

**Eurasian Water-milfoil (*Myriophyllum spicatum*)
Summer Rake Removal and
Fall Rake Removal and Bed Mapping Surveys
Red Lake - WBIC: 2492100
Douglas County, Wisconsin**



Large EWM plant found 8/2/18



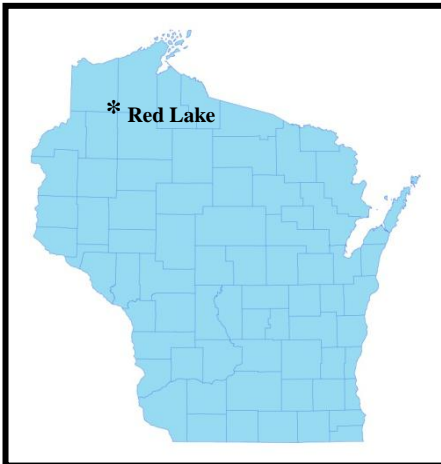
EWM raked out of lake 10/6/18



EWM Beds on Red Lake 10/6/18

Project Initiated by:

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



Eurasian water-milfoil (Berg 2007)

Surveys Conducted by and Report Prepared by:

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August 2 and October 6, 2018

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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). The lake 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 2018). Red Lake is mesotrophic in nature, and water clarity is good with Secchi readings averaging 11.0ft from 1993-2018 (WDNR 2018). This clarity produced a littoral zone that extended to at least 20ft in 2018. 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).

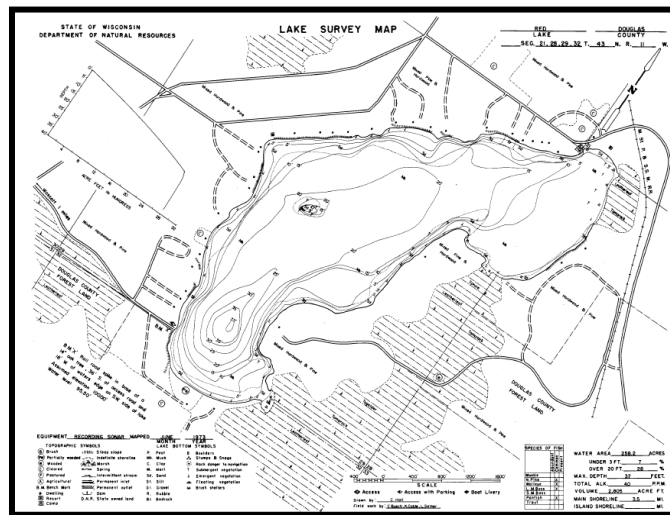


Figure 1: Red Lake Bathymetric Map

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 baseline data on the richness, diversity, abundance, and distribution of the lake's aquatic plant populations. At that time, we found no evidence of Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM), an invasive exotic aquatic plant, anywhere in the lake.

Unfortunately, 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.

In 2017, the WDNR authorized the treatment of two areas that encompassed four of the five largest beds and totaled 4.0 acres (1.58% of the lake's surface area). Follow-up surveys in the treatment area showed most EWM was killed, but we found a few surviving plants were regrowing from large root crowns in the center of the largest bed. Ultimately, we mapped 0.09 acre that contained regular EWM plants in the fall of 2017.

Because of these surviving plants, it was decided to do an additional intensive treatment within the core 1.59 acres of the previously treated area. On May 31, 2018, Northern Aquatic Services, (Dale Dressel, Dresser, WI) applied Tribune (liquid Diquat – 3.18 total gallons – target 0.163ppm) to the entire area with a secondary treatment of Sculpin G (granular 2,4-D – 58.86 pounds – target 4.0ppm) applied to the 0.10 acre surrounding the bed mapped in fall 2017. Because of the small size of the treatment area and in an effort to save money, it was again decided **NOT** to perform pre and posttreatment surveys. However, we were asked to search the lake on August 2nd, and, if possible, remove any EWM found. We were also asked to return on October 6th to complete a fall bed mapping survey and again rake remove as many EWM plants as possible with the time allowed. These surveys will be used to determine where active management might be considered in 2019. This report is the summary analysis of these two field surveys.

METHODS:

Littoral Zone Eurasian Water-milfoil Rake Removal Survey:

During the August survey, we searched the lake’s visible littoral zone for Eurasian water-milfoil. When found, we logged a GPS waypoint and used a rake to remove all EWM plants by the roots. Extra care was also taken to gather any fragments that broke off of the plants. Each of these points was then revisited during the October Survey.

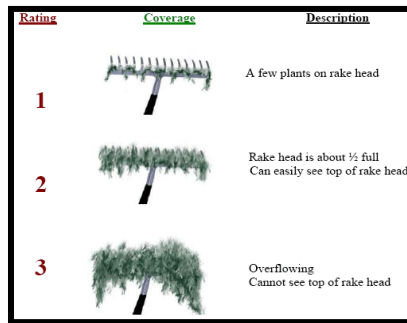


Figure 2: Rake Fullness Ratings (UWEX 2010)

Fall Eurasian Water-milfoil Bed Mapping Survey:

During the fall survey, we searched the lake’s entire visible littoral zone. 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. We also rake removed and GPS marked individual EWM plants outside of the beds.

RESULTS:

August Eurasian Water-milfoil Distribution:

On August 2nd, we surveyed transects covering 16.2km (10.1 miles) spending extra time in the treatment area and along the northeast shore where we have found scattered plants but not beds in past surveys (Figure 3). Unfortunately, the forecasted sunny conditions for the day never materialized so, although we had calm winds and fair to good water clarity, we were only able to see 7-8ft down into the water column. We did **NOT** find any evidence of Eurasian water-milfoil within the treatment area during this initial survey, and raking at the core of the area didn't produce any surviving plants either. However, we did find and remove a total of 30 plants in the northeast bay with 25 of those occurring around the Red Lake Resort docks. This was similar to Dave Blumer's (LEAPS) survey that occurred during the week of July 9th. At that time, he and his assistant also failed to find any EWM in the treatment area, but reported they removed approximately 30 plants from around the docks at the resort.

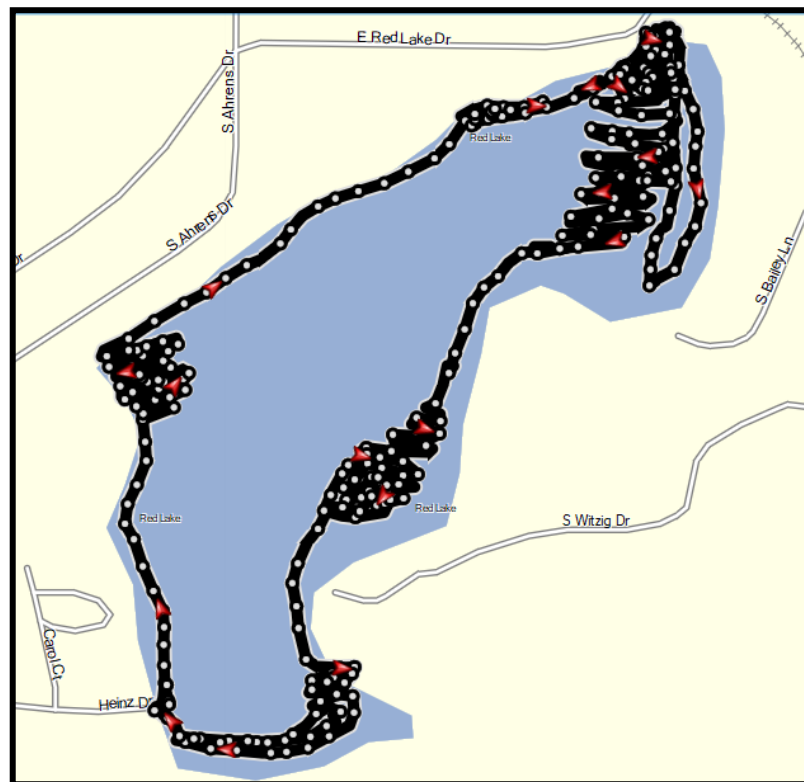


Figure 3: August 2018 Littoral Zone EWM Survey Transects

Fall Eurasian Water-milfoil Bed Mapping Survey:

During the October 6th survey, the winds were calm but it was again overcast for most of the day. Because of this, we could only see the bottom clearly in 5-7ft meaning short EWM plants in deep water may have gone unnoticed. These less than ideal conditions forced us to significantly tightened our transects in an attempt to not miss plants. In total, we searched 32.7km (20.3 miles) – over twice the distance covered in August (Figure 4).

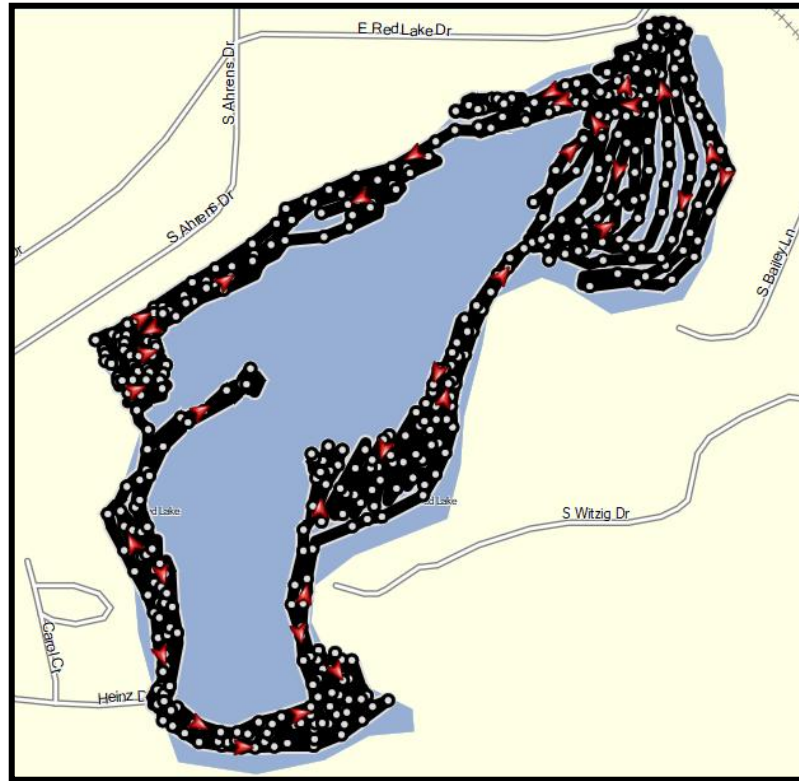


Figure 4: October 2018 Littoral Zone EWM Survey Transects

In fall 2016 and 2017, we found most Eurasian water-milfoil was well-established with sizable root crowns. These plants were almost all growing in a narrow band on the outer edge of the rooted littoral zone in 8-12ft of water (Figure 5). However, in August 2018, most of the individual plants we found were single-stemmed sprouts with simple root systems in <5ft of water. We also noted almost everyone was associated with bottom disturbance either at the ends of docks or in paths leading away from docks (Figure 6) (Appendix I). The October survey found a sharp uptick in plants as we located and rake removed 100 individuals (Figure 6) (Appendix II). Of these, 57 were found in the immediate vicinity of the Red Lake Lodge docks and 70 occurred within 200m of the docks. At the core of the 2018 treatment area in Bed 5, we mapped a small area with nearly continuous EWM. We also found a canopied super cluster of plants on the south end of Bed 7. Collectively, these two areas covering 0.05 acre or approximately 0.02% of the lake's surface area, and they represented a 55.6% decline from the 0.09 acre mapped in 2017 as well as a further decline from the 1.18 acres mapped in the fall of 2016 (Table 1).

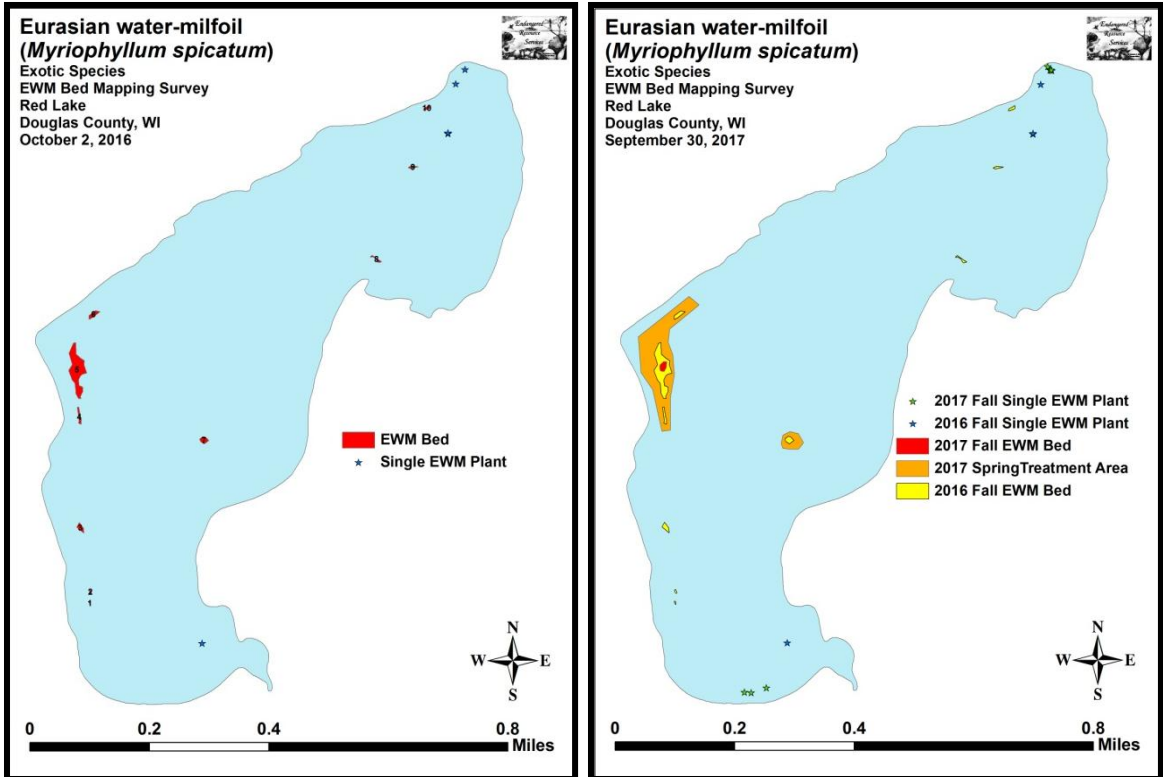


Figure 5: 2016 and 2017 Fall EWM Bed Maps

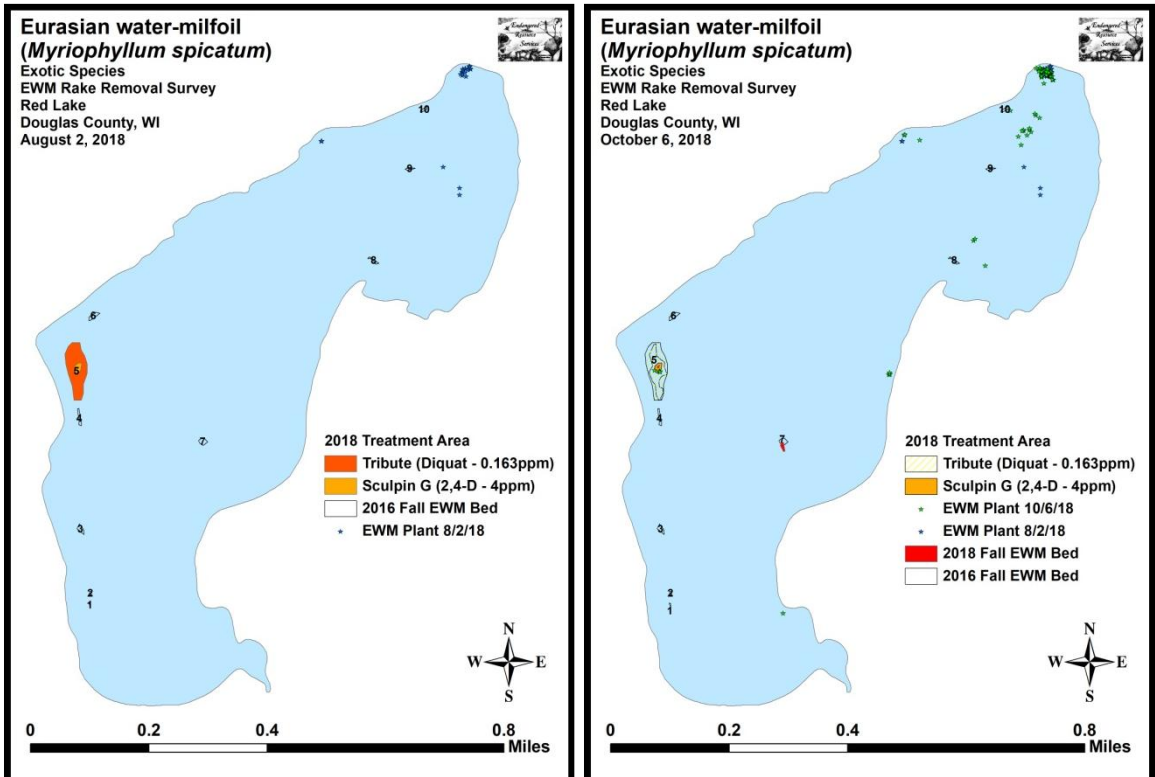


Figure 6: 2018 August and October EWM Maps

**Table 1: Fall Eurasian Water-milfoil Bed Mapping Summary
Red Lake, Douglas County
October 6, 2018**

Bed Number	2018 Area in Acres	2017 Area in Acres	2016 Area in Acres	Change in Acreage	Rake Range and Mean Rake Fullness	Field Notes
1	0	0	<0.01	0	0	No EWM seen.
2	0	0	<0.01	0	0	No EWM seen.
3	0	0	0.06	0	0	No EWM seen.
4	0	0	0.06	0	0	No EWM seen.
5	0.01	0.09	0.83	-0.08	<1-2; <1	EWM rapidly reestablishing
6	0	0	0.07	0	0	No EWM seen.
7	0.04	0	0.07	0.04	<1-3; <1	Several large towers.
8	0	0	0.03	0	0	No EWM seen.
9	0	0	0.03	0	0	No EWM seen.
10	0	0	0.03	0	0	No EWM seen.
Total	0.05	0.09	1.18	-0.04		

Descriptions of Past and Present EWM Beds:

South Bay – We found and rake removed a single plant in this area during the October survey. Other than an additional floating stem, we saw no other evidence of EWM in this area in 2018.

Beds 1, 2 and 3 – Despite extensive searching in the 8-11ft bathy ring during both the 2017 and 2018 surveys, we were unable to relocate these three narrow microbeds that we found growing along the western shoreline in 2016.

Beds 4 and 6 – No plants were seen anywhere in these former beds in either 2017 or 2018. This may be because the plants that were initially found in these areas in 2016 were small, not well-established, and likely easily killed by the spring 2017 treatment.

Bed 5 – Although we didn't find any evidence of EWM in the treatment area during the August survey, we documented 12 plants regrowing from burned root crowns in the 2018 2,4-D treatment area. Of these, eight occurred within the core area that we delineated as a minor bed in October as they were large (6-8ft tall in 9+ft of water), had multiple stems, and large root crowns. The four additional plants that fell outside this area were smaller (4-6ft) and single-stemmed. The depth at this location coupled with the size of many plants made them difficult to rake out. Although we attempted removal, all of these factors likely means our efforts were ineffective.

Bed 7 – In October 2018, after not finding anything in this area in either 2017 or August 2018, we counted seven large plants that were multi-stemmed, canopied in 12ft of water, and actively fragmenting. Located on the very outer edge of the littoral zone, we found rake removal was impossible due to the size of the root crowns and the depth. Because of this, we carefully clipped as much of the tops of the plants as possible to prevent further surface fragmentation and left the rest.

Beds 8, 9 and 10 – The fact that no plants were visible in the line that neatly connects these beds was somewhat frustrating as analysis of the map strongly suggests there is a deep water bed that is serving as a source population for the dramatic uptick in EWM “sprouts” found throughout the northeast bay.

Northeast Bay – In 2017, we found just three EWM plants growing near the Red Lake Lodge's docks. Between July and August, this area saw a dramatic increase in plants as, between LEAPS and us, we rake removed at least 60 plants. Just over two months later, the October 2018 survey found and rake removed an additional 57 plants from the area immediately around the docks. Expanding outward several 100m produced 13 additional small towers. We believe we were successful in removing each of the plants found in August which leaves us to conclude that there is a as of yet undiscovered source population for this localized infestation. Based on studying the map, we believe that bed likely occurs somewhere between the areas identified as Beds 8 and 9 in 2016. If it is present, hopefully it will canopy in 2019. Until then, the shallow area around the docks where motor start-ups regularly scour the bottom will likely continue to be an easy place for floating fragments of EWM carried by the prevailing summer winds to establish.

DISCUSSION AND 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 an important goal for the lake association moving forward.

Although the initial treatment in 2017 was highly successful at knocking back, but not eliminating EWM within the northwest treatment area, the follow-up 2018 treatment proved to be much less successful. During the October survey, plants we raked out of the treatment area all showed evidence of chemical burn, but most of them had well established root systems that appeared to have been the reason they survived the treatment. Although it's possible that these remaining plants and the bed on the east side could be removed with SCUBA divers, to our knowledge, no dive removal has occur on the lake to this points. Because of this, counting on it as a management strategy may be unrealistic at this time. With this in mind, continued rake removal surveys that occur at least once in the summer and a follow-up fall bed mapping survey to identify areas for potential herbicide applications will likely continue to be the management strategies of choice for the RLA – at least in the near future.

Residents should know that Red Lake has a significant amount of the very similar looking Northern water-milfoil – a valuable native plant that provides important fish habitat and is likely to be heavily impacted by any future chemical treatments. NWM is widely distributed throughout the lake's rooted littoral zone, but does best over sandy and organic muck often just inshore from EWM in 6-8ft of water. Despite its superficial resemblance to EWM, Northern water-milfoil can be told apart by its leaflets numbering <24 that are usually held rigidly at 90 degree angles off the stem when out of water. Conversely, EWM normally has >26 leaflets that fall limp against the stem when out of water (Figure 7). EWM also tends to have a bright red growth tip on the top of the plant whereas NWM has a bright lime green growth tip. NWM on Red Lake is often mixed with other plants, is seldom bed-forming, and rarely canopies on the surface; whereas EWM was often found in nearly monotypic beds that excluded most native species and canopied even in deep water. In the fall, NWM also forms winter buds on the tips of shoots whereas EWM has none. These buds were readily visible during the fall survey (Figure 8).

Because there is so much available habitat for Eurasian water-milfoil on the lake, we encourage all residents to be on the lookout for new beds and promptly contact us (saintcroixdfly@gmail.com and/or 715-338-7502) with a picture, specimen, description of, and/or preferably GPS coordinates of anything they find that looks suspicious. These locations could then be added to the existing map for management consideration and help keep small beds from becoming large ones. To assist with this effort, annually presenting all residents on the lake with "WANTED" posters that show the differences between native Northern water-milfoil and exotic Eurasian water-milfoil along with our contact information is another idea for the RLA to consider. Even if it's only in an email, a reminder at the start of the growing season in June could help us, or others, eliminate plants early in the growing season before they spread.



Eurasian water-milfoil



Northern water-milfoil

Figure 7: EWM and Northern Water-milfoil Identification (Berg 2007)



Figure 8: Limp Nature of EWM Leaflets along Stem – Stiff Nature of NWM Leaflets along Stem and Overwintering Turions

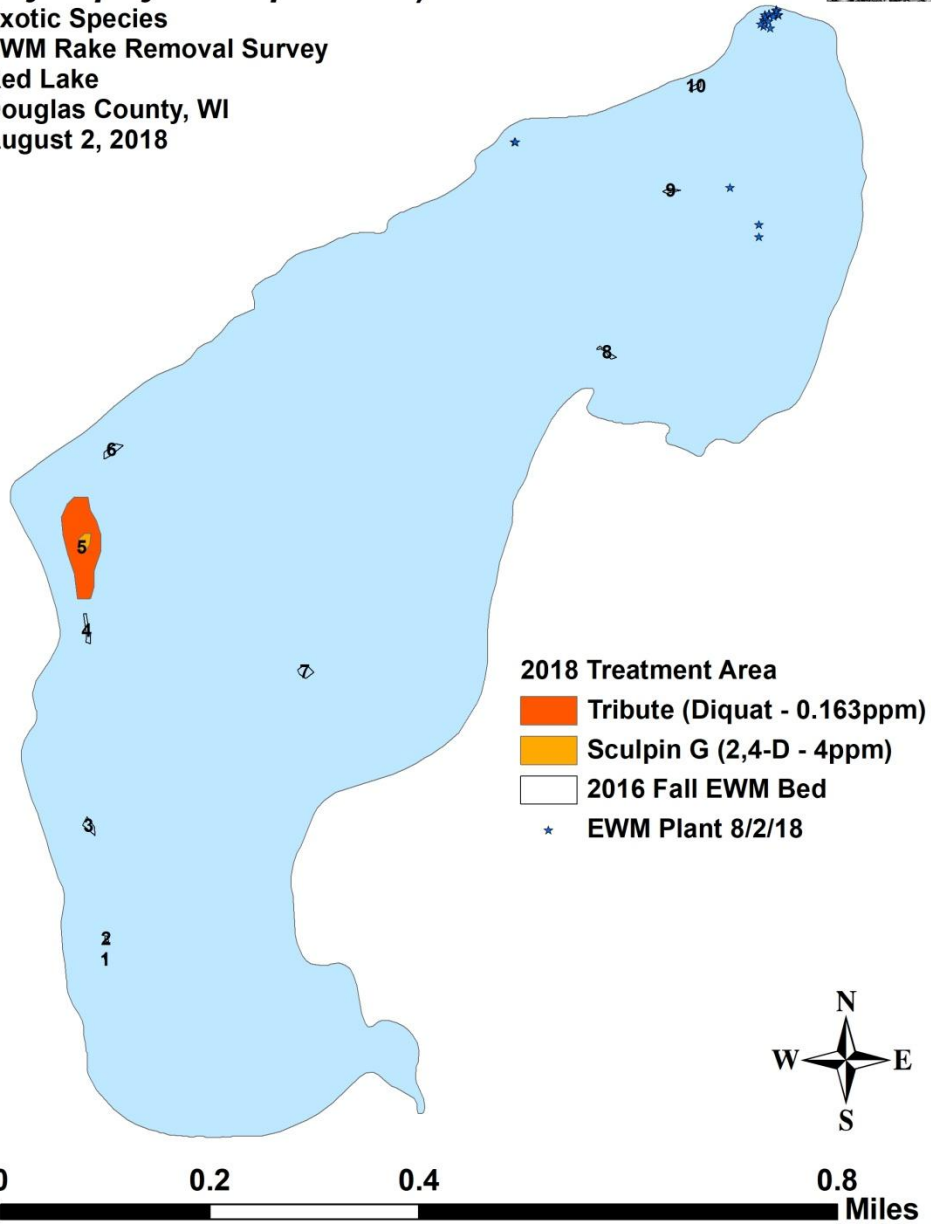
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- WDNR. [online]. 2018. Wisconsin Lake Citizen Monitoring Data for Red Lake – Douglas County. Available from <http://dnr.wi.gov/lakes/waterquality/Station.aspx?id=163383> (2018, November).
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Appendix I: August 2018 Eurasian Water-milfoil Rake Removal Map

Eurasian water-milfoil (*Myriophyllum spicatum*)

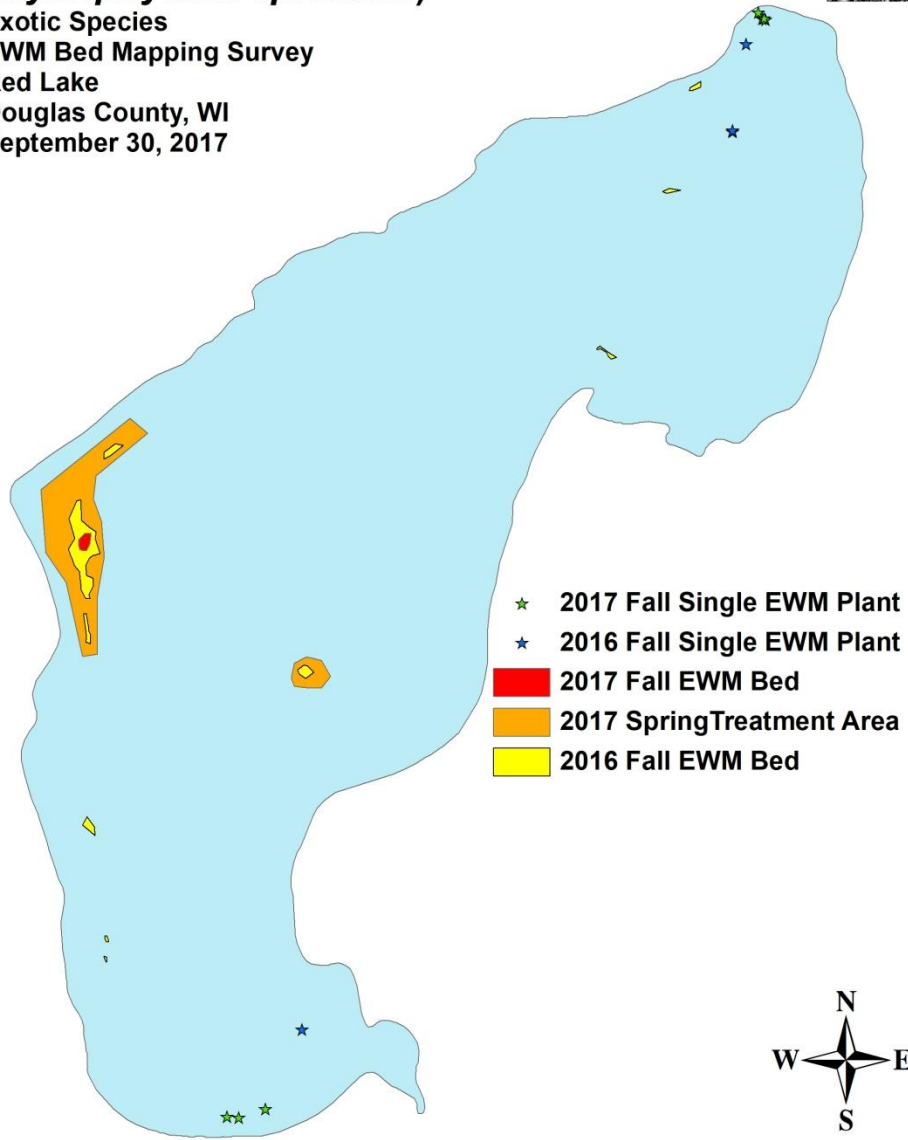
Exotic Species
EWM Rake Removal Survey
Red Lake
Douglas County, WI
August 2, 2018



Appendix II: Fall 2017 and 2018 Eurasian Water-milfoil Bed Maps

Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species
EWM Bed Mapping Survey
Red Lake
Douglas County, WI
September 30, 2017



- ★ 2017 Fall Single EWM Plant
- ★ 2016 Fall Single EWM Plant
- 2017 Fall EWM Bed
- 2017 Spring Treatment Area
- 2016 Fall EWM Bed



Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species
EWM Rake Removal Survey
Red Lake
Douglas County, WI
October 6, 2018

