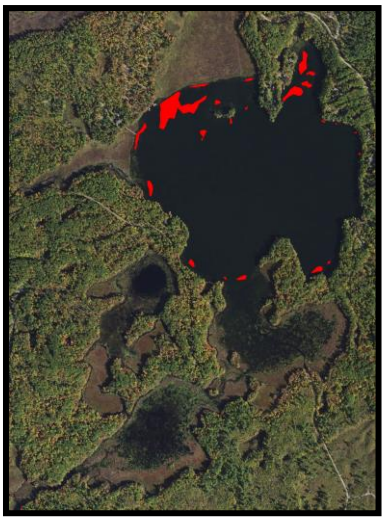
Eurasian water-milfoil (*Myriophyllum spicatum*)
Late Summer Bed Mapping Survey
Osprey Lake (WBIC: 2395100)
Sawyer County, Wisconsin

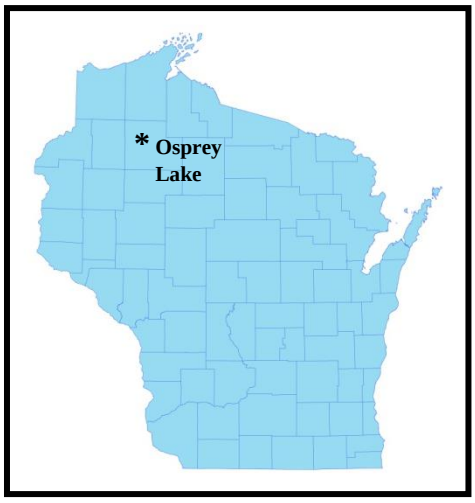


2022 Eurasian Water-milfoil beds

Dense canopied EWM blooming in the northeast bay 9/10/22

Project Initiated by:

The Osprey Lake Property Owners Association, the Lac Courte Oreilles Conservation Department, the Sawyer County Land & Water Conservation Department, and the Wisconsin Department of Natural Resources



Mat of canopied milfoil in Bed 3 with marker buoy - Osprey Lake 9/10/22

Survey Conducted by and Report Prepared by:

Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
Saint Croix Falls, Wisconsin
September 10, 2022

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INTRODUCTION:

Osprey Lake (WBIC 2395100) is a 214-acre seepage lake in northwest Sawyer County, Wisconsin in the Lac Courte Oreilles Reservation and the Towns of Hayward, Hunter, and Round Lake (T40/41N R7/8W). It has a maximum depth of 32ft and an average depth of 12ft. The lake is oligotrophic in nature, and water clarity is generally good with summer Secchi readings ranging from 10-18ft and averaging 14.4ft from 2008-2022 (Figure 1) (WDNR 2022). The lake's bottom substrate is variable with sand, gravel, and rock occurring along the majority of shorelines and around the lake's island, while sandy, marly, and organic muck dominate the deep flats and sheltered bays (Holt et al. 1972).

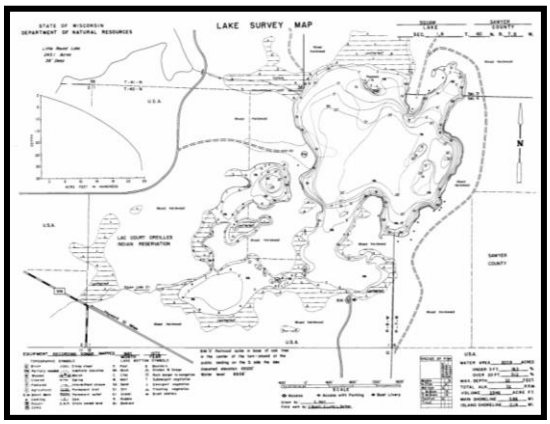

Figure 1: Osprey Lake Bathymetric Map

STUDY BACKGROUND AND RATIONALE:

Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) was first identified by the Lac Courte Oreilles Conservation Department in 2005 near the LCO boat landing. A follow-up survey by the Wisconsin Department of Natural Resources (WDNR) also located plants around the shoreline of much of the main northern basin.

After applying for and receiving a WDNR rapid response grant, the Osprey Lake Property Owners Association (OLPOA) and the Sawyer County Land and Water Conservation Department (SCLWC - K. Maki) used a 2006 WDNR point-intercept macrophyte survey to develop the lake's original Aquatic Plant Management Plan (APMP) that outlined manual removal by both volunteers and professionals as well as limited herbicide applications to control the infestation (OLPOA 2011). Since the APMP's approval by the WDNR in 2011, these small-scale herbicide treatments have occurred periodically based on low intensity boat surveys by the applicator and/or the SCLWC prior to treatment.

On June 22, 2020, the OLPOA authorized herbicide treatment of six areas totaling 3.85 acres (1.80% of the lake's total surface area) with 1,120lbs of Renovate Max G (Trichlopyr/2,4-D) at a target concentration of 2.3ppm; and on May 26, 2021, they treated a single 3.50 acre bed (1.64% surface area) in the northwest bay with 42.05 gallons of Amine 4 (2,4-D) at a target concentration of 2.5ppm (Appendix I). In 2022, the OLPOA decided not to manage EWM anywhere on the lake. To determine EWM levels following a "rest" year and to guide future management, the OLPOA requested we complete an intensive late-summer EWM bed mapping survey of the lake's visible littoral zone. This report is the summary analysis of that field survey conducted on September 10, 2022.

METHODS:

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 EWM 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. Because the goal of the survey was to identify all areas of the lake with significant EWM, we also mapped "high density areas" where EWM plants were continuous but didn't meet all of the other "bed" criteria.

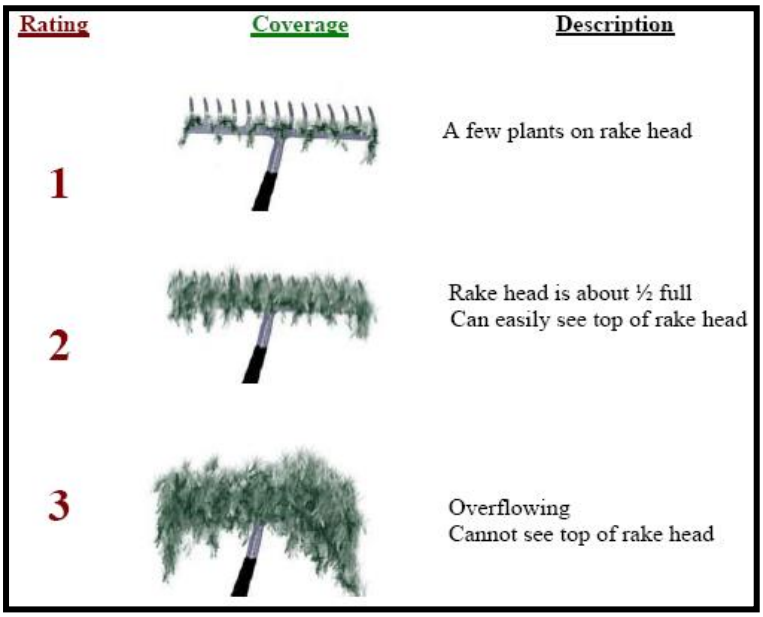

Figure 2: Rake Fullness Ratings (UWEX 2010)

RESULTS:

Eurasian Water-milfoil Bed Mapping Survey:

On September 10, 2022, we searched 14.3km (8.9 miles) of transects throughout the lake's visible littoral zone (Figure 3). In total, we mapped 24 areas covering 5.06 acres (2.36% of the lake's total surface area) (Figure 4) (Appendix II). This was an increase of 0.80 acre (+18.78%) from 2020 when we found 23 EWM areas that covered 4.26 acres (1.99% of the lake's surface (Table 1).

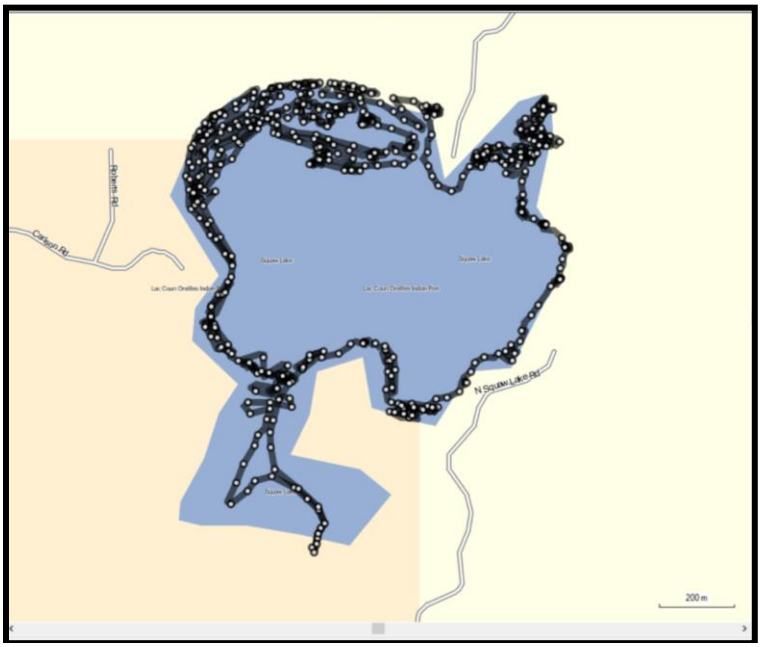

Figure 3: September 10, 2022 EWM Littoral Zone Survey – GPS Tracks

Table 1: Late Summer Eurasian Water-milfoil Bed Mapping Summary
Osprey Lake – Sawyer County, Wisconsin
September 10, 2022

Bed Number	2022 Acreage	2020 Acreage	2020-2022 Difference	Rake Range/ Mean Rake Fullness	Depth Range/ Mean Depth	Canopied	Navigation Impairment	2022 Field Notes
Bed 1	0.12	0.09	0.03	<<1-2; 1	6-10; 8	Near	None	Many plants lying flat on the bottom.
Bed 2	0.02	0.01	0.01	<1-3; 2	6-10; 8	Near	None	Dense microbed with satellite plants.
Bed 3	0.10	0.04	0.06	<<1-3; 3	4-10; 8	Yes	Moderate	Too small to be severe – blooming.
Bed 4	0.21	0.06	0.15	<<1-3; 2	4-10; 8	Yes	Moderate	Too narrow to be severe – blooming.
Bed 5	0.28	0.13	0.15	<<1-2; <1	2-6; 4	Near	None	EWM expanding/peppered throughout.
Bed 6	2.41	2.10	0.31	<<1-3; 2	2-10; 7	Near	Minor	Highly variable – fragmented nearshore.
Bed 7	0.13	0.01	0.12	<<1-1; 1	3-5; 4	Near	Minor	Narrow strip near shore.
Bed 8	0.08	0.08	0	<<1-2; 1	3-5; 4	Near	None	Sickly plants growing over marl.
Bed 9	0.06	0.10	-0.04	<<1-1; <1	3-5; 4	Near	None	Clusters of sickly plants.
Bed 10	0.02	0.02	0	<<1-2; 1	6-8; 7	No	Minor	Microbed with satellite plants.
Bed 11	0.13	0.05	0.08	<1-3; 3	7-10; 8	Yes	Moderate	Blooming at core – merged with Bed 12.
Bed 11A	0.04	0	0.04	1-3; 2	6-10; 8	No	None	Microbed with satellite plants.
Bed 12	Merged	<0.01	-	-	-	-	-	Merged with Bed 11.
Bed 13	0.49	0.55	-0.06	<<1-3; 3	4-10; 8	Yes	Severe	Blooming – prop-clipped throughout.
Bed 14	0.16	0.14	0.02	<<1-3; 3	6-8; 7	Yes	Moderate	Too small to be severe.
Bed 15	0.46	0.35	0.11	<<1-3; 1	4-7; 6	Near	Minor	Open bed with scattered, dense clusters.
Bed 16	0.10	0.24	-0.14	<<1-3; 2	4-8; 6	Yes	Moderate	Cluster of dense microbeds.
Bed 16A	<0.01	0	<0.01	2-3; 2	5-10; 8	Near	Minor	Microbed near deep water on point.
Bed 17	0.02	0.01	0.01	2-3; 2	5-10; 8	Near	Minor	Deepwater microbed.
Bed 18	0.01	0.01	0	<1-2; 1	4-10; 8	Near	None	Open microbed in deep water.
Bed 19	0.01	0.01	0	<<1-1; <1	3-6; 5	No	None	Most plants manually removed?
Bed 20	0.02	0.03	-0.01	<1-1; <1	3-6; 5	No	None	Most plants manually removed?
Bed 21	0.02	0.03	-0.01	<<1-2; 1	5-10; 8	No	None	Deepwater bed mixed with NWM.
Bed 22	0.15	0.20	-0.05	<<1-1; <1	4-8; 6	No	None	Scattered plants w/ large towers at core.
Bed 23	<0.01	0.01	-<0.01	<1-2; 1	5-9; 8	No	None	Microbed on uninhabited point.
Total	**5.06**	**4.26**	**0.80**					

Descriptions of Past and Present Eurasian Water-milfoil Beds:

Bed 1 – In 2020, we found this initial bed directly in the center of the entrance to the main basin. Many plants were prop-clipped, and it seems likely that most boats coming to and from the public landing would motor right through it. Interestingly, the 2022 survey found that, although the bed had grown slightly in size, most plants were either lying flat on the bottom or were subcanopy making it a non-issue for navigation (Figure 4) (Appendix II).

Beds 2 and 3 – Compared to 2020, both beds had more than doubled in size. Bed 2 was still relatively small and unlikely to cause significant navigation impairment, but we noted Bed 3 was canopied, extremely dense at its core, and flowering. Residents had placed a buoy in the center (see report cover) to avoid running through it, but it was still shedding fragments through wave action.

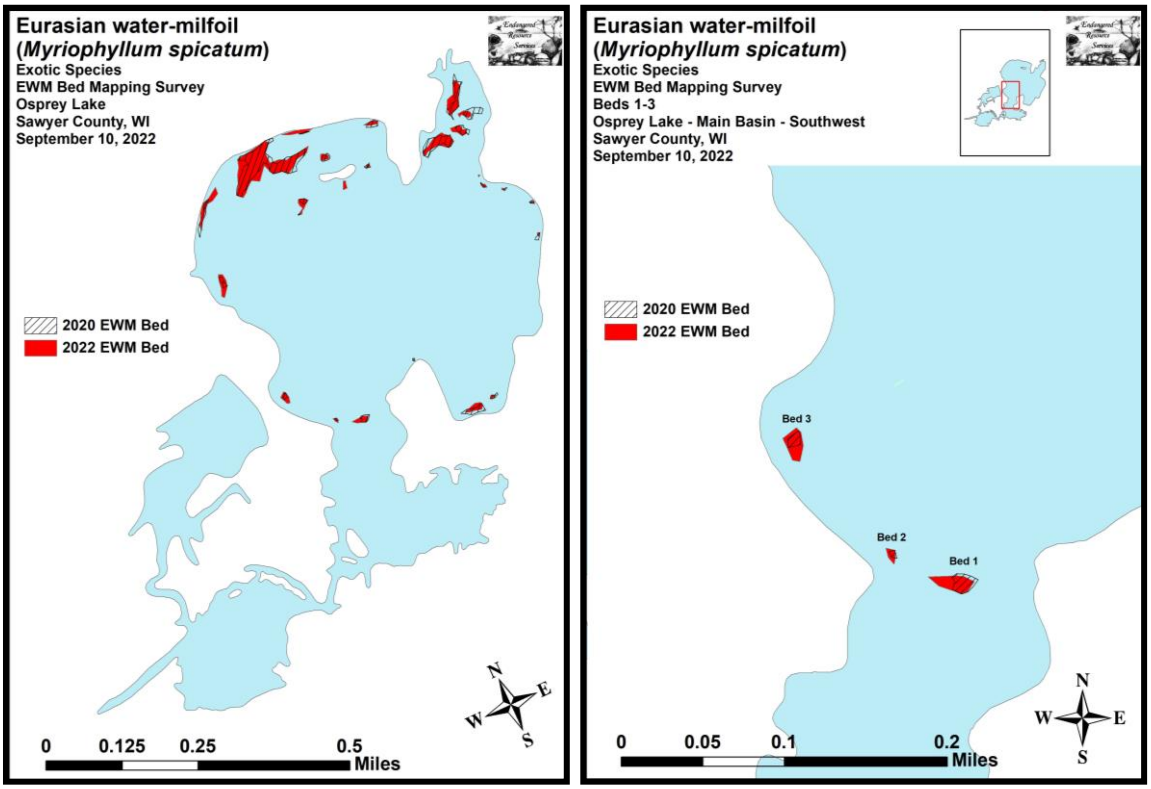

Figure 4: 2022 EWM Bed Map/Beds 1-3 – Main Basin – Southwest

Bed 4 – This bed nearly quadrupled in size compared to the 2020 survey (Figure 5) (Appendix II). Plants at the core were dense, canopied, and flowering; and motoring through the center would likely have caused at least moderate impairment making this area a potential management priority.

Bed 5 – In addition to EWM, the low-density bed on the northwest shoreline supported large numbers of native Northern water-milfoil (*Myriophyllum sibiricum*) and diverse stands of native pondweeds; especially Large-leaf pondweed (*Potamogeton amplifolius*) and Fern pondweed (*Potamogeton robbinsii*). Eurasian water-milfoil was peppered throughout making it more of a "High Density Area" than a true bed.

Bed 6 – This bed was the biggest on the lake, but EWM densities within it were again highly variable. We found the bed became fragmented and mixed with natives near shore, and we also noted the deepwater edges were often patchy. In the 5-8ft bathymetric ring, EWM grew interspersed among beds of Wild celery (*Vallisneria americana*) before becoming the dominant and often only species found in 9-10ft.

Bed 7 – We logged a nearly continuous string of plants near the shoreline north of the island. Most parts of the bed occurred at low density and appeared to be recently established as plants were often only a few feet tall.

Beds 8 and 9 – Immediately north of the island and in the northeast end of the north bay, we again marked low-density clusters of sickly-looking plants established over a marly muck – a bottom habitat type we don't normally associate with EWM. This may explain their limited numbers and poor condition.

Beds 10 and 11A – These small areas contained several canopied microbeds that had satellite plants radiating out in all directions.

Beds 11 and 12 – These formerly separate beds had essentially merged along a narrow continuum of plants that joined the two areas. The small but dense area we mapped as Bed 11 in 2020 was canopied and blooming with plants radiating out to the southeast. Plants in Bed 12, which were only a few feet tall in 2020, were nearing canopy on the southwest end of the area.

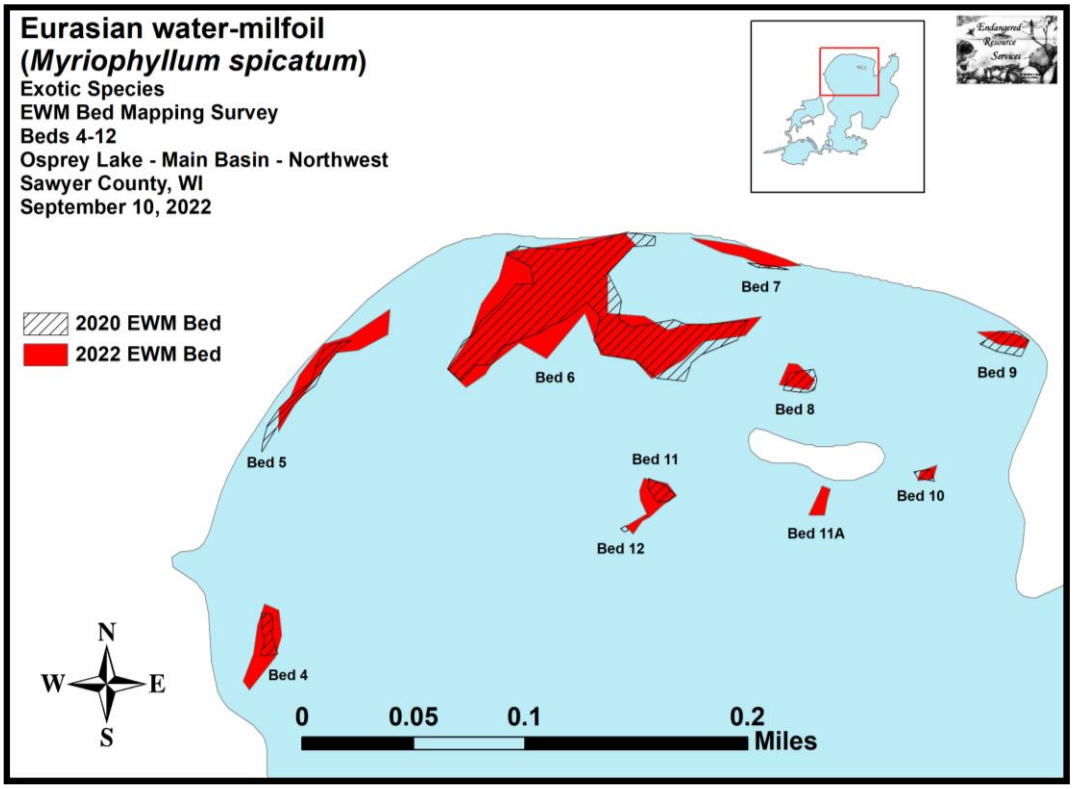

Figure 5: Beds 4-12 – Main Basin – Northwest and around the Island

Beds 13-16 – The four beds in the northeast bay had almost completely reestablished despite being targeted with herbicides in both 2020 and 2021 (Figure 6) (Appendix II). Most of the area was again covered with dense canopied beds, and we saw prop-clipped plants and floating fragments throughout the bay suggesting the beds were at least a moderate and potentially a severe impairment to recreational navigation.

Beds 16A, 17, and 18 – These small deepwater microbeds were located along the drop-off around the point at the southern entrance to the northeast bay. Plants were regular, but subcanopy making it unlikely they would cause more than a minor impairment (Figure 6) (Appendix II)

Beds 19 and 20 – These two microbeds were established near docks. Both were little more than a collection of short plants, and it is possible local residents were raking them out.

Beds 21 and 22 – Short subcanopy plants again dominated these beds that were mixed with NWM. Each was more a collection of clusters than a true continuous bed, and neither appeared likely to cause any impairment.

Bed 23 – Little more than a super cluster of canopied plants, Bed 23 was again established on an uninhabited area of the rocky point at the entrance to the southeast bay.

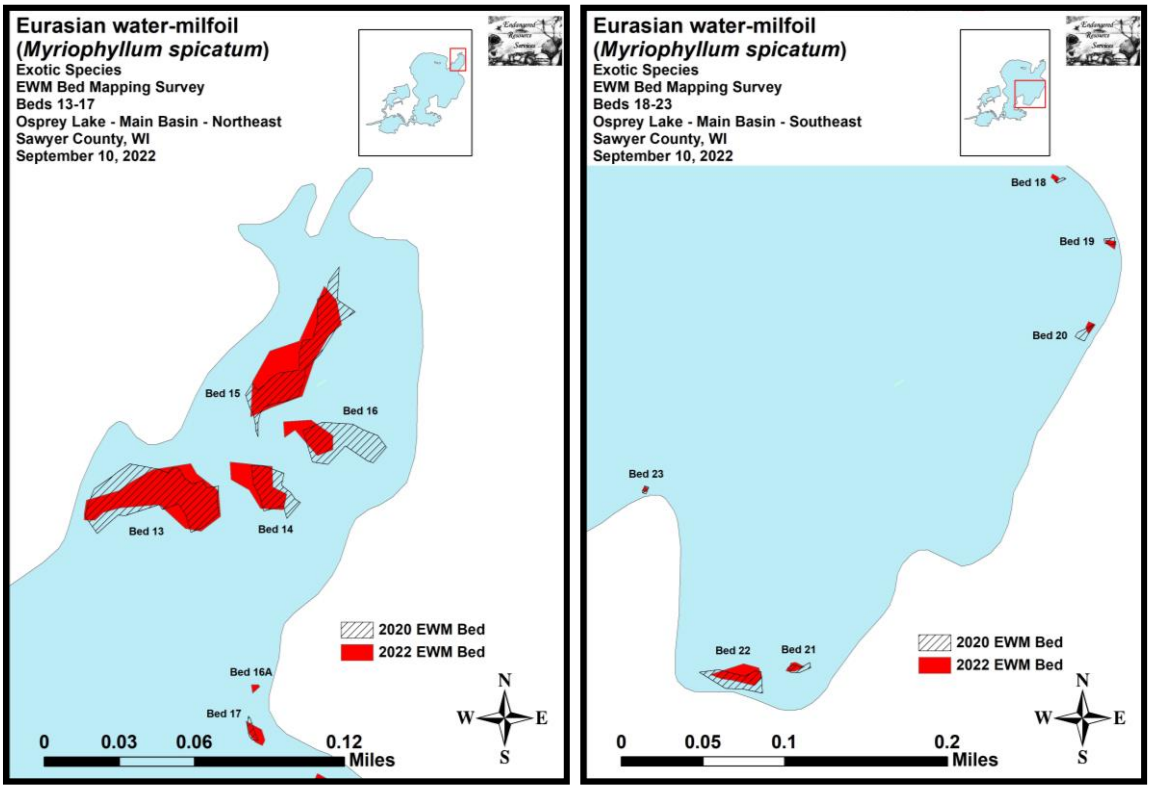

Figure 6: Beds 13-17 – Main Basin – Northeast/ Beds 18 – 23 – Main Basin - Southeast

DISCUSSION AND CONSIDERATIONS FOR MANAGEMENT:

Eurasian water-milfoil continues to occupy only a small percentage of Osprey Lake's surface area, but it is widely-established making eradication an unrealistic expectation. With this in mind, continuing to work to control its spread in the most cost effective manner possible, while simultaneously minimizing its impact on the lake's aquatic ecosystem will likely continue to be important goals for the OLPOA moving forward.

Although the 2020 and 2021 treatments were successful at knocking back EWM in each area where chemicals were used, the applications often occurred only in the center of or on the edge of an existing bed, or they occurred at a relatively low dosage over a broad area. Potentially because of this, neither treatment provided long-term control as plants were largely reestablished by the end of the growing season. If possible, focusing future treatments on a single larger area of the lake or using higher dosages when treating small areas may offer longer-lasting control in that area. Also, working to eliminate EWM in high traffic areas first would likely help slow the rate of reestablishment from floating and windblown fragments; especially when these areas occur on the southern ends of both the entire basin and smaller bays. In areas where EWM beds are small and occur at low densities – especially near deep water drop-offs, using suction harvesting or diver removal may offer better control than chemicals.

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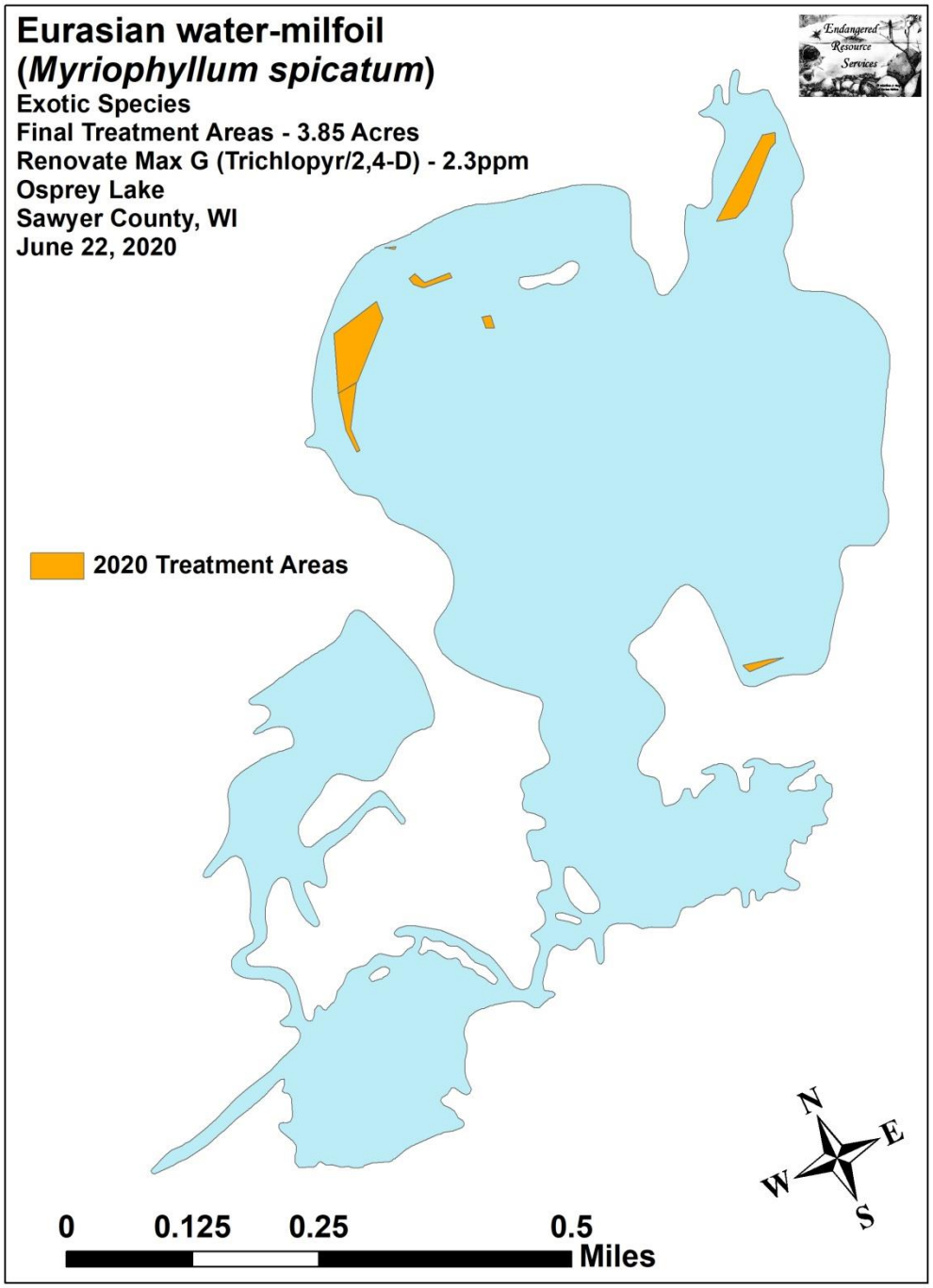
Appendix I: 2020 and 2021 Eurasian Water-milfoil Treatment Area Maps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(Myriophyllum spicatum)
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Final Treatment Areas - 3.85 Acres
Renovate Max G (Trichlopyr/2,4-D) - 2.3ppm
Osprey Lake
Sawyer County, WI
June 22, 2020
Endangered Resource Services
2020 Treatment Areas
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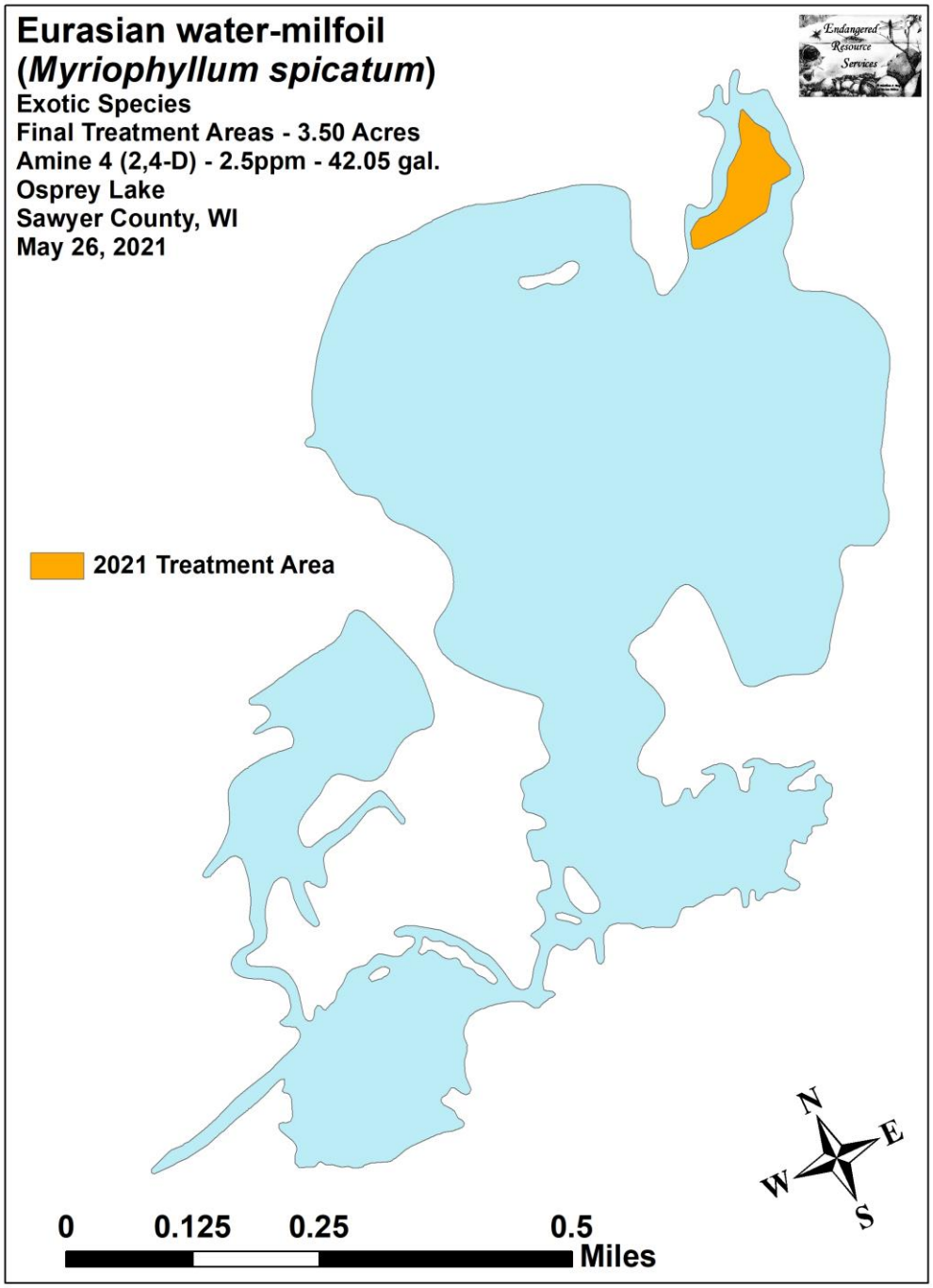
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Exotic Species
Final Treatment Areas - 3.50 Acres
Amine 4 (2,4-D) - 2.5ppm - 42.05 gal.
Osprey Lake
Sawyer County, WI
May 26, 2021
Endangered Resource Services
2021 Treatment Area
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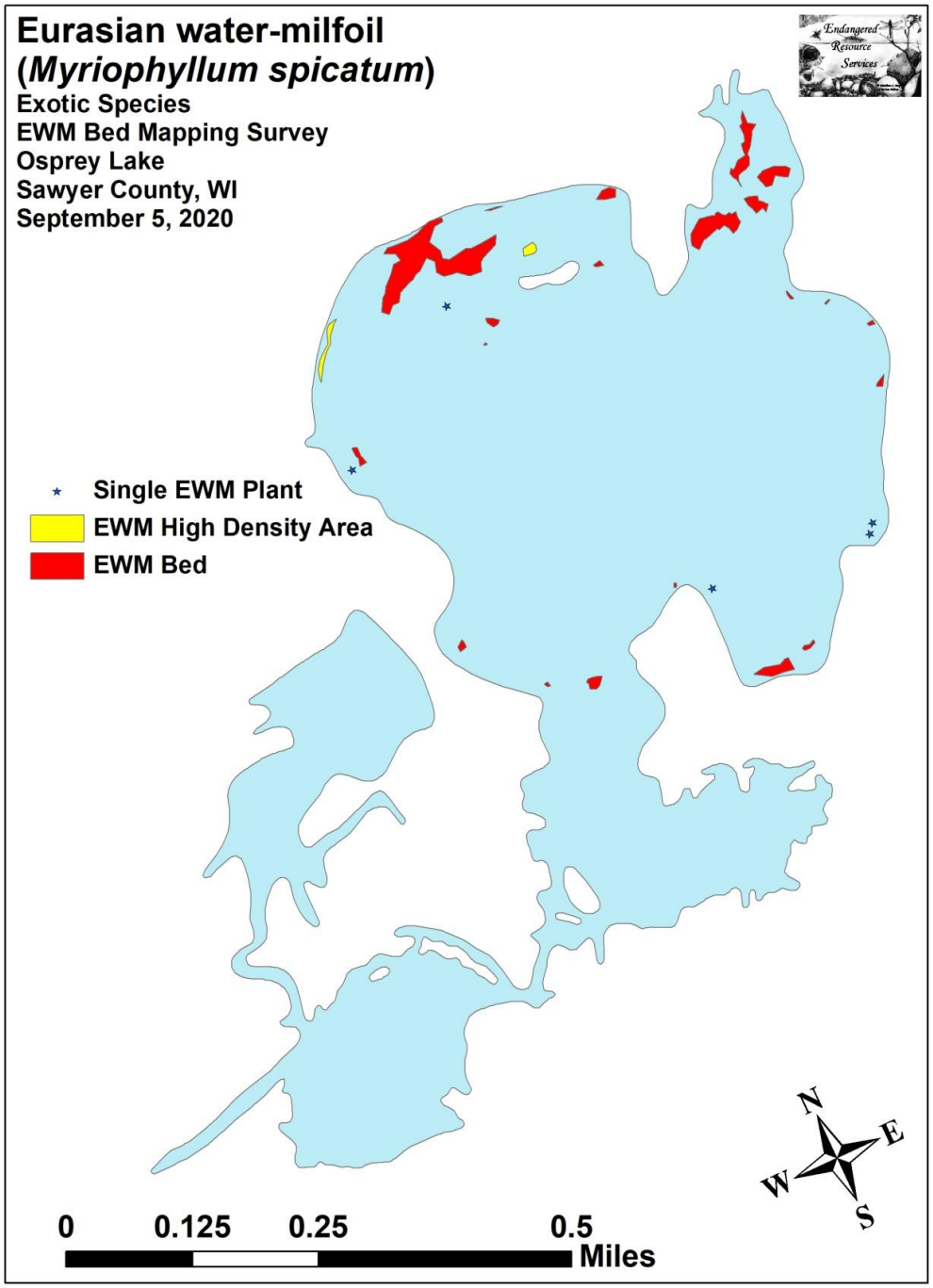
Appendix II: 2020 and 2022 Eurasian Water-milfoil Bed Maps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Osprey Lake
Sawyer County, WI
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EWM High Density Area
EWM Bed
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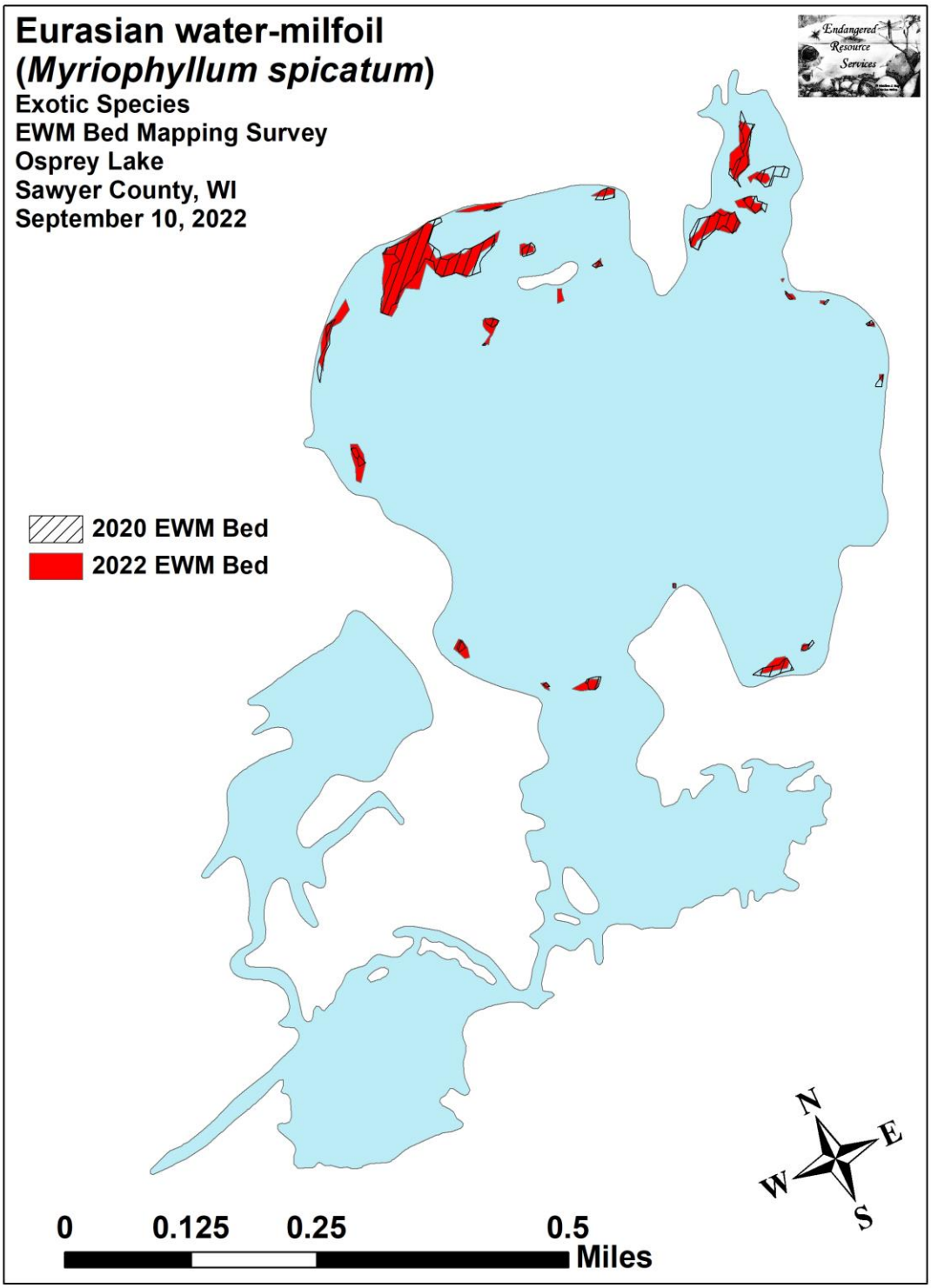
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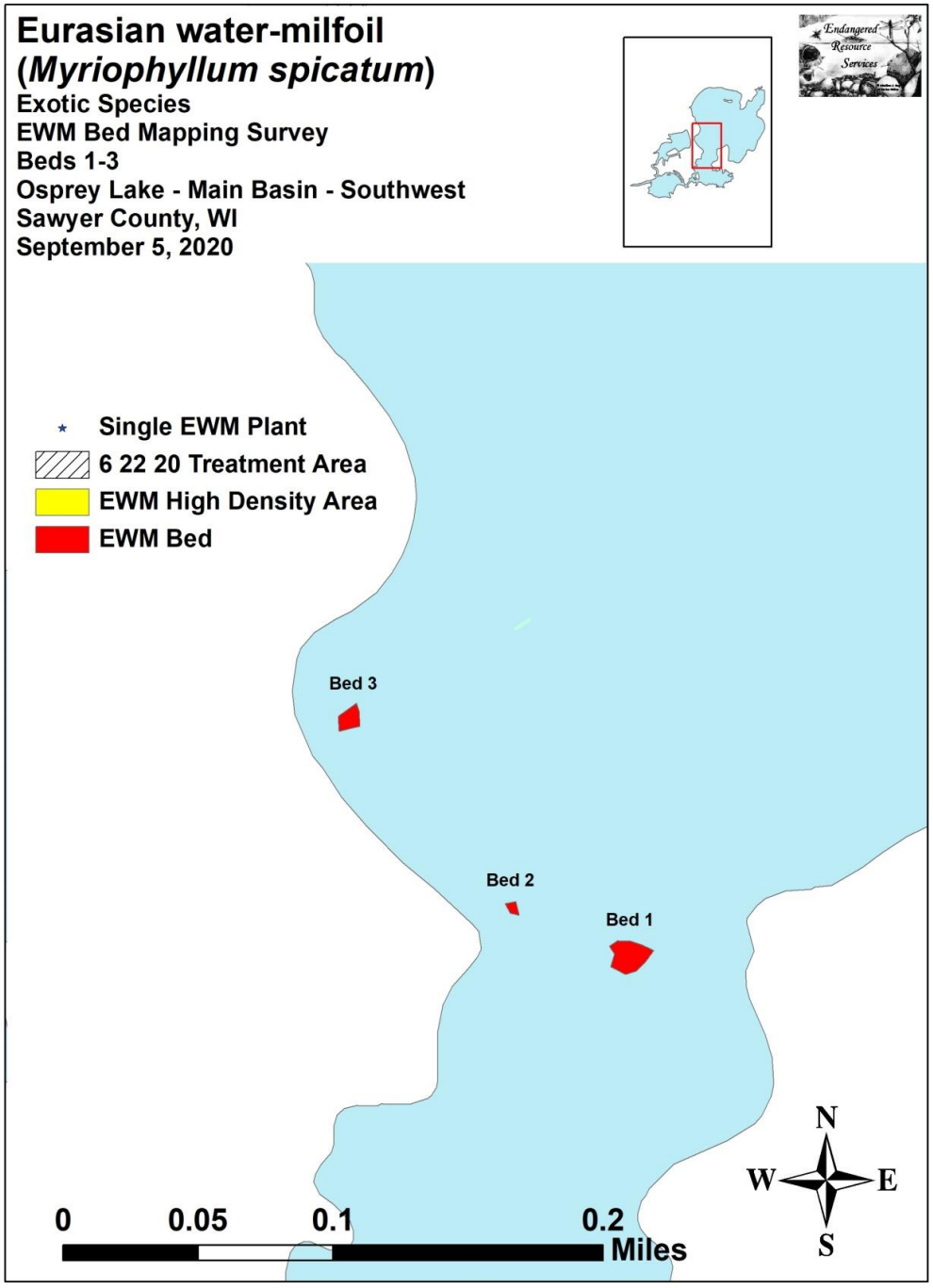
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September 5, 2020
Endangered Resource Services
Single EWM Plant
6 22 20 Treatment Area
EWM High Density Area
EWM Bed
Bed 3
Bed 2
Bed 1
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0.1
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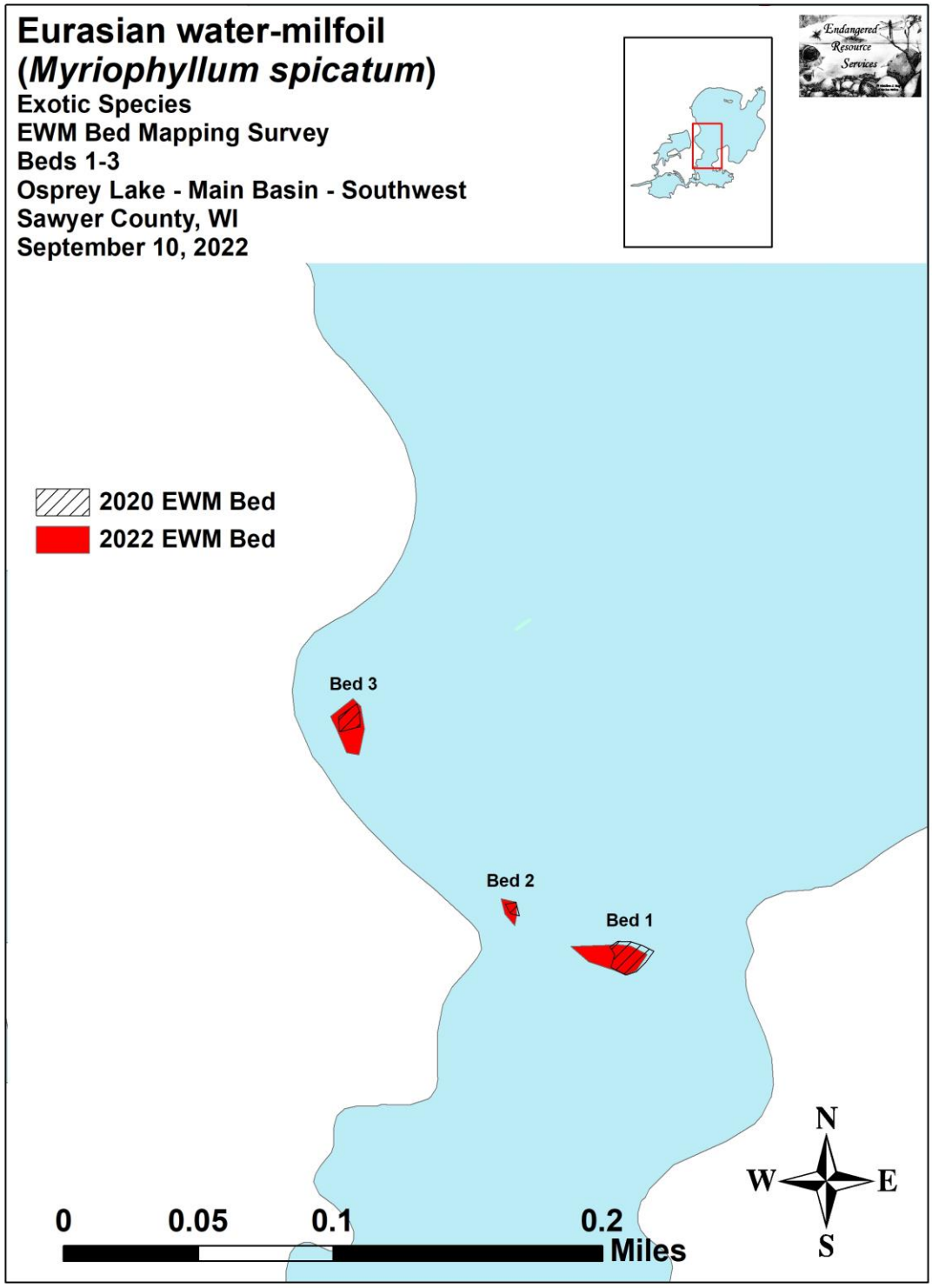
Miles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2022 EWM Bed
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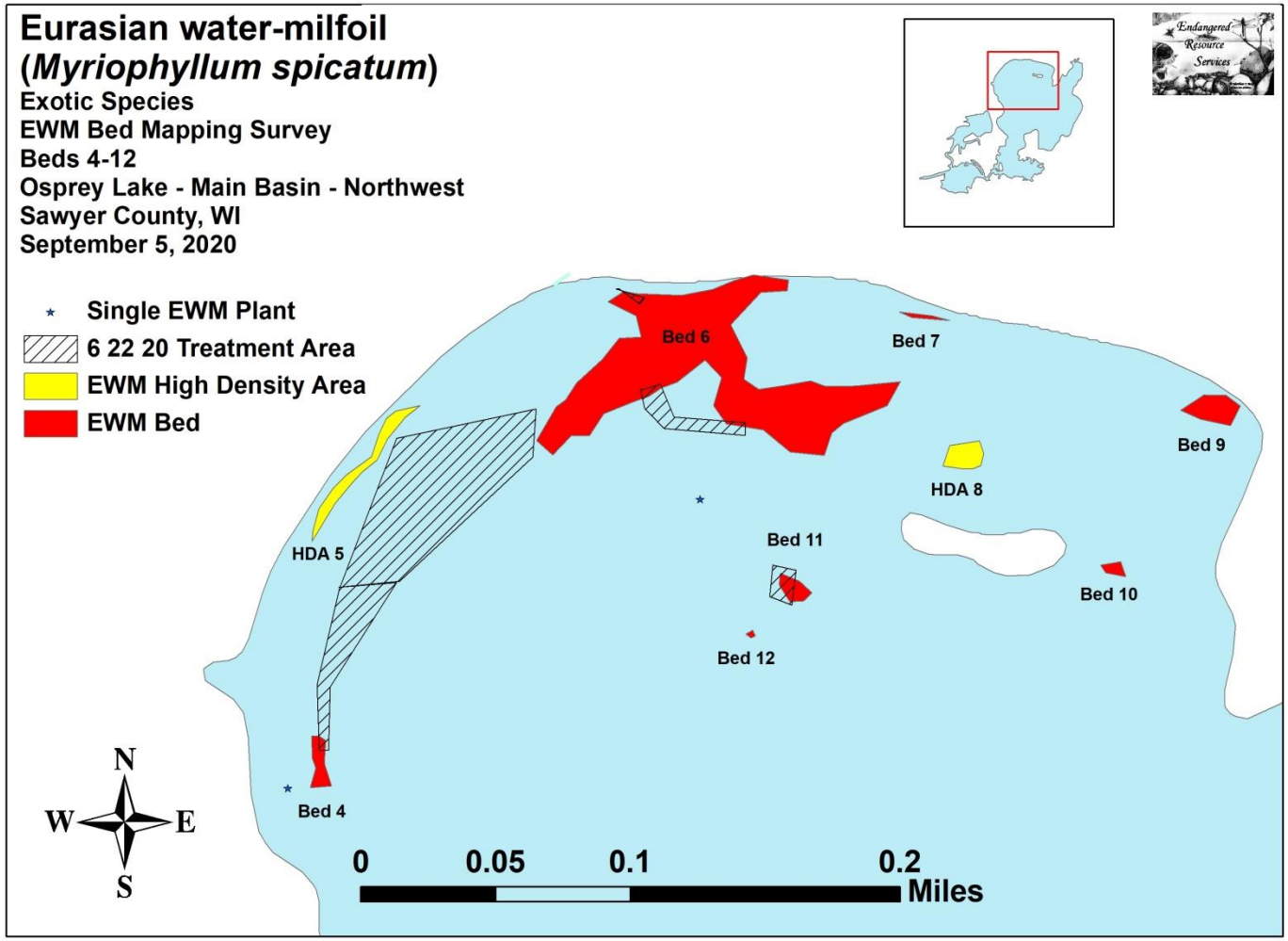
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September 5, 2020
Single EWM Plant
6 22 20 Treatment Area
EWM High Density Area
EWM Bed
Endangered Resource Services
Bed 6
Bed 7
Bed 9
HDA 8
HDA 5
Bed 11
Bed 10
Bed 12
Bed 4
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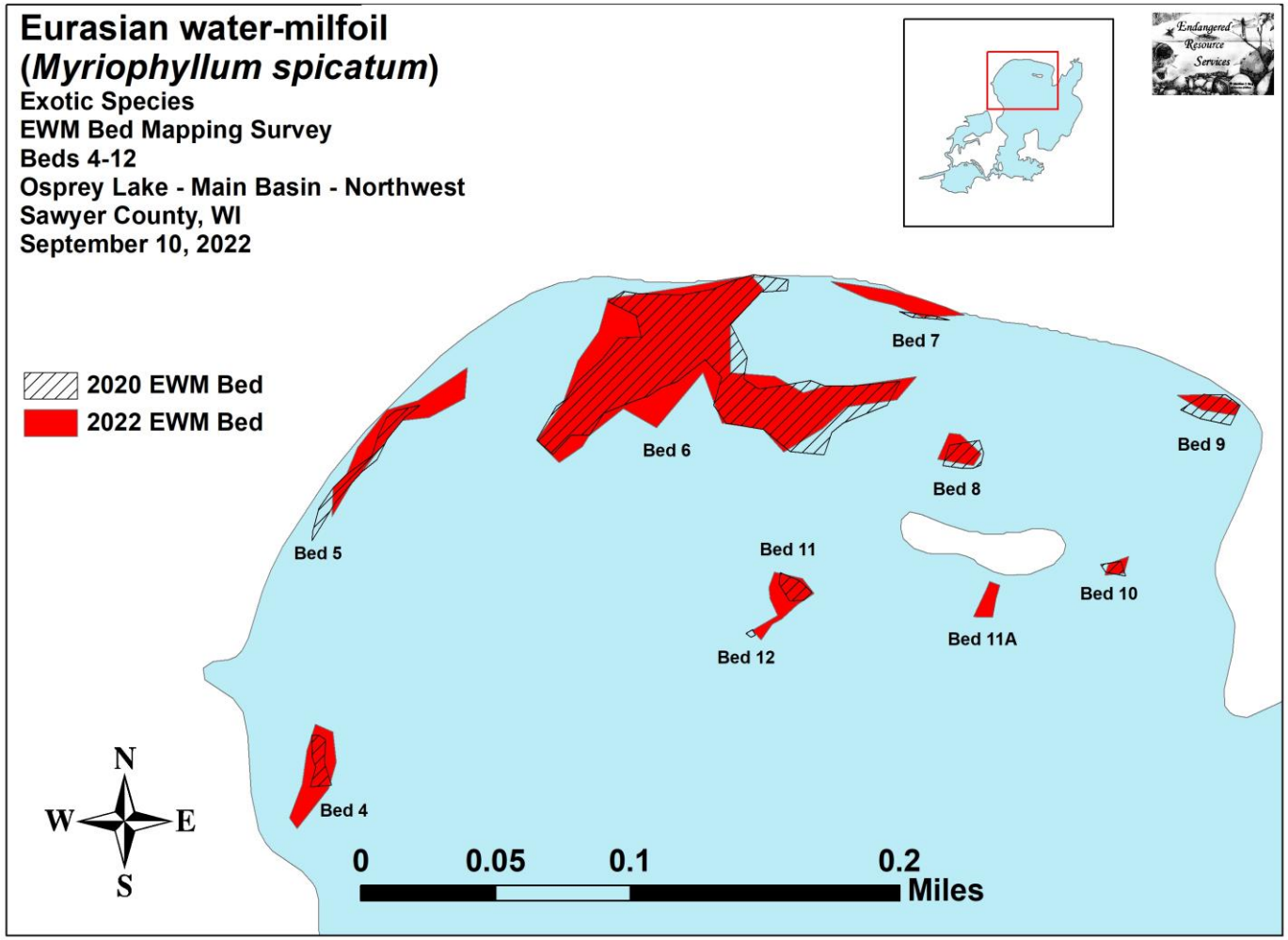
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Sawyer County, WI
September 10, 2022
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2020 EWM Bed
2022 EWM Bed
Bed 4
Bed 5
Bed 6
Bed 7
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Bed 11A
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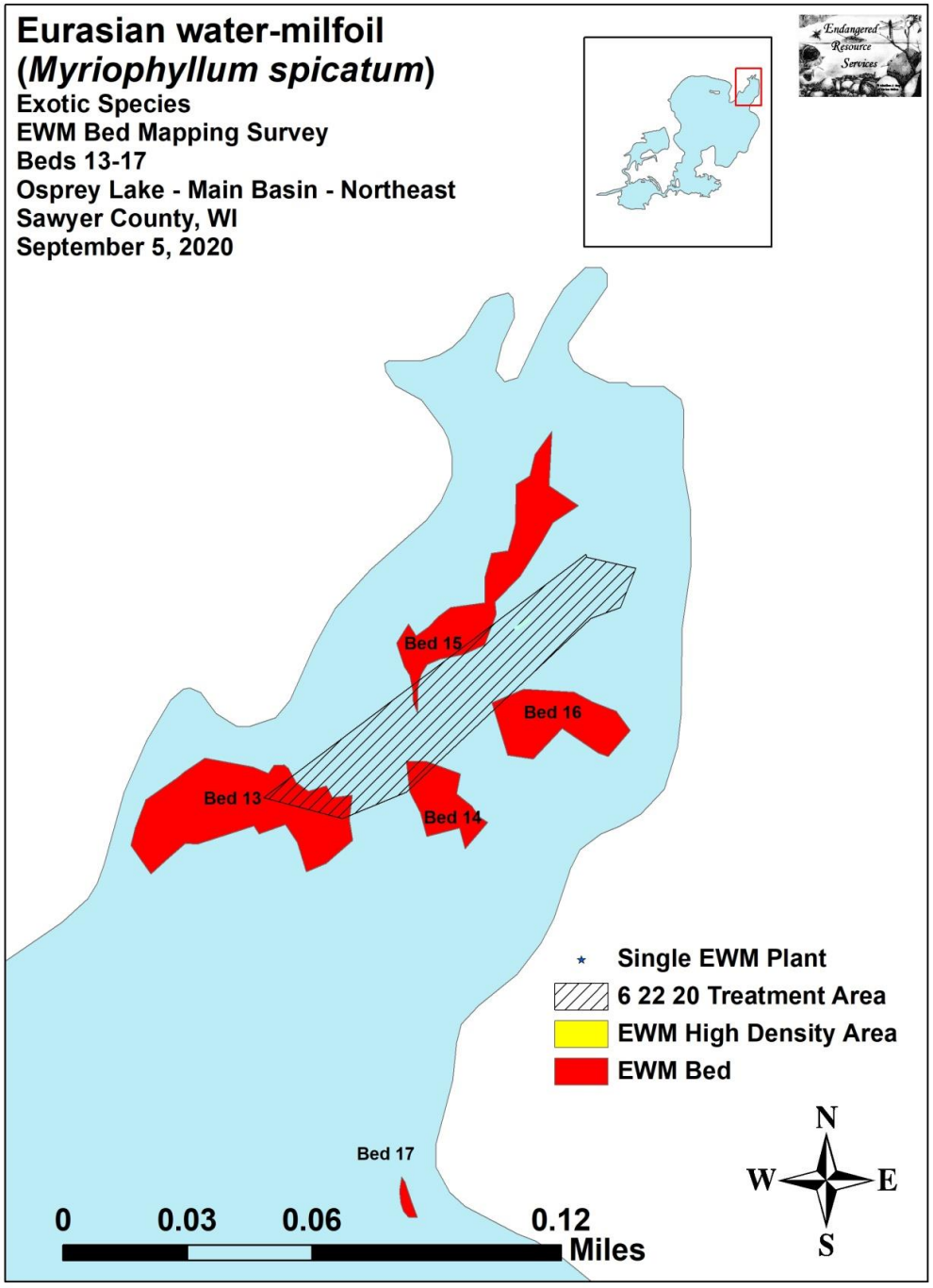
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EWM Bed Mapping Survey
Beds 13-17
Osprey Lake - Main Basin - Northeast
Sawyer County, WI
September 5, 2020
Endangered Resource Services
Bed 15
Bed 16
Bed 13
Bed 14
Bed 17
Single EWM Plant
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EWM High Density Area
EWM Bed
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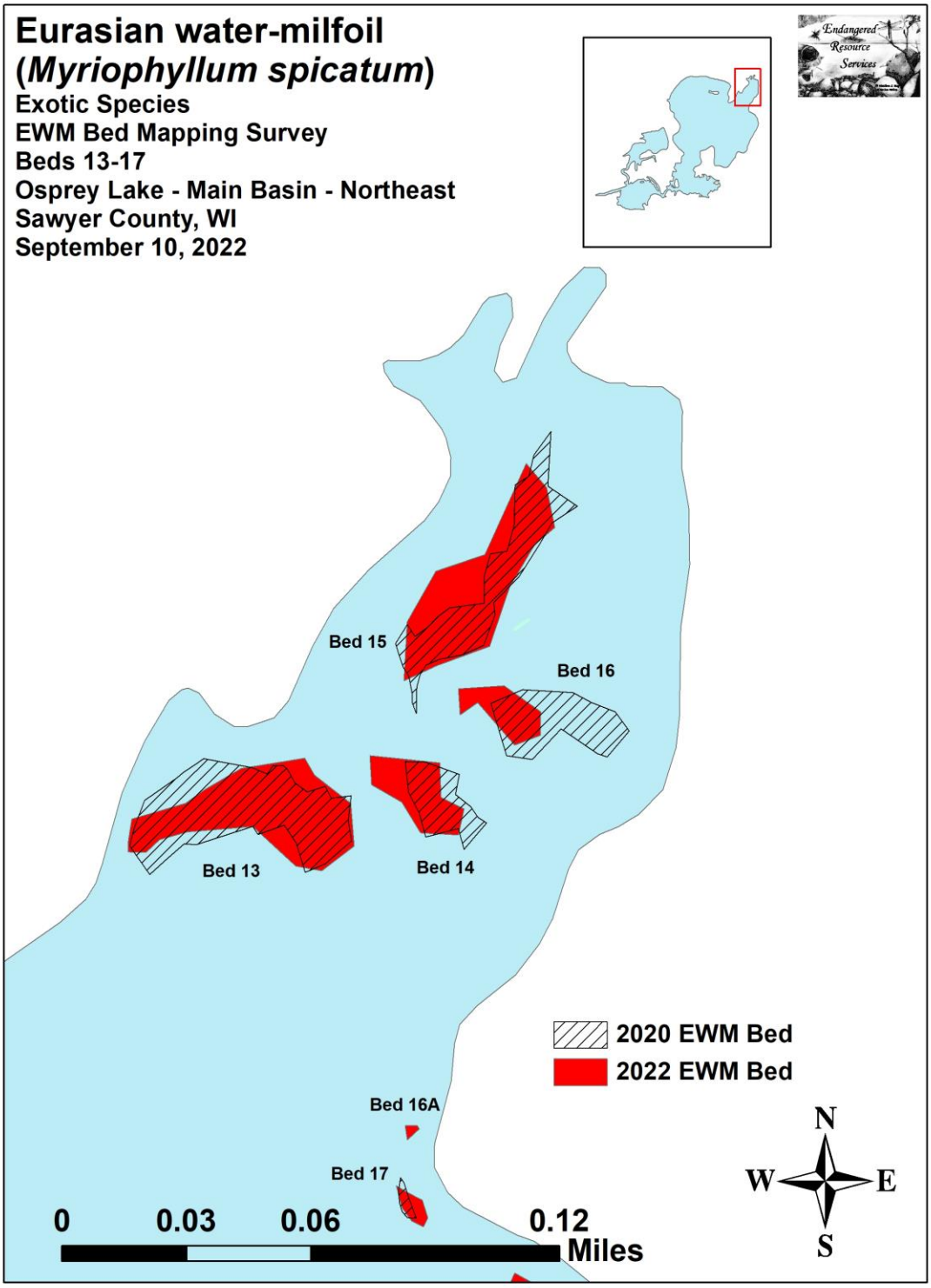
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Sawyer County, WI
September 10, 2022
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Bed 15
Bed 16
Bed 13
Bed 14
Bed 16A
Bed 17
2020 EWM Bed
2022 EWM Bed
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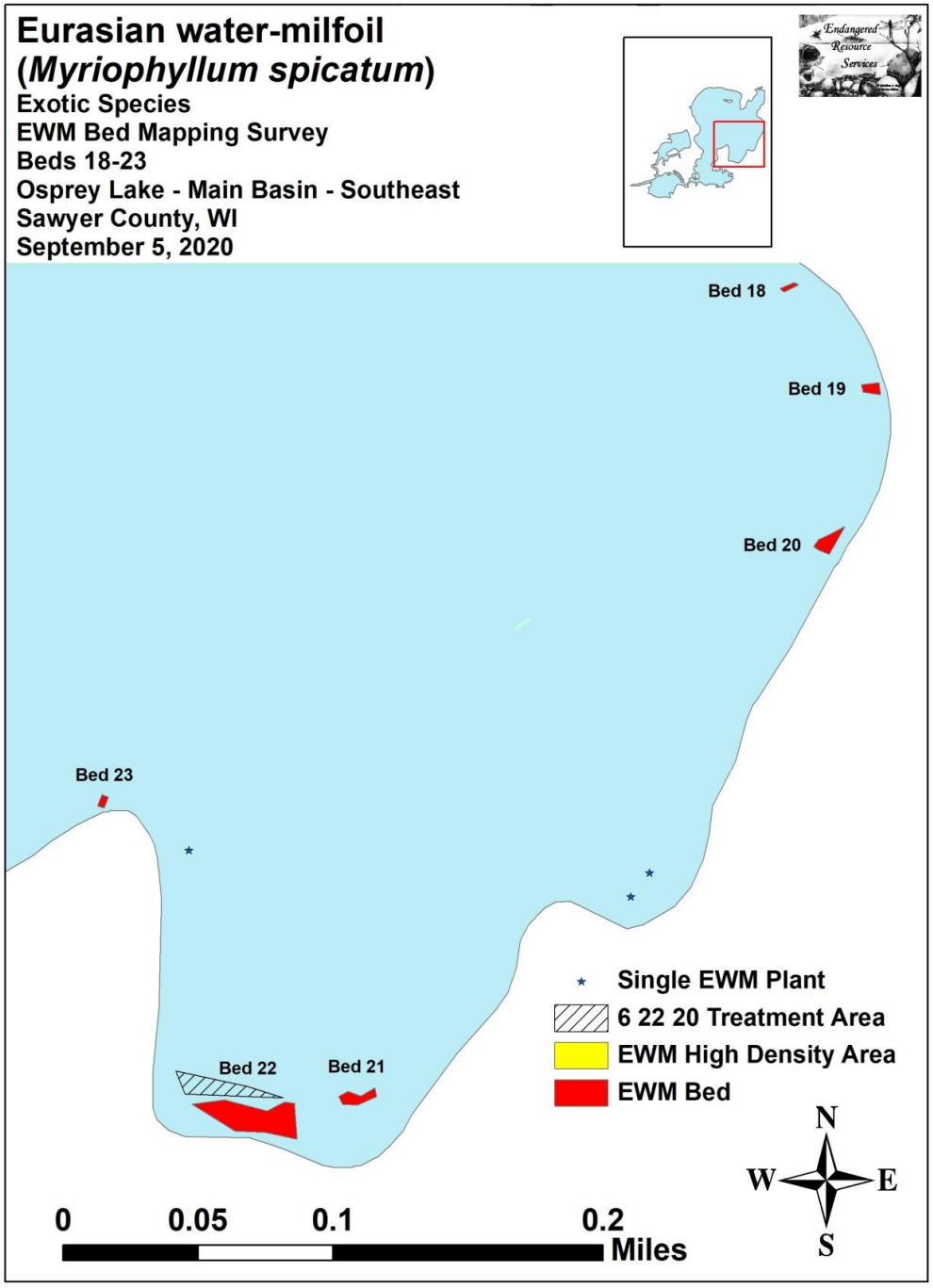
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EWM Bed Mapping Survey
Beds 18-23
Osprey Lake - Main Basin - Southeast
Sawyer County, WI
September 5, 2020
Endangered Resource Services
Bed 18
Bed 19
Bed 20
Bed 23
Bed 22
Bed 21
Single EWM Plant
6 22 20 Treatment Area
EWM High Density Area
EWM Bed
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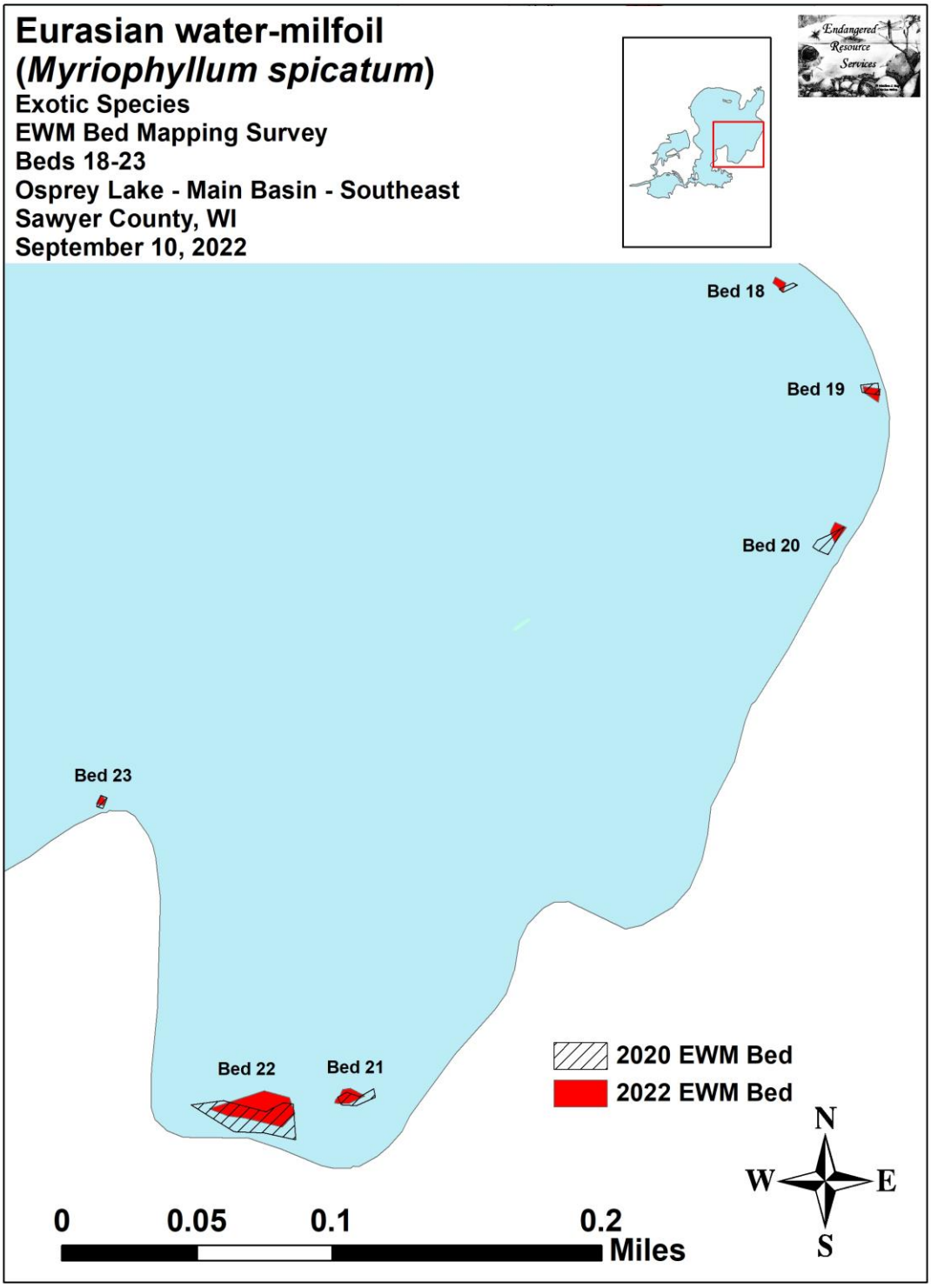
0.2
Miles


Eurasian water-milfoil
(Myriophyllum spicatum)
Exotic Species
EWM Bed Mapping Survey
Beds 18-23
Osprey Lake - Main Basin - Southeast
Sawyer County, WI
September 10, 2022
Endangered Resource Services
Bed 18
Bed 19
Bed 20
Bed 23
Bed 22
Bed 21
2020 EWM Bed
2022 EWM Bed
N
W
E
S
0
0.05
0.1
0.2
Miles