

**Eurasian water-milfoil (*Myriophyllum spicatum*)
Late Summer Bed Mapping Survey
Sand Bar Lake - WBIC: 24924900
Bayfield County, Wisconsin**



EWM among the dead jack pine along Sand Bar Lake's shoreline - 9/3/23



Eurasian water-milfoil (Berg 2007)

Project Initiated by:

The Town of Barnes – Aquatic Invasive Species Committee and the Wisconsin Department of Natural Resources



Typical canopied clusters on Sand Bar Lake's west side – 7/5/23

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INTRODUCTION:

Sand Bar Lake (WBIC 2494900) is a 127-acre stratified seepage lake on the west-central edge of Bayfield County, Wisconsin in the Town of Barnes (T45N R9W S19/20). It reaches a maximum depth of 49ft on the east side and has an average depth of approximately 25ft. The lake is oligotrophic in nature with Secchi readings taken over the summer of 2023 averaging 18.8ft (WDNR 2023). This good water clarity produced a littoral zone that extended to at least 20ft. The bottom substrate is predominately sand along the shoreline, but this gradually transitions to sand with a thin top layer of muck at most depths over 6ft (Figure 1) (Holt et al. 1972).

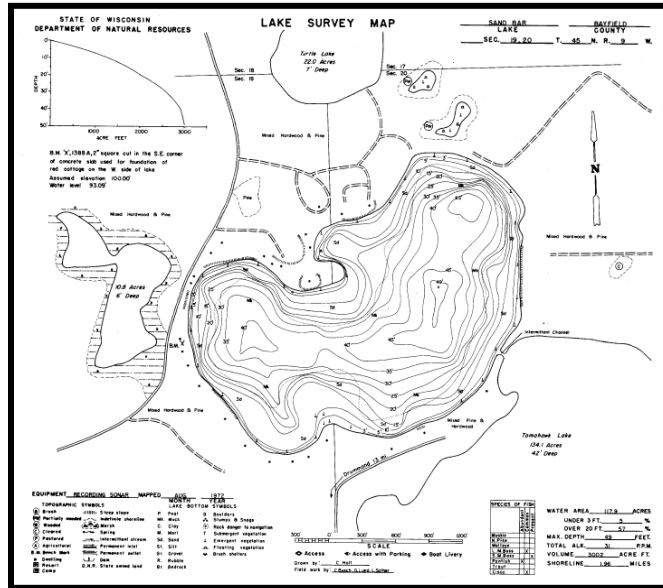


Figure 1: Sand Bar Lake Bathymetric Map

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. Now present in 13 different Bayfield County waterbodies (WDNR 2023), the Town of Barnes Aquatic Invasive Species Committee (TOB) and the Wisconsin Department of Natural Resources (WDNR) first confirmed EWM in Tomahawk and Sand Bar Lakes in the fall of 2004. Because the lakes are so similar (and even connected at high water), WDNR and Army Corp of Engineer (ACE) biologists decided they would initially serve as test (Tomahawk) and control (Sand Bar) lakes for a variety of treatments regimes as shareholders decided how to best fight the infestation. Over the next several years, the lakes would become a true case study as managers used different types of herbicides singly and in combination; tried them at varying concentrations; and conducted both bed and whole-lake applications. To assess the impacts of these treatments (or the lack thereof in the case of Sand Bar) on both EWM and the lakes' native macrophytes, WDNR and ACE biologists conducted annual macrophyte surveys on Tomahawk from 2006 to 2015 and on Sand Bar from 2007 to 2015. However, due to budget cuts and a lack of staffing, these surveys were discontinued after the July 2015 survey at which time the TOB took over primary responsibility for the management of the lakes.

In 2016, the TOB built and began using a suction harvester as part of an integrated approach to managing EWM. Following a whole-lake treatment with 2, 4-D (Shredder Amine 4) that occurred on May 15, 2017 – the “Barnes Aquatic Invasive Species Sucker” or BAISS was utilized as the only active management during the rest of 2017 through 2021. Initially, annual full point-intercept surveys requested by the TOB and the WDNR showed suction harvesting was sufficient to maintain EWM at low levels. The 2018 surveys found no sign of EWM on Sand Bar Lake and only a floating fragment near the public landing on Tomahawk Lake. Unfortunately, although the 2019 survey found that the BAISS continued to keep EWM at undetectable levels on Sand Bar, EWM was spreading rapidly along Tomahawk’s northern shoreline. The 2020 and 2021 surveys found that harvesting was no longer keeping up with EWM’s expansion in Tomahawk and barely keeping up in Sand Bar, and, in 2022, we found EWM had essentially reestablished throughout Sand Bar. This prompted the TOB, under the direction of Lake Education and Planning Services, LLC (LEAPS – Dave Blumer), to apply for a permit to chemically treat a narrow strip along the eastern shoreline on Sand Bar Lake in 2023. Although no formal pre/posttreatment surveys were done, it was requested that we conduct a late summer EWM bed mapping survey to assess the impact of the treatment and allow for future active management decisions. This report is the summary analysis of that survey conducted on September 3, 2023.

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.

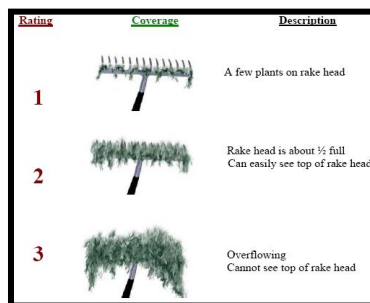


Figure 2: Rake Fullness Ratings (UWEX 2010)

RESULTS:

Treatment Areas:

The single treatment area along the lake’s eastern shoreline just north of the channel between the lakes totaled 1.13 acres (0.89% of the lake’s total surface area) (Table 1). Treatment occurred on June 19th with Northern Aquatic Services (Dale Dressel - Dresser, WI) applying ProcellaCor at a target rate of 4pdu/acre-ft (29.4 total pdu) (Figure 3) (Appendix I). The reported water temperature at the time of treatment was 70°F, the ambient air temperature was 74°F, and winds were out of the south/southwest at 3mph.

**Table 1: Spring Eurasian Water-milfoil Treatment Summary
Sand Bar Lake – Bayfield County, WI
June 19, 2023**

Treatment Area #	Final Treatment Area (acres)	Chemical, Rate, and Total Volume
Area 1	1.13	ProcellaCor – 4pdu/acre ft. – 29.4 pdu
Total	1.13	ProcellaCor – 4pdu/acre ft. – 29.4 pdu

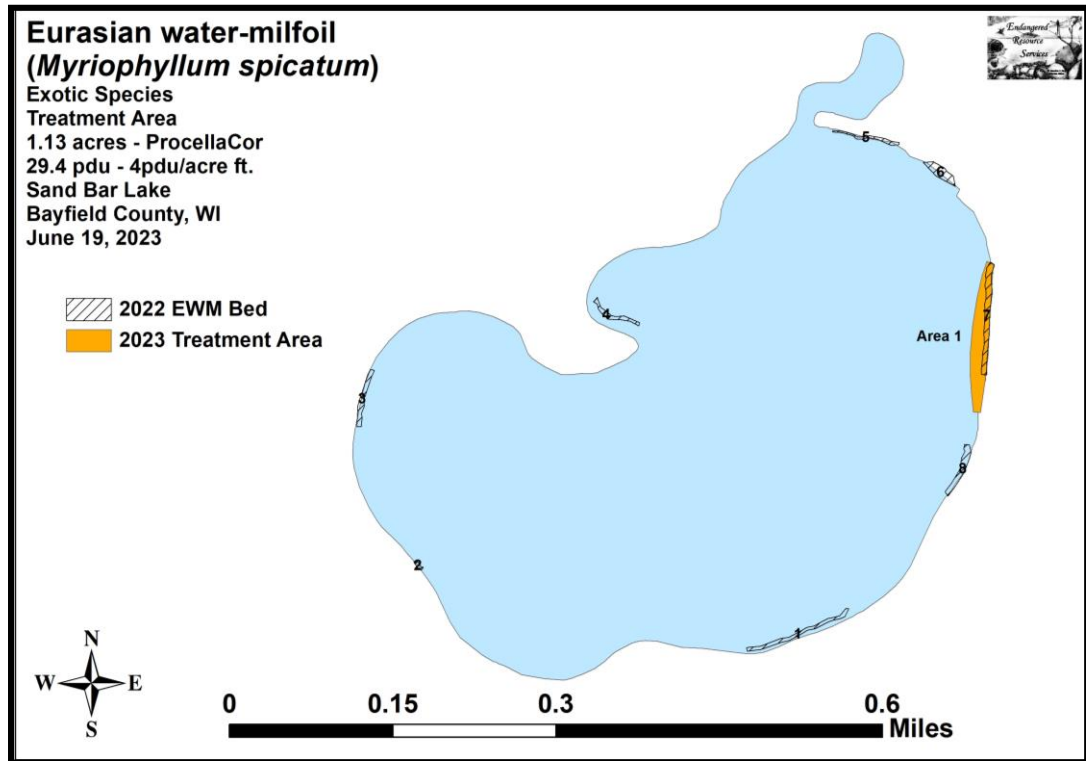


Figure 3: Eurasian Water-milfoil Treatment Areas - June 19, 2023

Eurasian Water-milfoil Bed Mapping Survey:

On September 4, 2022, we searched 10.4km (6.5 miles) of transects throughout the lake's visible littoral zone (Figure 4). We had mostly sunny skies and relatively calm winds that allowed us to see down in the water approximately 7-8ft. Whereas we saw no evidence of Eurasian water-milfoil in Tomahawk Lake, we immediately noted floating fragments were common and found plants and clusters of plants were establishing among the dead Jack pines (*Pinus banksiana*) around much of the lake (Figure 5). In total, we mapped 13 areas covering 3.47 acres (2.73% of the lake's surface areas) (Figure 6). This represented a 186.77% increase over 2022 when we found eight beds covering 1.21 acres (0.95% surface area) (Table 1).



Figure 4: September 3, 2023 EWM Littoral Zone Survey – GPS Tracks



Figure 5: Canopied EWM Growing among Dead Jack Pines – 9/3/23

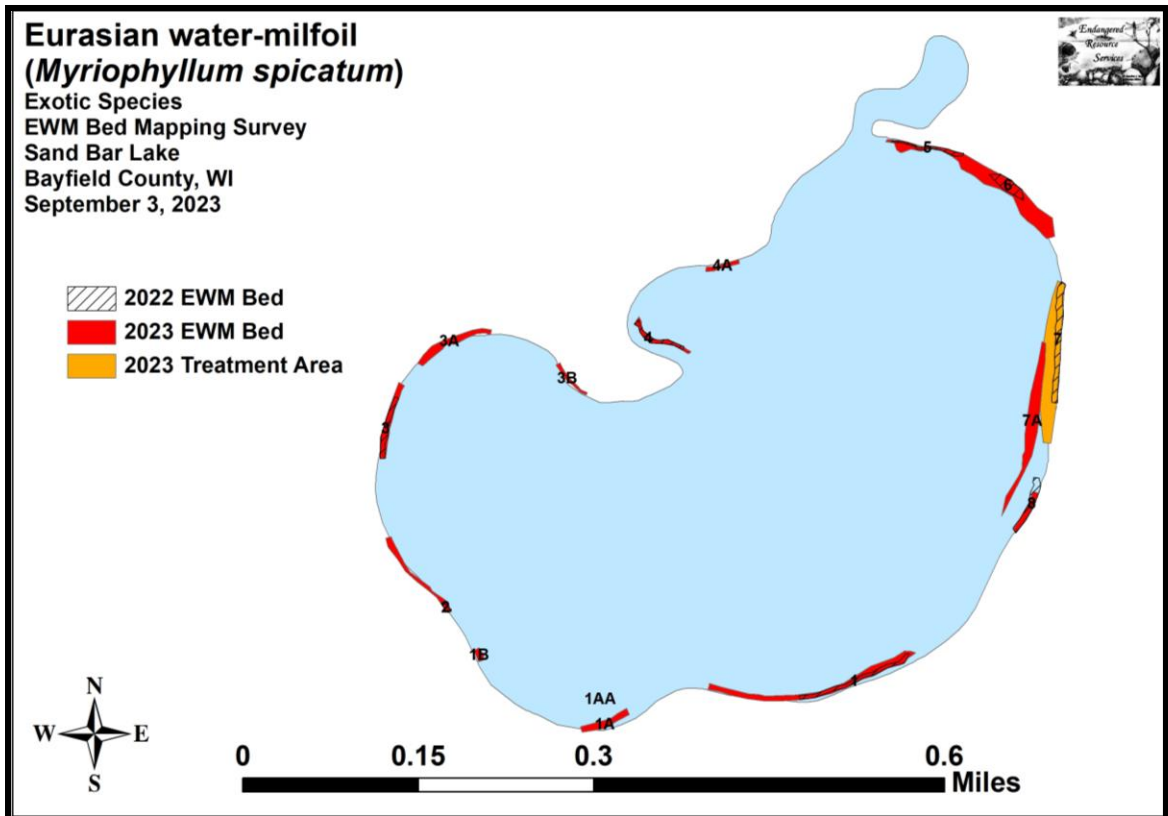
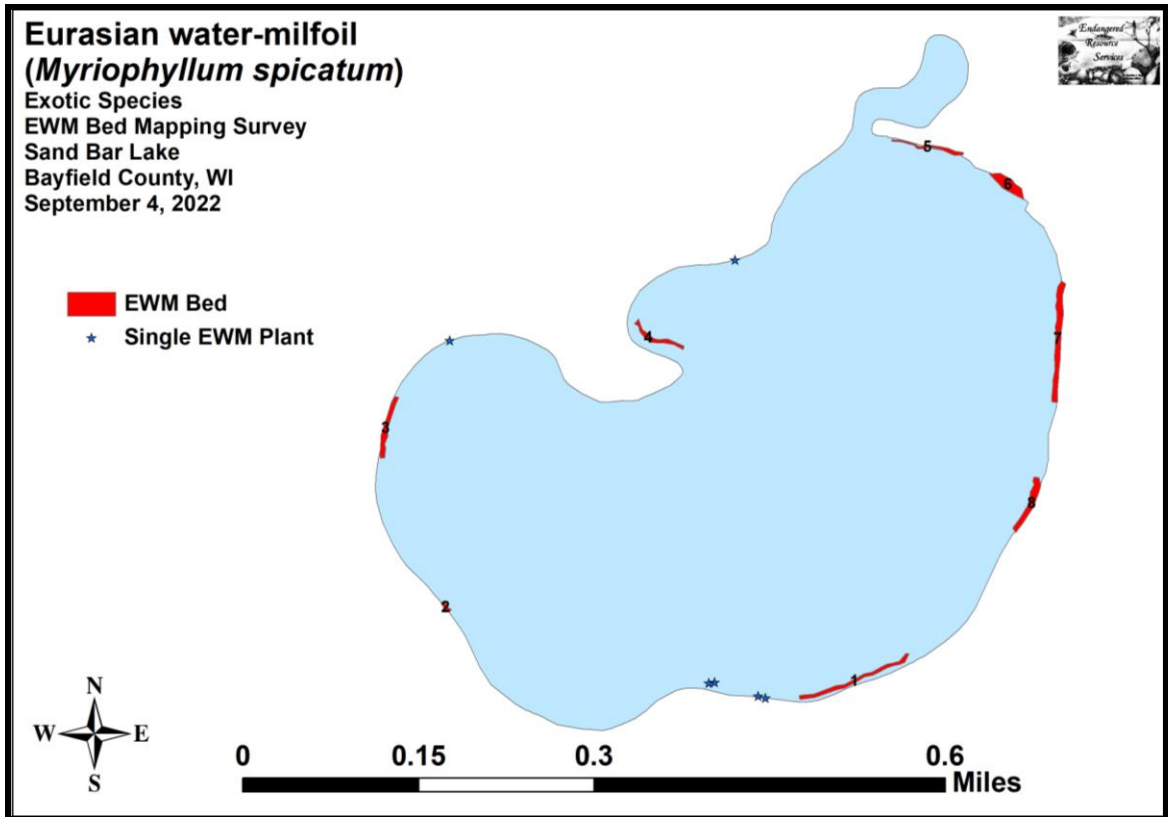


Figure 6: 2022 and 2023 Late Summer Eurasian Water-milfoil Bed Maps

**Table 1: Late Summer Eurasian Water-milfoil Bed Mapping Summary
Sand Bar Lake – Bayfield County, WI
September 3, 2023**

Bed Number	2023 Acreage	2022 Acreage	2022-23 Change in Acreage	Rake Range and Mean Rake Fullness	Depth Range and Mean Depth	Canopied	Navigation Impairment	2023 Field Notes
Bed 1	0.61	0.20	0.41	<<<1-3; 1	1-3; 2	Yes	None	Regular plants in dead Jack pines.
Bed 1A	0.16	0.00	0.16	<<<1-3; 2	1-3; 2	Yes	Minor	Bed on edge of dead Jack pines.
Bed 1AA	<0.01	0.00	<0.01	2-3; 3	8-9; 9	Near	None	Dense subcanopy microbed.
Bed 1B	0.04	0.00	0.04	<<<1-2; 1	1-4; 3	Yes	Minor	Regular pioneer plants/clusters.
Bed 2	0.19	0.02	0.17	<<<1-3; 1	1-5; 3	Yes	Minor	Residents raking out plants.
Bed 3	0.23	0.15	0.08	<<<1-3; 1	1-5; 3	Yes	Minor	Residents raking out plants.
Bed 3A	0.25	0.00	0.25	<<<1-3; 1	1-5; 3	Yes	Minor	Plants expanding into deep H ₂ O.
Bed 3B	0.06	0.00	0.06	<<<1-3; 1	1-5; 3	Yes	Minor	Plants expanding into deep H ₂ O.
Bed 4	0.12	0.10	0.02	<<<1-3; 2	1-6; 3	Yes	Minor	Plants expanding into deep H ₂ O.
Beds 4A	0.06	0.00	0.06	<<<1-3; 1	1-4; 2	Yes	None	Plants spreading in dead pines.
Bed 5/6	1.01	0.25	0.76	<<<1-3; 2	1-6; 4	Yes	Minor	Merging dense microbeds.
Bed 7	0.00	0.32	-0.32	-	-	No	None	No EWM seen in treatment area.
Bed 7A	0.62	0.00	0.62	<<<1-2; <1	5-10; 8	No	None	Regular low-density pioneers.
Bed 8	0.12	0.17	-0.05	<<<1-1; <<<1	1-3; 3	Yes	None	Regular pioneer plants.
Total	3.47	1.21	+2.26					

Descriptions of Eurasian Water-milfoil Beds and High-Density Areas:

Beds 1 and 1A – Each of these beds was a nearly continuous ribbon of pioneer plants and merging clusters. In each case, Eurasian water-milfoil was almost exclusively confined to the immediate shoreline where it was growing among dead Jack pines that had been killed by rising lake levels after decades of low water. Because EWM in Bed 1 was completely imbedded in these “flooded forests”, it was not an impairment to navigation. However, Bed 1A might have posed a minor impairment for residents as most of it was beyond the trees and occurred in front of several docks.

Bed 1AA – This subcanopy microbed occurred in deepwater. It is probably a harbinger of things to come in 2024 as we noted pioneering plants expanding outward from most shallow shoreline beds.

Beds 1B, 2, and 3 – Each of these beds along the western shoreline had significant gaps in them as many residents were taking it into their own hands to rake out plants. In undeveloped shoreline areas, EWM tended to have higher densities.

Beds 3A, 3B, and 4 – Beds in the north bays were still largely restricted to shallow areas along the immediate shoreline, but we noted there were increasing numbers of small subcanopy pioneer plants in deeper water. Each of these areas was more a collection of merging patches than a solid bed so they likely weren't causing more than minor impairment to residents.

Bed 4A - Similar to Bed 1, EWM in this area was largely restricted to growing among the ring of dead trees. Because of this, it is currently unlikely to be an impairment to navigation.

Beds 5 and 6 – The core areas we mapped in 2022 had become canopied mats. In between these dense areas, regular plants and microbeds were rapidly expanding creating a single large superbed.

Bed 7 – We saw no evidence of EWM in the treatment area formerly covered by Bed 7.

Bed 7A – Just outside the treatment area, we found low-density but regular plants establishing on the slope to deep water. It's possible that they were recently established from surrounding areas or even from a seed bank. Regardless, this seems to be one of the first places on the lake that EWM takes hold as this area is often targeted by the BAISS boat.

Bed 8 – The bed near the channel to Tomahawk Lake was the worst area on Sand Bar in 2022, but it had only scattered plants in 2023. This suggests that the adjacent treatments in Tomahawk and/or Sand Bar may have provided residual control to this area. Although still not an impairment to navigation, wave action was causing the plants growing in open water to break apart, and we again saw a concentration of floating fragments throughout this area.

DISCUSSION AND CONSIDERATIONS FOR MANAGEMENT:

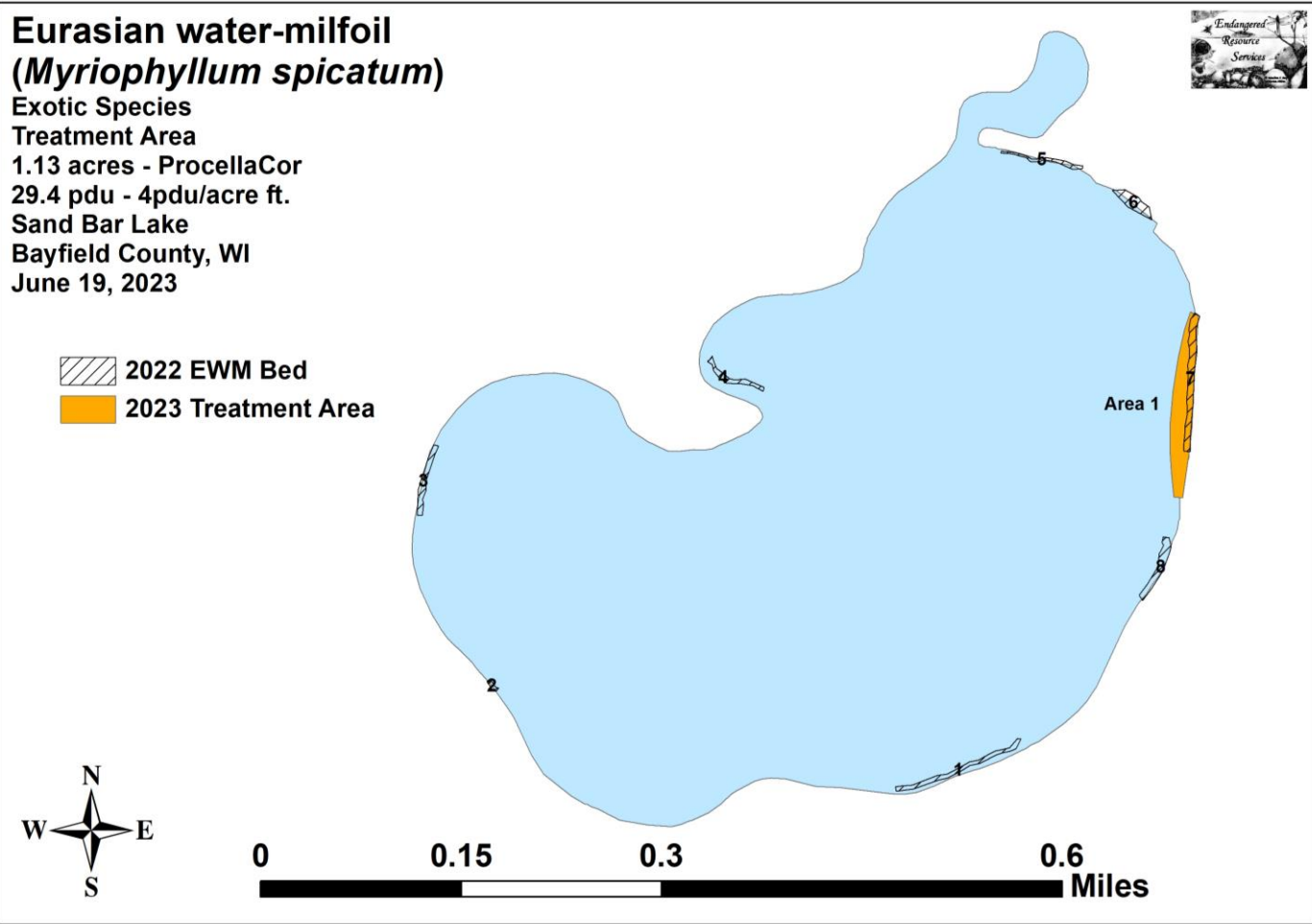
Eurasian water-milfoil continues to occupy only a small percentage of Sand Bar Lake's surface area, but it is widely-established making eradication an unrealistic expectation. With this in mind, continuing to work to control its spread in the most cost-effective manner possible, while simultaneously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

The 2023 treatment provided effective control of EWM within Bed 7, and adjacent shallow areas also seem to experience residual control. Unfortunately, EWM's expansion elsewhere in the lake more than offset this control. Complicating future management, many of the remaining beds are essentially inaccessible within the "dead tree forest". Because of this, manual removal is likely not possible due to the danger of air hoses becoming entangled in the dead trees. Although it is unlikely that these beds will become a significant navigation impairment in 2024, the widespread establishment of EWM around the lakeshore likely means these areas will continue to expand. Whether this constitutes a need for expanded active management in 2024 needs to be discussed. Likewise, there should be a decision made on how much monitoring, if any, will be needed in 2024. Ultimately, the TOB, LEAPS, and the WDNR will have to decide on a future course of action.

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Appendix I: 2023 Eurasian Water-milfoil Treatment Area Map



Appendix II: 2022 and 2023 Eurasian Water-milfoil Bed Maps

