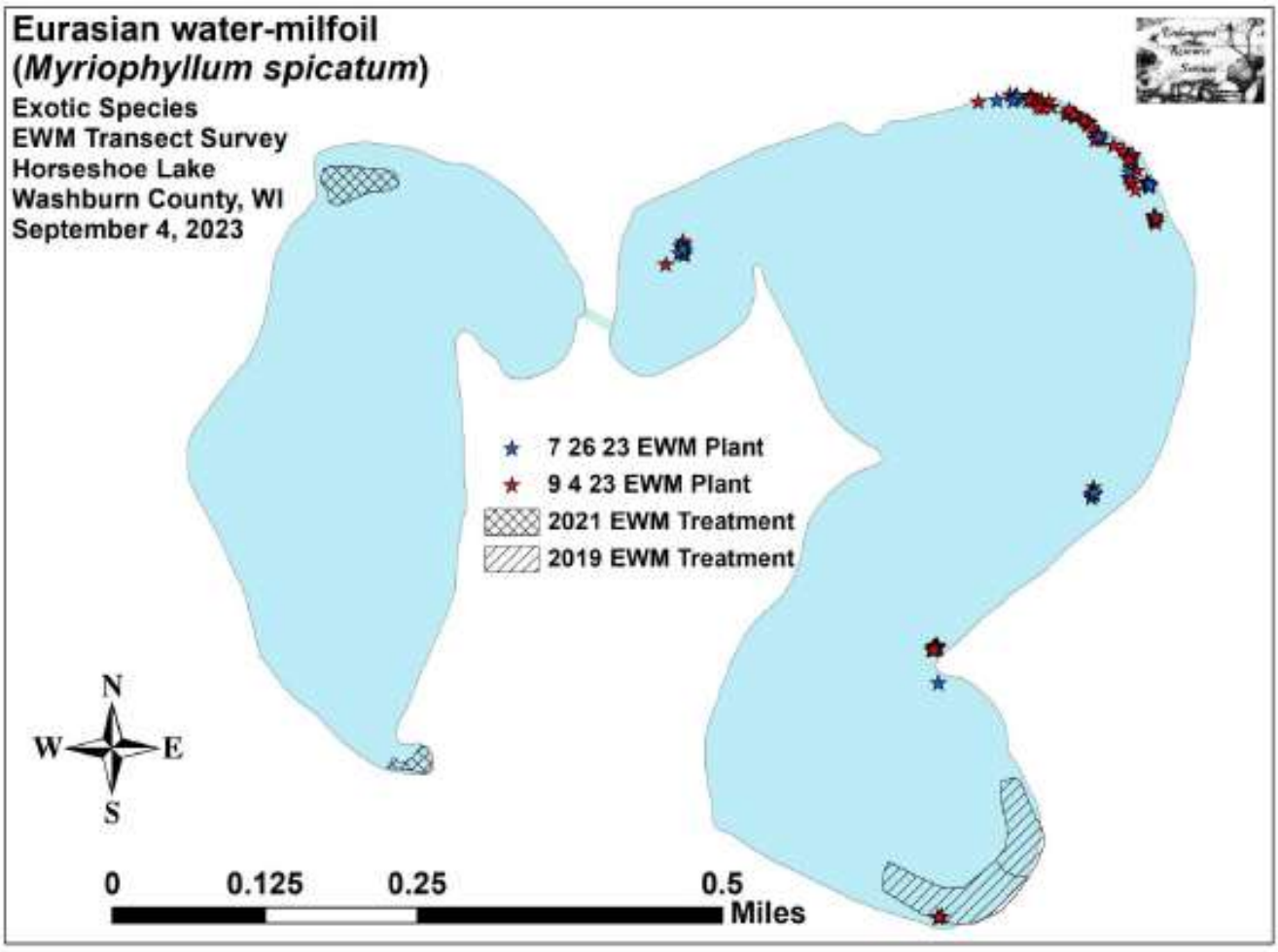
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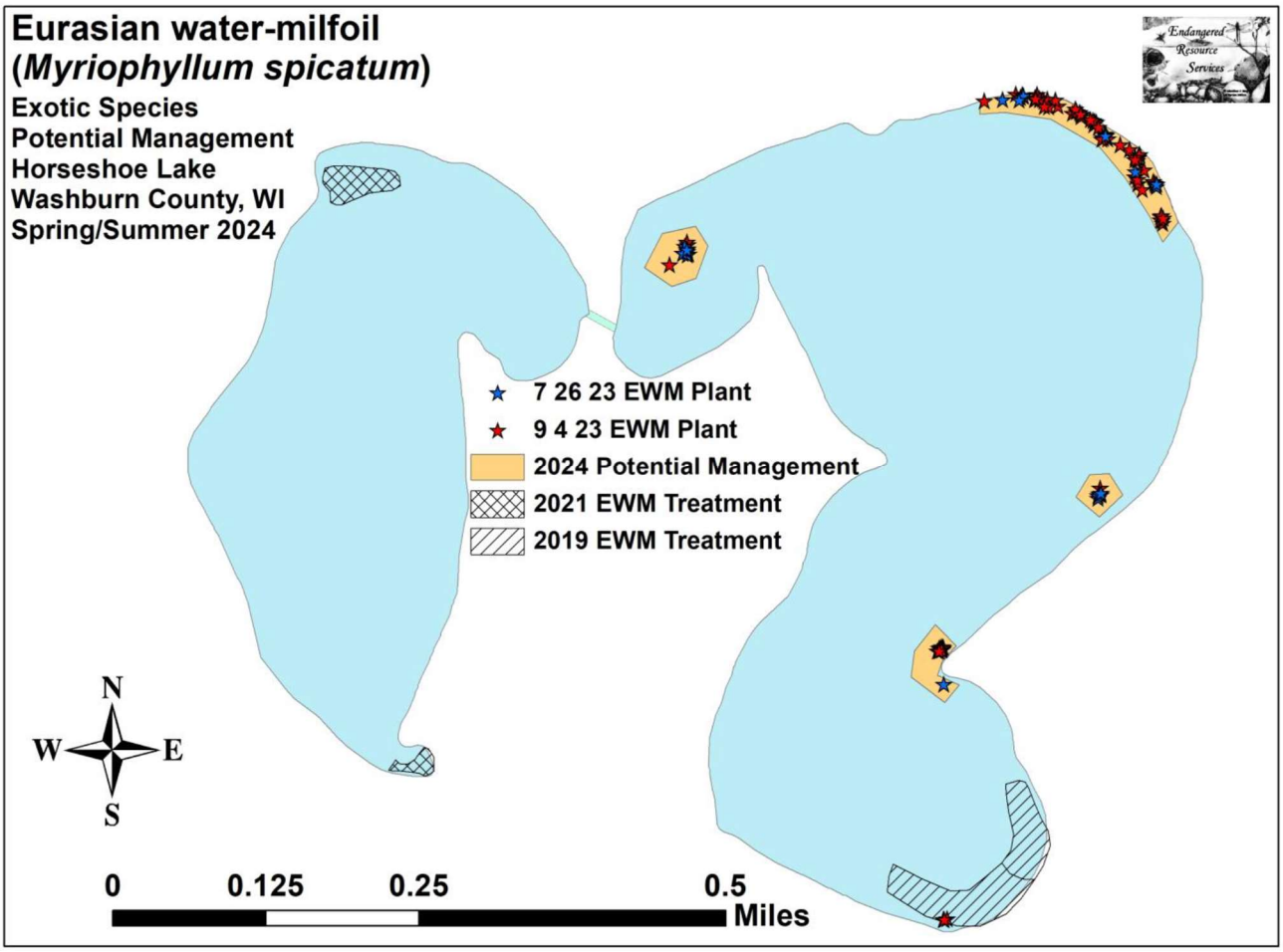
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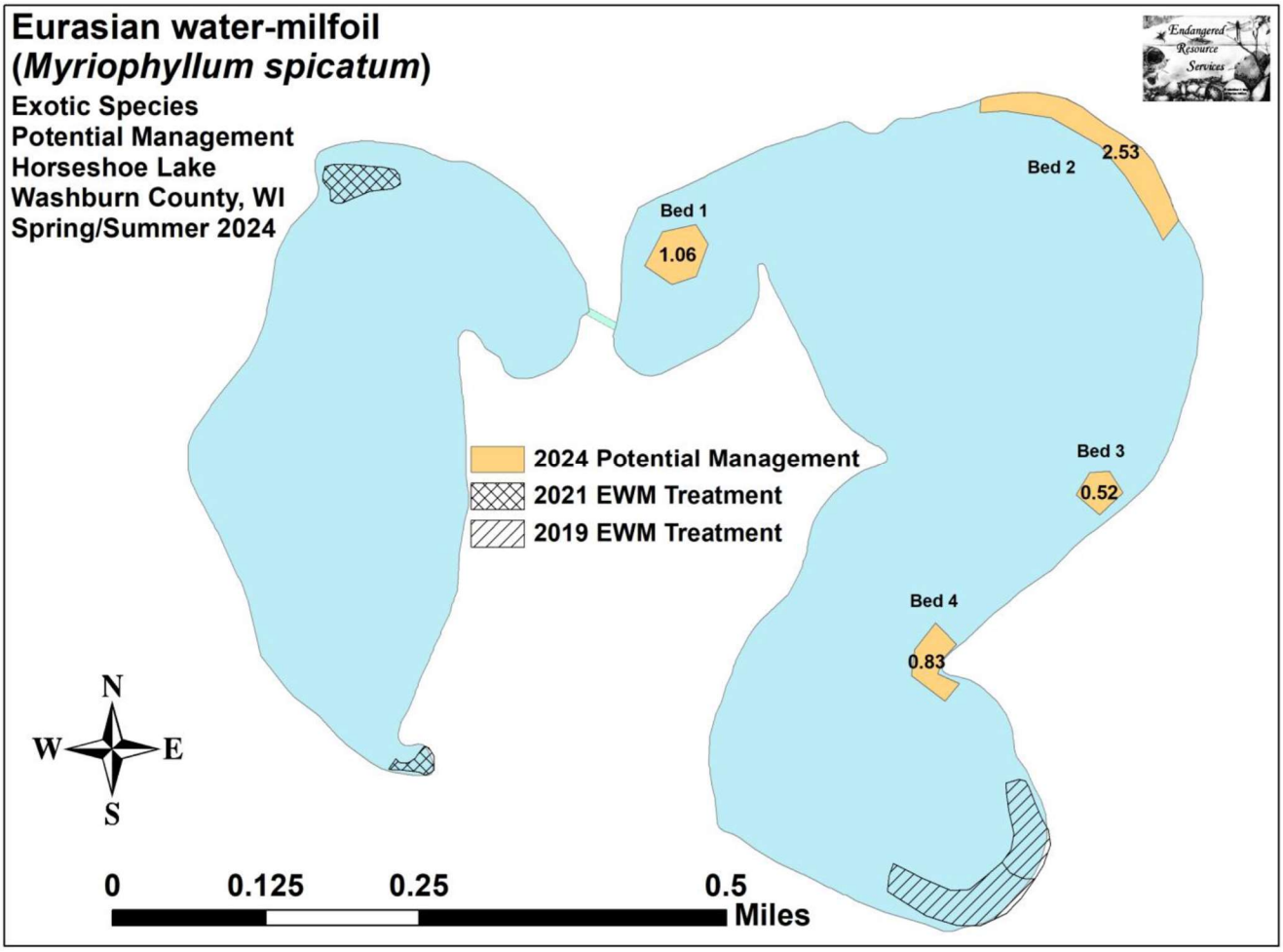
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2024 Potential Management
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Appendix 2): EWM Removal by DASH Report 2023
Horseshoe Lake
Washburn County, Wisconsin
Aquatic Plant Management, LLC

EST. 2013

AQUATIC PLANT MANAGEMENT

Horseshoe Lake EWM Removal Report 2023

PO Box 1134 Minocqua, WI 54548

Horseshoe EWM Removal Summary 2023

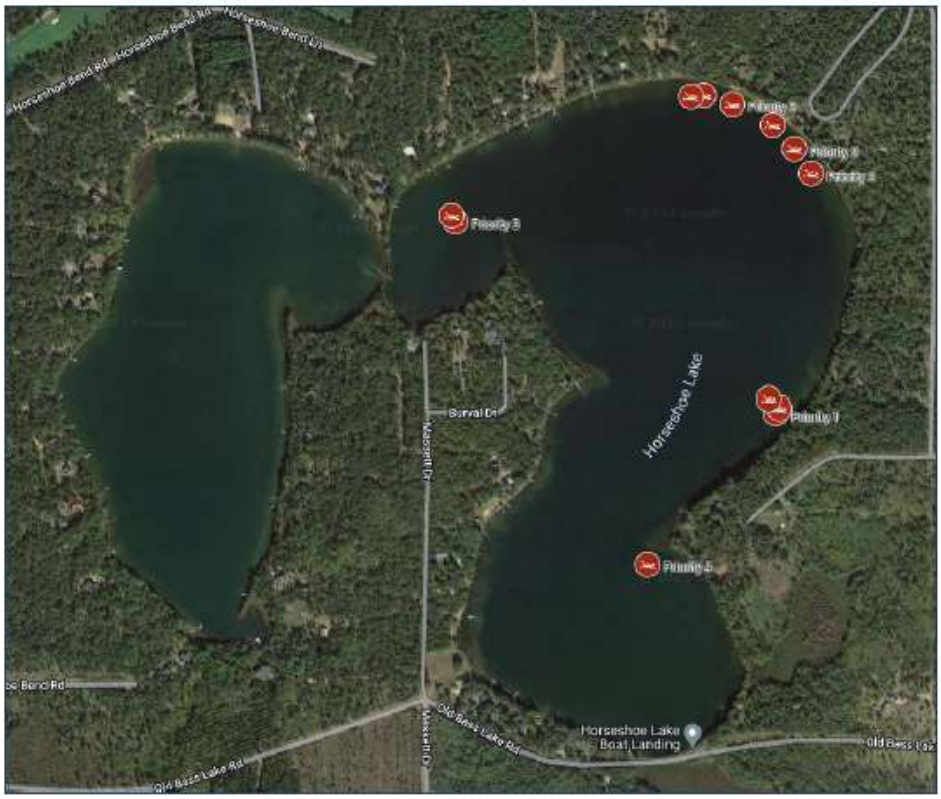
Dive Background: In August, Aquatic Plant Management LLC (APM) conducted one (1) day of Diver Assisted Suction Harvesting (DASH) for Eurasian Watermilfoil (EWM) on Horseshoe Lake in Washburn County, WI. The team focused their efforts at 4 sites as prioritized by the Horseshoe Lake Property Association. In total APM was able to remove **6 cubic feet of EWM** from Horseshoe Lake.

Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
8/18/2023	Partly Cloudy	70	3.9	6.0
Grand Total			3.9	6.0

Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
Priority 1	7.0	3	1.8	3.5
Priority 2	6.2	6	0.9	2.0
Priority 3	4.0	2	0.7	0.5
Priority 4	7.5	1	0.5	0.0
Grand Total	6.1	12	3.9	6.0

Dive Highlights and Recommendations: The dive team spent the bulk of their time at the first two dive sites where they were encountering most of the highly scattered plants. Overall, Horseshoe Lake should continue to take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the EWM population on the lake. Continued monitoring and management efforts are important to prevent the spread of EWM throughout Horseshoe Lake.

Map of Horseshoe 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
8/18/2023	Priority 1	46.08606	-91.91666	0.50	2.0	Small Plant Colony	7.0	Grasses	2.0	Organic
8/18/2023	Priority 2	46.08966	-91.91589	0.17	0.5	Highly Scattered	8.0	None	0.0	Organic
8/18/2023	Priority 2	46.09003	-91.91626	0.08	0.0	Single or Few	7.0	Grasses	0.0	Organic
8/18/2023	Priority 2	46.09039	-91.91673	0.17	0.5	Highly Scattered	6.0	Grasses	0.0	Organic
8/18/2023	Priority 2	46.09071	-91.91761	0.17	0.5	Scattered	6.0	Elodea	0.0	Organic
8/18/2023	Priority 2	46.09084	-91.91823	0.17	0.5	Highly Scattered	5.0	None	0.0	Organic
8/18/2023	Priority 2	46.09082	-91.91851	0.17	0.0	None	5.0	None	0.0	Organic
8/18/2023	Priority 3	46.08894	-91.92364	0.50	0.5	Highly Scattered	4.0	None	0.0	Organic
8/18/2023	Priority 3	46.08902	-91.92372	0.17	0.0	Single or Few	4.0	None	0.0	Organic
8/18/2023	Priority 4	46.08379	-91.91946	0.50	0.0	Single or Few	7.5	None	0.0	Organic
8/18/2023	Priority 1	46.08614	-91.91658	0.83	1.0	Scattered	7.0	Grasses	0.0	Organic
8/18/2023	Priority 1	46.08627	-91.91682	0.50	0.5	Highly Scattered	7.0	Grasses	0.0	Organic
Total	12			3.93	6.0					