

**Eurasian Water-milfoil (*Myriophyllum spicatum*)  
Manual Rake Removal and Bed Mapping Survey  
Echo Lake – WBIC: 2630200  
Barron County, Wisconsin**



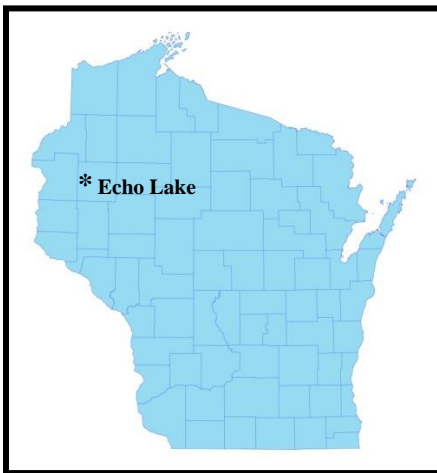
Eurasian water-milfoil (Berg 2007)



Total EWM found and removed 9/11/22

**Project Initiated by:**

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



Dead calm survey conditions on Echo Lake 9/11/22

**Survey Conducted by and Report Prepared by:**

Endangered Resource Services, LLC  
Matthew S. Berg, Research Biologist  
St. Croix Falls, Wisconsin  
September 11, 2022

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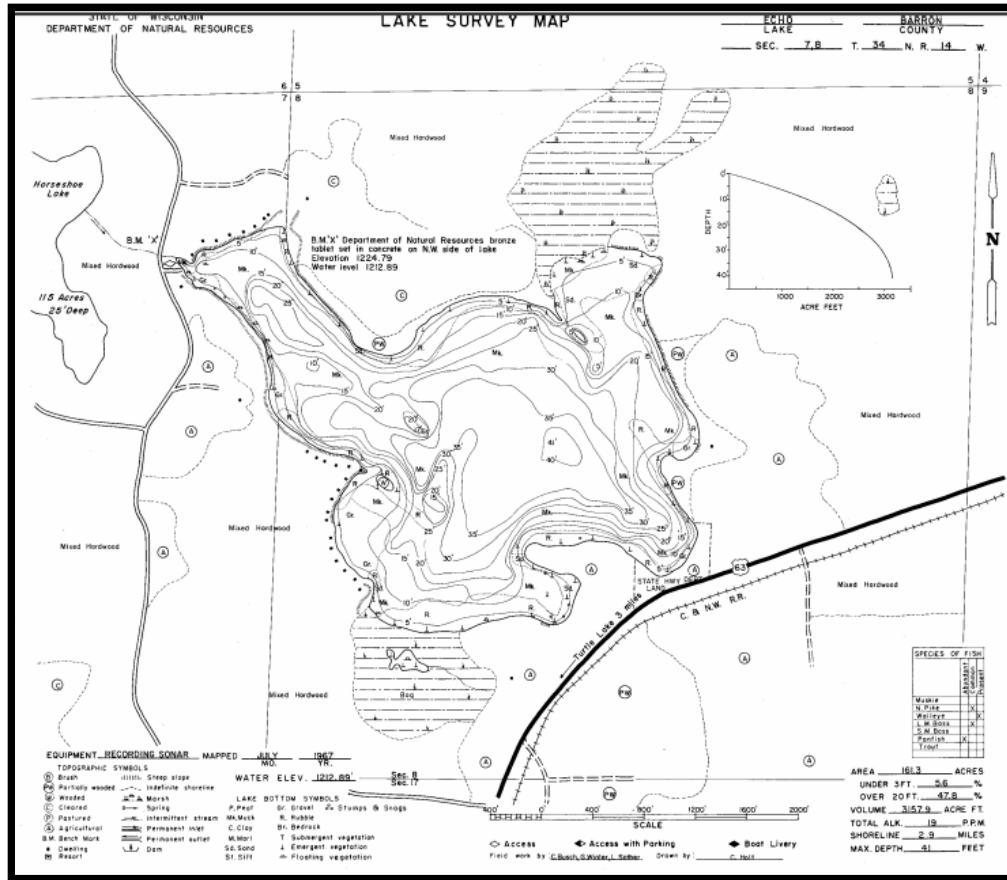
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## INTRODUCTION:

Echo Lake (WBIC 2630200) is a 172-acre stratified seepage lake in west-central Barron County, Wisconsin in the Town of Almena (T34N R14W S07 NE NE). The lake reaches a maximum depth of 41ft in the southeast corner of the central basin and has an average depth of 20ft (Busch et al. 1967) (Figure 1). Echo Lake is mesotrophic bordering on oligotrophic in nature, and water clarity is good to very good with summer Secchi readings averaging 11.2ft from 2004-2020 (the last year data was available from) (WDNR 2022). The lake's bottom substrate is variable with sandy muck in most bays, and rock/sandbars along most points and around the islands.



**Figure 1: Echo Lake Bathymetric Map**

## BACKGROUND AND STUDY RATIONALE:




Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) was discovered in Echo Lake in 2004, and the Echo Lake Association (ELA) has been actively managing this invasive exotic species since 2008. Following the EWM monitoring and manual rake removal surveys in 2018 that documented a significant uptick in EWM in the northeast bay, the ELA, under the direction of Lake Education and Planning Services, Inc. (LEAPS), decided to treat 3.84 acres with granular 2, 4-D (Shredder Amine 4) with a target concentration of 4ppm on June 2, 2019. Two 2019 posttreatment surveys found and removed just five plants near the public boat landing, and two more surveys in 2020 turned up 28 plants which were also rake removed. Because of these low numbers, no chemical treatment occurred in 2020 or 2021.

During the summer of 2021, the ELA and LEAPS decided to use a SCUBA diver to perform manual removal of all plants volunteers could find on the lake. That survey, conducted on July 16, 2021, located and eliminated approximately 50 plants – most of which occurred on the rock bar just southeast of the boat landing. During our fall survey, we found and removed approximately 50 more plants – most of which were also concentrated on this rock bar. Based on these findings, the ELA decided to chemical treat this 0.34-acre area (0.2% of the lake’s total surface area) on May 27, 2022 with ProcellaCor at a rate of 6 pdu/acre ft. Following the treatment, we were asked to conduct a late summer meandering littoral zone survey to look for, map, and, if possible, remove any remaining EWM. This report is the summary analysis of that survey conducted on September 11, 2022. These data will be used to determine if and where EWM management might be considered in 2023.

**METHODS:**

**Littoral Zone Rake Removal and Bed Mapping Surveys:**

During the survey, we searched the lake’s visible littoral zone for Eurasian water-milfoil. When found, we used a telescopic rake to remove EWM plants by their roots and logged the location with a GPS waypoint. We also took extra care to gather any fragments that broke off of the plants. If we found a “bed” where we estimated that EWM made up >50% of the plants and was generally continuous with clearly defined borders; we motored around the perimeter of the area, took GPS coordinates at regular intervals, documented the rake range and depth range of plants, and estimated the average rake fullness rating and depth of EWM within the bed (Figure 2). Using the WDNR’s Forestry Tool’s Extension to ArcGIS 9.3.1, we used these coordinates to generate bed shapefiles and determine the acreage to the nearest hundredth of an acre.

<u>Rating</u>	<u>Coverage</u>	<u>Description</u>
1		A few plants on rake head
2		Rake head is about 1/2 full Can easily see top of rake head
3		Overflowing Cannot see top of rake head

**Figure 2: Rake Fullness Ratings**

## RESULTS AND DISCUSSION:

### September Littoral Zone and Rake Removal Survey:

In September, we covered transects totaling 21.4km (13.3miles) (Figure 3) and found and cleanly rake removed **two total Eurasian water-milfoil plants**. Both of these plants were sub-canopied but had multiple stems. An exhaustive search of the immediate surrounding area and the locations where plants were identified in fall 2021 failed to turn up any additional plants. We also didn't see any plants in the 2019 or 2022 treatment areas. These results were a sharp decline from the 50 plants found in September 2021 and the 19 plants found in August 2020, but similar to the five plants found in October 2019 (Table 1) (Figure 4) (Appendix I).

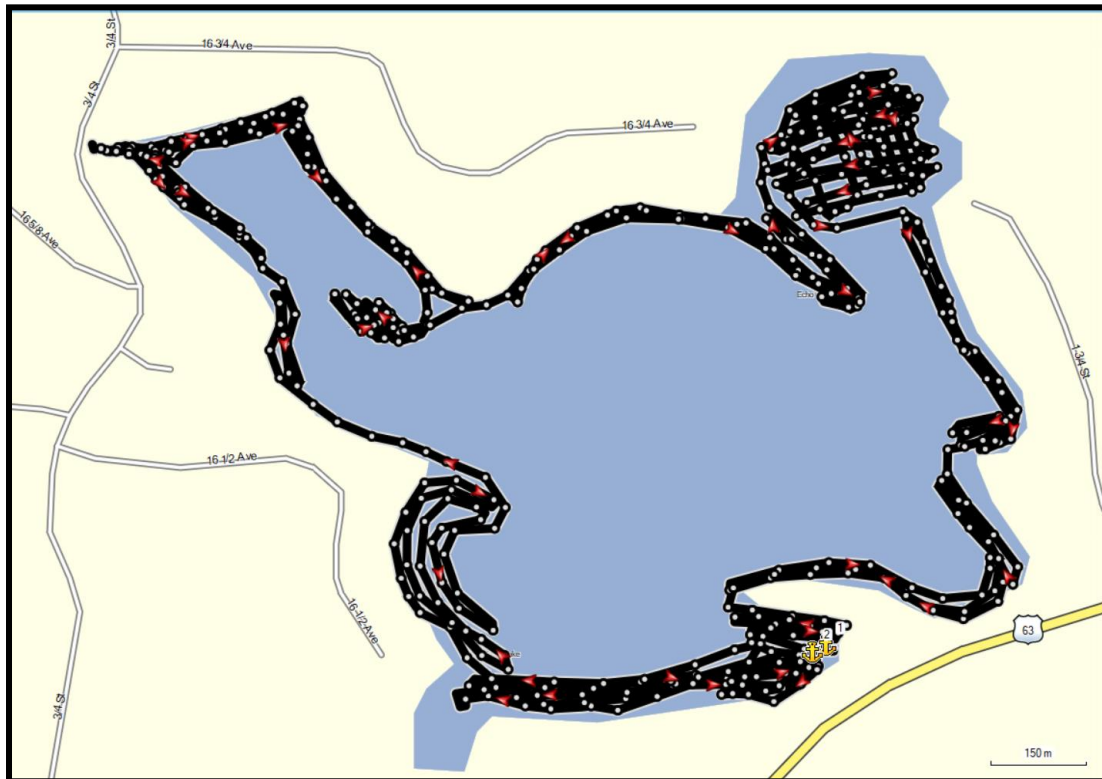
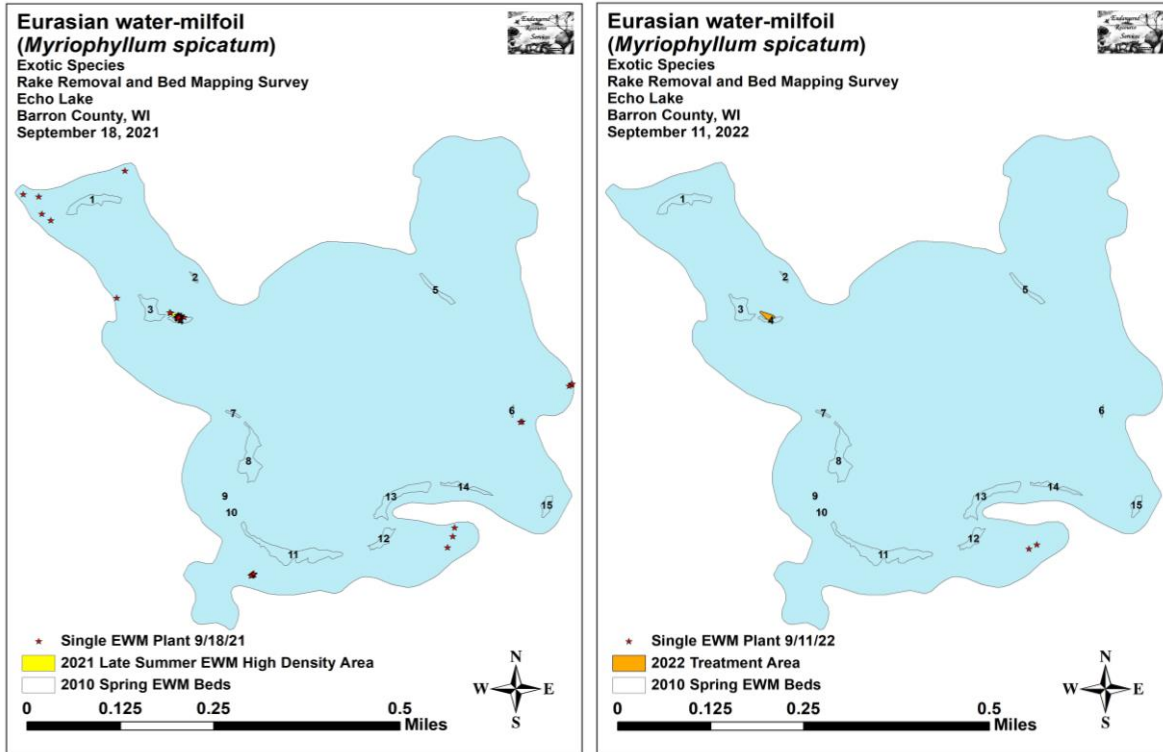


Figure 3: September 11, 2022 Survey Tracks

**Table 1: Late Summer/Fall Eurasian Water-milfoil Bed Mapping Summary  
Echo Lake, Barron County  
September 11, 2022**

<b>Bed Number</b>	<b>2022 HDA Acreage</b>	<b>2021 HDA Acreage</b>	<b>2020 HDA Acreage</b>	<b>2019 Fall HDA Acreage</b>	<b>2018 Fall HDA Acreage</b>	<b>2017 Fall HDA Acreage</b>	<b>2016 Fall HDA Acreage</b>	<b>2015 Fall Bed Acreage</b>	<b>Years Treated</b>	<b>2022 Late Summer HDA Field Notes</b>
1	0	0	0	0	0	0	0.32	0	2010, 2014, 2017	No EWM found
2	0	0	0	0	0	0	0	0	2010	No EWM found
3	0	0	0	0	0	0	0	0	2010	No EWM found
4	0	0.08	0	0	0	0	0	0	2010; <b>2022</b>	No EWM found
4B	0	0	0	0	0	0	0	0	2014	No EWM found
5	0	0	0	0	0	0	0	0	2010	No EWM found
5A	0	0	0	0	0	0.03	0	0	None	No EWM found
5B	0	0	0	0	6.38	0.16	0	0	2019	No EWM found
6	0	0	0	0	0	0	0	0	2010, 2013	No EWM found
6A	0	0	0	0	0	0.06	0	0	None	No EWM found
7	0	0	0	0	0	0	0	0	2010	No EWM found
8	0	0	0	0	0	0	0	0	'10, '11, '13, '14	No EWM found
8A, B, C, D	0	0	0	0	0	0	0	0	2012, 2013	No EWM found
9	0	0	0	0	0	0	0	0	2010, 2011	No EWM found
10	0	0	0	0	0	0	0	0	2010	No EWM found
11	0	<0.01	0	0	0	0	0	0	'10, '11, '12, '14	No EWM found
11A	0	0	0	0	0	0.01	0	0	None	No EWM found
12	0	0	0	0	0	0	0	0	2010, 2014	No EWM found
12A	0	0	0	0	0	0.33	0	0	None	Two plants
12B	0	0	0	0	0	0	0	0	None	No EWM found
13	0	0	0	0	0	0	0	0	2010, 2014	No EWM found
14	0	0	0	0	0	0	0	0	2010	No EWM found
15	0	0	0	0	0	0	0	0	2010, 2014	No EWM found
<b>Total</b>	<b>0.00</b>	<b>0.09</b>	<b>0.00</b>	<b>0.00</b>	<b>6.38</b>	<b>0.59</b>	<b>0.32</b>	<b>0.00</b>		



**Figure 4: 2021 and 2022 EWM Locations**

### **CONSIDERATIONS FOR MANAGEMENT:**

The combination of the 2019 and 2022 chemical treatments, the 2021 dive removal, and the annual late-summer/fall rake removal of plants have again reduced EWM to almost undetectable levels. At this point, it doesn't appear any intensive active management will be required in 2023. Despite this, regularly monitoring and rake remove of pioneer plants by either volunteers or professionals throughout the 2023 growing season is encourages as a cost-effective way to slow the spread of EWM and minimize the need for widespread herbicide use.

### **LITERATURE CITED**

Busch, C., G. Winter, L. Sather, and C. Holt. [online]. 1967. Echo Lake Map. Available from <http://dnr.wi.gov/lakes/maps/DNR/2630200a.pdf> (September 2022).

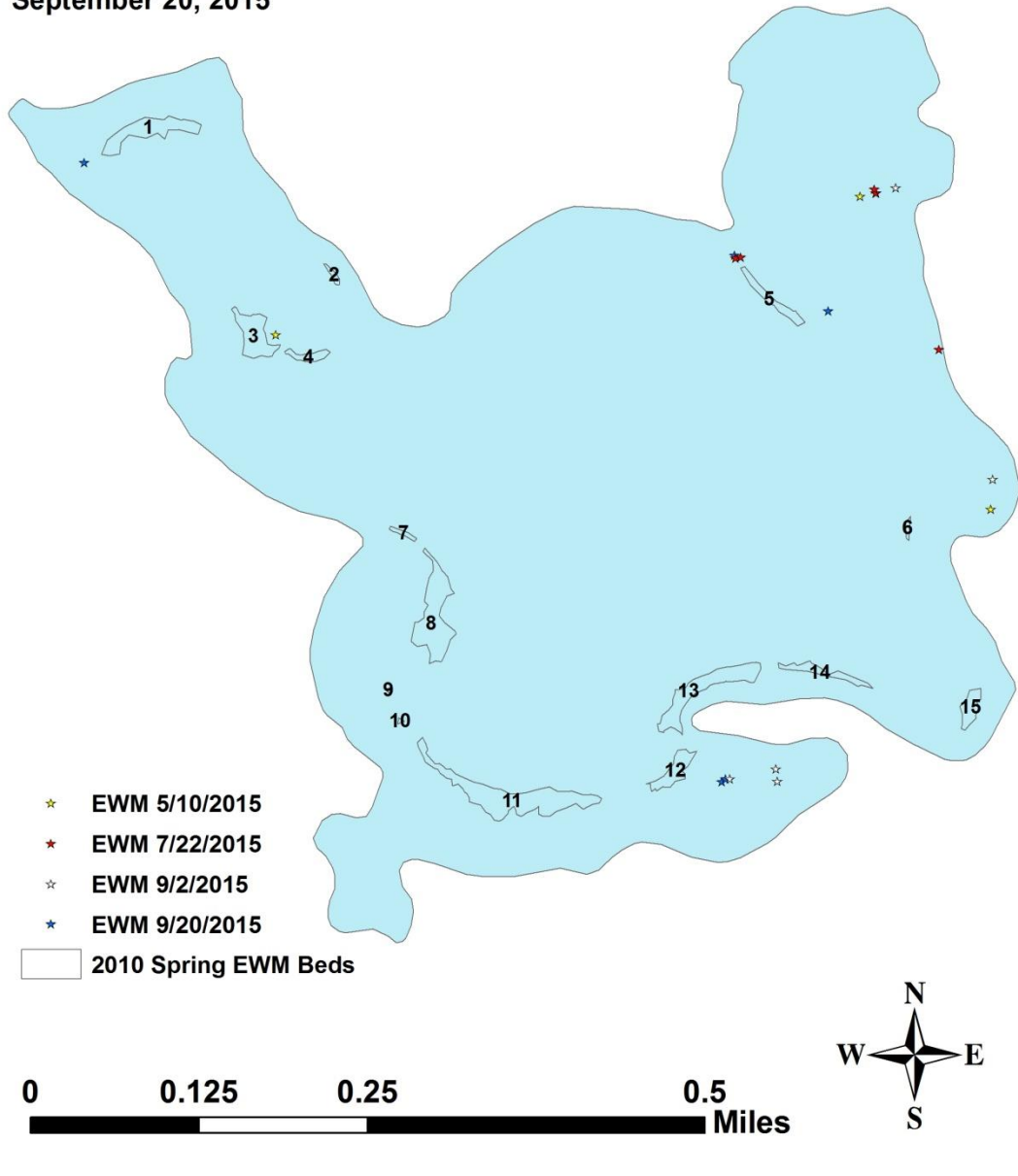
WDNR. [online]. 2022. Echo Lake - Citizen Lake Water Quality Monitoring Database. Available from <http://dnr.wi.gov/lakes/waterquality/Station.aspx?id=033210> (September 2022).



**Appendix I: 2015-2022 Bed Mapping Survey Maps**

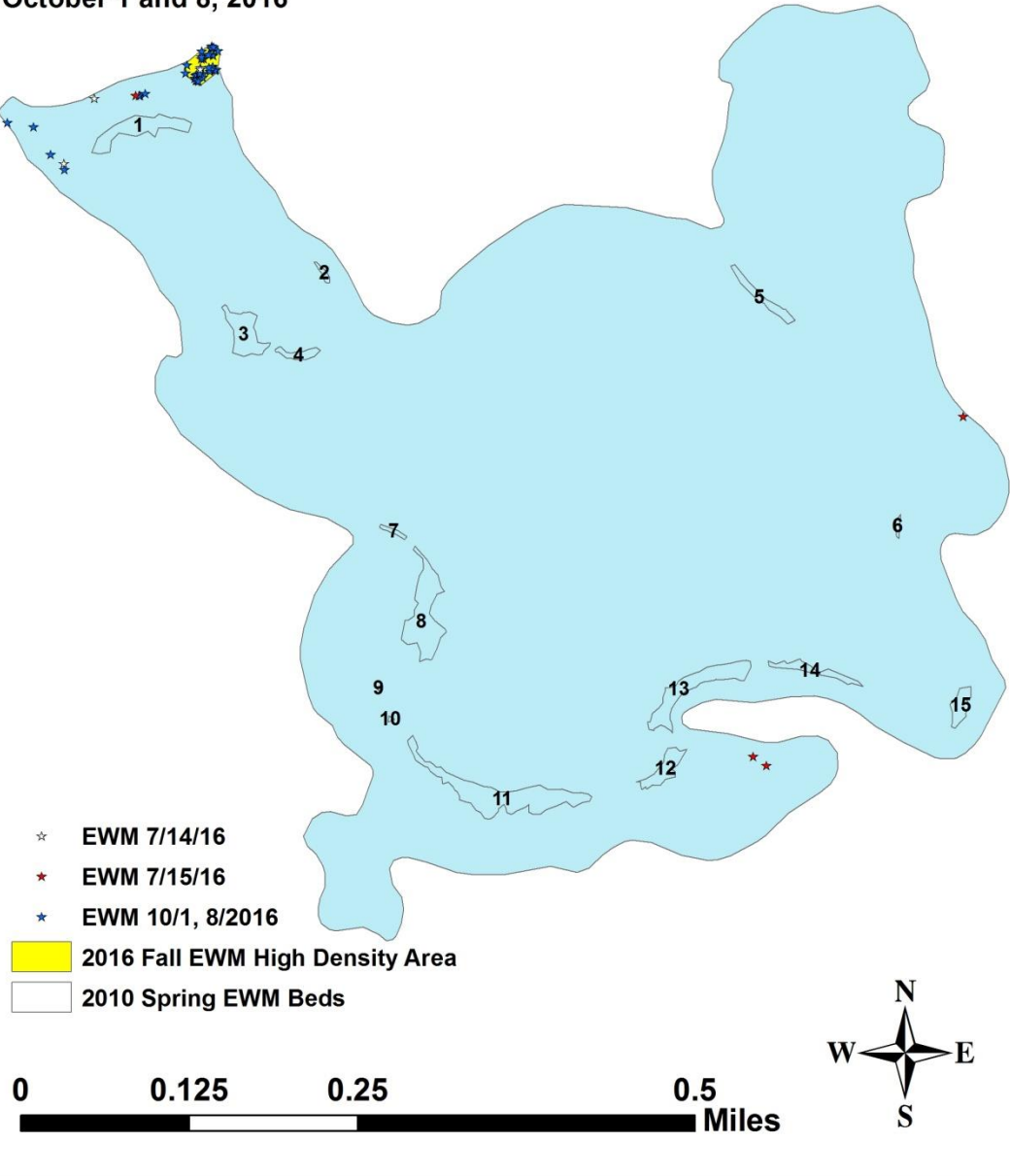
# Eurasian water milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake  
Barron County, WI  
September 20, 2015



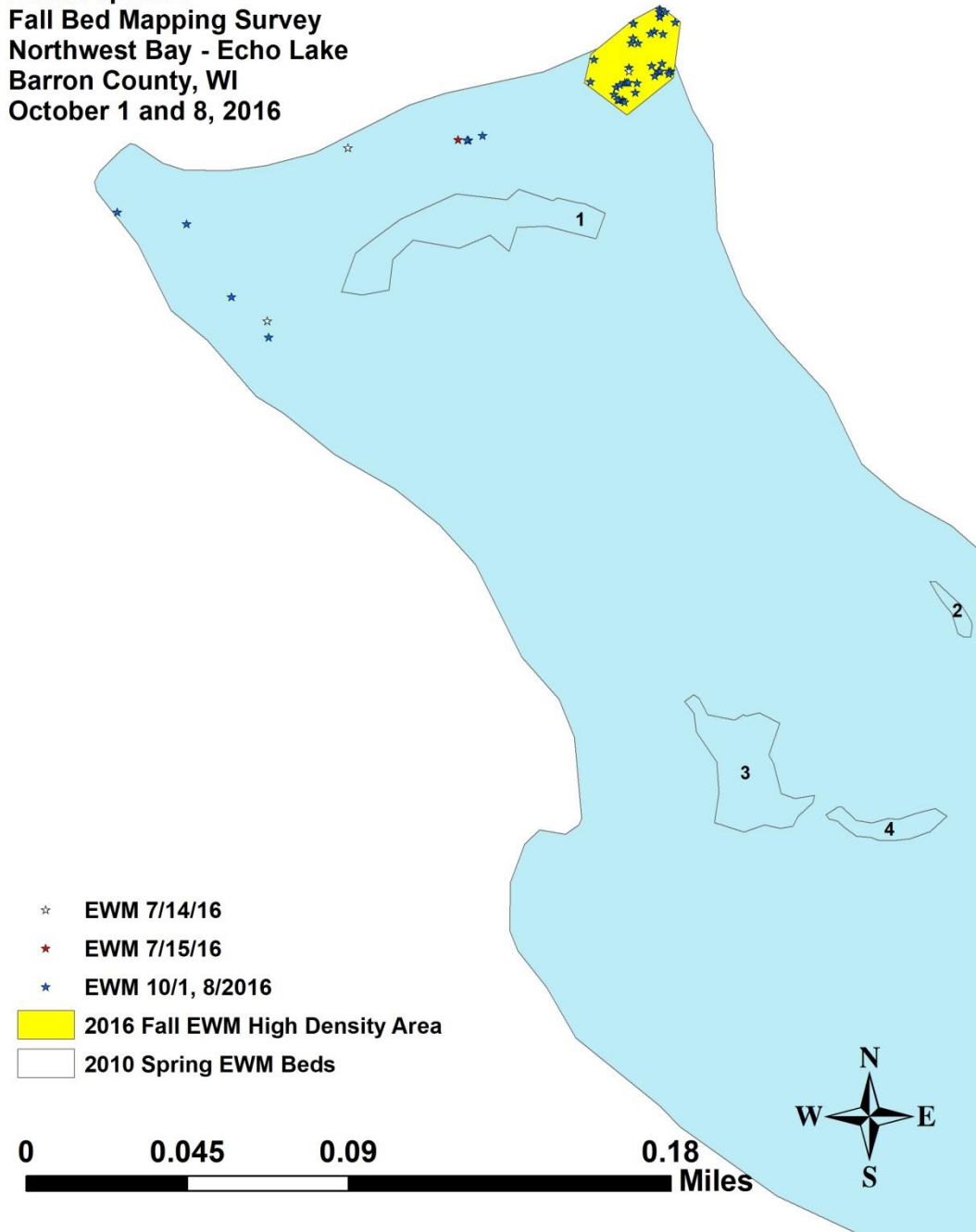
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake  
Barron County, WI  
October 1 and 8, 2016



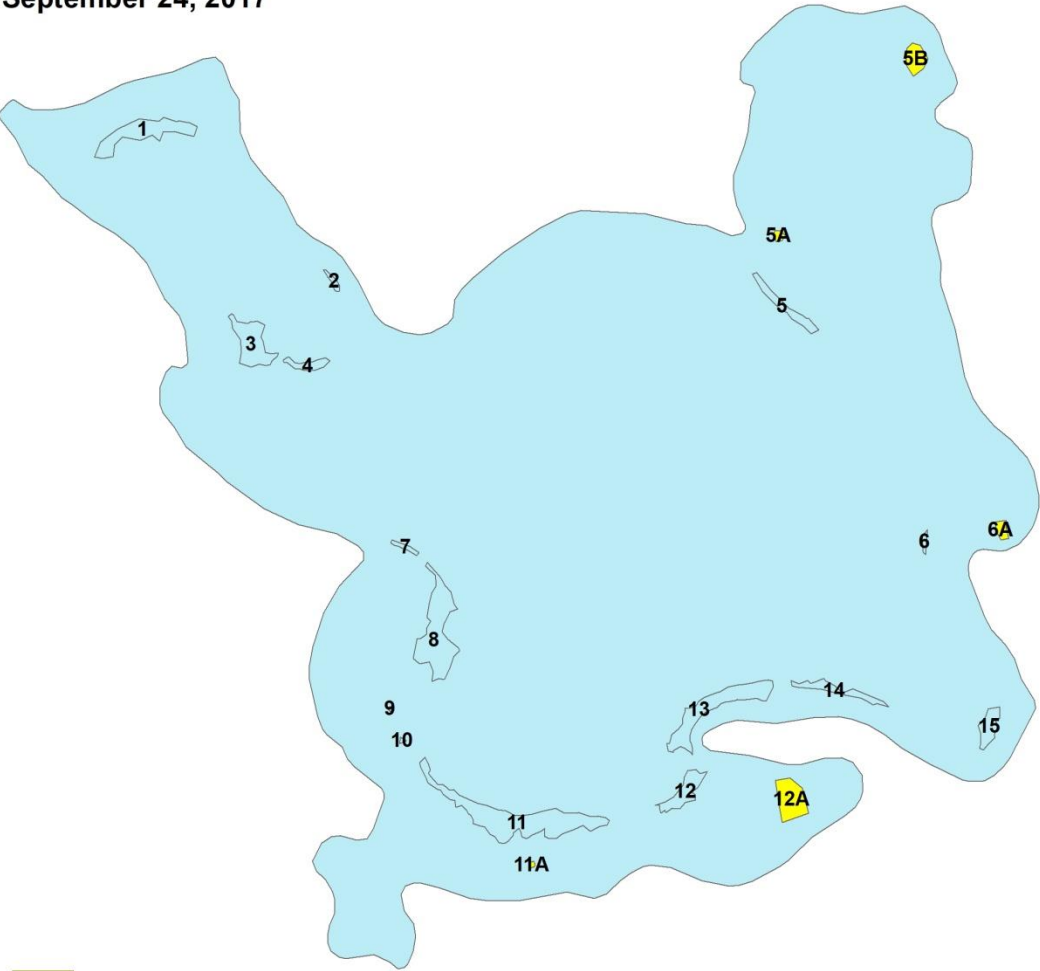
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Northwest Bay - Echo Lake  
Barron County, WI  
October 1 and 8, 2016



# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake  
Barron County, WI  
September 24, 2017

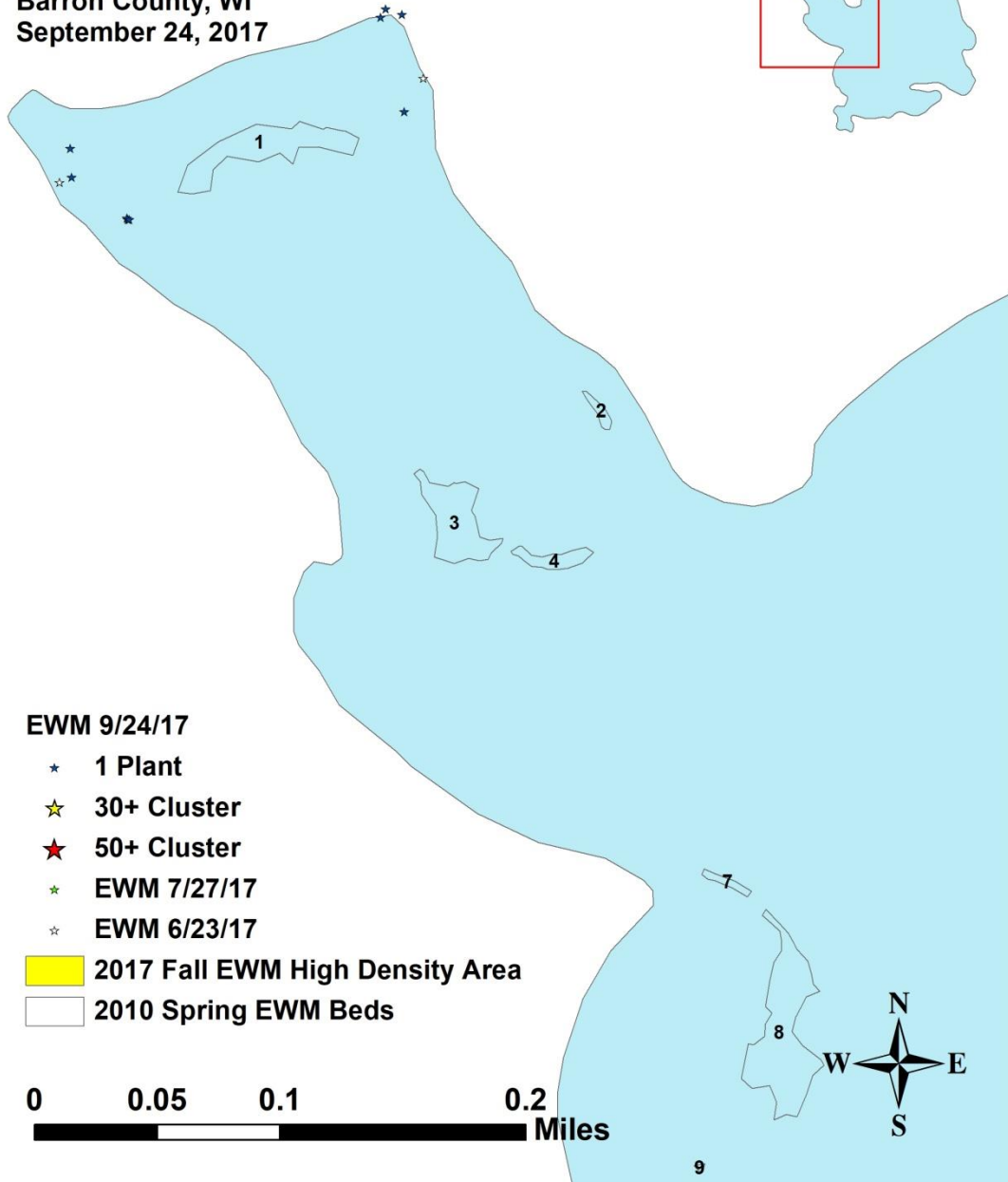
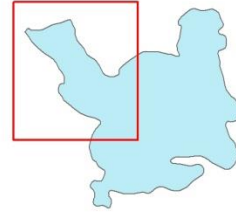


 2017 Fall EWM High Density Area  
 2010 Spring EWM Beds



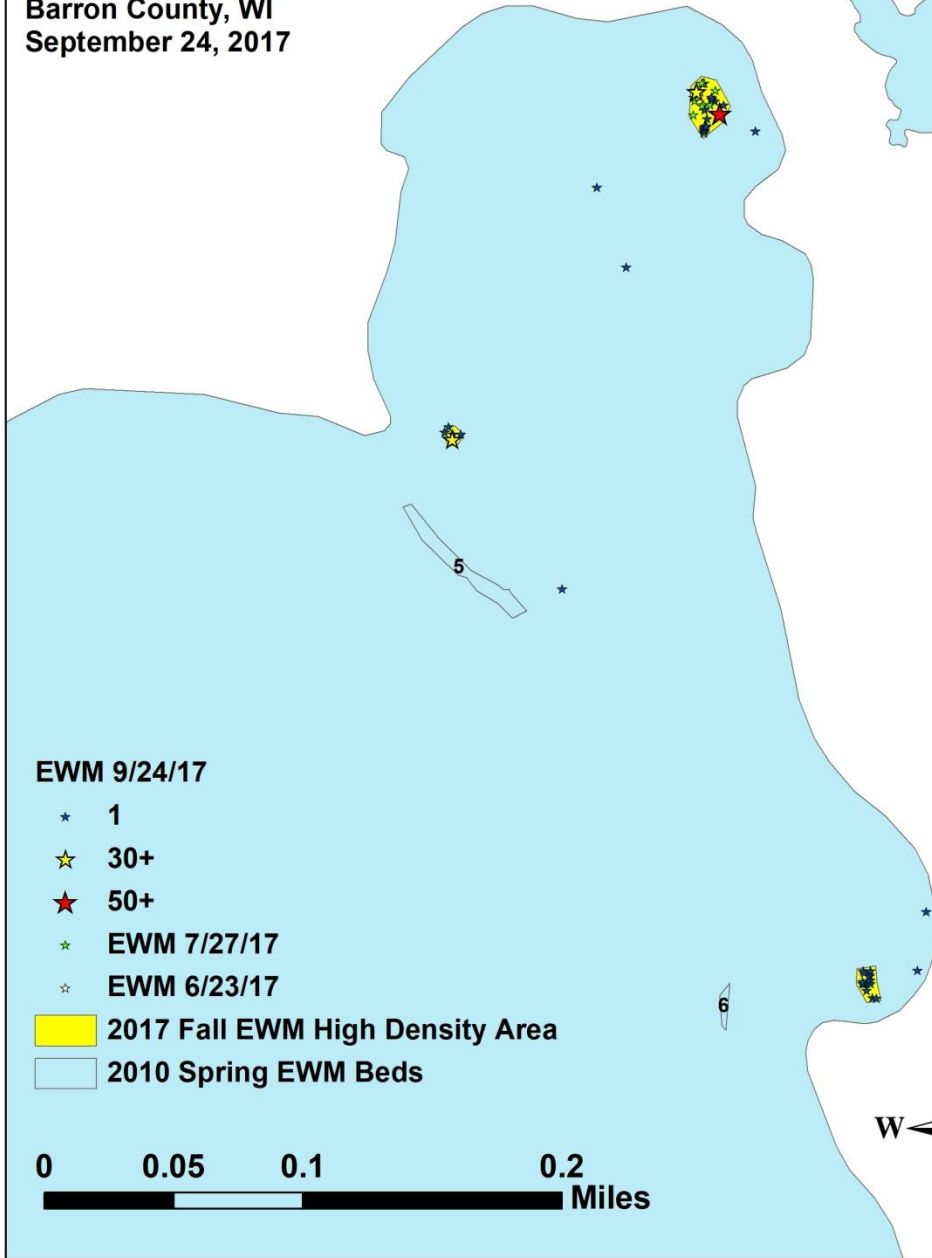
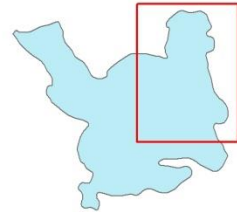
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake - Northwest Bay  
Barron County, WI  
September 24, 2017



# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake - Northeast Bay  
Barron County, WI  
September 24, 2017



## EWM 9/24/17

★ 1

★ 30+

★ 50+

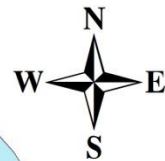
★ EWM 7/27/17

★ EWM 6/23/17

2017 Fall EWM High Density Area

2010 Spring EWM Beds

0 0.05 0.1 0.2 Miles



# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake - South Bays  
Barron County, WI  
September 24, 2017



## EWM 9/24/17

- ★ 1 Plant
- ☆ 30+ Cluster
- ★ 50+ Cluster
- ★ EWM 7/27/17
- ☆ EWM 6/23/17

■ 2017 Fall EWM High Density Area

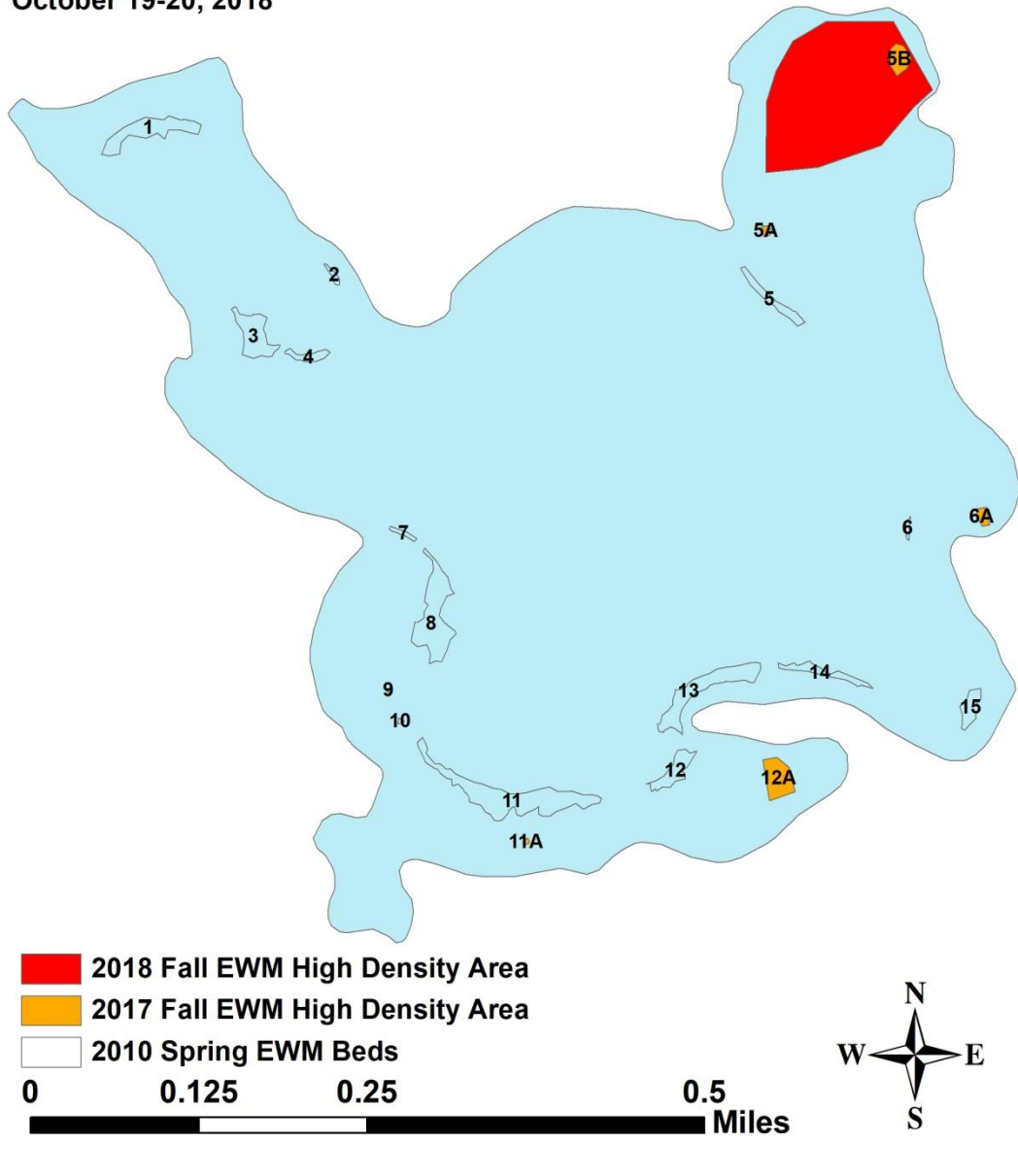
□ 2010 Spring EWM Beds





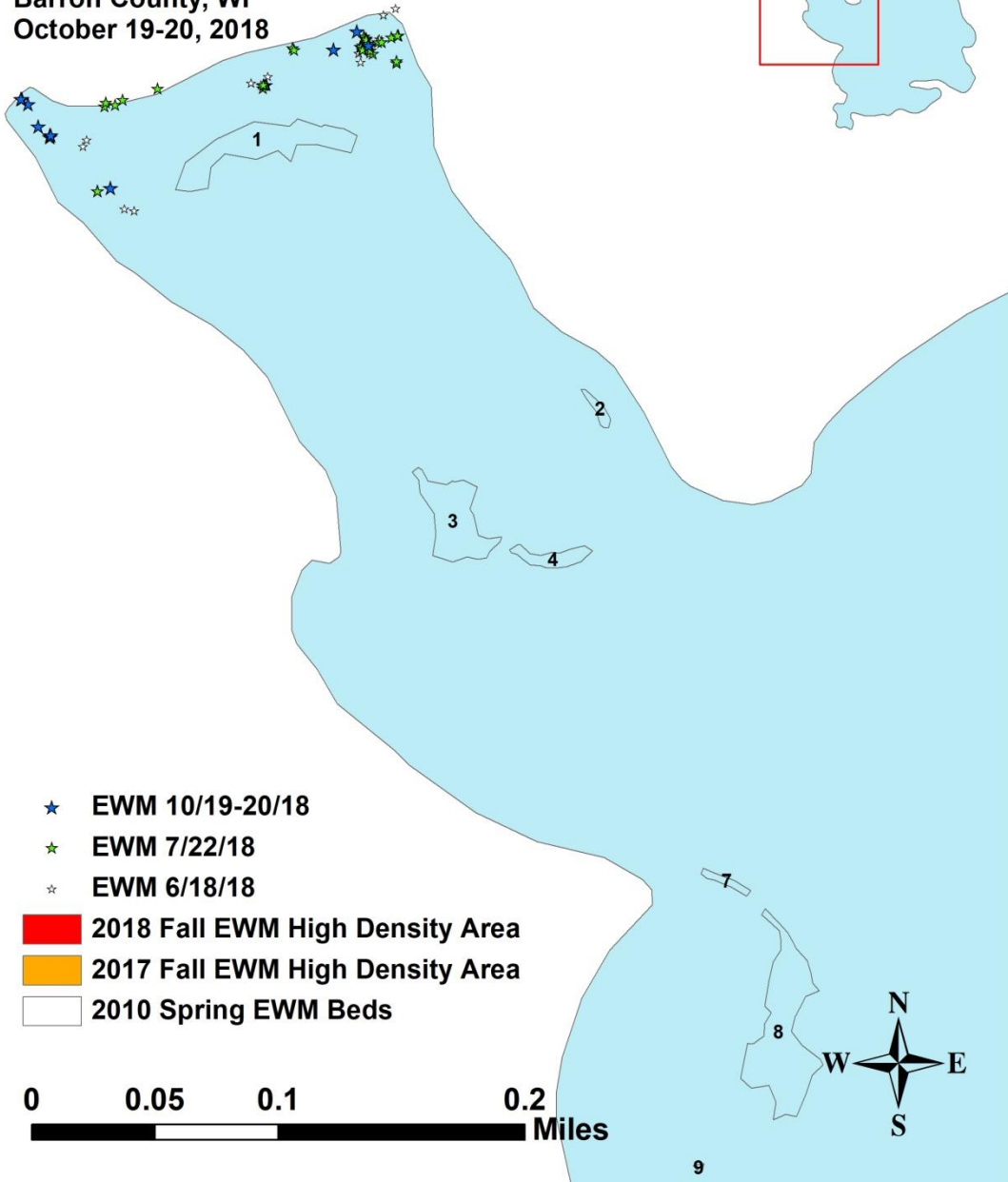
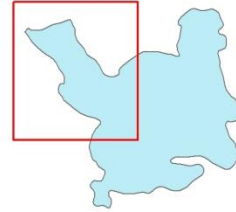
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species  
Fall Bed Mapping Survey  
Echo Lake  
Barron County, WI  
October 19-20, 2018



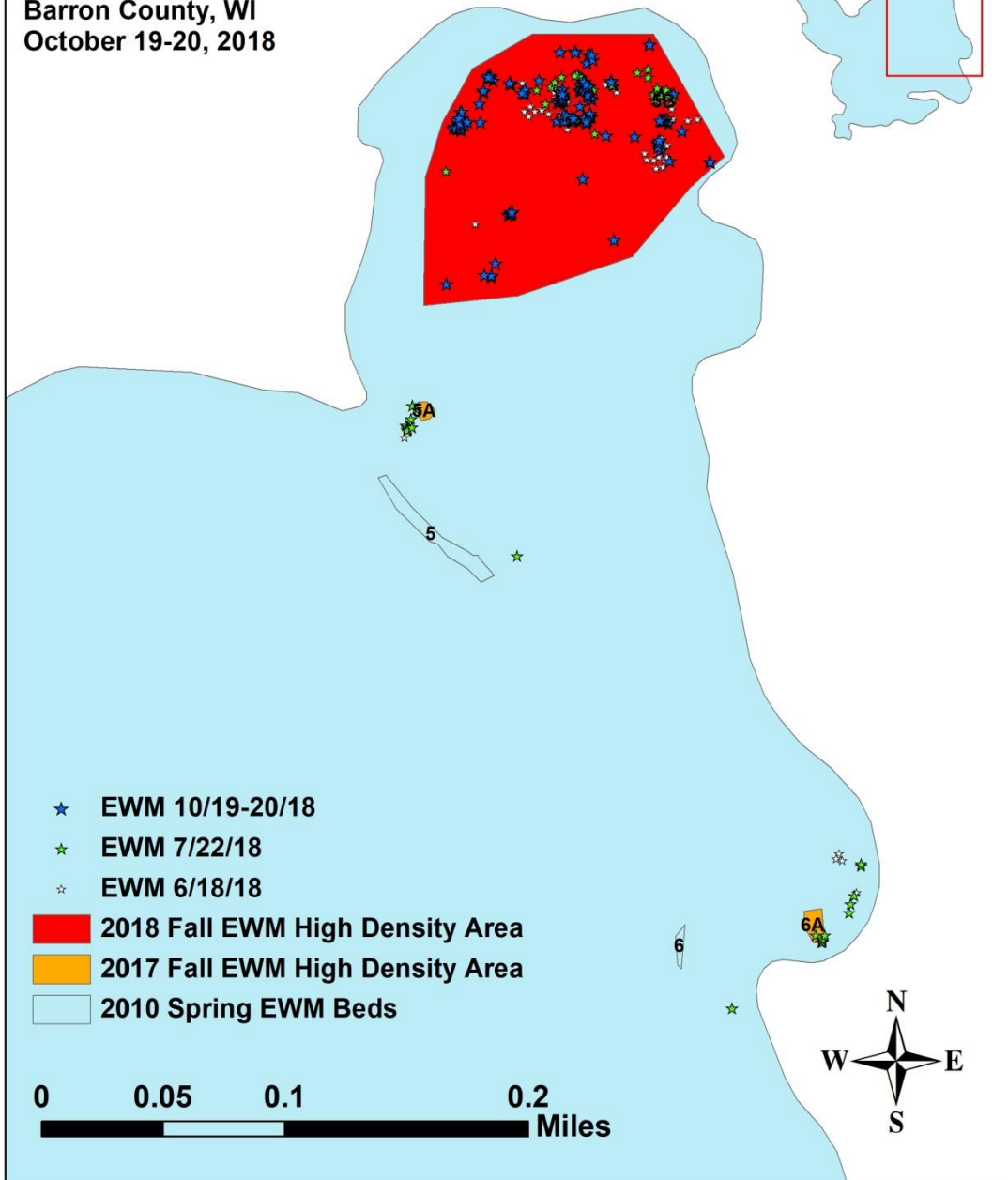
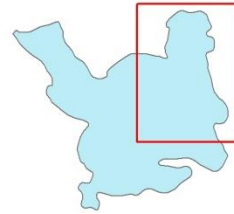
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake - Northwest Bay  
Barron County, WI  
October 19-20, 2018



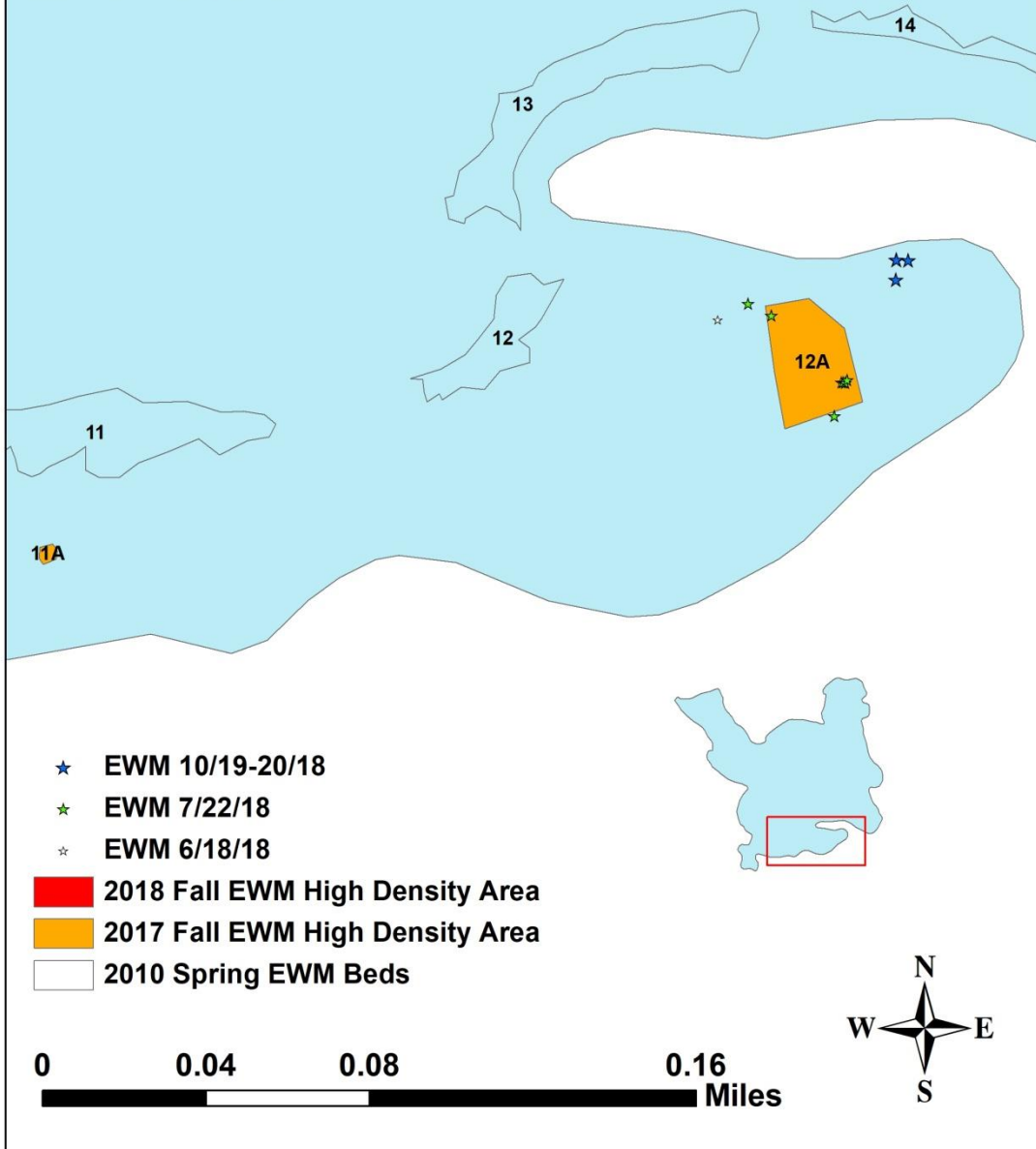
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake - Northeast Bay  
Barron County, WI  
October 19-20, 2018



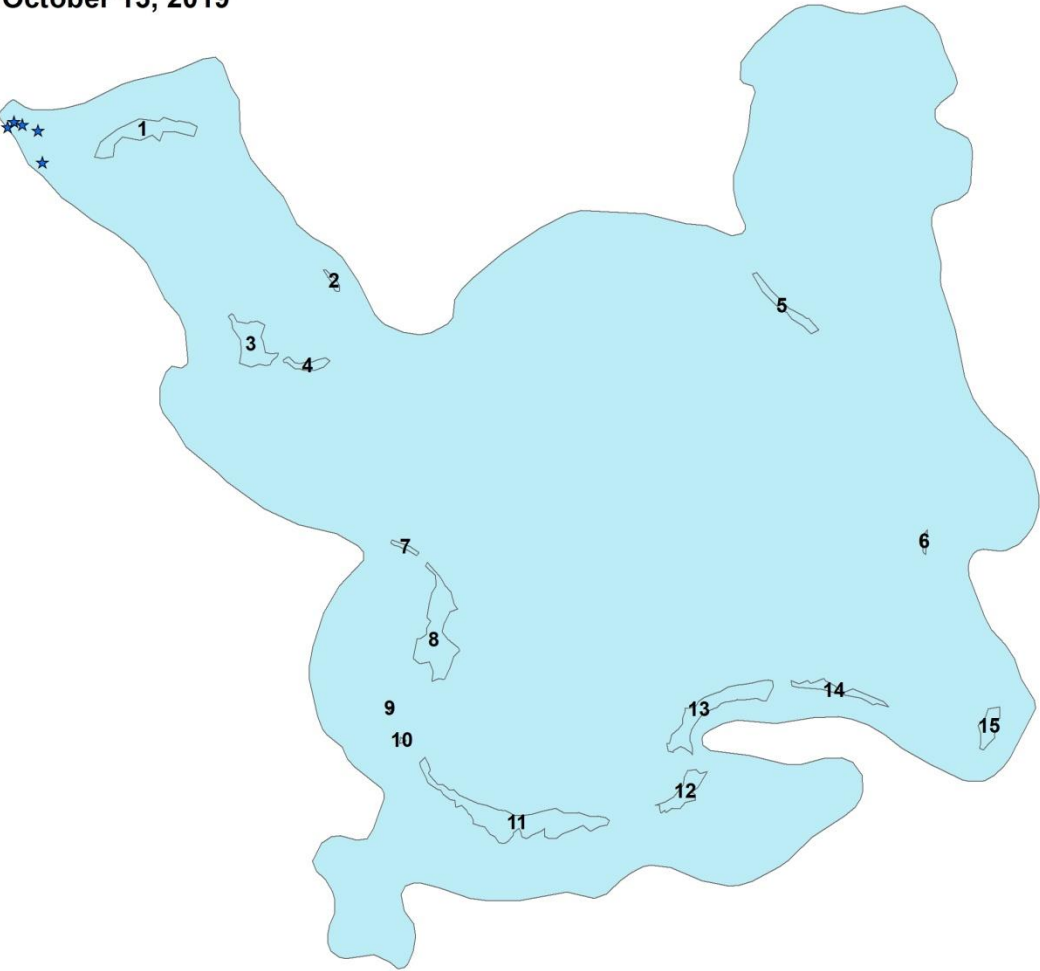
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic species  
Fall Bed Mapping Survey  
Echo Lake - South Bays  
Barron County, WI  
October 19-20, 2018



# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species  
Fall Bed Mapping Survey  
Echo Lake  
Barron County, WI  
October 13, 2019



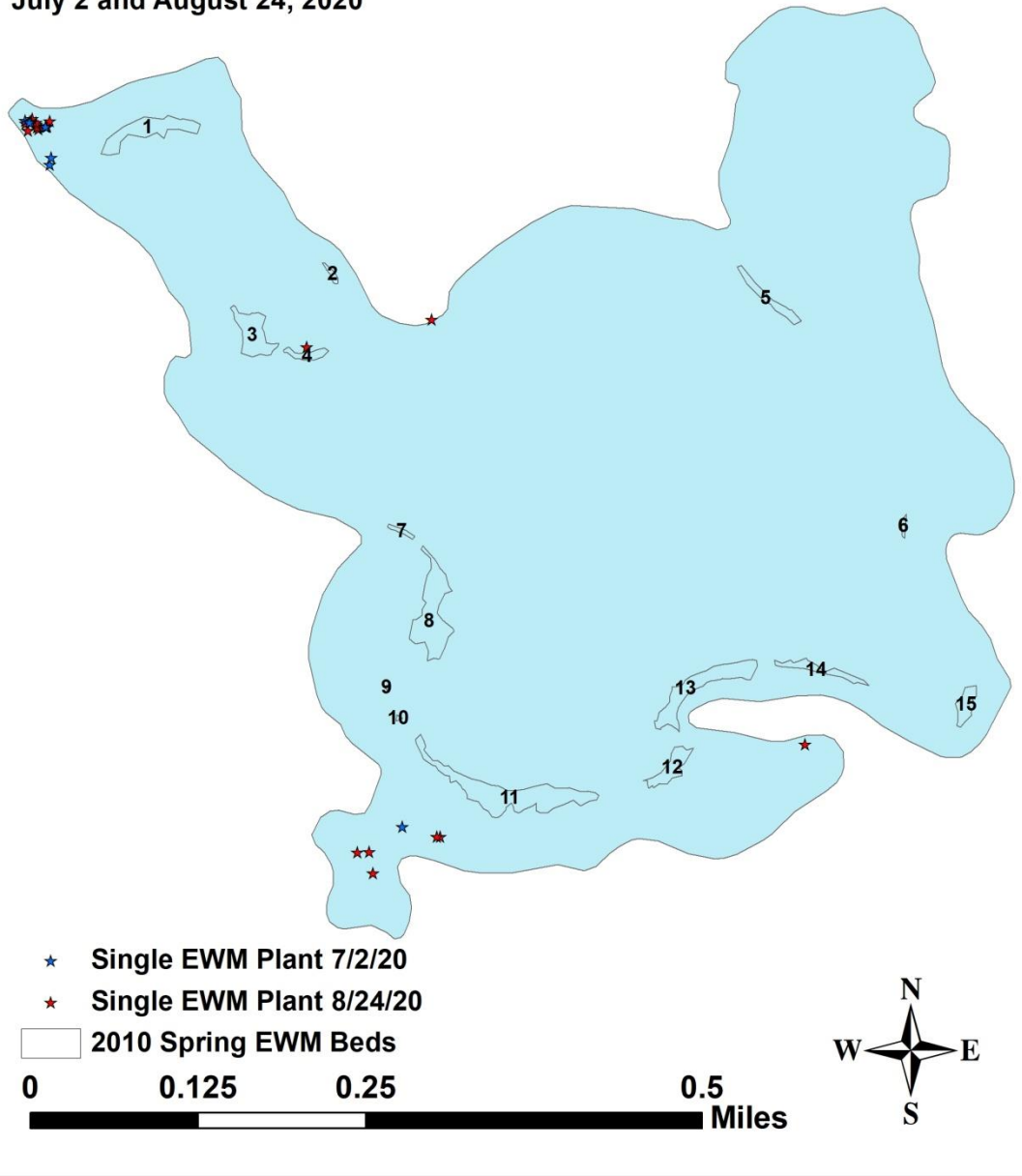
★ Single EWM Plant 10/13/19

□ 2010 Spring EWM Beds



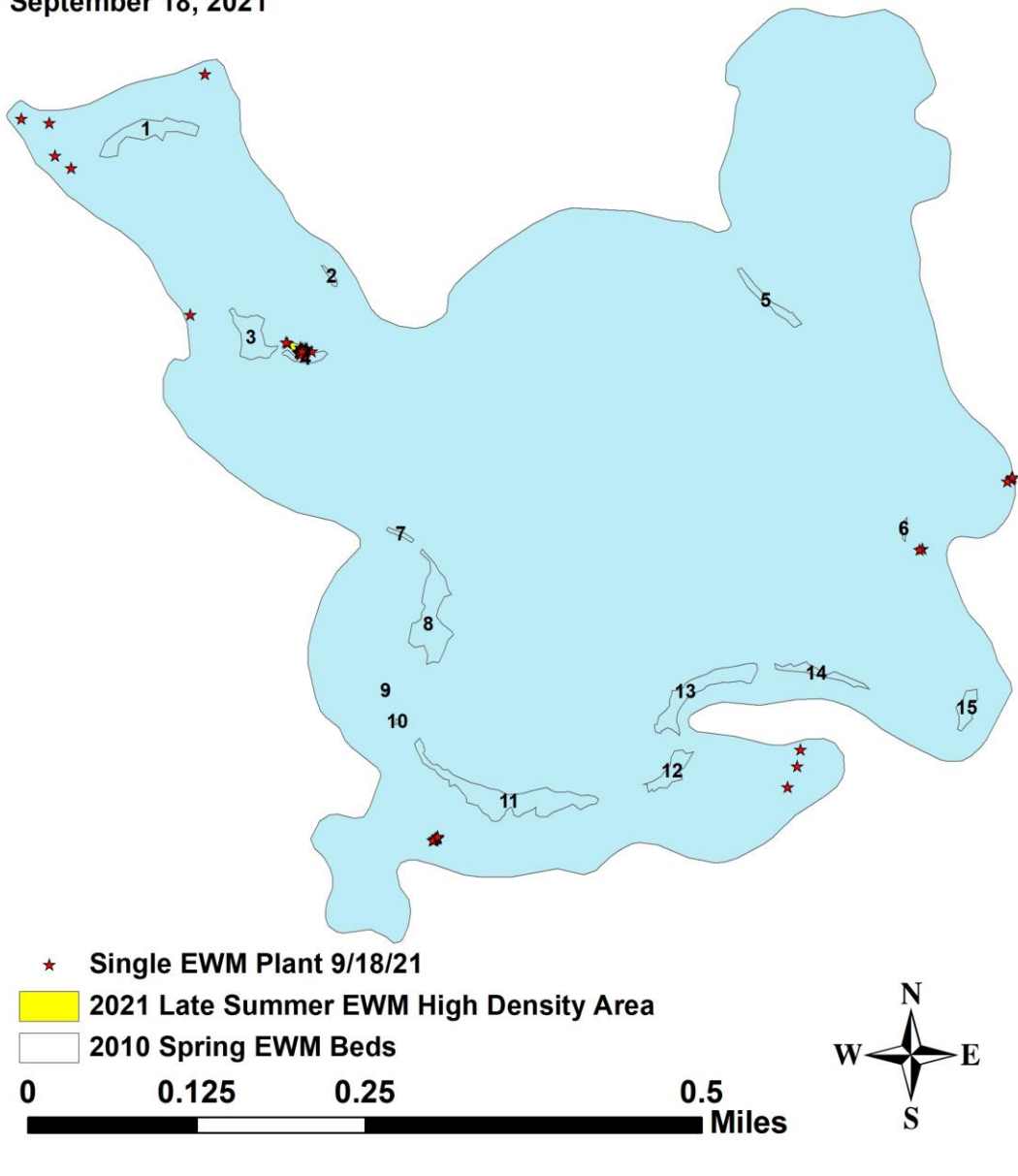
# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species  
Bed Mapping Surveys  
Echo Lake  
Barron County, WI  
July 2 and August 24, 2020



# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species  
Rake Removal and Bed Mapping Survey  
Echo Lake  
Barron County, WI  
September 18, 2021



# Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species  
Rake Removal and Bed Mapping Survey  
Echo Lake  
Barron County, WI  
September 11, 2022

