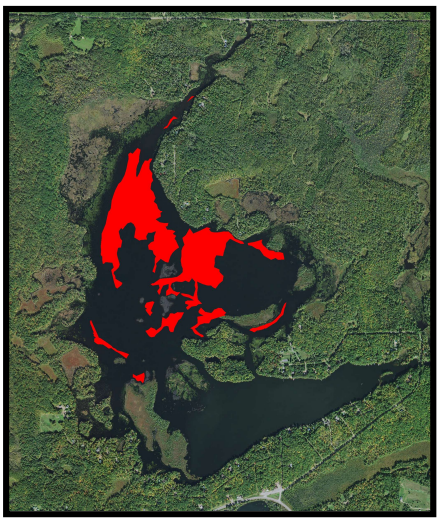
Eurasian water-milfoil (*Myriophyllum spicatum*)
Late-summer Bed Mapping Survey
Mud Lake (WBIC: 2434800)
Sawyer County, Wisconsin



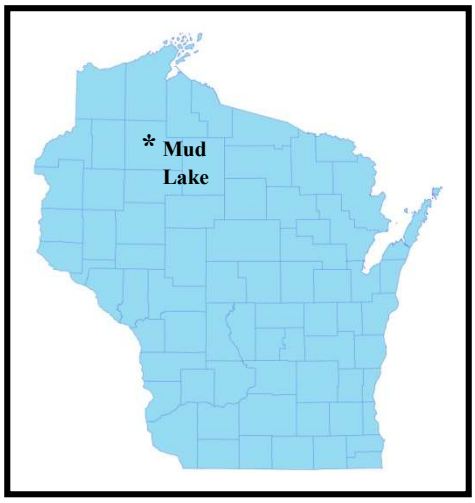
Eurasian Water-milfoil beds on Mud Lake – 8/19/26



Canopied mat of Eurasian water-milfoil in the river inlet - 8/19/26

Project Initiated by:

The Callahan and Mud Lakes Protective Association,
Lake Education and Planning Services, LLC, and the
Wisconsin Department of Natural Resources (Grant ACEI35725)





Canopied Eurasian water-milfoil mat on the lake's north side – 8/19/26

Survey Conducted by and Report Prepared by:

Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
Saint Croix Falls, Wisconsin
August 19, 2026

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES…….. ii

INTRODUCTION…….. 1

BACKGROUND AND STUDY RATIONALE…… 1

METHODS……..…….…….. 2

RESULTS..……..…….…….. 3

Late-summer Eurasian Water-milfoil Bed Mapping Survey…….. 3

Descriptions of Past and Present Eurasian Water-milfoil Beds…….. 6

DISCUSSION AND CONSIDERATIONS FOR MANAGEMENT……. 8

LITERATURE CITED…….…….……. 8

APPENDIX…… 9

I: 2020, 2021, 2025, and 2026 Eurasian Water-milfoil Bed Maps……... 9

LIST OF FIGURES AND TABLES

Page

Figure 1: Mud Lake Bathymetric Map..... 1

Figure 2: Rake Fullness Ratings..... 2

Figure 3: 2026 EWM Littoral Zone Survey – GPS Tracks..... 3

Figure 4: 2021 and 2026 Eurasian Water-milfoil Bed Maps..... 3

Table 1: Late-summer Eurasian Water-milfoil Bed Mapping Summary – Mud Lake - Sawyer County, WI – August 19, 2026..... 4

INTRODUCTION:

Mud Lake (WBIC 2434800) is a 464-acre drainage lake created by an 8ft dam on the north fork of the Chief River in north-central Sawyer County, Wisconsin in the Town of Round Lake (T41N R7W S27/28 and 33/34). It has a maximum depth of 15ft and an average depth of 6ft. The lake is mesotrophic in nature, and water clarity is good with summer Secchi readings averaging 9.6ft over the past ten years (WDNR 2026). The lake's bottom substrate is primarily sand along the shoreline before transitioning to a sandy muck at most depths over 7ft (Bush et al. 1968) (Figure 1).

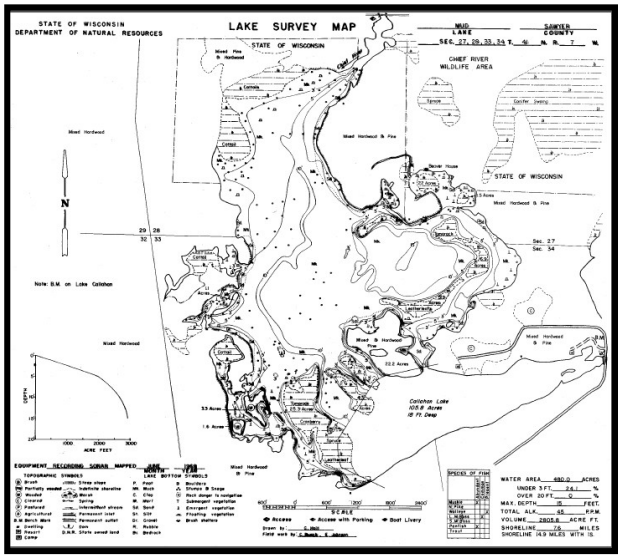


Figure 1: Mud Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) is an exotic invasive plant species that was first identified in Mud Lake in the fall of 2005. Following an initial whole lake point-intercept survey in 2008 (J. Williamson), the Callahan and Mud Lakes Protective Association (CMLPA) and the Sawyer County Land and Water Conservation Department (SCLWC - K. Maki) used a 2009 Wisconsin Department of Natural Resources (WDNR) rapid response grant to hire Ayres Associates to write the lakes' original Aquatic Plant Management Plan (APMP) that called for herbicide applications to control the infestation (Kleczewski 2009). Using data gathered from our 2020, 2021, and 2025 late-summer EWM bed mapping surveys, and our 2021 and 2025 whole lake point-intercept surveys, Dave Blumer (Lake Education and Planning Services, LLC - LEAPS) updated this plan in 2022 and 2026. In addition to continued small-scale herbicide treatments, the new APMP outlined manual removal efforts that included diver assisted suction harvesting (DASH).

No active management occurred on Mud Lake in 2025 or 2026. To see how EWM levels responded to this pause, the CMLPA, LEAPS, and the WDNR requested we complete an additional late-summer EWM bed mapping survey of the lake in 2026. Data from the survey will provide current acreage and density of EWM that will help guide any future management. This report is the summary analysis of our August 19, 2026 field survey.

METHODS:

Late-summer Eurasian Water-milfoil Bed Mapping Survey:

During the survey, we searched the visible littoral zone of the lake. By definition, a "bed" was determined to be any area where we visually estimated that Eurasian water-milfoil made up >50% of the area's plants, was generally continuous with clearly defined borders, and was canopied or close enough to being canopied that it would likely interfere with boat traffic. After we located a bed, we motored around the perimeter taking 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.

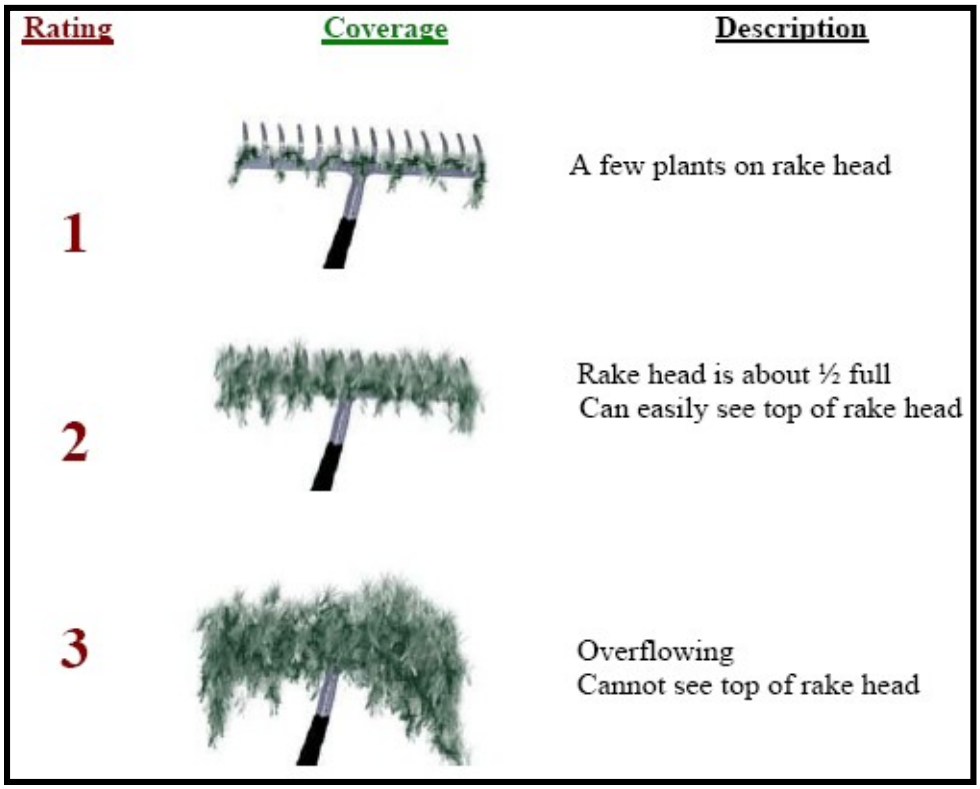


Figure 2: Rake Fullness Ratings (UWEX 2010)

RESULTS:

Late-summer Eurasian Water-milfoil Bed Mapping Survey:

During the August 19, 2026 Eurasian water-milfoil bed mapping survey, we searched transects totaling 30.1km (18.7 miles) throughout the lake's visible littoral zone (Figure 3). We noted water levels were down sharply, and this resulted in some beds shifting into deeper water, while parts of others were eliminated by exposed mud bogs. Collectively, we mapped 12 beds that covered 87.85 acres (18.93% of the lake's surface area) (Figure 4) (Appendix I). This was a 35.07-acre increase **(+66.45%)** compared to 2025 when we delineated 11 beds that covered 52.78 acres (11.37% surface area). It was also a 74.84-acre increase **(+575.25%)** compared to 2021 when we found 29 beds covering 13.01 acres (2.80% surface area); and a 76.79-acre increase **(+694.30%)** relative to our original 2020 survey when we documented 28 beds on 11.06 acres (2.38% coverage) (Table 1).

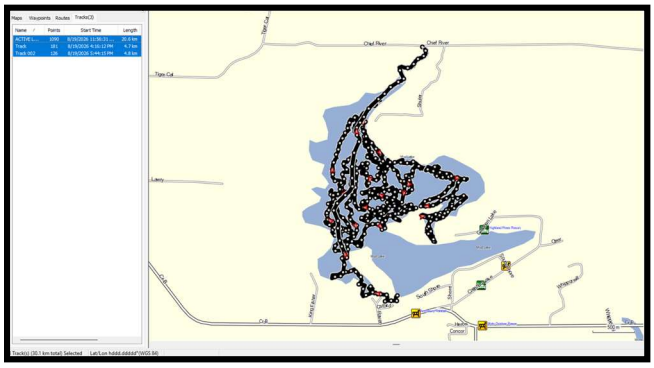


Figure 3: 2026 EWM Littoral Zone Survey – GPS Tracks

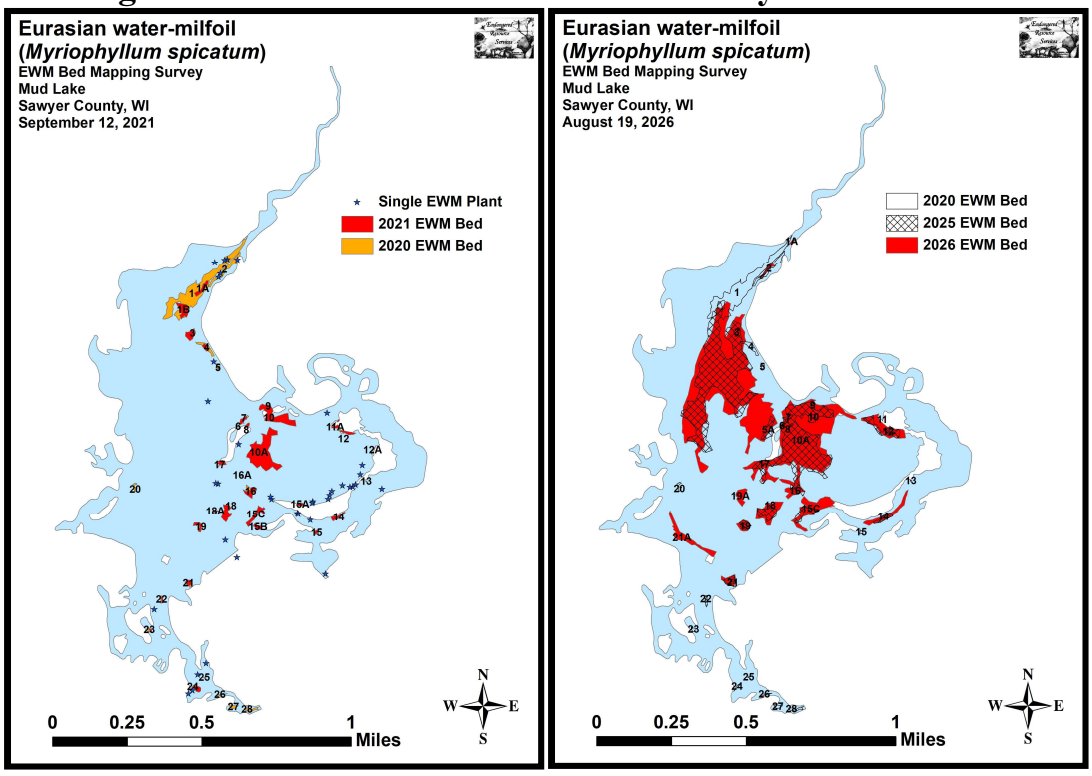


Figure 4: 2021 and 2026 Eurasian Water-milfoil Bed Maps

Table 1: Late-summer Eurasian Water-milfoil Bed Mapping Summary
Mud Lake - Sawyer County, WI
August 19, 2026

Bed Number	2026 Acreage	2025 Acreage	2021 Acreage	2020 Acreage	2025-2026 Change in Acreage	Rake Range and Mean Rake Fullness	Depth Range and Mean Depth	Canopied	Navigation Impairment	2026 Field Notes
1 (A + B)	46.00	27.40	1.19	7.18	17.64	<<<1-3; 2	2-7; 6	Yes	Moderate	Prop-clipped plants throughout – canopied mat at core.
2	0.34	0.08	0	0.92	0.26	<<<1-2; 1	2-4; 3	Yes	Minor	Establishing bed along river channel.
3	Merged	Merged	0.46	0.23	-	<<<1-3; 2	4-6; 5	Yes	Moderate	Merged with Bed 1.
4	Merged	0	0.20	0.48	-	<<<1-3; 1	3-5; 4	Yes	Minor	Merged with Bed 1; fragmented on edge of area.
5	0	0	0.02	0.07	0	<<<1	3-5; 4	Yes	None	Scattered individuals.
5A	Merged	0.96	0	0	-	<<<1-3; 1	4-6; 5	Yes	Minor	Merged with Bed 1; fragmented on edge of area.
6 and 7	Merged	Merged	0.19	0.18	-	<<1-3; 3	4-8; 6	Yes	Moderate	Merged with Bed 10A/one of the worst parts of the bed.
8	Merged	Merged	0.08	0.07	-	<<1-3; 3	4-8; 6	Yes	Moderate	Merged with Bed 10A/one of the worst parts of the bed.
9 and 10	Merged	Merged	2.08	0.15	-	<<<1-3; 3	4-9; 7	Yes	Minor	Merged with Bed 10A.
10A	27.15	18.92	4.88	0		<<<1-3; 2	2-11; 7	Yes	Minor	Much of bed is subcanopy or it would be mod. impair.
11	Merged	Merged	0.02	<0.01	-	1-3; 2	4-7; 6	Near	Minor	Merged with Bed 12.
11A	Merged	Merged	0.15	0	-	<1-3; 2	4-7; 6	Near	Minor	Merged with Bed 12.
12	2.79	1.56	0.21	0.09	1.23	<<<1-3; 1	4-9; 6	Near	Minor	Too narrow to be a moderate impairment.
12A	0	0	0.04	0	0	<<<1	4-8; 6	Near	None	Scattered individuals.
13	0	0	<0.01	0.01	0	<<< 1	2-5; 4	Near	None	Scattered individuals.
14	1.45	0.49	0.26	0.05	0.96	<<<1-3; 2	3-6; 5	Yes	Minor	Expanding shoreline ribbon.
15	0	0	0.07	0.06	0	-	-	-	-	No EWM seen – residual control from Callahan in ‘25?
15A	0	0	0.11	0	0	<<<1	4-6; 5	Yes	None	Handful of scattered plants.
15B/C	3.43	1.05	0.83	0	2.38	<<<1-3; 1	4-6; 5	Near	Minor	Open bed with scattered dense microbeds within.
16	Merged	Merged	0.47	0.45	-	<<<1-3; 2	2-6; 4	Yes	Minor	Merged with Bed 10A/too narrow to be mod. impair.
16A	Merged	0	0.02	0	-	<<<1-3; 2	5-7; 6	Yes	Minor	Merged with Bed 10A/too narrow to be mod. impair.
17	Merged	Merged	0.21	0.03	-	<<1-3; 3	2-5; 3	Yes	Minor	Merged with Bed 10A/one of the worst parts of the bed.
18 and 18A	2.44	1.29	0.79	0.02	1.15	<<<1-3; 1	4-8; 6	Yes	Minor	Open bed.
19	0.75	0.43	0.24	0.09	0.32	<<<1-3; 2	3-7; 5	Yes	Minor	Too narrow to be a moderate impairment.

Table 1 (continued): Late-summer Eurasian Water-milfoil Bed Mapping Summary
Mud Lake - Sawyer County, WI
August 19, 2026

Bed Number	2026 Acreage	2025 Acreage	2021 Acreage	2020 Acreage	2025-2026 Change in Acreage	Rake Range and Mean Rake Fullness	Depth Range and Mean Depth	Canopied	Navigation Impairment	2026 Field Notes
20	0	0	0	0.12	0	<<<1	1-4; 3	Near	None	Handful of scattered plants.
21	0.73	0.48	0.16	0.21	0.25	<<<1-3; 2	2-6; 4	Yes	Minor	Too narrow to be a moderate impairment.
21A	1.94	0	0	0	1.94	<<<1-3; <1	4-6; 5	No	None	More HDA than true bed – continuous plants.
22	0	0.12	0.06	0.10	-0.12	<<<1	2-6; 4	Near	None	Handful of scattered plants.
23	0	0	0.04	0.08	0	<<<1	4-5; 5	Near	None	Handful of scattered plants.
24	0	0	0.23	0.04	0	<<<1	4-5; 5	Near	None	Handful of scattered plants.
25	0	0	0	0.01	0	<<<1	4-5; 5	Near	None	Handful of scattered plants.
26	0	0	0	0.06	0	<<<1	4-5; 5	Near	None	Handful of scattered plants.
27	0	0	0	0.15	0	<<<1	4-5; 5	Near	None	Handful of scattered plants.
28	0	0	0	0.20	0	<<<1	4-5; 5	Near	None	Handful of scattered plants.
Total Acres	**87.85**	**52.78**	**13.01**	**11.06**	**+35.07**					

Descriptions of Past and Present Eurasian Water-milfoil Beds:

Beds 1-4 and 5A – Past treatments in the lake inlet had resulted in a significant decline in the Eurasian water-milfoil population in the upstream area of Bed 1. However, in 2026, Bed 1A and Bed 2 were reforming as low-density EWM continued to spread downstream along the river channel. Further downstream, the main body of Bed 1 had merged with Beds 3, 4, and 5A. Outside of the main navigation channel where regular boat traffic was keeping a lane open down the middle of the bed, the majority of the area's core was a dense canopied mat that represents the worst area on the lake (see report cover). Here, we noted floating fragments and prop-trails were common throughout, and motoring through the bed would have likely been at least a moderate impairment.

Bed 5 – EWM plants were only widely-scattered in this former shoreline bed.

Beds 6-10A, 16/16A, and 17 – In 2020, we found that the stained water in the system seemed to largely restrict EWM from growing in areas deeper than 7ft. During the 2021 and especially the 2025 and 2026 growing seasons, low water levels and improved clarity appear to have allowed EWM to expand into deeper areas, and this giant bed had nearly continuous low-density plants on the periphery that were approaching canopy in up to 11ft. In shallower areas, EWM often formed dense canopied mats; especially in areas that were covered by smaller beds initially delineated in 2021. The majority of Bed 10A (as we have designated the entire merged area) would have been a moderate impairment if the EWM was canopied throughout instead of just in patches.

Beds 11/11A and 12 – In 2025, these beds had merged into a nearly continuous canopied mat. The 2026 survey documented a further expansion in coverage but found most parts of the bed were subcanopy. This, coupled with the bed's narrowness and proximity to isolated bog islands, likely makes the area a low priority for any future management.

Beds 12A, 13, and 15A – Low-density EWM was again scattered throughout these former microbeds and high-density areas.

Bed 14 – This open bed was a ribbon of plants and microclusters immediately along a bog island. Although noticeably thicker than in 2025, its nearness to shore and low potential for impairment likely make it a low management priority.

Bed 15 – Located just north of Callahan Lake, we again saw no evidence in EWM in this former bed. This may mean the area received residual control from the 2025 Callahan herbicide treatment.

Beds 15B and 15C – These two areas had merged into a continuous bed that showed significant expansion in 2026. Many plants were prop-clipped, and several dense microbeds were imbedded in the overall area. Although not likely more than a minor navigation impairment, regular boat traffic through the area makes it worth considering for future management.

Beds 18/18A, 19, and 19A – These beds were scattered along the edges of floating and sunken muck bogs. Beds 18 and 19 again showed year-over-year growth, and it appeared likely they would merge together in the near future. Bed 19A represented a new area we have never documented EWM in before. All of these beds likely posed at least a minor and potentially a moderate navigation impairment if boats motored right through them. Based on them occurring in high traffic areas, they are likely a consideration for any future active management.

Bed 21 – This small, moderate-density bed occurred east of the main navigation channel in the southwest bay. Because of its small size, it appeared unlikely to be more than a minor impairment to navigation.

Bed 21A – We found nearly continuous EWM sprouts, clusters, and microbeds ringed this part of the southwest bay. Plants were subcanopy and not continuous making the whole area more of a "high-density area" than a true bed. However, because the main north/south navigation channel runs through it, we believed it was worth mapping.

Beds 20 and 22-28 – We saw no evidence of EWM beds in these parts of the southwest bays and channels. The only EWM present occurred as a few widely-scattered individuals – usually along the margins of the main navigation channel.

DISCUSSION AND CONSIDERATIONS FOR MANAGEMENT:

Eurasian water-milfoil is widespread in the Mud/Callahan system making eradication an unrealistic expectation. Although EWM was still found throughout Mud Lake, past active management had dramatically reduced it from an estimated 109 acres covering 23.49% of the lake's surface area in 2008 (Kleczewski 2009). However, without recent management, levels of EWM are again climbing, and the 2026 total is now within 21.15 acres of the previous high **(-19.40%)**.

Past management of Eurasian water-milfoil in Mud Lake has come at a high economic cost, and, as herbicides are non-selective, has also likely had significant impacts on the native aquatic plant community. With this in mind, working to control EWM's spread in the most cost-effective manner possible, while simultaneously balancing both its impact on lake access, recreational navigation, and the lake's aquatic ecosystem, with any collateral damage to native vegetation from active management, will likely continue to be important for the CMLPA moving forward. Ultimately, the amount of EWM growth the CMLPA and WDNR are comfortable with will determine how much, if any, active management occurs in Mud Lake in 2027. Likewise, what if any future monitoring will occur on the lake is a conversation that needs to occur.

LITERATURE CITED

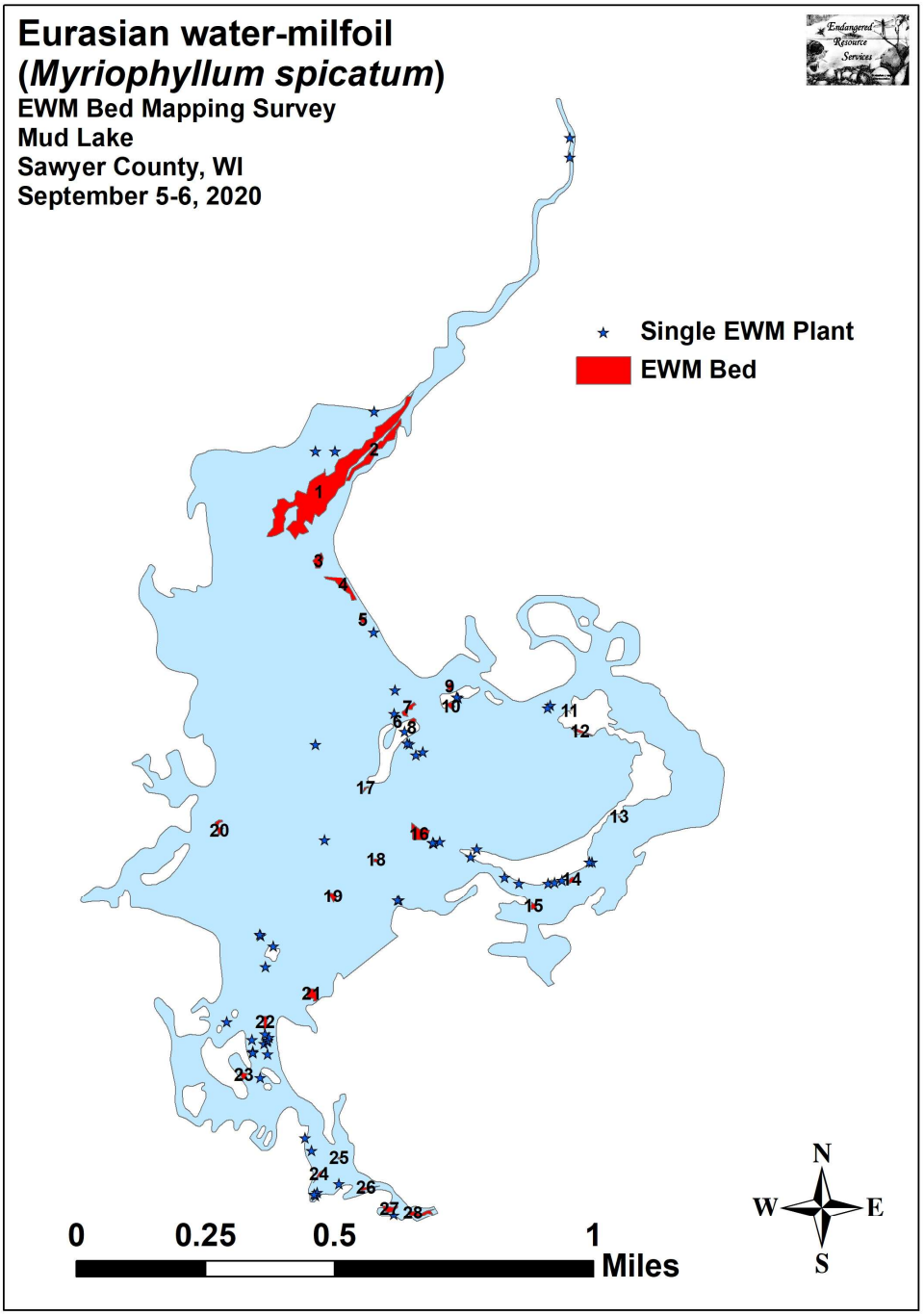
Busch, C., E. Johnson, and C. Holt. [online]. 1968. Mud Lake Map. Available from https://apps.dnr.wi.gov/doclink/lakes_maps/2434800a.pdf (2026 November).

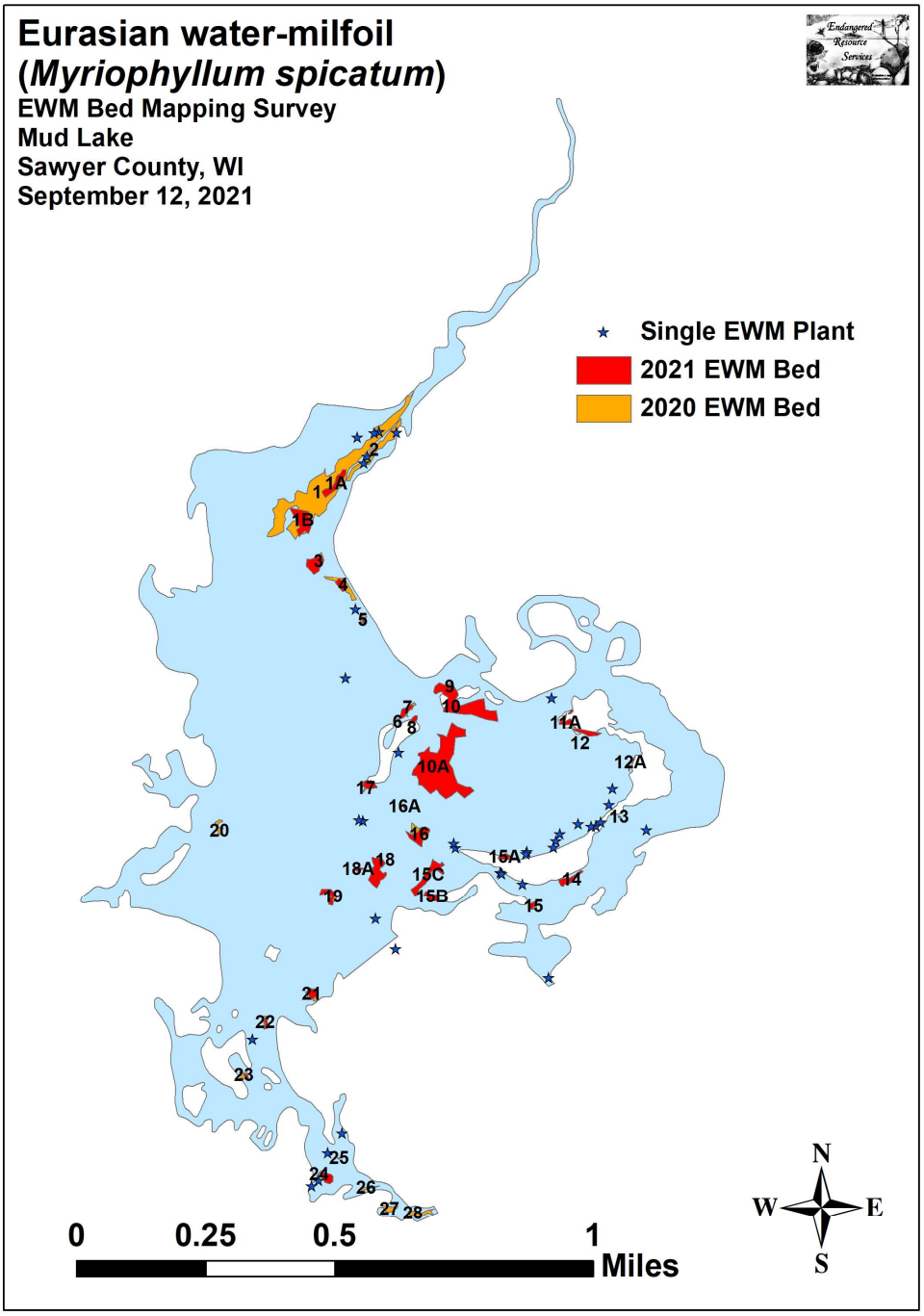
Kleczewski, T. 2009. Callahan and Mud Lakes Aquatic Plant Management Plan. Ayres Associates. Eau Claire, WI

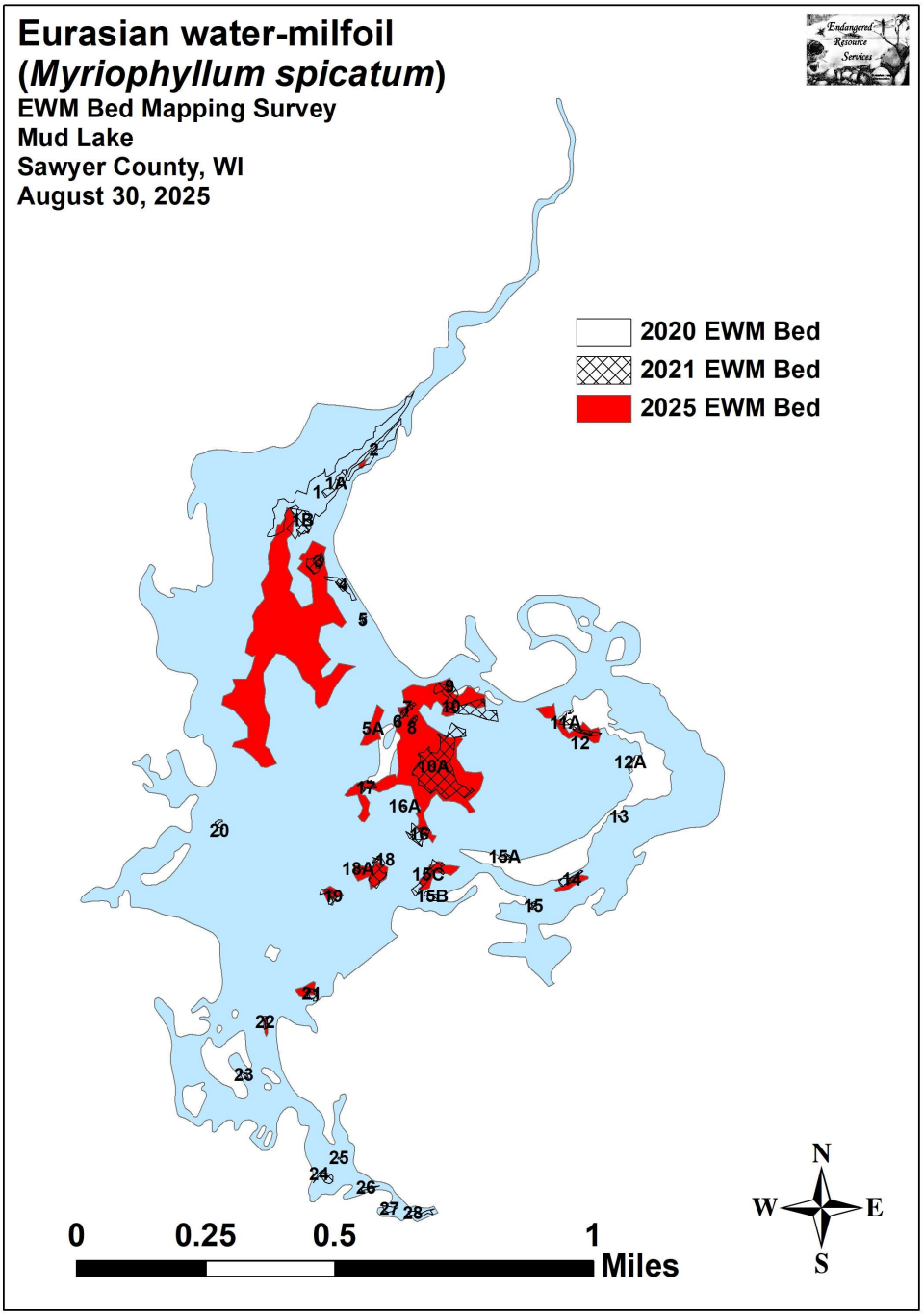
WDNR. [online]. 2026. Mud Lake - Citizen Lake Water Quality Monitoring Database. Available from https://apps.dnr.wi.gov/lakes/waterquality/Station.aspx?id=583216 (2026 November).

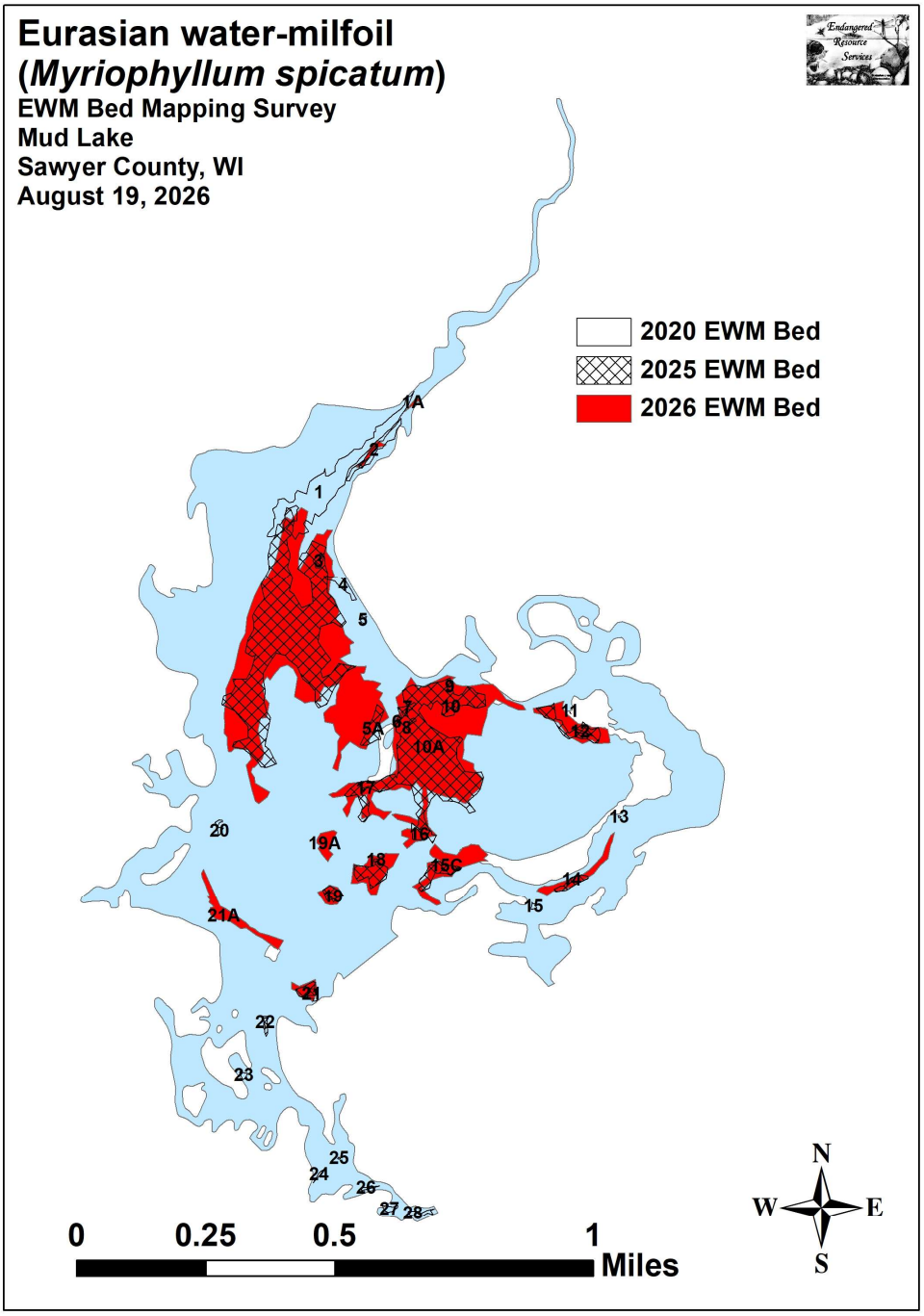
WDNR. [online]. 2026. Mud Lake - Wisconsin Lakes Information. Available from Wisconsin Lakes (2026 November).

Appendix I: 2020, 2021, 2025, and 2026 Eurasian Water-milfoil Bed Maps

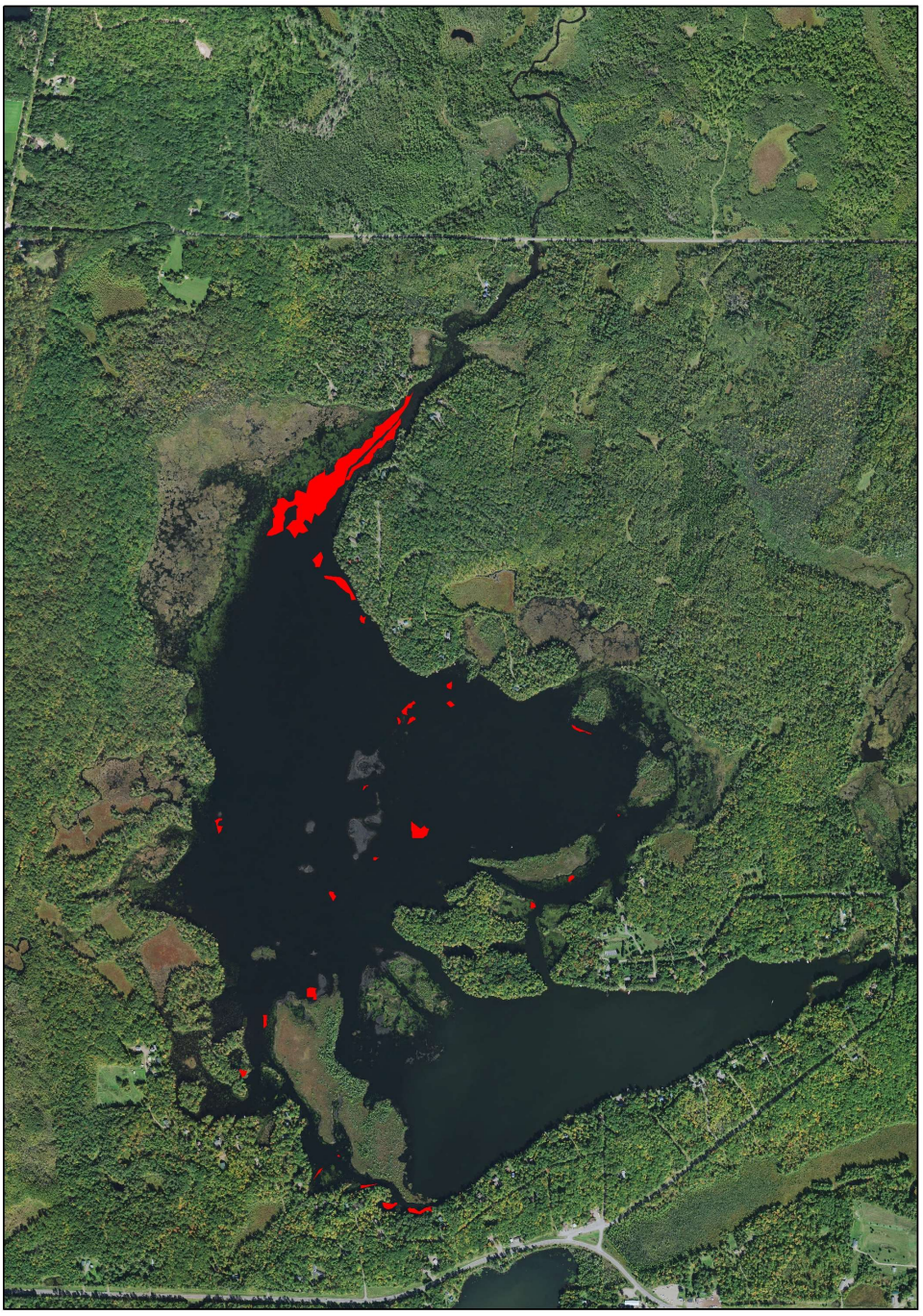

Eurasian water-milfoil
(Myriophyllum spicatum)
EWM Bed Mapping Survey
Mud Lake
Sawyer County, WI
September 5-6, 2020
Endangered Resource Services
Single EWM Plant
EWM Bed
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
0
0.25
0.5
1
Miles
N
W
E
S


Eurasian water-milfoil
(Myriophyllum spicatum)
EWM Bed Mapping Survey
Mud Lake
Sawyer County, WI
September 12, 2021
Endangered Resource Services
Single EWM Plant
2021 EWM Bed
2020 EWM Bed
1
1A
1B
2
3
4
5
6
7
8
9
10
10A
11A
12
12A
13
14
15
15A
15B
15C
16
16A
17
18
18A
19
20
21
22
23
24
25
26
27
28
0
0.25
0.5
1
Miles
N
W
E
S

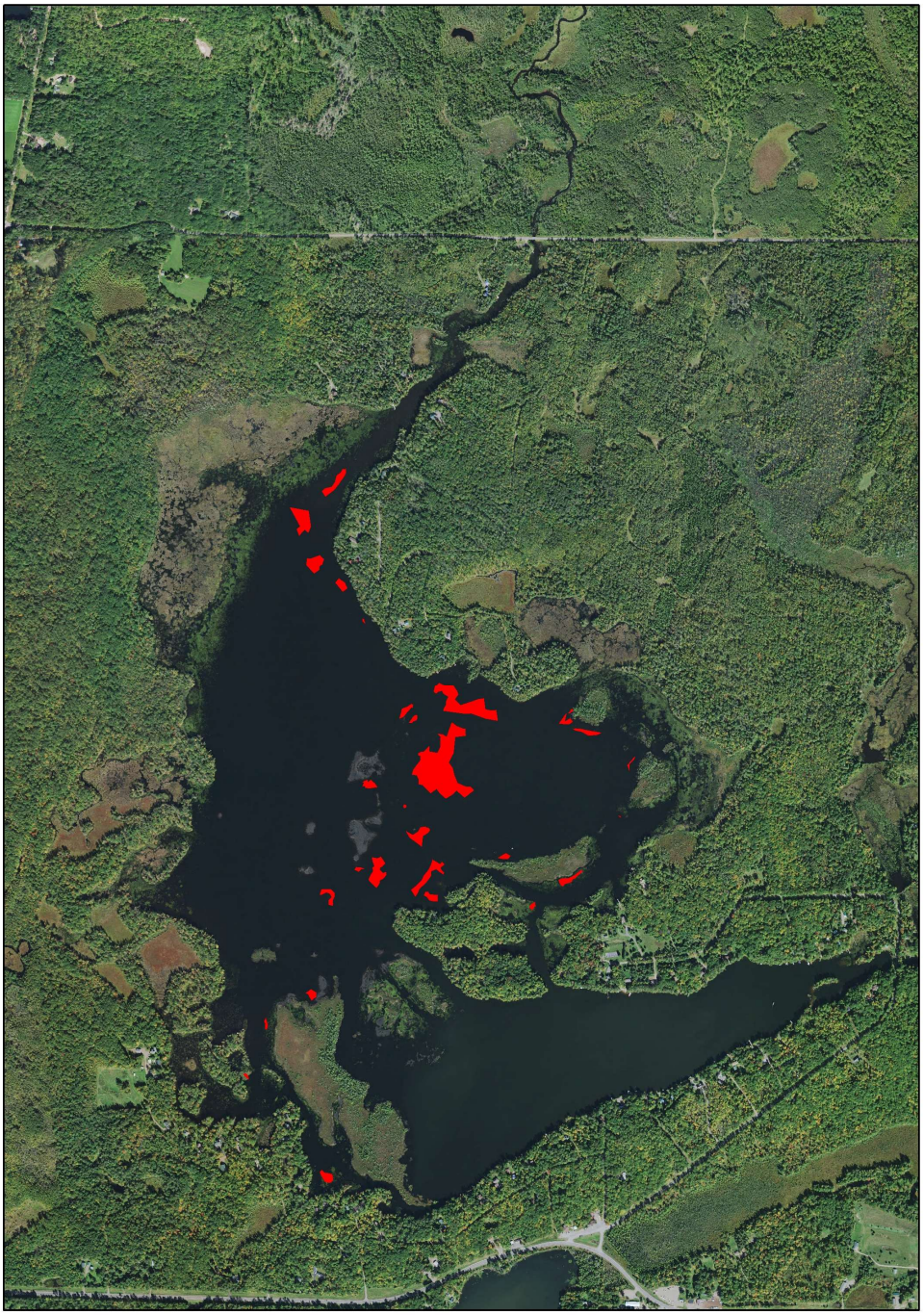

Eurasian water-milfoil
(Myriophyllum spicatum)
EWM Bed Mapping Survey
Mud Lake
Sawyer County, WI
August 30, 2025
2020 EWM Bed
2021 EWM Bed
2025 EWM Bed
1
1A
1B
2
3
4
5
5A
6
7
8
9
10
10A
11
11A
12
12A
13
14
15
15A
15B
15C
16
16A
17
18
18A
19
20
21
22
23
24
25
26
27
28
0
0.25
0.5
1
Miles
N
W
E
S


Eurasian water-milfoil
(Myriophyllum spicatum)
EWM Bed Mapping Survey
Mud Lake
Sawyer County, WI
August 19, 2026
Endangered Resource Services
2020 EWM Bed
2025 EWM Bed
2026 EWM Bed
1A
1
3
4
5
9
7
10
11
5A
8
12
10A
17
20
13
19A
16
18
15C
14
19
15
21A
21
22
23
25
24
26
27
28
0
0.25
0.5
1
Miles
N
W
E
S

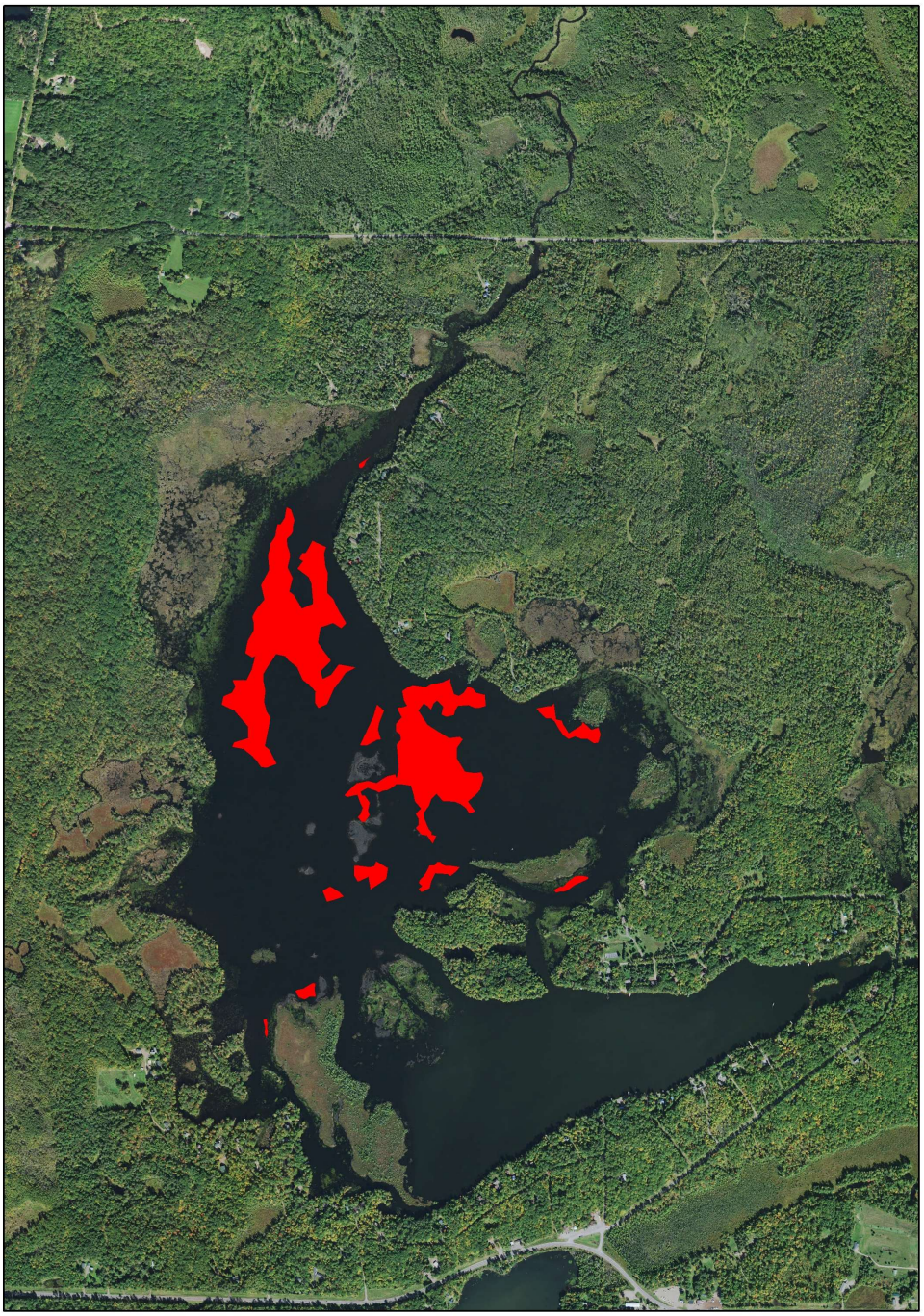
2020 Aerial View



2021 Aerial View



2025 Aerial View



2026 Aerial View

