LAKE EDUCATION AND PLANNING SERVICES, LLC

HORSESHOE LAKE
WASHBURN COUNTY

2021 MANAGEMENT SUMMARY REPORT
WBIC: 2470000

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HORSESHOE LAKE PROPERTY ASSOCIATION

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INTRODUCTION

This report discusses lake management activities completed by the Horseshoe Lake Property Association (HLPA) and Lake Education and Planning Services (LEAPS) throughout 2021. The following actions were completed by LEAPS to assist the HLPA in aquatic plant management and lake stewardship education.

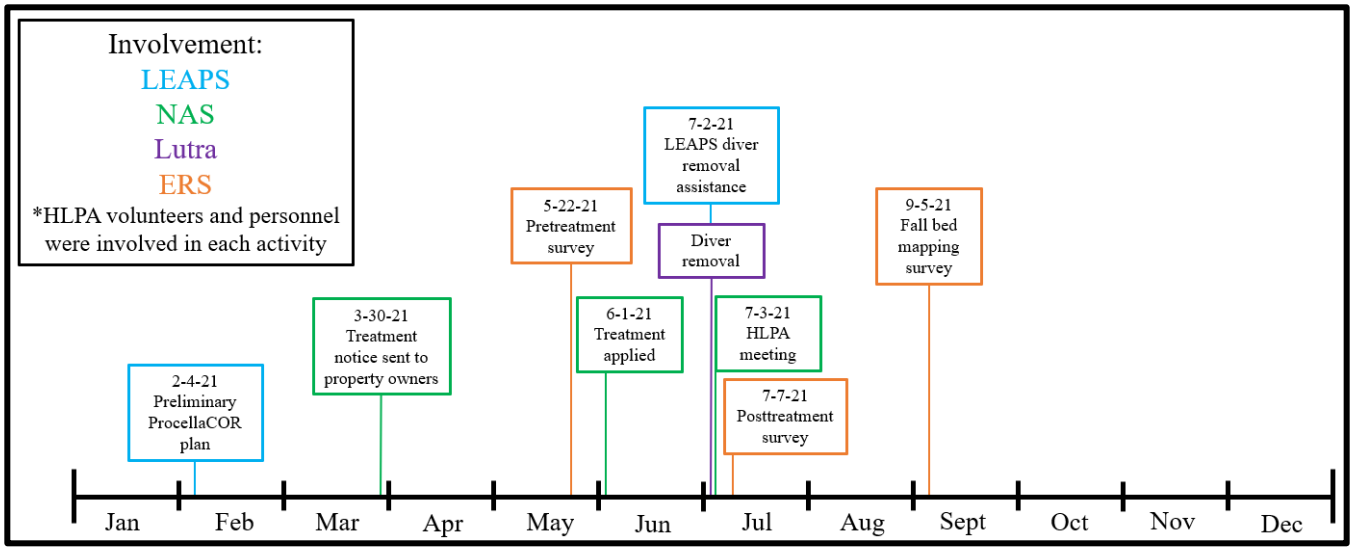

Figure 1. Timeline of 2021 Horseshoe Lake management events involving LEAPS and other hired contractors

2021 EWM MANAGEMENT

The HLPA participated in EWM management in 2021 as approved by the Wisconsin Department of Natural Resources. The proposed areas for chemical treatment were delineated from Endangered Resource Services, LLC (ERS) *Horseshoe Lake WBIC 2470000 Washburn Co 2020 EWM Shoreline and Rake Removal Survey Report* that found the northwest bay and the southwest nook of the western half of the lake to have the densest areas of EWM in late summer of 2020. After submitting a preliminary treatment plan and receiving a chemical permit early in 2021, the HLPA was approved to chemically treat the two proposed beds of EWM totaling 1.16 acres (Figure 2).

On 5/22/2021, ERS performed a pretreatment survey of the proposed treatment areas and found EWM present in both beds (Figure 3). Thus, the treatment was conducted as originally planned. On 6/1/2021, Dale Dressel of Northern Aquatic Services (NAS) applied 40.1 PDUs to the NWBay-2021 Bed and 3.2 PDUs of ProcellaCor to the smaller SWNook-2021 Bed (Table 1). Dressel reported that the water temperature was 69°F and that there was a 2-3mph wind from the west at the time of the application.

ERS performed a post-treatment survey on 7/7/2021 in order to determine the effectiveness of the ProcellaCor treatment. They found no evidence of EWM within the treatment areas or anywhere in the west basin, resulting in a significant decline in EWM total distribution (Figure 3; $p=0.04$). ERS also reported that the mean native species richness significantly increased from 1.54 species/point to 2.09 species/point ($p<0.001$); total richness remained almost the same; the Simpson's Diversity Index was unchanged; and the Floristic Quality Index declined slightly from 28.4 pretreatment to 25.6 posttreatment (Table 2).

Lutra Biological, LLC was contracted to perform a diver removal of several small stands of EWM discovered by volunteers in the east basin near the channel (Figure 2). LEAPS assisted by marking EWM plants for removal as Lutra's Noah Berg used scuba to physically remove the plants. Volunteers caught fragments of EWM and helped remove the plant material. Berg spent 3.25 hours on the water and removed approximately 50lbs (wet weight) of EWM.

ERS returned to Horseshoe on 9/5/2021 to conduct a meandering littoral survey for any surviving EWM. There was no evidence of EWM anywhere in the 2021 treatment areas or anywhere else in the west basin. Just east of the narrows where Lutra physically removed EWM, seven mature plants that were canopied or near canopied and actively fragmenting were discovered and removed (Figure 4). There was also a dense cluster of seven plants off the edge of a dock on the north shoreline that was removed (Figure 4).

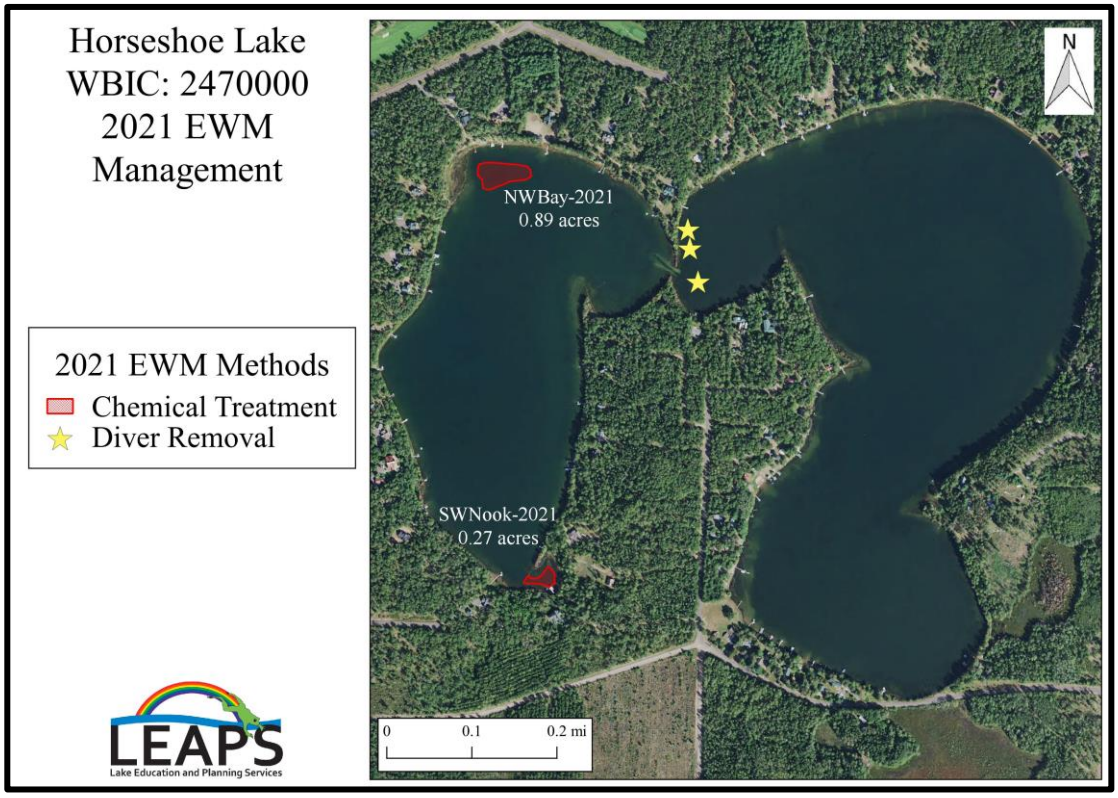

Figure 2. 2021 Horseshoe Lake EWM management

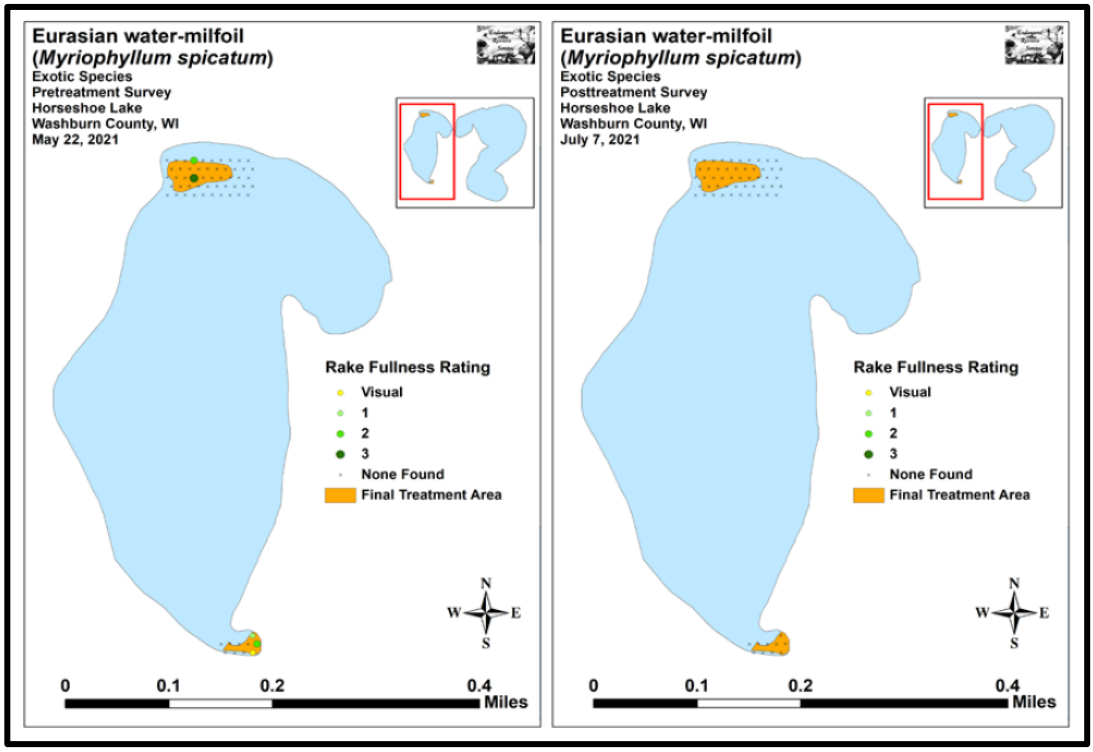

Figure 3. 2021 Horseshoe Lake EWM pre/posttreatment survey

Table 1. 2021 Horseshoe Lake EWM chemical treatment

Treatment Location	Acres	Mean Depth	Acre-feet	PDU Rate	PDU/Site	Fl oz/Site
NWBay-2021	0.89	9	8.01	5	40.1	127.0
SWNook-2021	0.27	4	1.08	3	3.2	10.3
Total	**1.16**		**9.09**		**43.3**	**137.2**

Table 2. 2021 Horseshoe Lake EWM pre/posttreatment survey summary statistics

Summary Statistics:	Pre	Post
Total number of points sampled	60	60
Total number of sites with vegetation	51	57
Total number of sites shallower than the maximum depth of plants	60	60
Freq. of occur. at sites shallower than max. depth of plants (in percent)	85.0	95.0
Simpson Diversity Index	0.80	0.80
Mean Coefficient of Conservatism	7.3	6.6
Floristic Quality Index	28.4	25.6
Maximum depth of plants (ft)	10.5	10.5
Mean depth of plants (ft)	8.9	8.4
Median depth of plants (ft)	9.5	9.0
Average number of all species per site (shallower than max depth)	1.35	1.98
Average number of all species per site (veg. sites only)	1.59	2.09
Average number of native species per site (shallower than max depth)	1.28	1.98
Average number of native species per site (sites with native veg. only)	1.54	2.09
Species Richness	16	15
Mean Rake Fullness (veg. sites only)	1.63	1.70

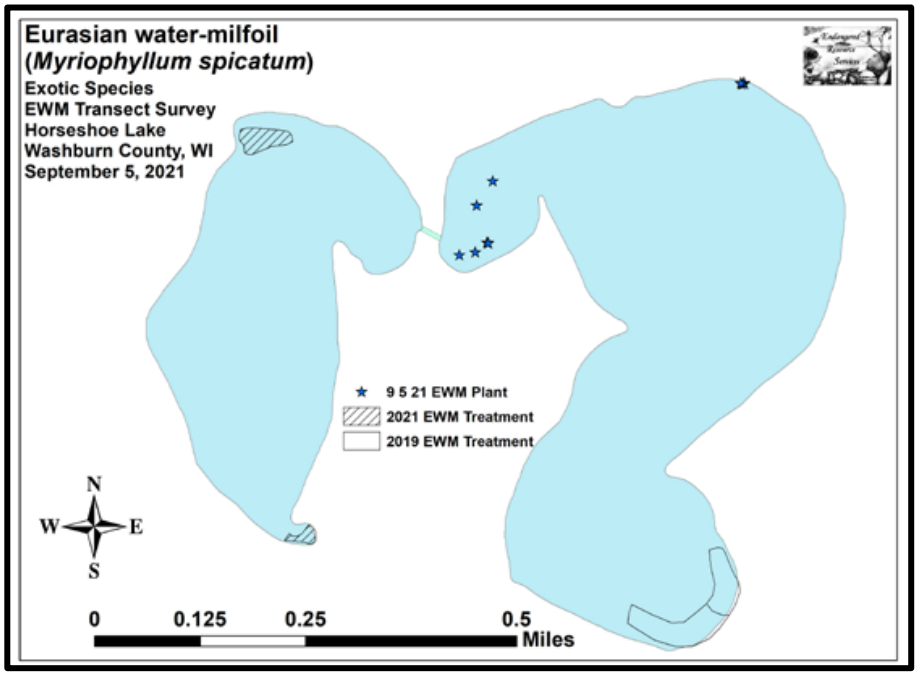

Figure 4. 2021 Horseshoe meandering littoral EWM survey and rake removal results

Water quality data was collected by volunteers in 2021 from the deep hole site (Station ID: 033161) and the west basin (Station ID: 10042010) in Horseshoe Lake. Total phosphorus (TP) samples were collected on two dates at the deep hole site and averaged 12.8 ug/L (Table 4). Chlorophyll samples were also collected twice throughout the summer at the deep hole site and averaged 3.1 ug/L (Table 4). Secchi disk readings were taken twice at the deep hole site and six times in the west basin and averaged 13.8 and 13.0 feet, respectively (Table 4; 5). These results gave the lake an average Trophic Status Index (TSI) score of 41.9, placing the lake in the mesotrophic range, which is consistent with the results of previous years (Figure 5). Mesotrophic lakes are characterized by moderate water clarity with occasional oxygen depletion in the bottom waters. These conditions accurately describe Horseshoe Lake in 2021.

LEAPS supports the collection of these data and uses it to inform management decisions and educate HLPA members and lake users about the lake.

Table 3. 2021 Horseshoe Lake water quality data Deep Hole (Station ID: 10042003)

Sample Date	TP (ug/L)	Chl-*a* (ug/L)	Secchi (ft)	
6/22/2021	-	-	14	
7/02/2021	-	-	13.5	
7/18/2021	15.5	3.2	-	
8/15/2021	10.0	3.1	-	
Average	**12.8**	**3.1**	**13.8**	
Average TSI	**47.5**	**43.5**	**39.5**	**= 43.5**

Table 4. 2021 Horseshoe Lake water quality data West Basin (Station ID: 10042010)

Sample Date	Secchi (ft)
4/18/2021	15
6/08/2021	16
6/22/2021	15
7/02/2021	13
7/19/2021	10
8/15/2021	9
Average	**13.0**
Average TSI	**40.3**

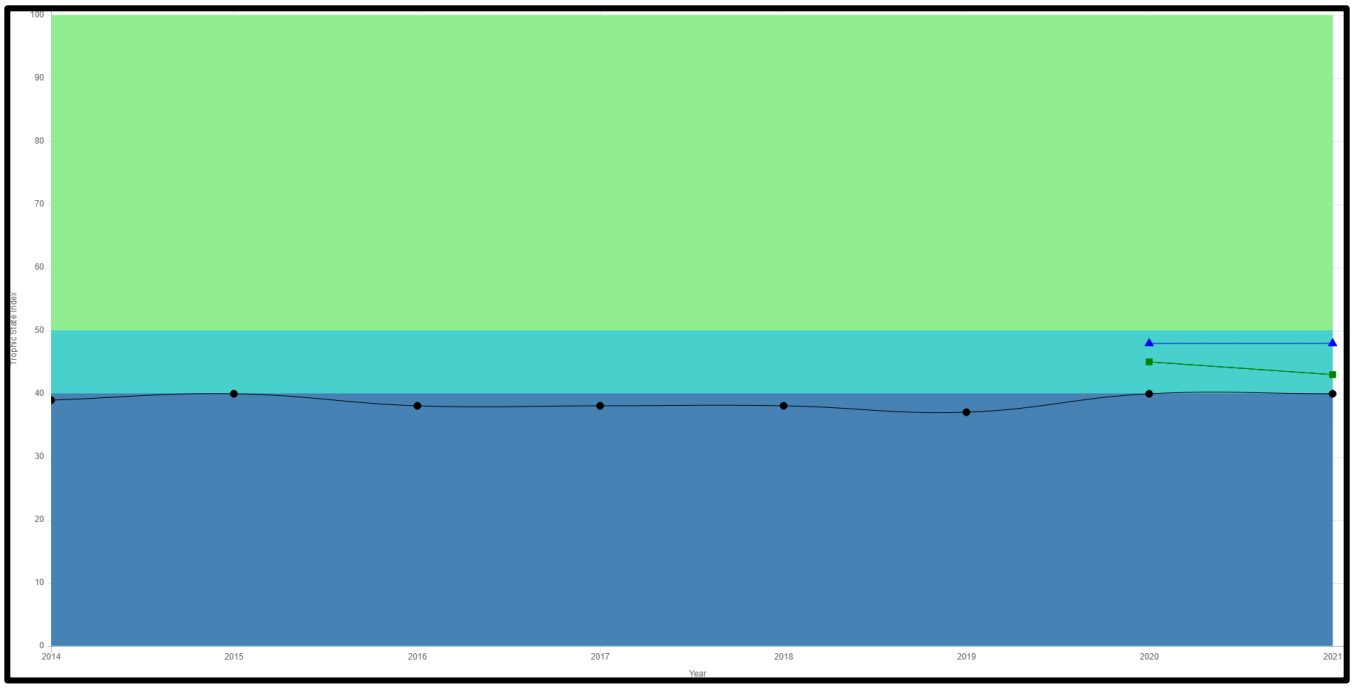

Figure 5. 2014-2021 Horseshoe Lake Deep Hole summer (July and August) TSI

2021 AQUATIC PLANT MANAGEMENT PLAN

LEAPS updated the Aquatic Plant Management Plan (APMP) for Horseshoe Lake as part of the 2020-21 Horseshoe Lake Updated APM Plan and EWM Planning Grant (#AEPP61320.1). LEAPS sent a draft of the plan for approval to the HLPA board on 11/7/2021. After review from the board, the draft plan was uploaded to the HLPA webpage (http://www.horseshoelake.org/home.asp) on 11/15/2021 for public comment as part of the public input process. LEAPS also assisted the HLPA in asking for an extension on the grant while waiting for, and incorporating, WDNR and public feedback. The extension was approved, allowing the HLPA and LEAPS to finalize the plan in 2022.

2021 AIS MONITORING

EWM was first discovered in Horseshoe Lake in 2011. Since then, volunteers have performed aquatic invasive species (AIS) monitoring on a regular basis. No other AIS are verified on the lake, but purple loosestrife, Japanese knotweed, and several other species are known to be in the immediate area. To stay ahead of the current infestations, as well as any other future AIS concerns, monitoring and education will continue in the future to prevent new introductions and limit their spread should they occur. LEAPS promotes and provides AIS education through events geared towards education and by attending HLPA meetings.

2022 EWM PRELIMINARY MANAGEMENT PLANNING

Following the 2021 treatment, EWM again occurs at very low levels in Horseshoe Lake. Although the plants found and removed during the September survey in 2021 were few in number, their proximity to the channel in an area that gets regular boat traffic might make a very limited chemical treatment in 2022 a consideration.

A 2022 preliminary chemical treatment plan for Horseshoe Lake has already been completed. It includes two areas, one on either side of the bay that leads from the east basin to the west basin. Scuba diver removal of EWM in 2021 was extensive in these two areas suggesting greater numbers of plants than what were seen at the surface during the final EWM survey of the lake in September 2021. The two areas combined cover 1.44 acres. Both areas will be chemically treated with ProcellaCOR unless WDNR permitting does not allow it, or if the resources available to the HLPA are not adequate to cover the cost. If this happens, modifications to the treatment proposal will be made, and/or physical removal, including diver removal will continue in 2022. All management actions are and will follow guidelines in the new APM Plan currently up for review by the WDNR.

The HLPA was not eligible for grant funds to support chemical treatment when the 2021 grant cycle was commencing. As such, no AIS population control grant application was submitted. An AIS population control grant to support EWM management planning and implementation will be submitted during the 2022 grant cycle.