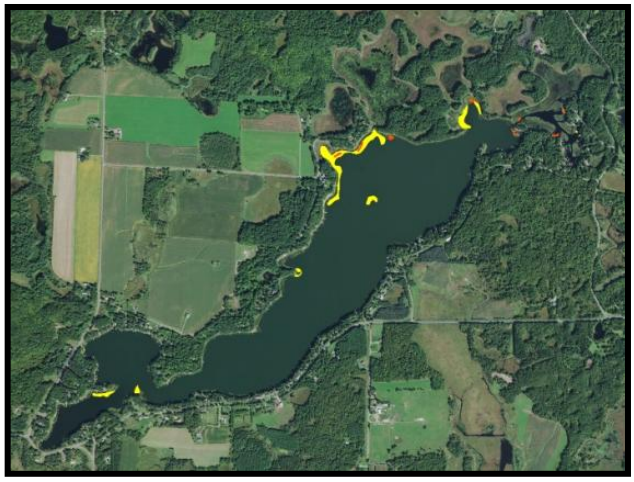
Hybrid Eurasian X Northern water-milfoil (*Myriophyllum spicatum* X *Myriophyllum sibiricum*) Late Summer Bed Mapping Survey

Horseshoe Lake - WBIC: 2630100

Polk/Barron Counties, Wisconsin

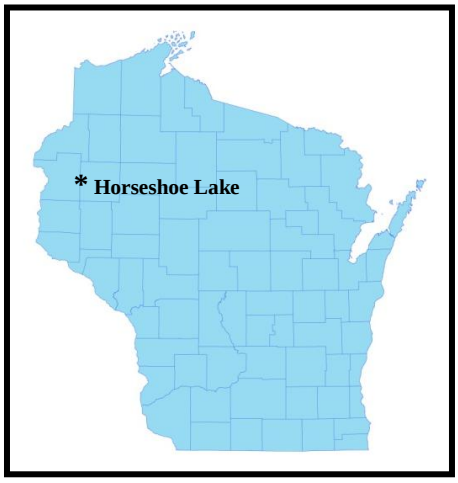
Hybrid Water-milfoil (C. Nackerud)



Fall 2018 (yellow) and 2019 (orange) HWM Bed Map

Project Initiated by:

Horseshoe Lake Improvement Association, Lake Education and Planning Services, LLC, and the Wisconsin Department of Natural Resources



Late Summer 2020 (red) Hybrid Water-milfoil High Density Areas

Survey Conducted by and Report Prepared by:

Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
August 24-25, 2020

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INTRODUCTION:

Horseshoe Lake (WBIC 2630100) is a 398 acre mesotrophic stratified seepage lake located on the border of Polk and Barron Counties in northwest Wisconsin in the Towns of Beaver/Almena (T34N R14/15W). The lake reaches a maximum depth of 57ft in the central basin and has an average depth of approximately 25ft under normal water conditions. The bottom is predominately sand and rock on the margins of the central basin before transitioning to nutrient-poor sandy muck with increased depth. Nutrient-rich organic muck occurs in the lake's sheltered bays on the northeast end (Holt et al. 1968). From 1995-2020, mean summer Secchi readings have averaged 8.0ft (WDNR 2020). This fair to good water clarity produced a littoral zone that extended to at least 18.5ft in 2020.

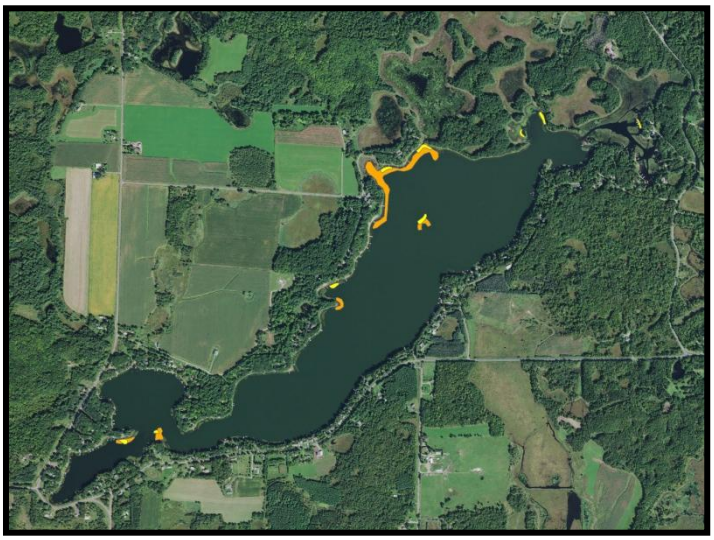

Figure 1: Aerial of June 2018 (Yellow) and 2019 (Orange) HWM Treatment Areas

BACKGROUND AND STUDY RATIONALE:

In 2006, the Wisconsin Department of Natural Resources identified the presence of Hybrid water-milfoil (HWM) – a cross between Northern and Eurasian water-milfoils (*Myriophyllum sibiricum* X *Myriophyllum spicatum*) in the lake, and the Horseshoe Lake Improvement Association (HLIA) has been actively working to control this invasive exotic species with herbicides and manual removal since 2008. Following analysis of the 2017 and 2018 fall HWM bed mapping surveys, the HLIA, under the direction of D. Blumer - Lake Education and Planning Services, LLC (LEAPS), decided to chemically treat nine areas totaling 1.83 acres (0.46% of the lake's surface area) in 2018 and five areas totaling 7.10 acres (1.78% of the lake's surface area) in 2019 with 2, 4-D (Figure 1).

The LEAPS fall 2019 bed mapping survey found eight HWM beds that covered 1.04 acres (0.26% surface area). Due to this small total acreage, the HLIA, LEAPS, and the WDNR decided NOT to treat HWM in 2020. However, in order to see how HWM responded after a year without active management, we were asked to conduct a bed mapping survey on August 24-25, 2020 to determine where HWM control might be considered in 2021. This report is the summary analysis of that field survey.

METHODS:

Late Summer Hybrid Water-milfoil Bed Mapping Survey:

During the bed mapping survey, we searched the lake's visible littoral zone and mapped all known beds of Hybrid water-milfoil. A "bed" was determined to be any area where we visually estimated that HWM made up >50% of the area's plants and was generally continuous with clearly defined borders. After we located a bed, we recorded the mean depth, estimated the rake range and mean rake fullness of HWM (Figure 2), and noted whether the HWM was canopied and likely to interfere with watercraft navigation. We then motored around the perimeter of the area and took GPS coordinates at regular intervals. After uploading these coordinates, we used the WDNR's Forestry Tool's Extension to ArcGIS 9.3.1 to generate bed shapefiles and determine the acreage of the beds to the nearest hundredth of an acre. We also GPS marked additional individual HWM plants that occurred outside of the beds as they were generally few in number. If these plants were isolated, we did our best to rake remove them.

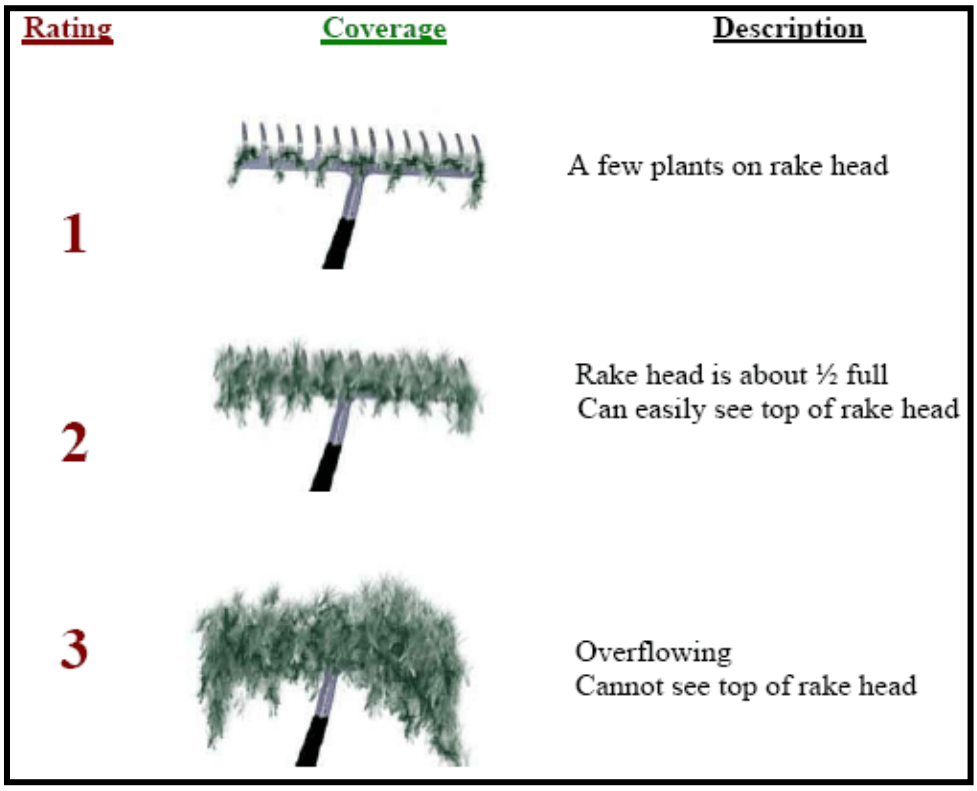

Figure 2: Rake Fullness Ratings

RESULTS AND DISCUSSION:

Treatment Areas:

In June of 2018, the HLIA treated nine areas covering 1.83 acres with granular 2,4-D (Sculpin G) at a target rate of 4ppm (Figure 3) (Appendix I). Following an uptick in HWM documented by the LEAPS fall 2018 survey, the 2019 treatment of liquid and granular 2,4-D (Shredder Amine/Sculpin G – target rate of 2.5-4ppm) was expanded to five areas totaling 7.10 acres (Table 1). No treatment occurred anywhere on the lake in 2020.

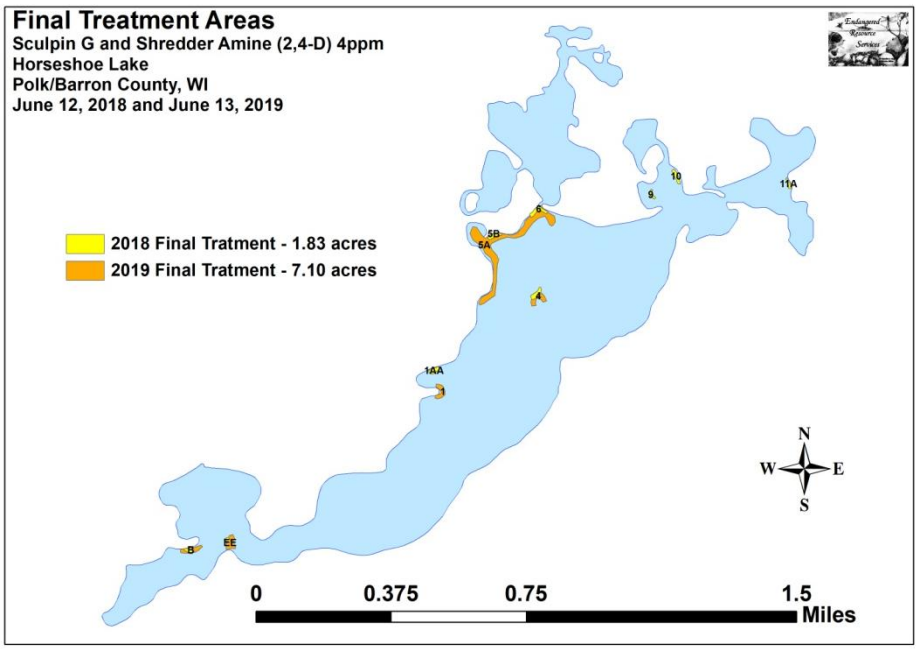

Figure 3: 2018 and 2019 Final HWM Treatment Areas

Table 1: HWM Treatment Summary
Horseshoe Lake – June 12, 2018 and June 13, 2019

Area	2018 Final Acreage	2019 Final Acreage	Treatment Rate
B	0.20	0.47	2,4-D - 4ppm
EE	0.09	0.49	2,4-D - 4ppm
1	0	0.40	2,4-D - 4ppm
1AA	0.21	0	2,4-D - 4ppm
4	0.28	0.52	2,4-D - 4ppm
5A	0	5.23	2,4-D - 4ppm
5B	0.24	0	2,4-D - 4ppm
6	0.34	0	2,4-D - 4ppm
9	0.13	0	2,4-D - 4ppm
10	0.23	0	2,4-D - 4ppm
11A	0.12	0	2,4-D - 4ppm
Total Acres	**1.83**	**7.10**	

Late Summer Hybrid Water-milfoil Bed Mapping Survey:

During the August 24-25, 2020 survey, we found we could see down in the water column approximately 7-8ft making it possible to view the majority of the rooted littoral zone. As in the past, we found few areas that met the true definition of a "bed" where HWM was canopied, continuous, and dominated the plant community; rather, most mapped areas were better defined as "High Density Areas" where HWM was canopied and regular, but not a solid mat or completely excluding native plant species. Ultimately, even using this expanded criteria, we mapped just five areas that totaled 0.09 acre (0.02% of the lake's surface area). They ranged in size from 0.04 acre (HDA 6C) to only 0.006 acre (HDA 5B). This was a 0.95 acre decline (**-91.35%**) from the 1.04 acres mapped in 2019 (Table 2). It was also the lowest total since 2013 (Table 3). Outside of these areas, we located an additional 18 HWM plants most of which we were able to cleanly rake remove (Figure 4) (Appendix II).

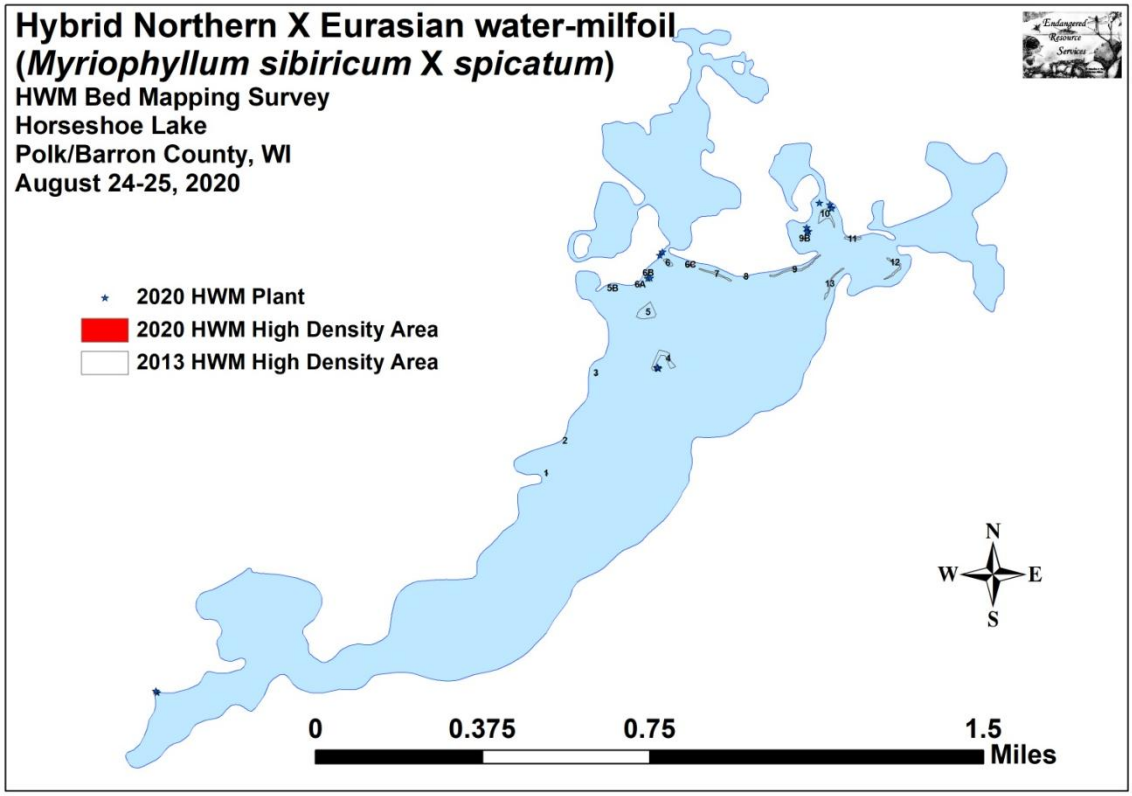

Figure 4: Late Summer 2020 HWM High Density Areas

Table 2: Late Summer Hybrid Water-milfoil High Density Areas Mapping Summary
Horseshoe Lake, Polk/Barron Counties
August 24-25, 2020

HDA	2020 Area in Acres	2019 Area in Acres	2020 Change in Acreage	Rake Range; Mean Rake Fullness	Depth Range; Mean Depth	Navigation Impairment	2020 Field Notes
AA	0	0	0	-	-	None	No HWM found.
A	0	0	0	<<<1	2-4; 3	None	2 HWM plants rake removed at the boat landing.
B	0	0	0	-	-	None	No HWM found.
C	0	0	0	-	-	None	No HWM found.
D	0	0	0	-	-	None	No HWM found.
E	0	0	0	-	-	None	No HWM found.
F	0	0	0	-	-	None	No HWM found.
FF	0	0	0	-	-	None	No HWM found.
G	0	0	0	-	-	None	No HWM found.
1	0	0	0	-	-	None	No HWM found.
1A	0	0	0	-	-	None	No HWM found.
1AA	0	0	0	-	-	None	No HWM found.
2	0	0	0	-	-	None	No HWM found.
3 and 3B	0	0	0	-	-	None	No HWM found.
4	0	0	0	<<<1	-	None	5 HWM plants rake removed from the rock island
5	0	0	0	-	-	None	No HWM found.
5A and 5B	<0.01	0.16	-0.16	<<1-1; <1	4-6; 5	None	Open micro-cluster of young plants
6 (A, B, C)	0.07	0.33	-0.26	<1-3; 2	4-6; 5	Minor	Several small but dense canopied micro-clusters
7	0	0	0	-	-	None	No HWM found.
8	0	0	0	-	-	None	No HWM found.
9	0	0	0	-	-	None	No HWM found.
9B	<0.01	0	<0.01	<1-1; <1	4-5; 5	None	Micro-cluster of mature plants – rake removed
10	0	0.17	-0.17	<<<1	4-5; 5	None	4 HWM plants rake removed
11	0	0	0	-	-	None	No HWM found.
11AA-C	0	0.27	-0.27	-	-	None	No HWM found.
12	0	0.11	-0.11	-	-	None	No HWM found.
13	0	0	0	-	-	None	No HWM found.
Total Acres	**0.09**	**1.04**	**-0.95**				

Table 3: Historical Late Summer/Fall Hybrid Water-milfoil High Density Areas Mapping Summary Horseshoe Lake, Polk/Barron Counties – 2013-2020

HDA	2020 Area in Acres	2019 Area in Acres	2018 Area in Acres	2017 Area in Acres	2016 Area in Acres	2015 Area in Acres	2014 Area in Acres	2013 Area in Acres
AA	0	0	0	<0.01	0.07	0	0	0
A	0	0	0	0	0.12	0	0.13	0
B	0	0	0.56	<0.01	0	0	0.17	0
C	0	0	0.02	0	0	0	<0.01	0
D	0	0	0	0	0	0	0.04	0
E and EE	0	0	0.27	0	0	0	0.03	0
F	0	0	0	0	0	0	0.01	0
FF	0	0	0	0.09	0	0	0	0
G	0	0	0	0	0	0	<0.01	0
1	0	0	0.25	0.05	0.03	0	<0.01	0.01
1A	0	0	0	0.16	0	0	0	0
1AA	0	0	0	0.04	0	0	0	0
2	0	0	0	0	0	0	0	0.01
3 and 3B	0	0	0	0.35	0.03	0	0.01	0.01
4	0	0	0.51	0.29	0.12	0	0	0.48
5	0	0	Merged	0	0	0	0	0.65
5A and 5B	<0.01	0.16	4.82	0.35	0.12	0	0	0
6 (A, B, C)	0.07	0.33	Merged	0.24	1.12	0.24	0.29	0.13
7	0	0	0	0	0	0	0	0.15
8	0	0	0	0	0	0	0	0.01
9	0	0	0	0	0	0	0.01	0.26
9B	<0.01	0	1.06	0	0.25	0	0.16	0
10	0	0.17	0.33	0.02	0.06	0.02	0.25	0.39
11	0	0	0	0	<0.01	0	0	0.11
11AA-C	0	0.27	0.07	0.01	0	0	0	0
12	0	0.11	0	0	0	0	0	0.17
13	0	0	0	0	0	0	<0.01	0.15
Total Acres	**0.09**	**1.04**	**7.88**	**1.60**	**1.93**	**0.26**	**1.13**	**2.54**

Descriptions of Current and Former HWM Beds/High Density Areas:

West End of the Lake: We found and rake removed two Hybrid water-milfoil plants immediately west of the public boat landing (Figure 5) (Appendix II). Other than these, we saw no evidence of rooted HWM plants or floating fragments anywhere else in the west end of the lake during this survey or during the mid-August point-intercept survey.

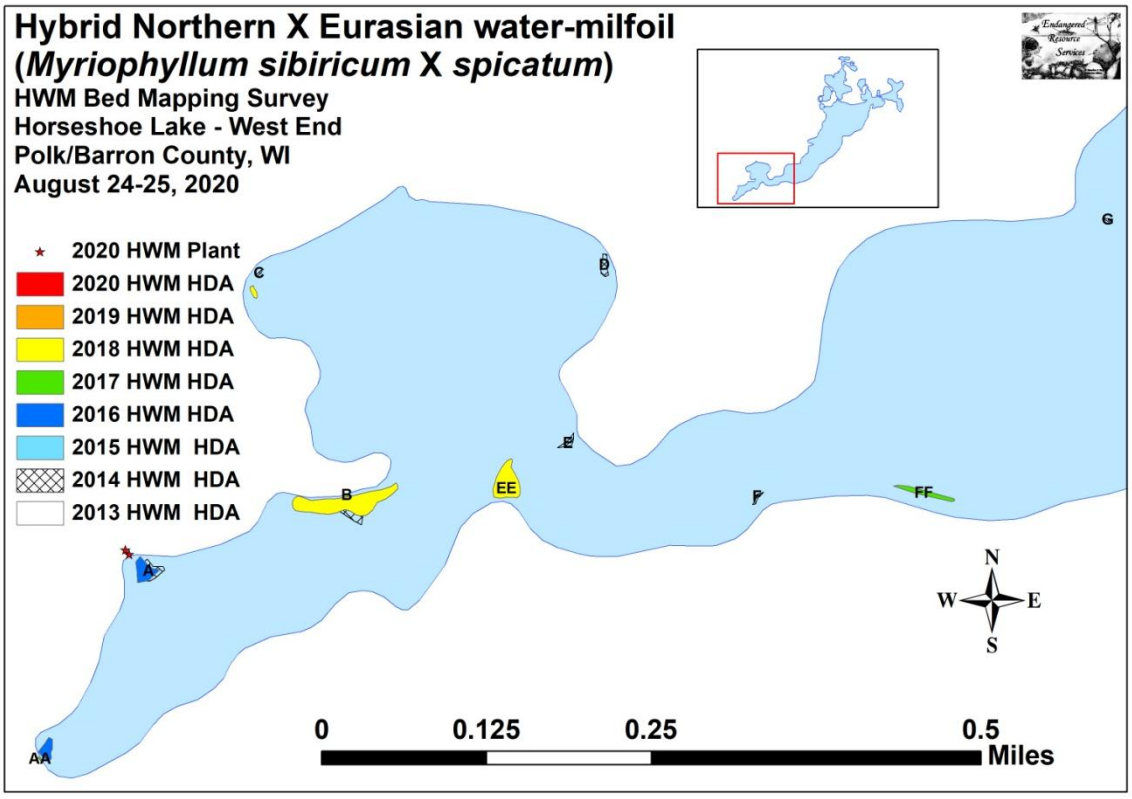

Figure 5: Late Summer 2020 HWM – West End

East End of the Lake: We mapped five microbeds/high density areas along the shorelines near the Mud Lake outlet and in the bay northwest of Buckwald Bay (Figure 6) (Appendix II). Outside these areas, we marked 16 additional plants most of which we were able to cleanly rake remove.

HDAs 1-3, 5, 5A, and 7-9 - We found no evidence of HWM anywhere in these historic areas.

HDA 4 – A small cluster of nearly canopied plants occurred on the west side of the "rock island". Although we rake removed each of them, their roots were impacted in the gravel which likely means some stems will survive. Assuming manual removal will occur in 2021, this area should be a priority to search as plants in this location appear to "seed" the bays to the north and west with fragments.

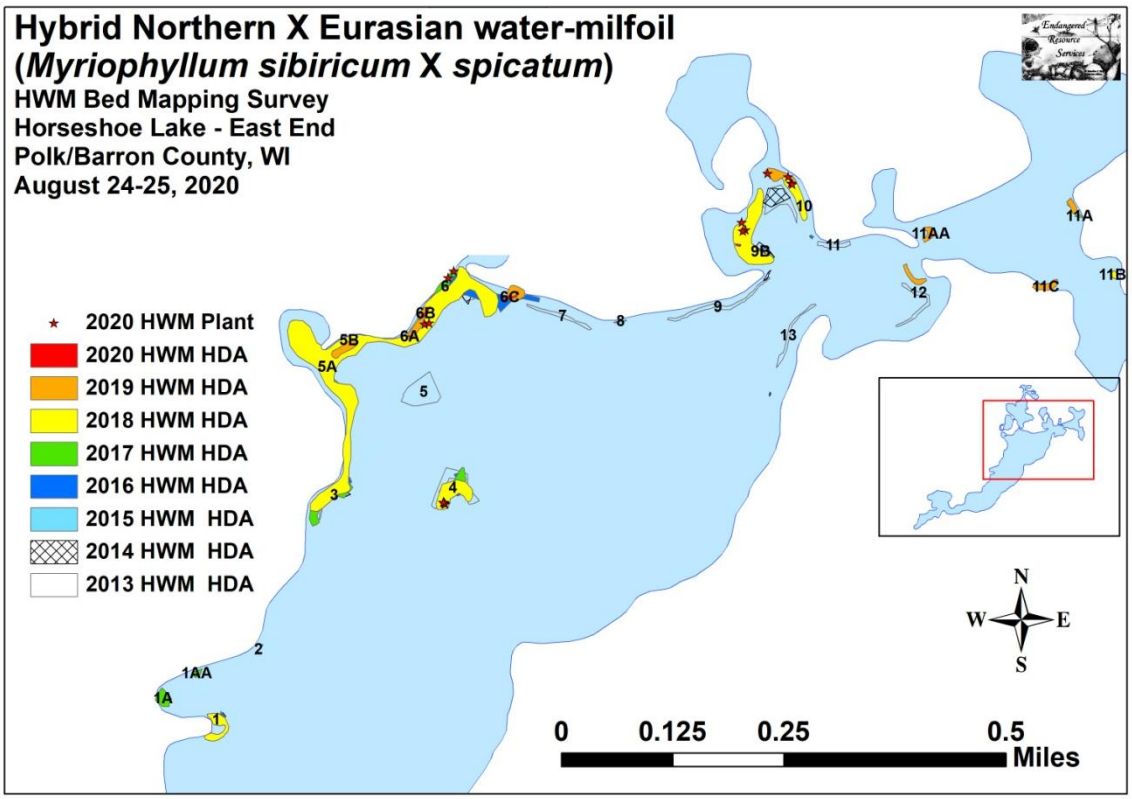

Figure 6: Late Summer 2020 HWM – East End

HDA 5B – This HDA consisted of little more than regular scattered plants in an open micro-cluster. Most were single-stemmed and appeared to be newly established.

HDAs 6A, 6B, and 6C – Areas 6A and 6B were both small but dense micro-clusters of perhaps 50 mature plants each. Situated in front of residences near the Mud Lake outlet, they were canopied or near canopy, but likely not more than a minor impairment. Area 6C was little more than a scattering of young single-stemmed plants – many of which we were able to rake remove.

HDA 9B and 10 – We found a few handfuls of HWM plants scattered around the bay northwest of the channel to Buckwald Bay. Although we were able to rake remove most of them, there will likely be more established in this location by spring as we noticed several floating fragments in the area.

HDAs 11, 11AA-C (Buckwald Bay), and 12 – We saw no evidence of HWM along the shoreline northwest of Buckwald Bay's channel, in the bay itself, or in the bay immediately to the southwest of the channel.

HDA 13 and the south shoreline – We saw no evidence of HWM anywhere along the lake's south shoreline.

LITERATURE CITED

Holt, C., S. Busch, C., R. Kerr, and S. Johannes. [online]. 1968. Horseshoe Lake Map. Available from http://dnr.wi.gov/lakes/maps/DNR/2630100a.pdf (2020, November).

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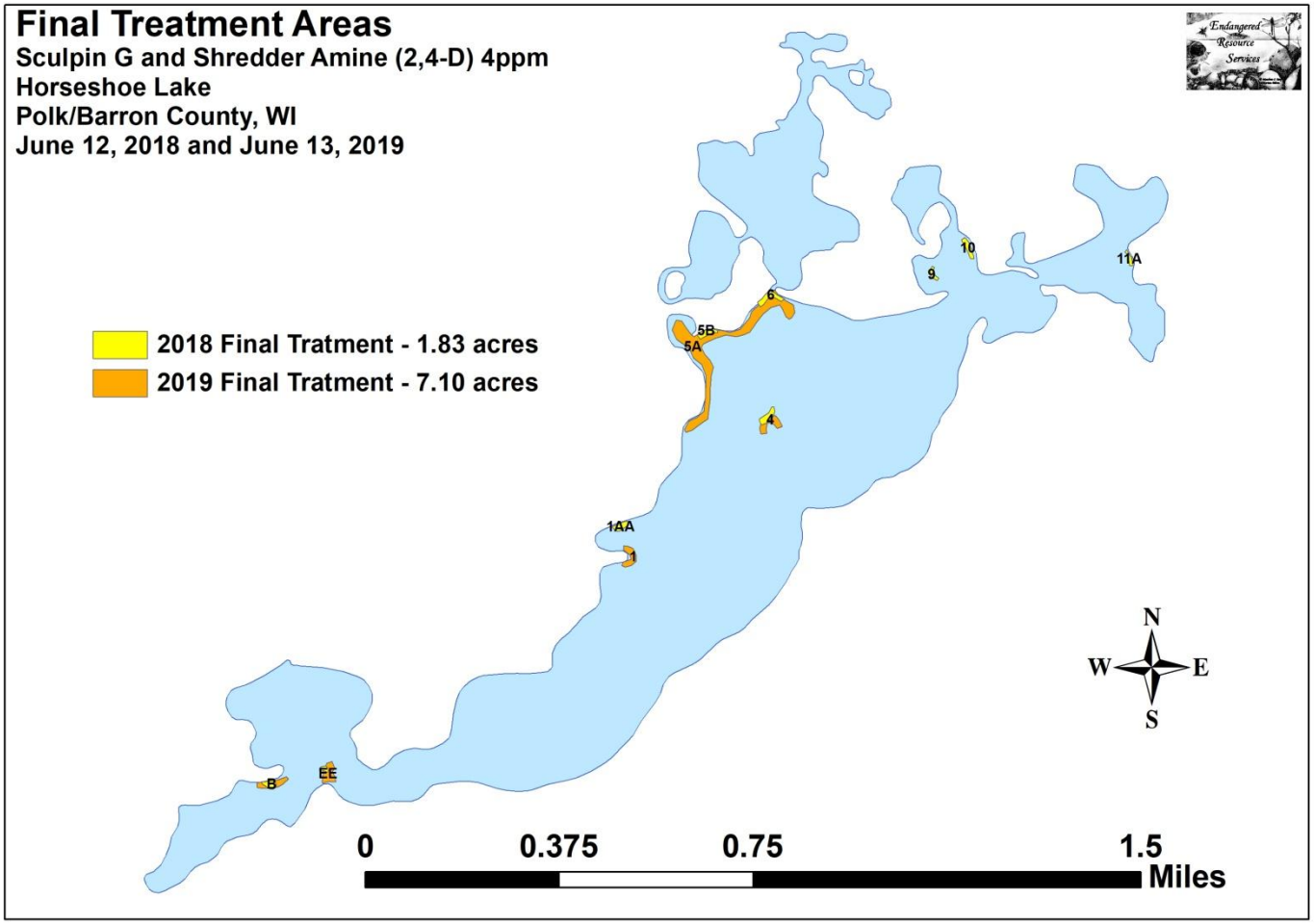
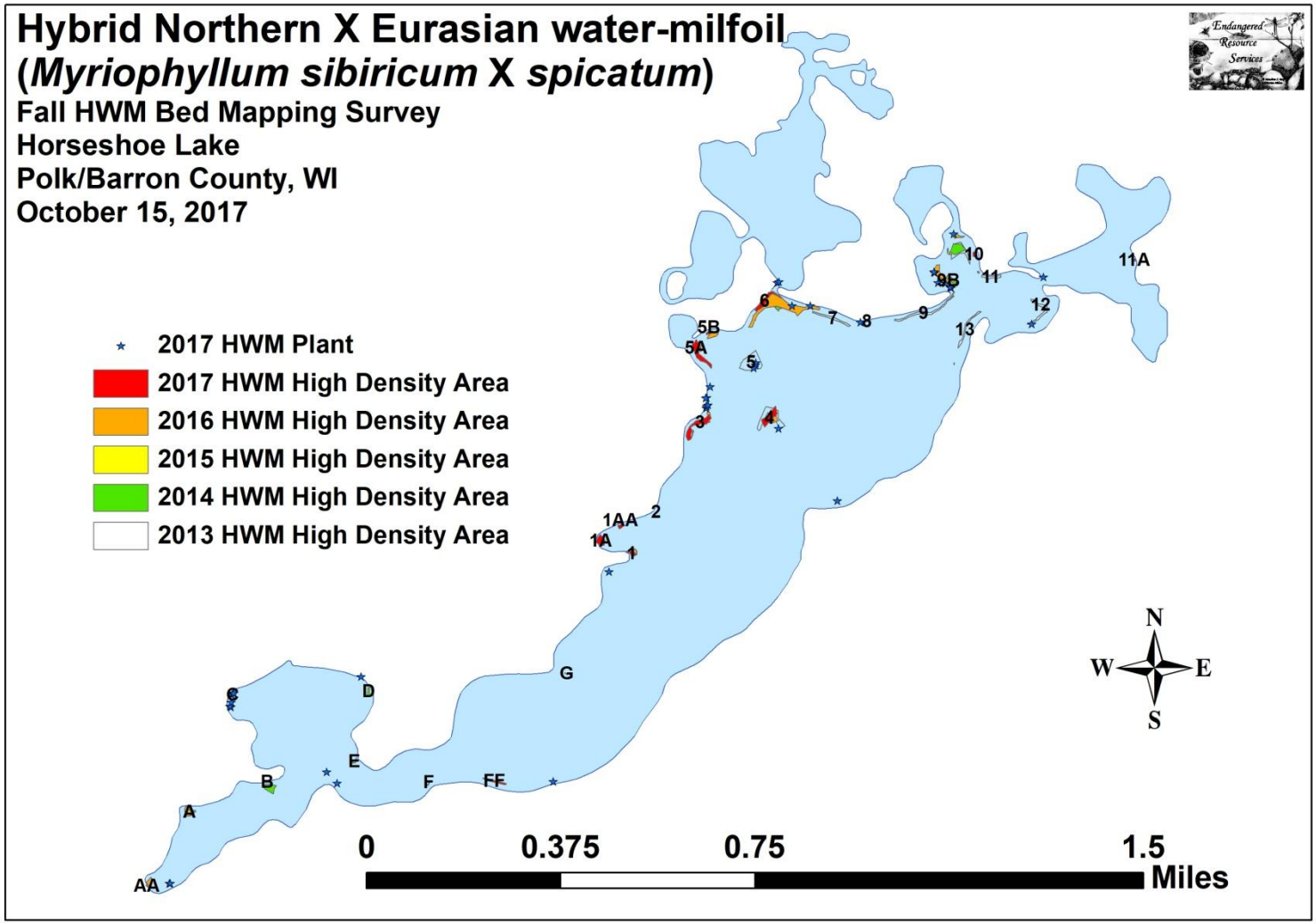
Appendix I: 2018 and 2019 Hybrid Water-milfoil Treatment Areas


Final Treatment Areas
Sculpin G and Shredder Amine (2,4-D) 4ppm
Horseshoe Lake
Polk/Barron County, WI
June 12, 2018 and June 13, 2019
Endangered Resource Services
2018 Final Tratment - 1.83 acres
2019 Final Tratment - 7.10 acres
10
11A
9
6
5B
5A
4
1AA
1
B
EE
N
W
E
S
0
0.375
0.75
1.5
Miles

Appendix II: Fall 2017 and 2020 HWM Survey Maps


Hybrid Northern X Eurasian water-milfoil
(Myriophyllum sibiricum X spicatum)
Fall HWM Bed Mapping Survey
Horseshoe Lake
Polk/Barron County, WI
October 15, 2017
Endangered Resource Services
2017 HWM Plant
2017 HWM High Density Area
2016 HWM High Density Area
2015 HWM High Density Area
2014 HWM High Density Area
2013 HWM High Density Area
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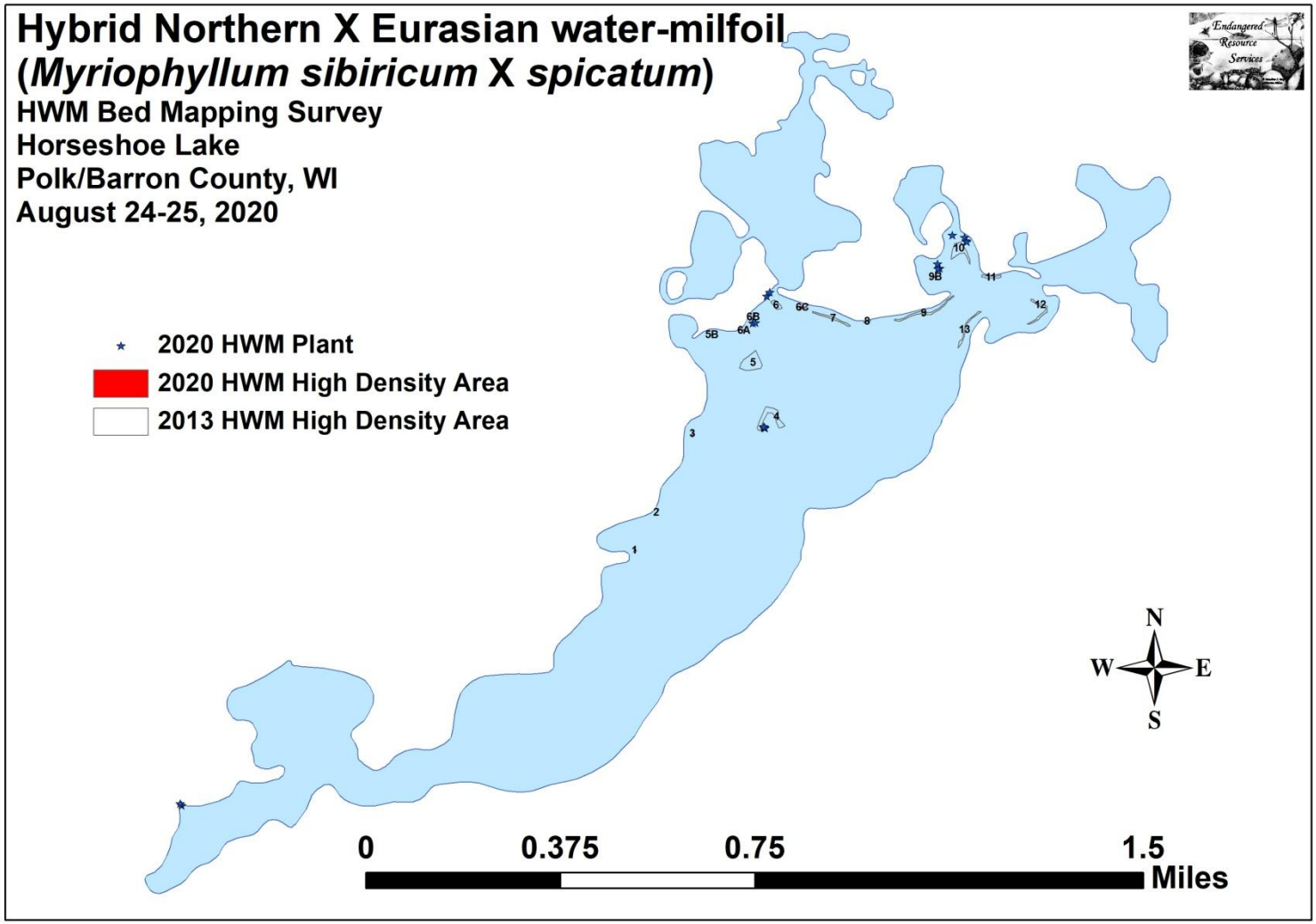
Miles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Polk/Barron County, WI
August 24-25, 2020
2020 HWM Plant
2020 HWM High Density Area
2013 HWM High Density Area
Endangered Resource Services
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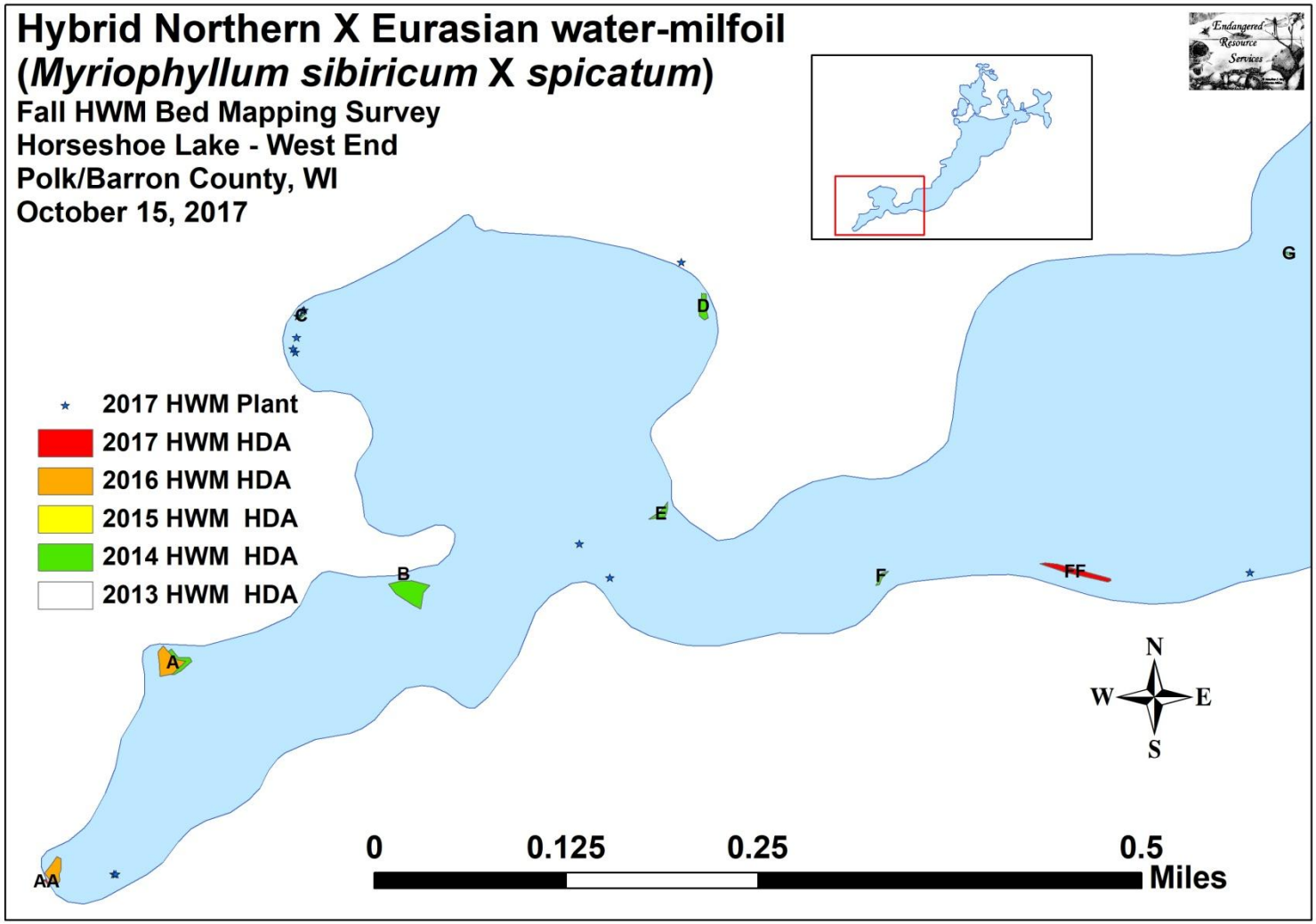
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2016 HWM HDA
2015 HWM HDA
2014 HWM HDA
2013 HWM HDA
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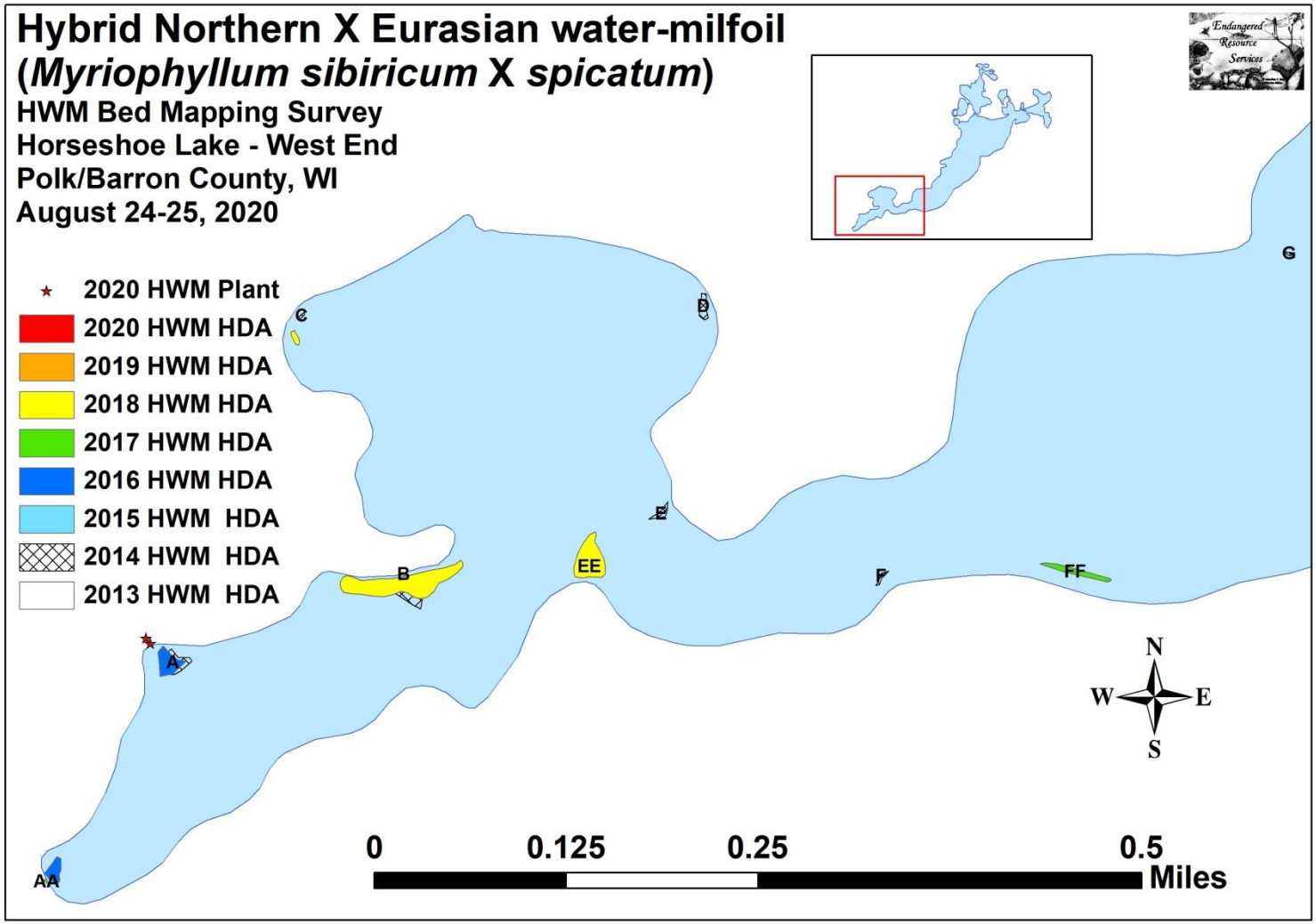
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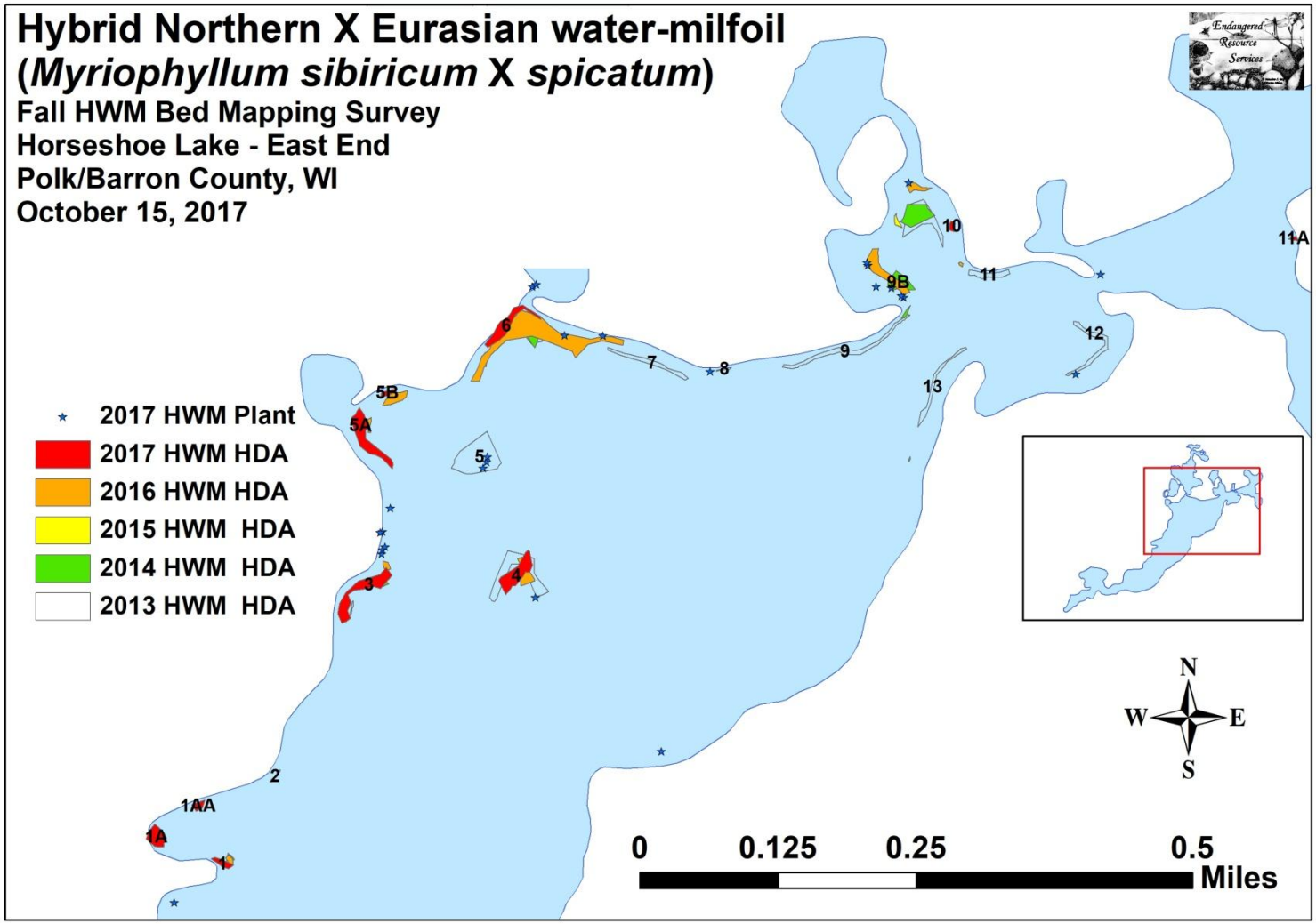
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2017 HWM HDA
2016 HWM HDA
2015 HWM HDA
2014 HWM HDA
2013 HWM HDA
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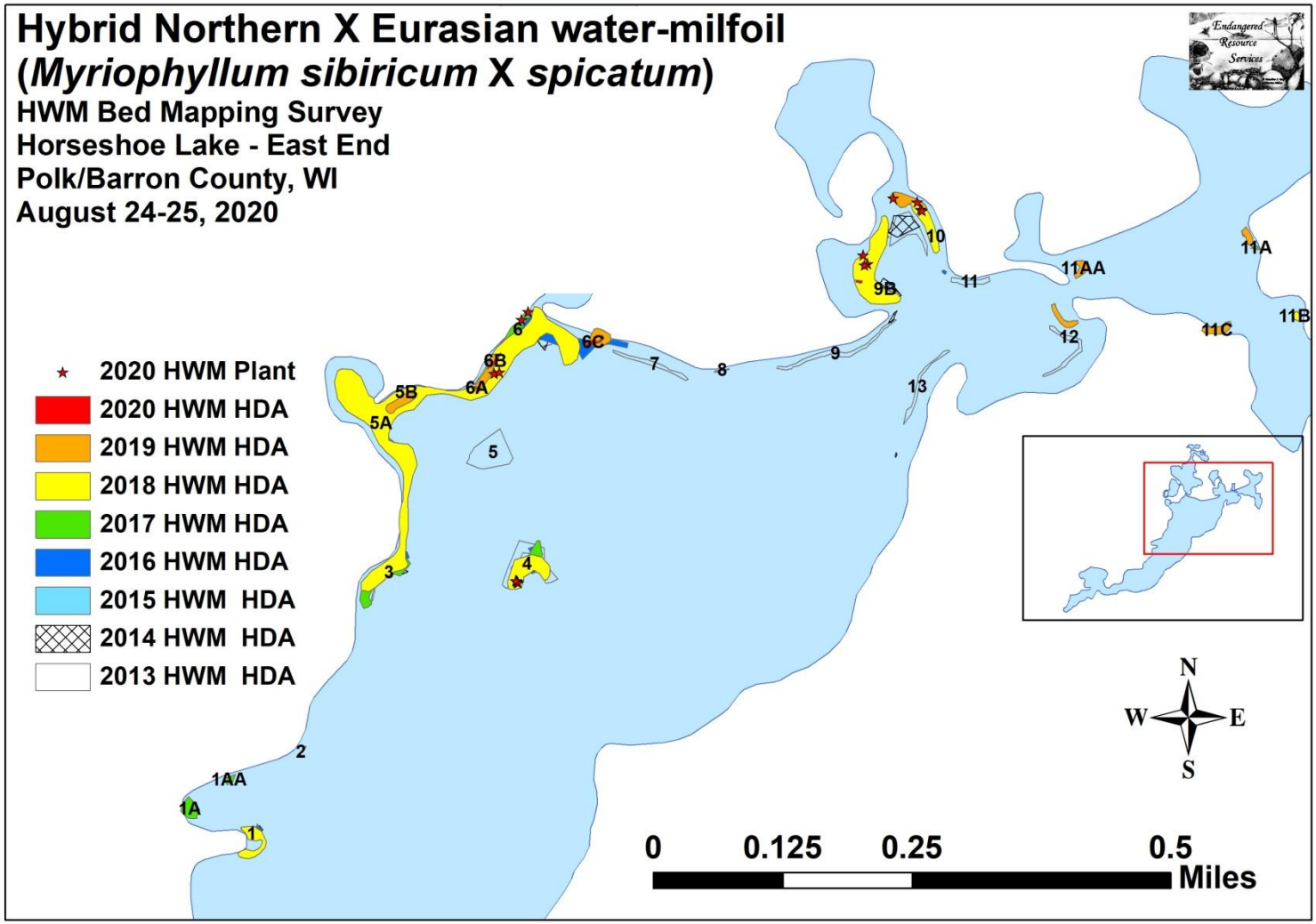
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2017 HWM HDA
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2014 HWM HDA
2013 HWM HDA
1
1A
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5A
5B
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