Eurasian water-milfoil (*Myriophyllum spicatum*)
Late Summer Bed Mapping Survey
Red Lake (WBIC: 2492100)
Douglas County, Wisconsin

Red Lake 2022 treatment areas (in orange)

Clean rake of EWM 9/4/22

Subcanopy EWM among Wild celery 9/4/22

Project Initiated by:

The Red Lake Association, Lake Education and Planning Services, LLC and the Wisconsin Department of Natural Resources

Rake removed EWM 9/4/22

Survey Conducted by and Report Prepared by:

Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
September 4, 2022

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INTRODUCTION:

Red Lake (WBIC 2492100) is a 253-acre stratified seepage lake located in the Town of Wascott in south-central/southeastern Douglas County (T43N R11W S21/28/29/32). It reaches a maximum depth of 37ft in the deep hole on the south end of the central basin and has an average depth of 11ft (WDNR 2022). The lake is mesotrophic in nature, and water clarity is good with Secchi readings averaging 11.0ft from 1993-2022 (WDNR 2022). The shoreline is dominated by sand with most areas transitioning to sandy muck at depths beyond 10ft. The lake's only nutrient-rich organic muck occurs in areas adjacent to the tamarack bogs near the small bay in the far southeast corner and on the north and south ends of the northeast bay (Holt et al. 1973) (Figure 1).

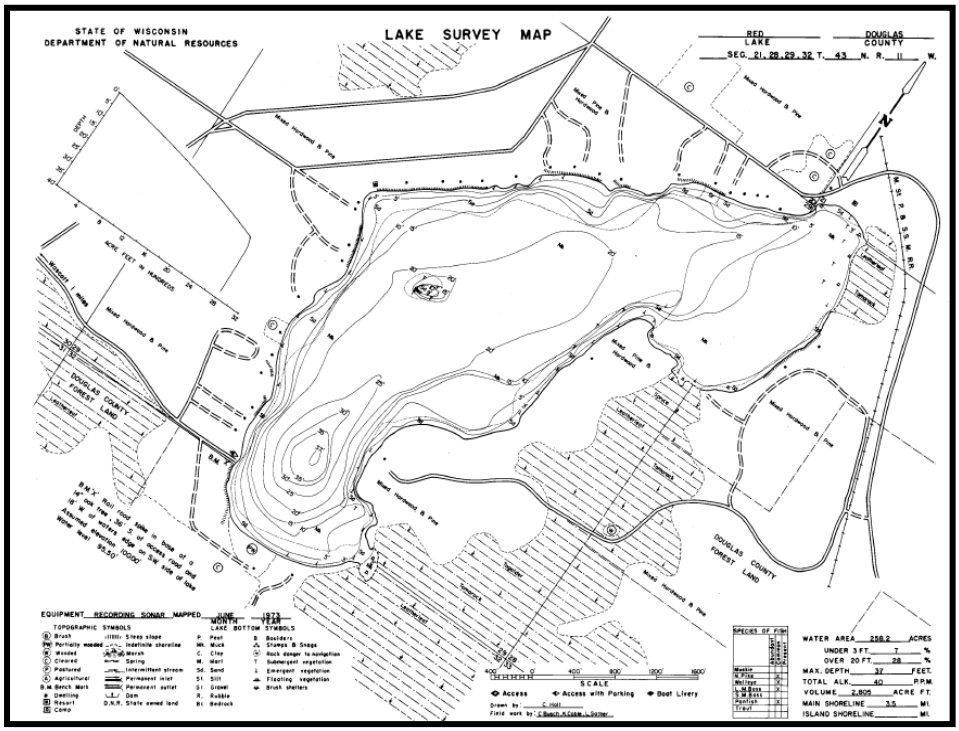


Figure 1: Red Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

On July 25, 2013, at the request of the Red Lake Association (RLA) and the Wisconsin Department of Natural Resources (WDNR), we conducted the original warm-water point-intercept survey of all aquatic plants in Red Lake. This extensive study established base-line data on the richness, diversity, abundance, and distribution of the lake's aquatic macrophyte populations. At that time, we found no evidence of Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM), an invasive exotic aquatic plant, anywhere in the lake.

In July 2016, biologists from the Great Lakes Indian Fish & Wildlife Commission (GLIFWC) found a few EWM plants near the public boat landing on the lake's southwest side and near the Red Lake Resort in the northeast bay. A follow-up survey by the WDNR also located plants in these areas, and our lakewide EWM bed mapping survey on October 2, 2016 found ten separate beds totaling 1.18 acres.

Since that time, the RLA's WDNR approved Aquatic Plant Management Plan has outlined manual removal by both volunteers and professionals as well as limited herbicide applications to control the infestation; and these small-scale treatments have occurred annually since 2017. Following our 2021 late summer bed mapping survey, the RLA and Lake Education and Planning Services, LLC (LEAPS – D. Blumer) decided to treat two beds in 2022. Due to the small size of the treatments and limited budgets, pre and posttreatment surveys were not conducted. However, we were asked to search the lake for surviving EWM in late summer, and, if possible, remove any plants found. This report is the summary analysis of that survey conducted on September 4, 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.

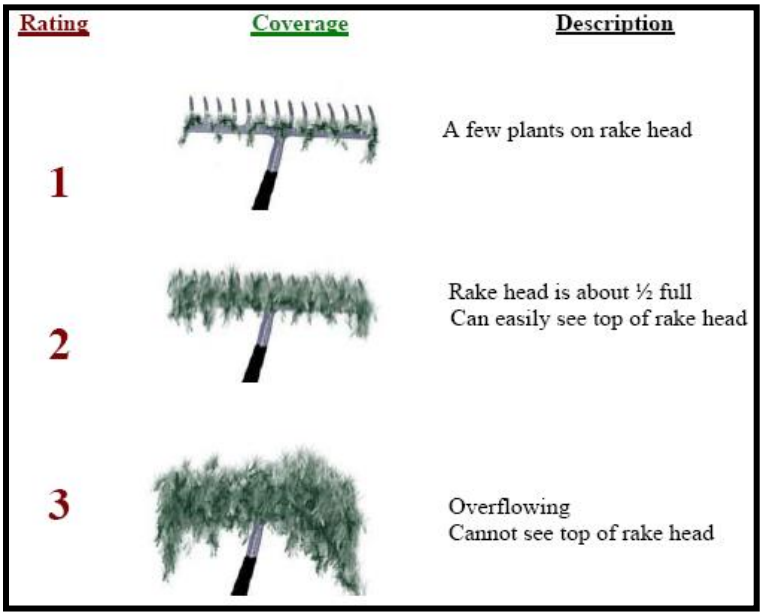


Figure 2: Rake Fullness Ratings (UWEX 2010)

RESULTS AND DISCUSSION:

Treatment Areas:

The two treatment areas along the lake's north shoreline totaled 0.84 acre (0.33% of the lake's total surface area) (Figure 3) (Appendix I). Treatment occurred on May 27th with Northern Aquatic Services (Dale Dressel - Dresser, WI) applying ProcellaCor at a rate of 4-5 pdu/acre ft. (27.33 total pdus – at 3.17 fl. oz./pdu) (Table 1). At the time of treatment, the reported water temperature was 64°F and the air temperature was 70°F. Wind speeds were clocked at 2-3mph out of the west.

Table 1: Spring Eurasian Water-milfoil Treatment Summary
Red Lake – Douglas County, WI
May 27, 2022

Bed Number	Final Treatment Area (acres)	Chemical, Rate, and Total Volume
6	0.30	ProcellaCor – 5pdu – 12.75pdu
11	0.54	ProcellaCor – 4pdu – 14.58pdu
Total	**0.84**	**ProcellaCor – 4-5pdu– 27.33pdu**

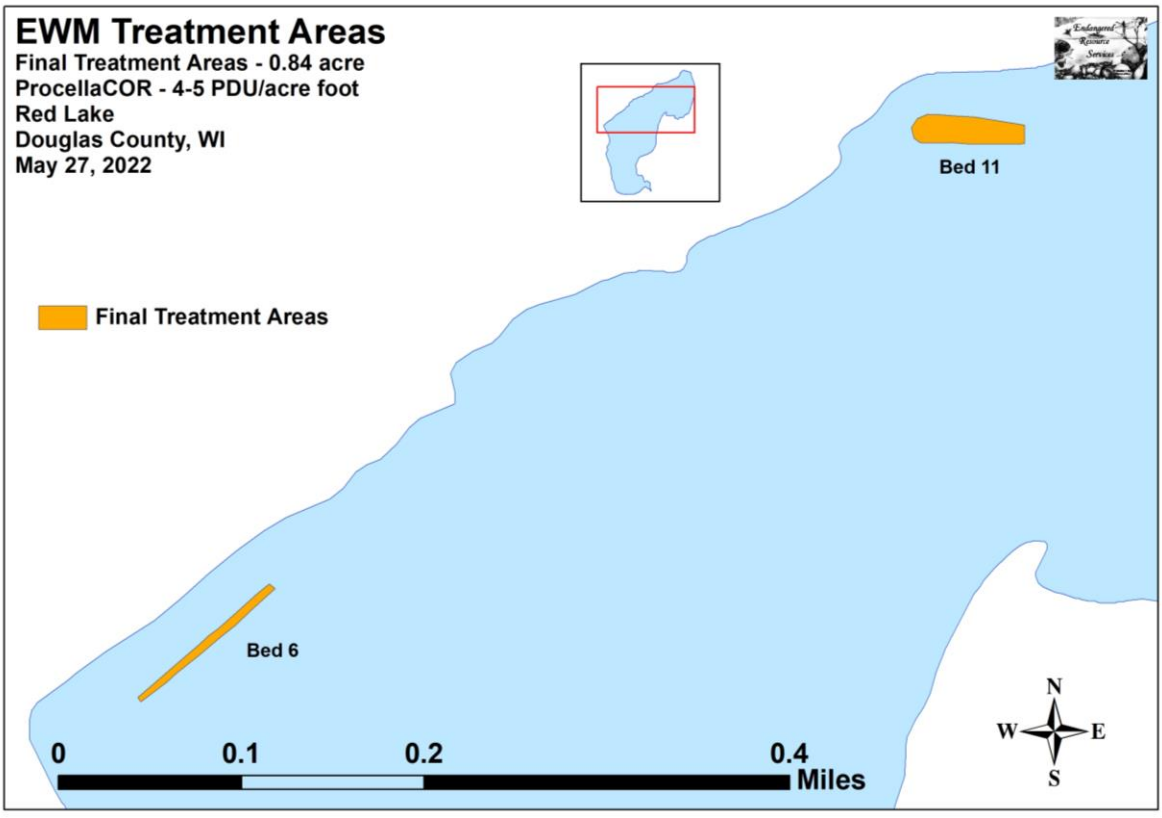


Figure 3: 2022 Eurasian Water-milfoil Treatment Areas

September EWM Rake Removal and Bed Mapping Survey:

On September 4th, we surveyed transects covering 22.9km (14.2 miles) spending extra time in the 2021 and 2022 treatment areas, looking at all areas that previously supported EWM beds, and searching in the northeast bay were fragments from elsewhere would likely be blown by the prevailing winds (Figure 4). We had mostly sunny skies and calm winds which allowed us to see down 7-8ft into the water column – slightly better than normal due to the exceptionally good conditions. We did not find any evidence of Eurasian water-milfoil within the 2021 treatment areas, but we did rake remove six individual plants from surrounding areas of the south bay. Elsewhere, we were disappointed to find plants in each of the 2022 treatment areas. This was potentially due to "reseeding" from downwind beds as we found significant areas of EWM along the western shoreline in areas we haven't seen more than a handful of plants in since 2016 (Figure 5) (Appendix II). In total, we mapped eight areas covering 0.45 acre (0.12% of the lake's surface area). The smallest, Beds 11 and 12, bookended the 2022 eastern treatment area. Each was <0.01acre and was little more than a canopied super cluster of plants. The largest, Bed 6, covered much of the western 2022 treatment area; although technically, this 0.25-acre area wasn't a true bed as most plants weren't canopied and the mean density was <1 (Table 2). The presence of so many new beds is disappointing; however, the total area impacted continues to be relatively small and on the low end of what we've found in past years (Table 3).

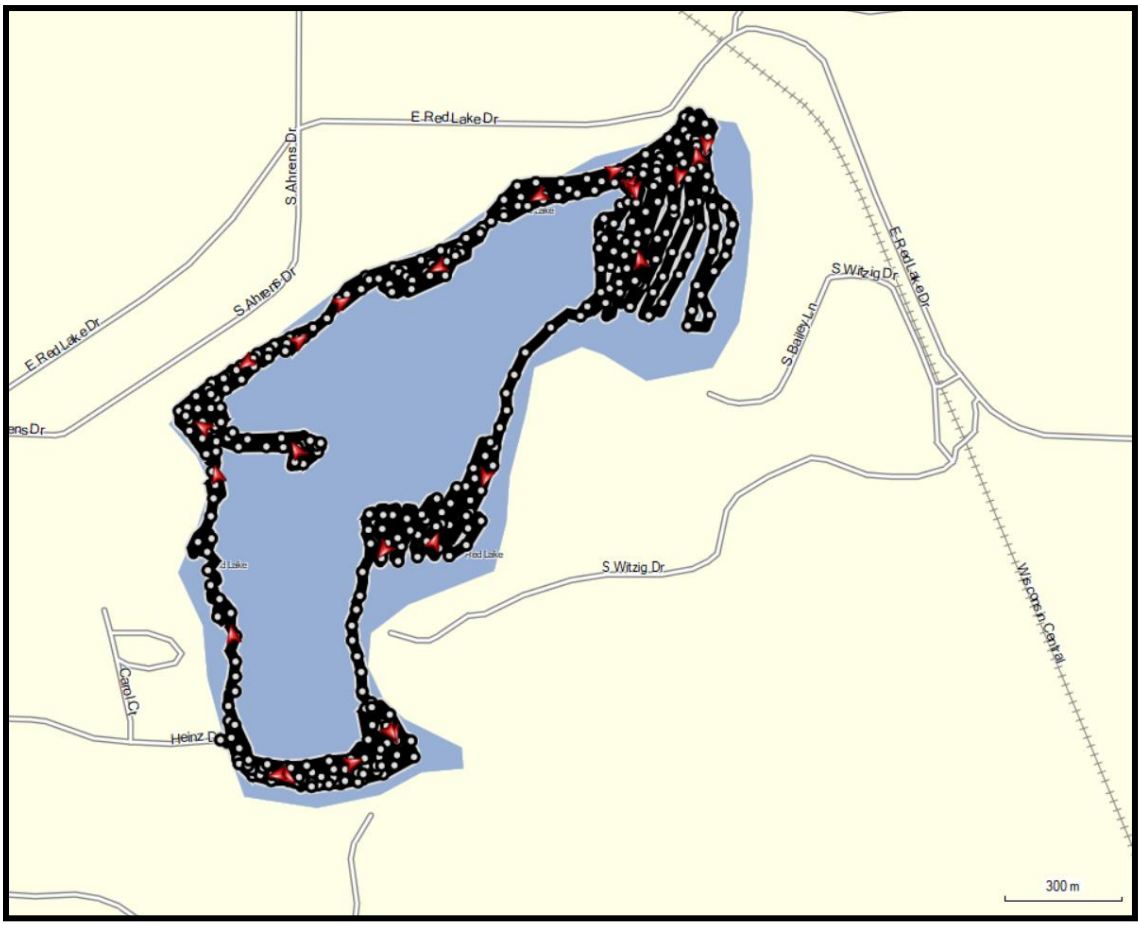


Figure 4: September 4, 2022 Littoral Zone EWM Survey Transects

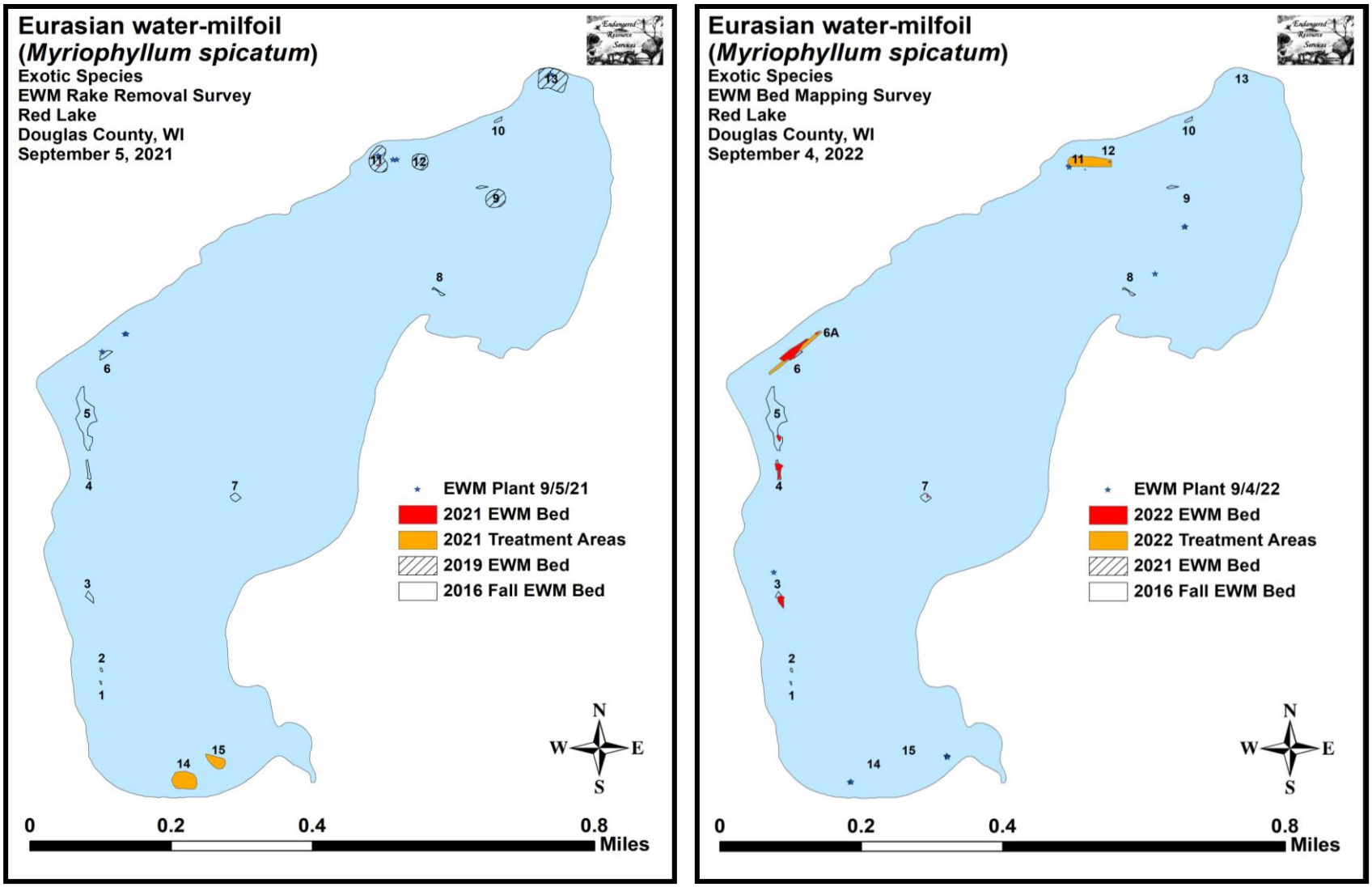


Figure 5: 2021 and 2022 September Eurasian Water-milfoil Bed Maps

Table 2: Late Summer Eurasian Water-milfoil Bed Mapping Summary
Red Lake - Douglas County, WI
September 4, 2022

Bed Number	2022 Acreage	Rake Range and Mean Rake Fullness	Depth Range and Mean Depth	Canopied	Navigation Impairment	2022 Field Notes
1	0	-	-	-	-	No EWM found.
2	0	-	-	-	-	No EWM found.
3	0.07	<1-3; 2	6-9; 8	Near	None	Majority of plants 1-2ft below the surface.
4	0.09	<<<1-3; 1	4-10; 8	Near	None	Low density bed radiating out along the shoreline.
5	0.02	1-3; 3	6-10; 6	No	None	Small microbed; barely visible from the surface.
6	0.25	<<<1-1; <<1	5-10; 7	No	None	Scattering of nearly continuous plants; newly established.
6A	0.01	<<<1-2; 1	4-8; 7	No	None	Regular low-density plants in the same area as 2021.
7	0.01	<1-2; 1	7-9; 8	No	None	Deepwater bed – barely visible.
8	0	-	-	-	-	No EWM found.
9	0	-	-	-	-	No EWM found.
10	0	-	-	-	-	No EWM found.
11	<0.01	1-3; 1	6-10; 8	No	None	Microbed on edge of treatment area.
12	<0.01	1-3; 1	5-8; 6	No	None	Microbed on edge of treatment area.
13	0	-	-	-	-	No EWM found.
14	0	-	-	-	-	No EWM found.
15	0	-	-	-	-	No EWM found.
Total	**0.45**					

Table 3: Eurasian Water-milfoil Late Summer/Fall Bed Summary
Red Lake - Douglas County, WI
2016-2022

Bed Number	2022 Area in Acres	2021 Area in Acres	2020 Area in Acres	2019** Area in Acres	2018 Area in Acres	2017 Area in Acres	2016 Area in Acres	2021-22 Change in Acreage
1	0	0	0	0	0	0	<0.01	0.00
2	0	0	0	0	0	0	<0.01	0.00
3	0.07	0	0.03	0	0	0	0.06	0.07
4	0.09	0	<0.01	0	0	0	0.06	0.09
5	0.02	0	0	0	0.01	0.09	0.83	0.02
6	0.25	0	0	0	0	0	0.07	0.25
6A	0.01	0	0	0	0	0	0	0.01
7	0.01	0	0	0	0.04	0	0.07	0.01
8	0	0	0	0	0	0	0.03	0.00
9	0	0	0	0.39	0	0	0.03	0.00
10	0	0	0	0	0	0	0.03	0.00
11	<0.01	0.01	0	0.49	0	0	0	-<0.01
12	<0.01	0	0	0.29	0	0	0	<0.01
13	0	0	0	0.76	0	0	0	0.00
14	0	0	0.49	0	0	0	0	0.00
15	0	0	0.11	0	0	0	0	0.00
Total	**0.45**	**0.01**	**0.63**	**1.93**	**0.05**	**0.09**	**1.18**	**0.44**

**We did not survey in 2019 so treatment areas were used as an estimate

Descriptions of Past and Present EWM Beds:

Beds 1-2 – Despite extensive searching in the 8-11ft bathy ring, we were unable to locate any plants within these narrow littoral areas.

Beds 3, 4, and 5 – After being almost completely absent from these areas since 2016, we found expanding deepwater beds in each of these areas. Although each bed was still relatively small, there are likely satellite plants throughout the area that are not yet visible from the surface.

Beds 6 and 6A – We found regular low-density plants scattered throughout the 2022 western treatment area. Because they were universally small in size, it may be that they were reseeded from the newly found beds further south.

Bed 7 – On the eastern edge of the former bed, we located a small deepwater patch of plants that was barely visible from the surface.

Beds 8-10 – We found and rake removed just three individual plants on the outer visible littoral edge of the northeast bay.

Beds 11 and 12 – A few small plants and clusters were found on the deepwater edges of the eastern 2022 treatment area.

Bed 13 – We didn't see any evidence of plants around the docks at the Red Lake Resort.

Beds 14 and 15 – We saw no evidence of EWM anywhere in the 2021 treatment areas, but we did rake remove six individual plants scattered around the south bay.

CONSIDERATIONS FOR MANAGEMENT:

Eurasian water-milfoil continues to occupy only a small percentage of the 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 lake association moving forward.

Following the discovery of several small but expanding beds in 2022, it's likely that a herbicide treatment or extensive manual removal will be needed to reset the infestation on the western shoreline and perhaps elsewhere in 2023. Similarly, how much monitoring will be needed in 2023, if any, is a conversation that needs to take place. Ultimately, the RLA, LEAPS, and the WDNR will have to decide on a course of action. In the meantime, lake residents should remain on the lookout for any signs of EWM. If they discover a plant they even suspect may be EWM, we strongly encourage them to 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. Texting pictures from a smartphone is actually ideal as it give immediate feedback. Likewise, we are happy to identify ANY plant a lake resident finds that they may want identified.

LITERATURE CITED

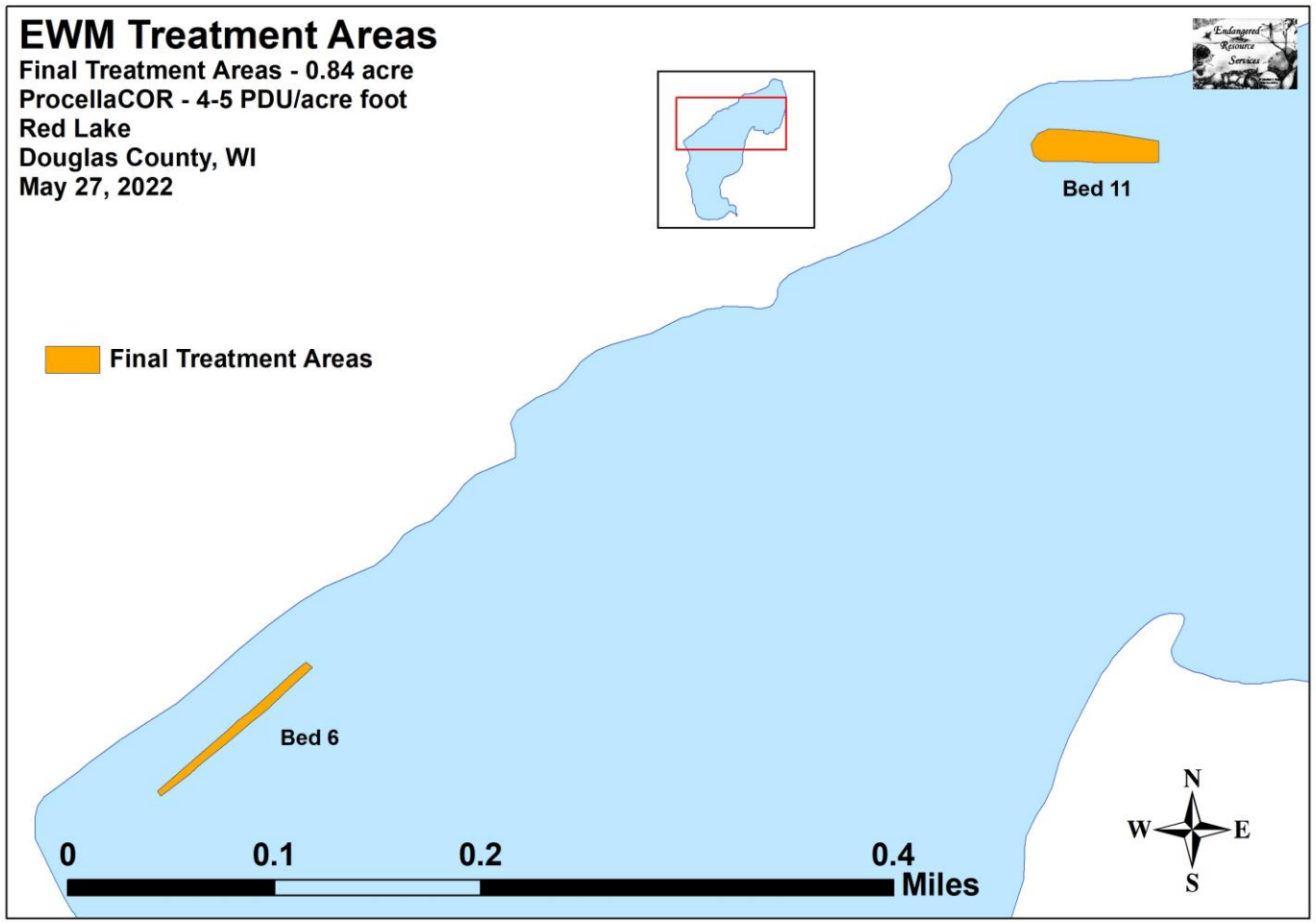
Holt, C, C. Busch, K. Cable, and L. Sather. [online]. 1973. Red Lake Bathymetric Map. http://dnr.wi.gov/lakes/maps/DNR/2492100a.pdf (2022 September).

UWEX Lakes Program. [online]. 2010. Aquatic Plant Management in Wisconsin. Available from http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/ecology/aquaticplants/default.aspx (2022 September).

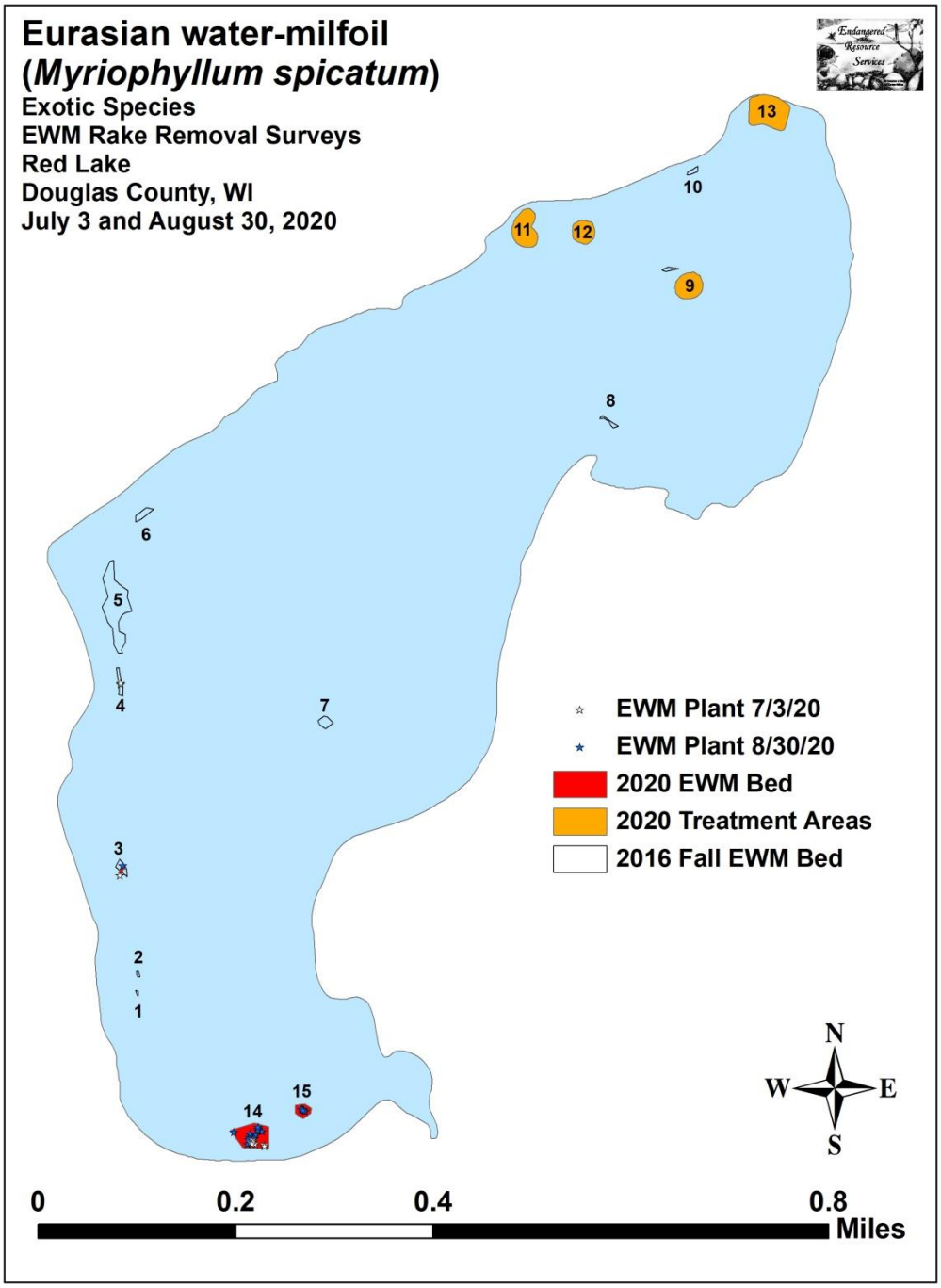
WDNR. [online]. 2022. Wisconsin Lake Citizen Monitoring Data for Red Lake – Douglas County. Available from http://dnr.wi.gov/lakes/waterquality/Station.aspx?id=163383 (2022 September).

WDNR. [online]. 2022. Wisconsin Lakes Information – Red Lake – Douglas County. http://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2492100 (2022 September).

Appendix I: 2022 Eurasian Water-milfoil Treatment Areas


EWM Treatment Areas
Final Treatment Areas - 0.84 acre
ProcellaCOR - 4-5 PDU/acre foot
Red Lake
Douglas County, WI
May 27, 2022
Bed 11
Final Treatment Areas
Bed 6
0
0.1
0.2
0.4
Miles
N
W
E
S

Appendix II: 2020, 2021, and 2022 EWM Rake Removal and Bed Maps


Eurasian water-milfoil
(Myriophyllum spicatum)
Exotic Species
EWM Rake Removal Surveys
Red Lake
Douglas County, WI
July 3 and August 30, 2020
Endangered Resource Services
13
10
11
12
9
8
6
5
4
7
3
2
1
15
14
EWM Plant 7/3/20
EWM Plant 8/30/20
2020 EWM Bed
2020 Treatment Areas
2016 Fall EWM Bed
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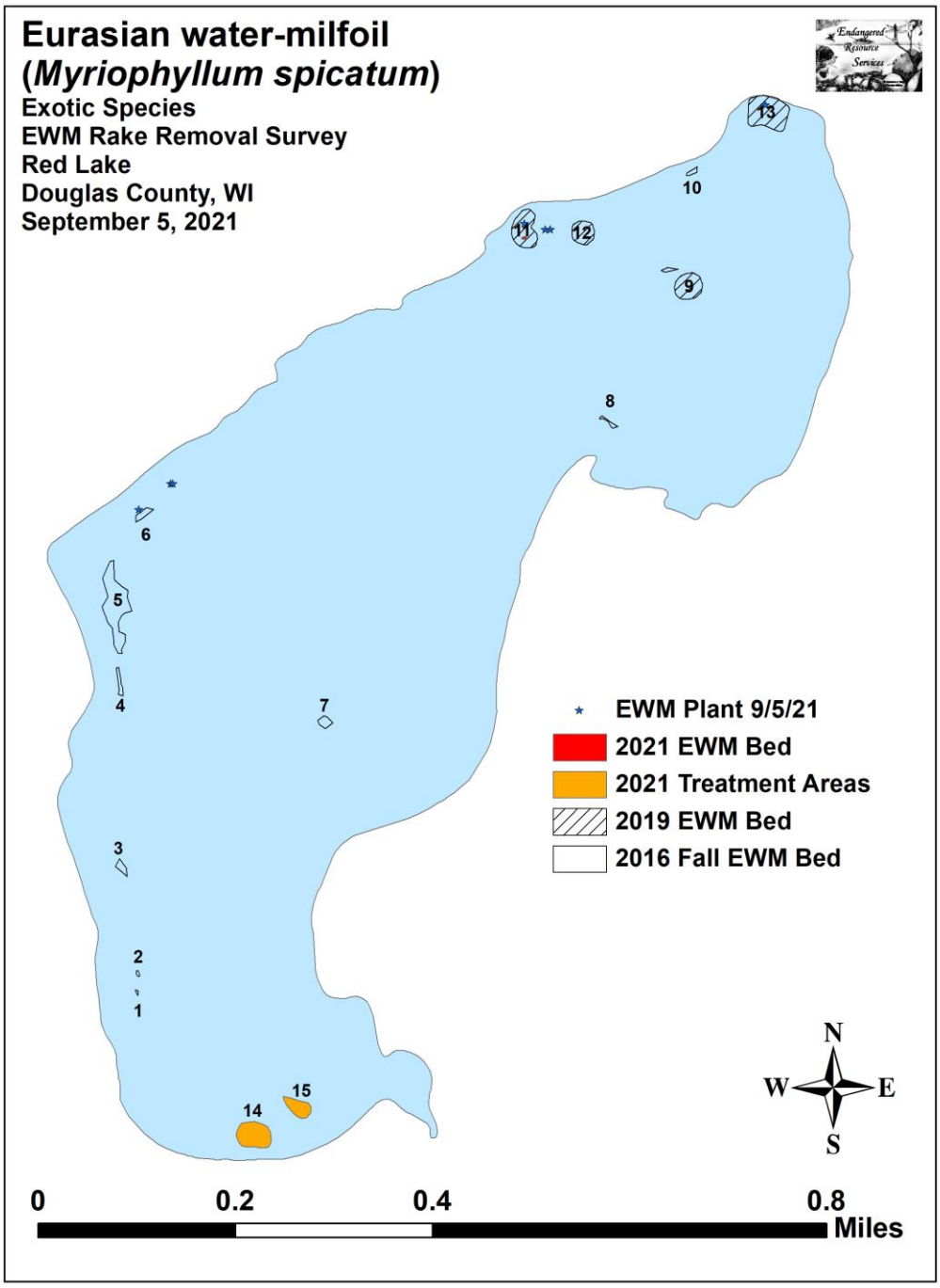
0.4
0.8
Miles


Eurasian water-milfoil
(Myriophyllum spicatum)
Exotic Species
EWM Rake Removal Survey
Red Lake
Douglas County, WI
September 5, 2021
Endangered Resource Services
13
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12
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EWM Plant 9/5/21
2021 EWM Bed
2021 Treatment Areas
2019 EWM Bed
2016 Fall EWM Bed
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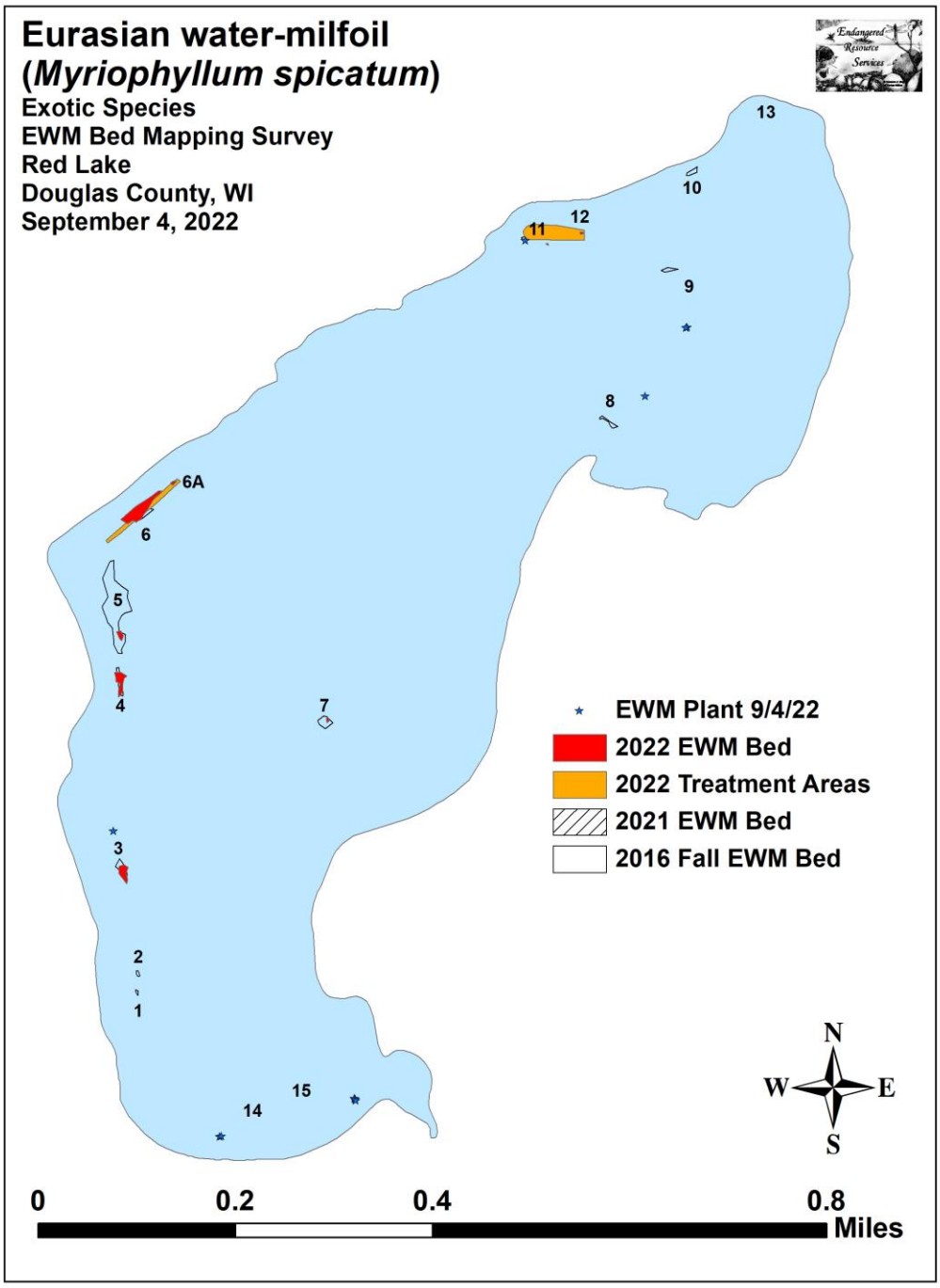
Miles


Eurasian water-milfoil
(Myriophyllum spicatum)
Exotic Species
EWM Bed Mapping Survey
Red Lake
Douglas County, WI
September 4, 2022
Endangered Resource Services
13
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EWM Plant 9/4/22
2022 EWM Bed
2022 Treatment Areas
2021 EWM Bed
2016 Fall EWM Bed
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0.8
Miles