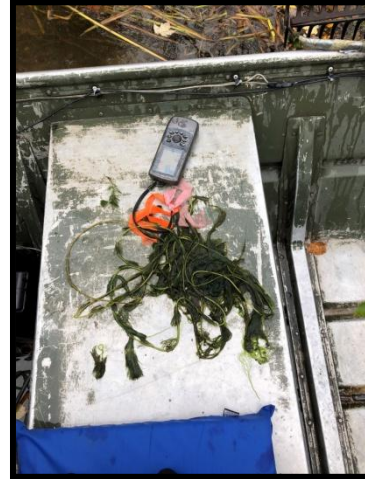


**Eurasian Water-milfoil (*Myriophyllum spicatum*)  
Manual Rake Removal and Fall Bed Mapping Surveys  
Echo Lake – WBIC: 2630200  
Barron County, Wisconsin**



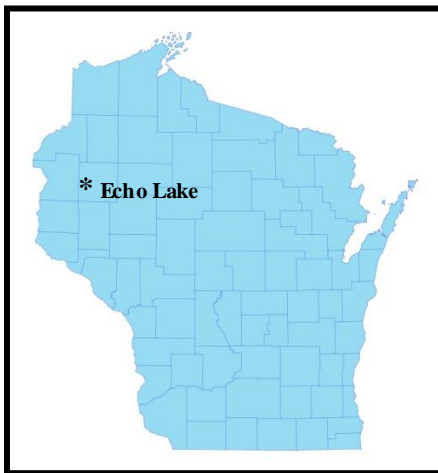
Eurasian water-milfoil (Berg 2007)



EWM Removal 10/13/13

**Project Initiated by:**

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



Dead calm during survey on Echo Lake 10/13/19

**Surveys Conducted by and Report Prepared by:**

Endangered Resource Services, LLC  
Matthew S. Berg, Research Biologist  
St. Croix Falls, Wisconsin  
July 13 and October 13, 2019

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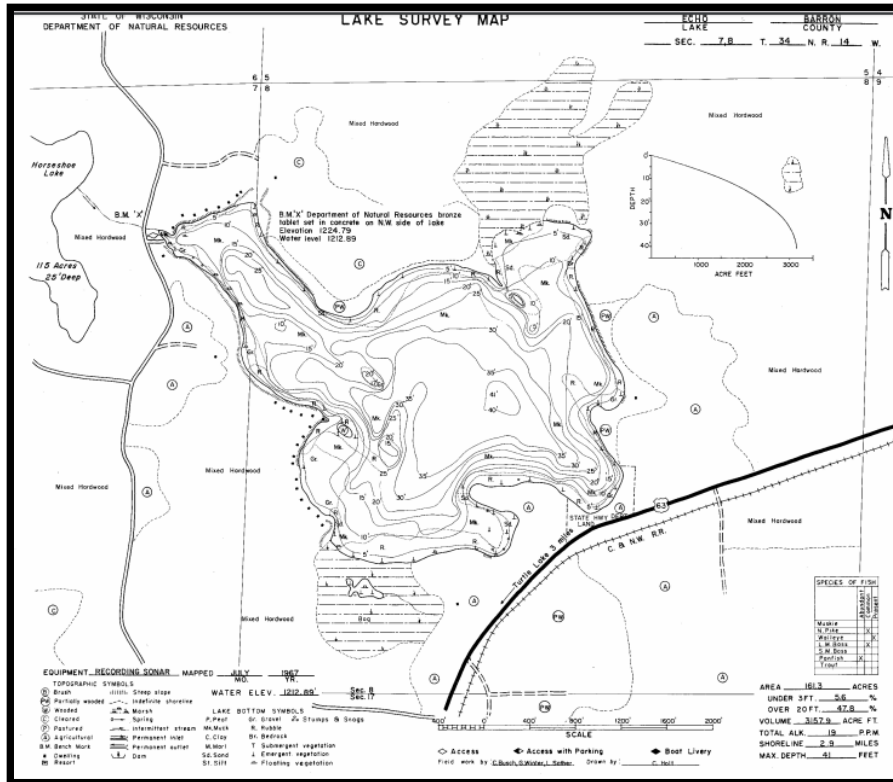
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## INTRODUCTION:

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 41 ft 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 11.7ft from 2004-2018 (no data was reported for 2019) (WDR 2019). The lake's bottom substrate is variable with sandy muck bottoms in most bays, and rock/sand bars 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 three 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. Posttreatment, we were asked to complete two lakewide EWM monitoring and manual rake removal surveys over the summer and a third survey in the fall if we found a significant number of plants. This report is the summary analysis of our surveys on the lake in 2019. These data will also be used to determine if and where EWM control might be considered in 2020.

## **METHODS:**

### **Littoral Zone and Rake Removal Surveys:**

During the surveys, 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.

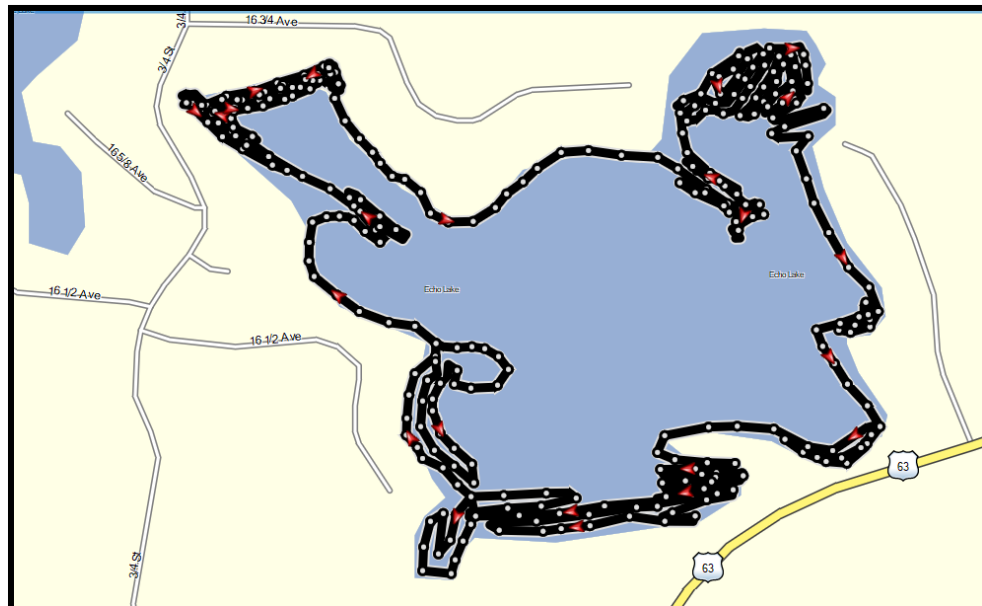
### **Fall Eurasian Water-milfoil Bed Mapping Survey:**

During the fall survey, we again searched the visible littoral zone of the lake and mapped all known beds of EWM. A "bed" was determined to be any area where we visually estimated that EWM made up >50% of the area's plants and was generally continuous with clearly defined borders. After we located a bed, 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. 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. We also GPS marked individual EWM plants outside of the beds.

## **RESULTS AND DISCUSSION:**

### **July Littoral Zone and Rake Removal Survey:**

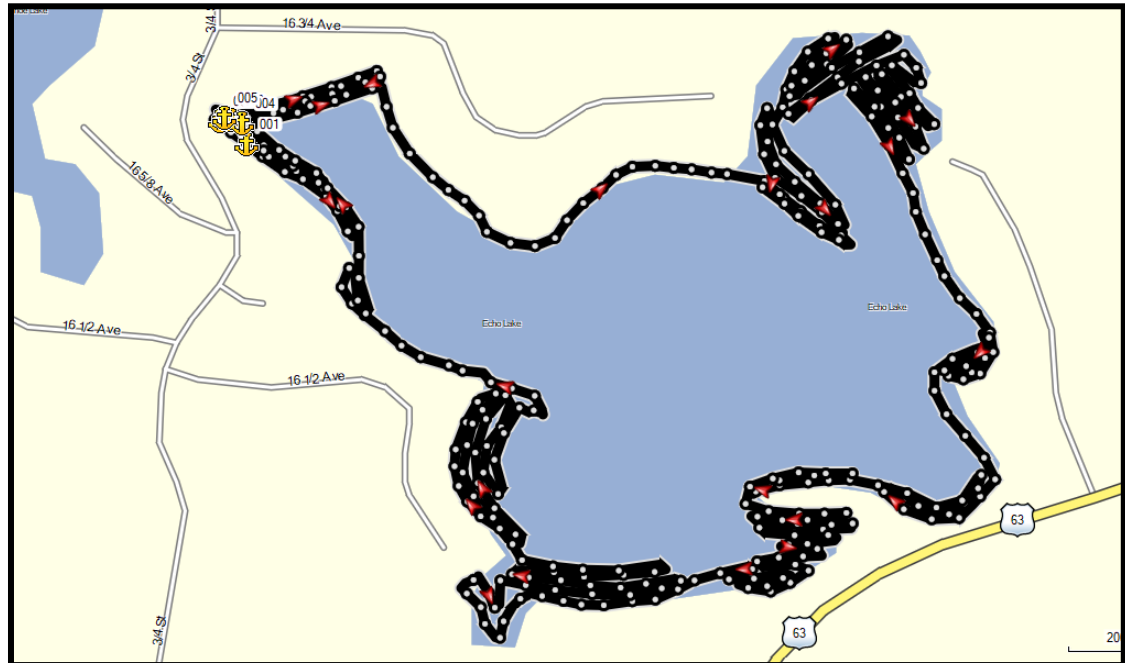
As in 2016, 2017, and 2018, heavy snows and spring rains in 2019 kept the lake at bankfull levels. During our initial visit in July, we covered transects totaling 14.8km (9.2miles) and spent extra time searching locations we found plants in during the fall 2018 survey (Figure 2). Somewhat to our surprise, we didn't find any evidence of EWM anywhere in the lake. Because of this, **it was decided to cancel the second summer survey; however, it was requested that we still return in the fall (M. Clohisy – ELA President/D. Blumer - LEAPS – pers. comm. 9/13/19).**



**Figure 2: July 13, 2019 Survey Tracks and EWM Locations**

### Fall Eurasian Water-milfoil Bed Mapping Survey:

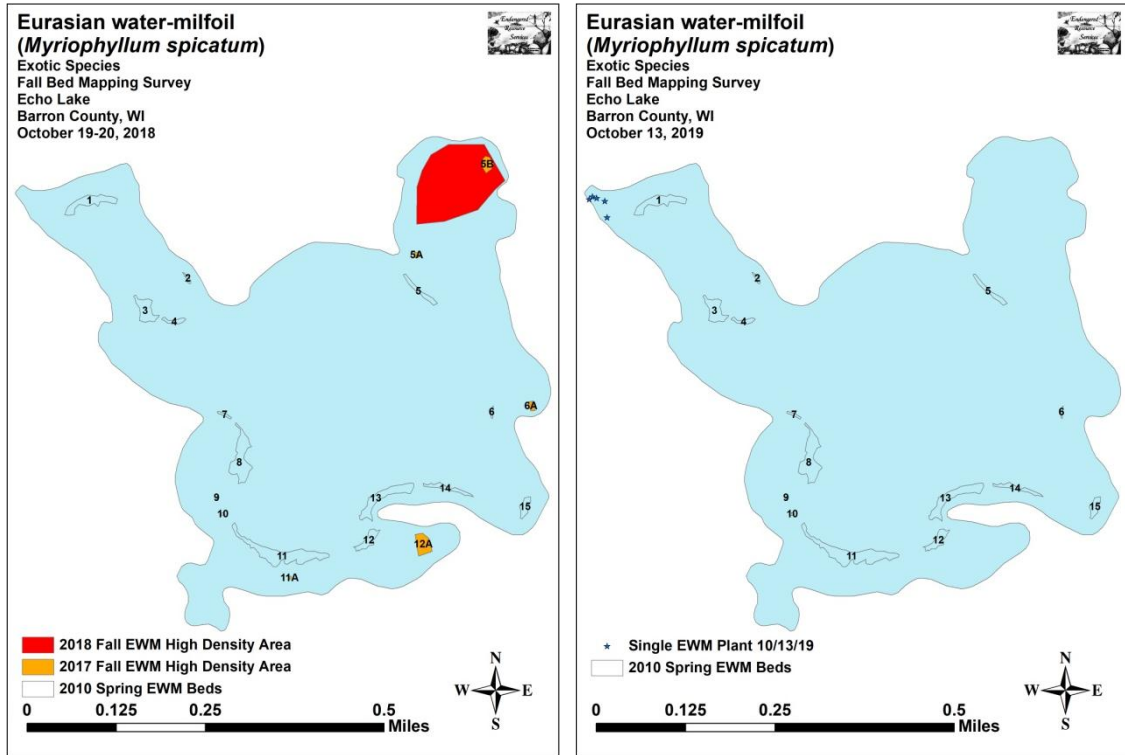
Nearly a month of poor weather forced us to delay the fall survey until October 13<sup>th</sup>. During this final survey, we searched transects totaling 14.7km (9.1 miles) (Figure 3) and found just five total Eurasian water-milfoil plants each of which occurred in the far northwest bay near the public boat landing (down from 180 in the fall of 2018 and 209 in fall 2017) (Figure 4)(Appendix I). Because of this, **no true Eurasian water-milfoil beds were present**. This was a sharp decline from the **6.38 acres high density area we mapped in 2018** or the **0.59 acre we mapped in 2017** (Table 1).



**Figure 3: October 13, 2019 Survey Tracks and EWM Locations**

**Table 1: Fall Eurasian Water-milfoil Bed Mapping Summary  
Echo Lake, Barron County  
October 13, 2019**

<b>Bed Number</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>2014 Fall Bed Acreage</b>	<b>2013 Fall Bed Acreage</b>	<b>2012 Fall Bed Acreage</b>	<b>Years Treated</b>	<b>2019 Fall Bed /HDA Field Notes</b>
1	0	0	0	0.32	0	0	0	0	2010, 2014, 2017	5 EWM plants
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	0	0	0	0	0	0	2010	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	0.03	0	0	0	0	0	None	No EWM found
5B	0	6.38	0.16	0	0	0	0	0	2019	No EWM found
6	0	0	0	0	0	0	0	0	2010, 2013	No EWM found
6A	0	0	0.06	0	0	0	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	0.02	0.09	'10, '11, '13, '14	No EWM found
8A, B, C, D	0	0	0	0	0	0	0.02	0.05	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	0	0	0	0	0	0	'10, '11, '12, '14	No EWM found
11A	0	0	0.01	0	0	0	0	0	None	No EWM found
12	0	0	0	0	0	0	0	0	2010, 2014	No EWM found
12A	0	0	0.33	0	0	0	0	0.03	None	No EWM found
12B	0	0	0	0	0	0	0	0.04	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>6.38</b>	<b>0.59</b>	<b>0.32</b>	<b>0.00</b>	<b>0.00</b>	<b>0.04</b>	<b>0.21</b>		



**Figure 4: 2017/2018 and 2019 Fall EWM High Density Areas**

### CONSIDERATIONS FOR MANAGEMENT:

The combination of chemical treatment in the northeast bay coupled with volunteer and professional efforts to rake remove plants on the lake proved effective in keeping the EWM infestation well in check during the 2019 growing season. Based on our findings, it appears that chemical control will not be necessary in 2020. However, we continue to recommend regular monitoring and rake removal of pioneer plants as this method has proved to be a cost effective way to slow the spread of EWM and minimize the need for herbicides.

### LITERATURE CITED

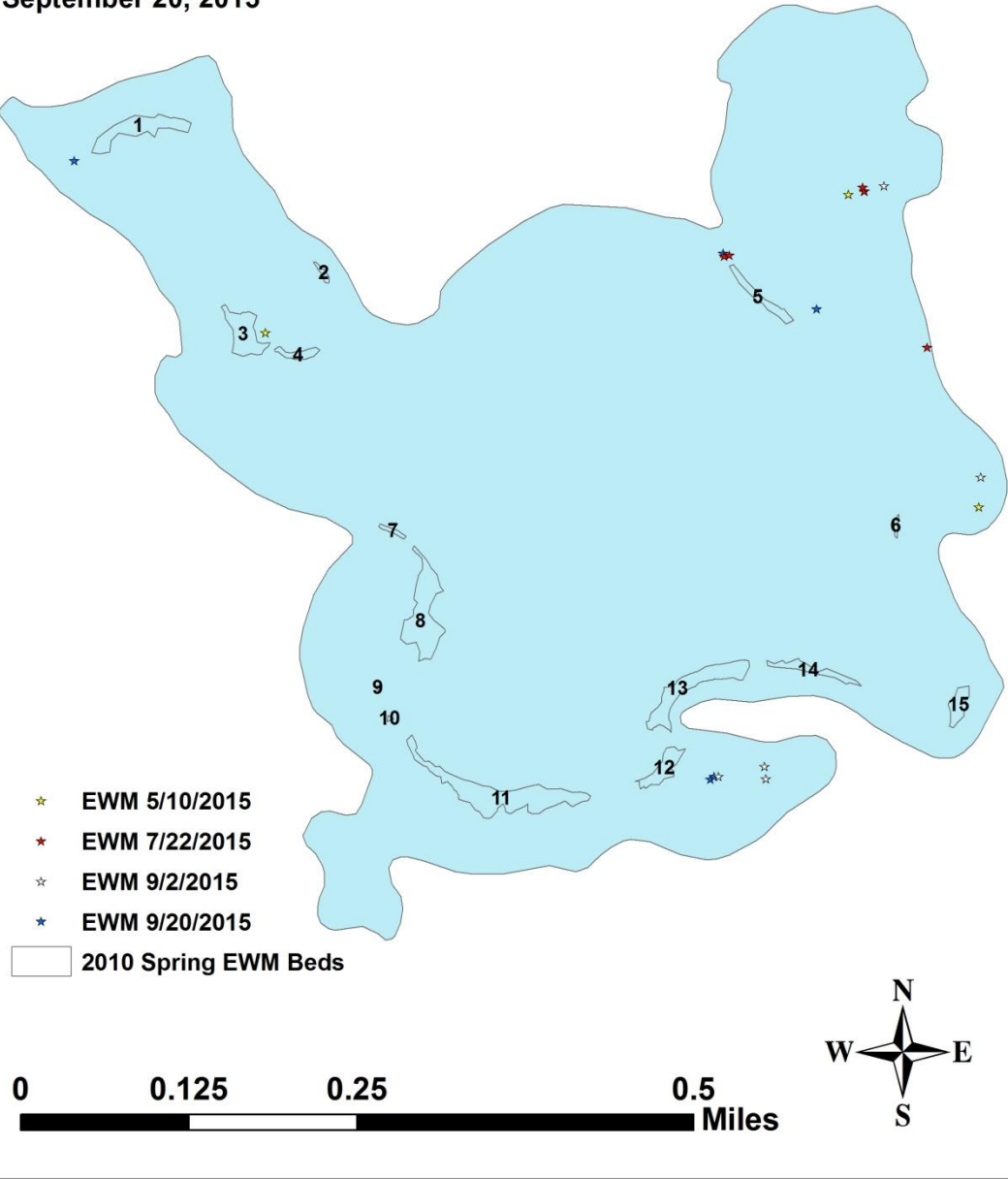
- Busch, C., G. Winter, L. Sather, and C. Holt. [online]. 1967. Echo Lake Map. Available from <http://dnr.wi.gov/lakes/maps/DNR/2630200a.pdf> (2019, October).
- WDNR. [online]. 2019. Echo Lake - Citizen Lake Water Quality Monitoring Database. Available from <http://dnr.wi.gov/lakes/waterquality/Station.aspx?id=033210> (2019, October).



**Appendix I: 2015, 2016, 2017, 2018, and 2019 Fall Bed Mapping Surveys**

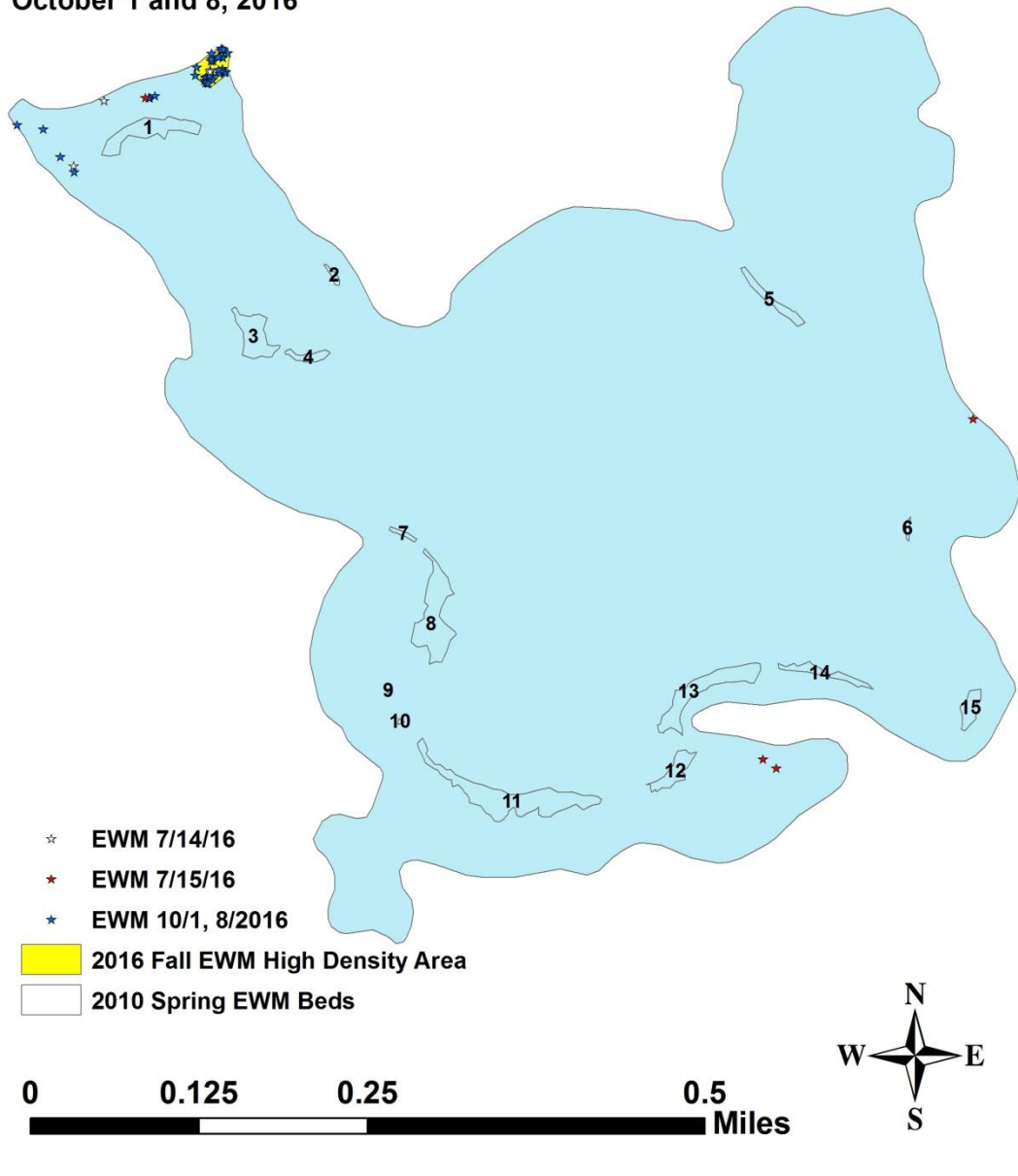
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Exotic species  
Fall Bed Mapping Survey  
Echo Lake  
Barron County, WI  
September 20, 2015



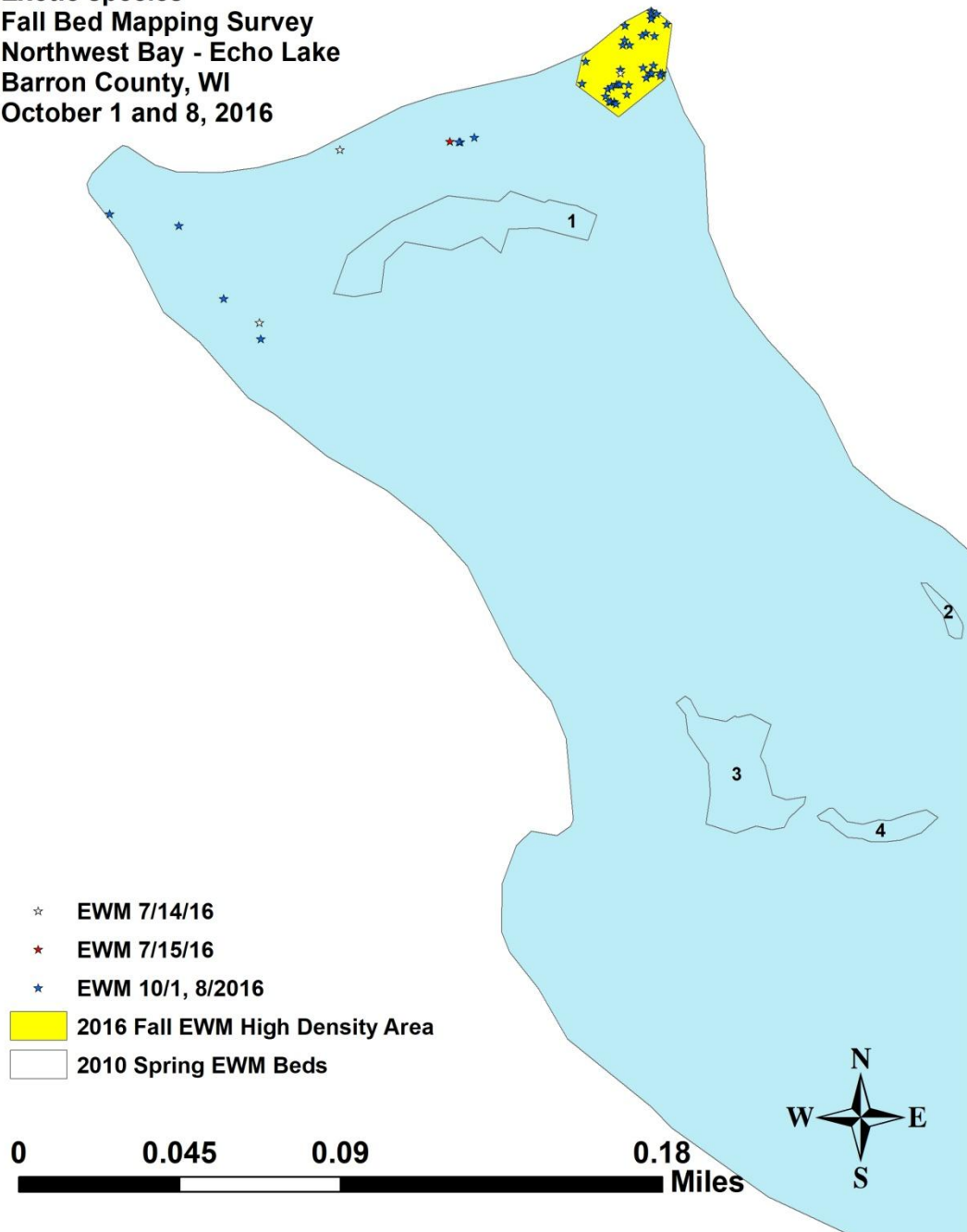
# Eurasian water-milfoil (*Myriophyllum spicatum*)

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



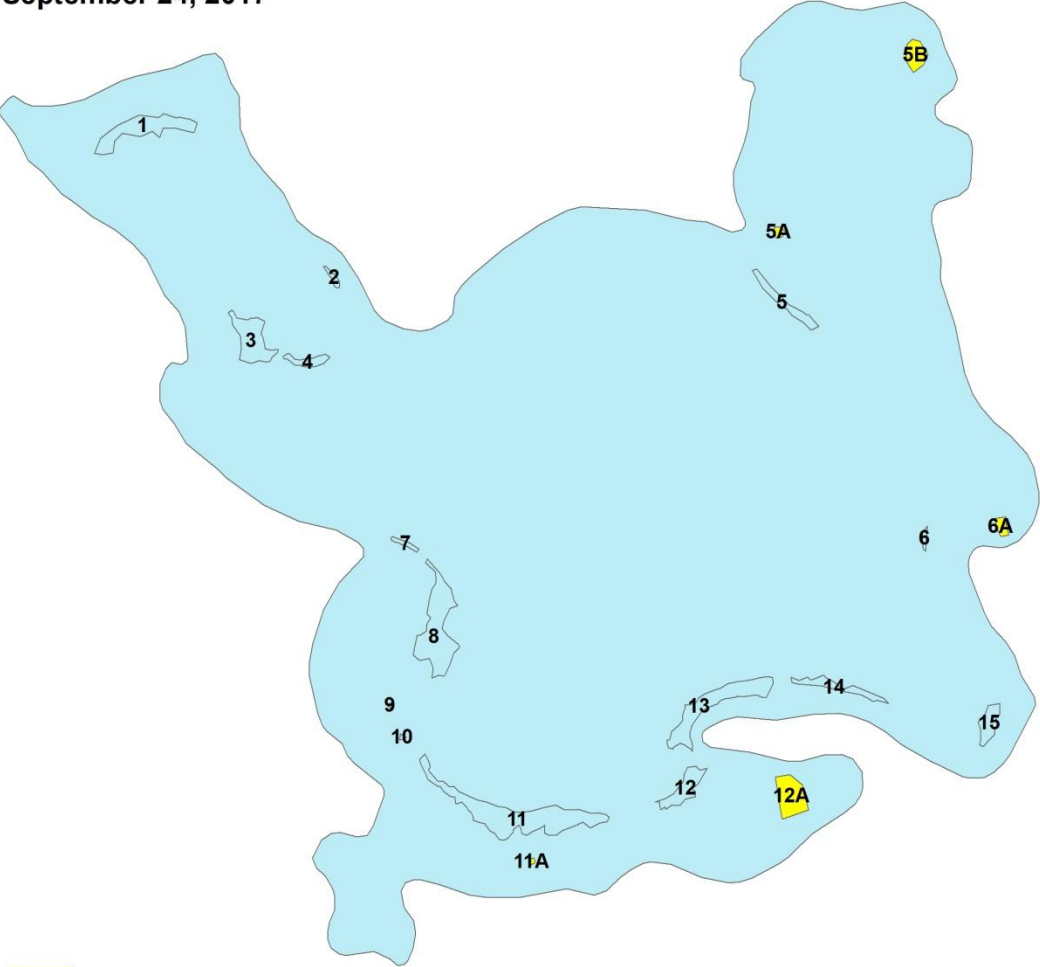
# Eurasian water-milfoil (*Myriophyllum spicatum*)

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

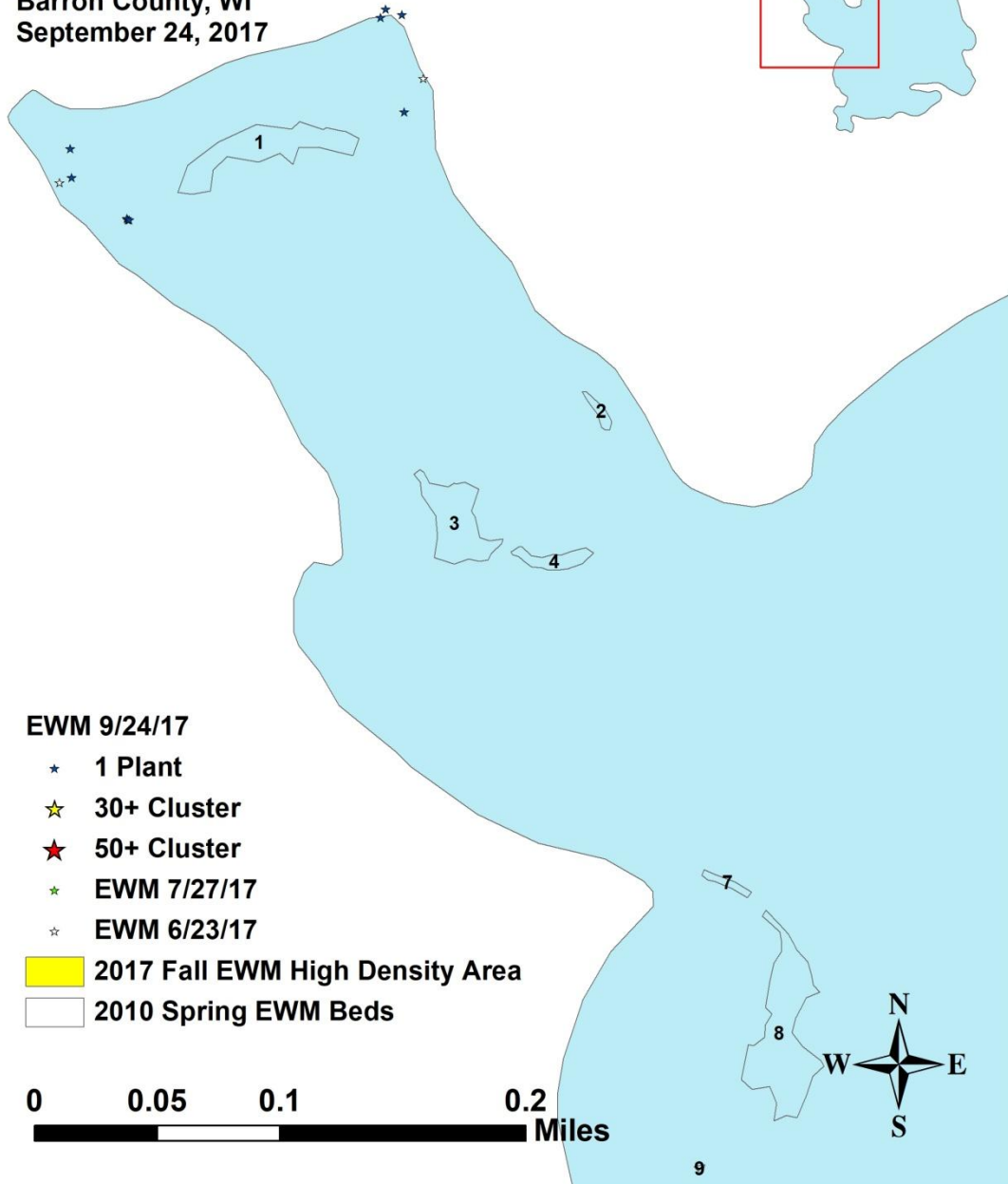
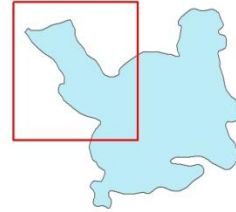


 2017 Fall EWM High Density Area  
 2010 Spring EWM Beds



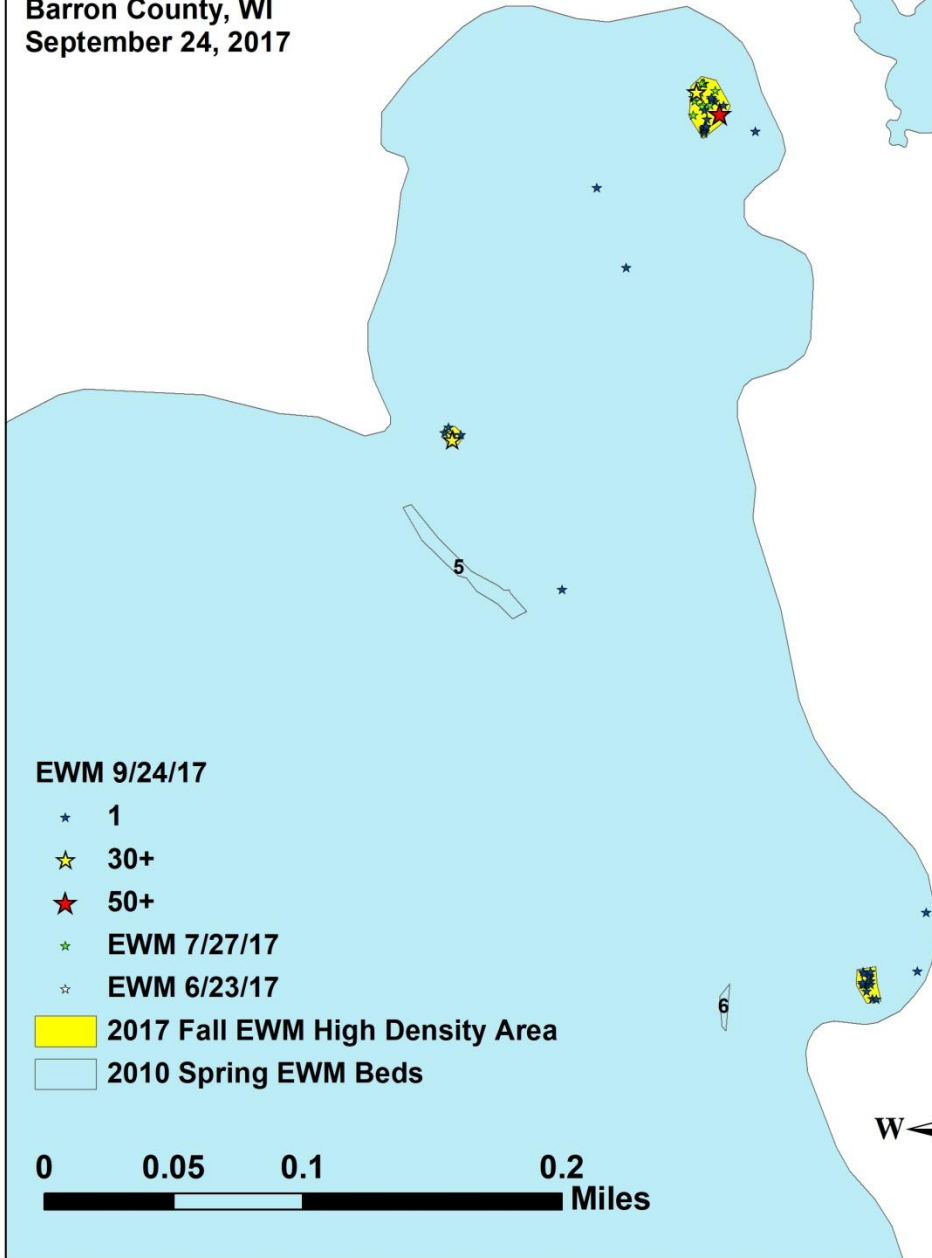
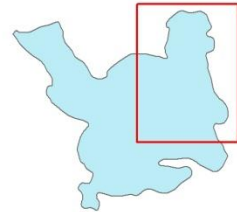
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Exotic species  
Fall Bed Mapping Survey  
Echo Lake - Northwest Bay  
Barron County, WI  
September 24, 2017



# 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

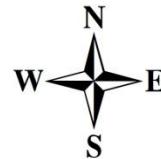
★ EWM 7/27/17

☆ EWM 6/23/17

■ 2017 Fall EWM High Density Area

□ 2010 Spring EWM Beds

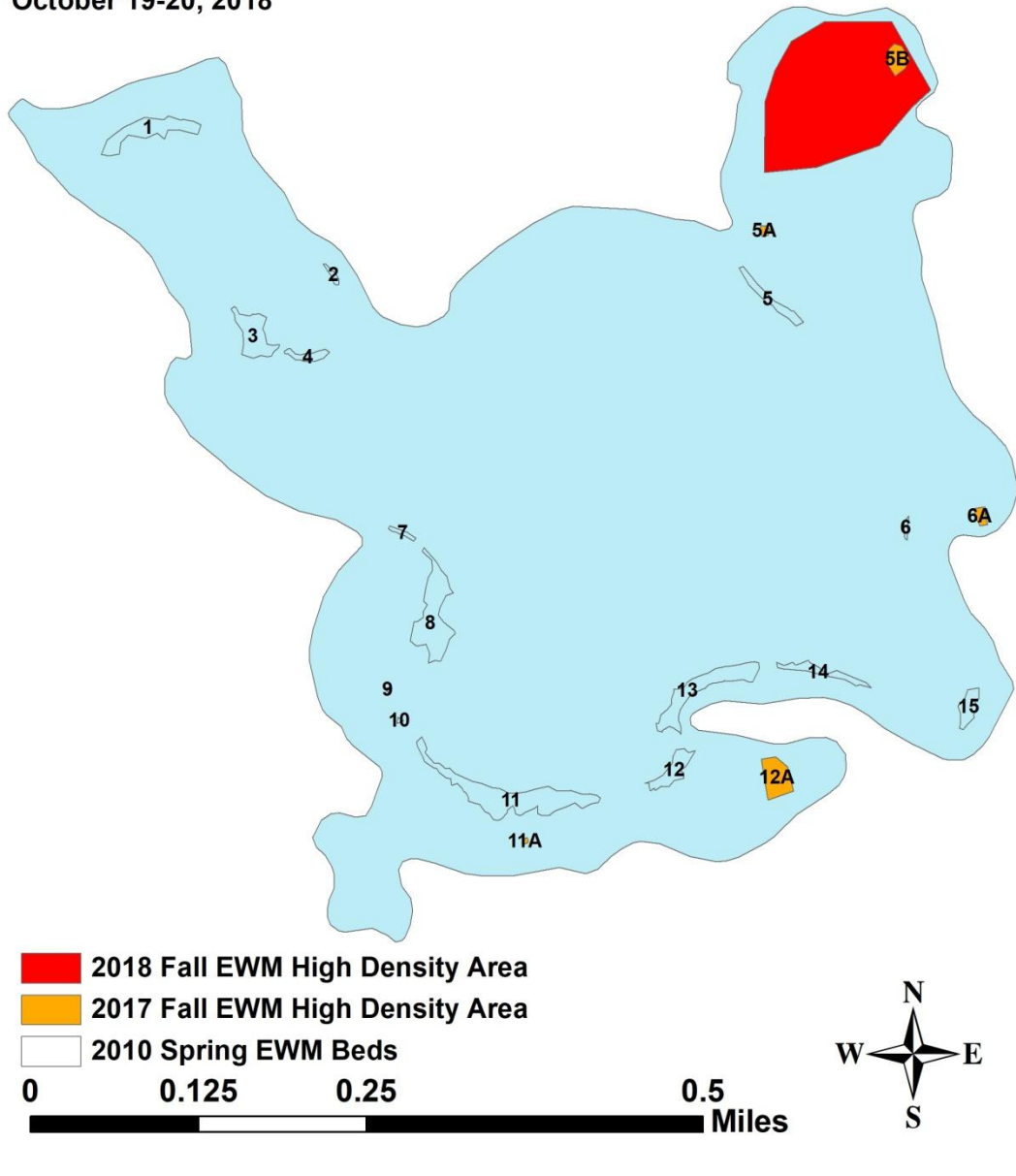
0 0.0375 0.075 0.15 Miles





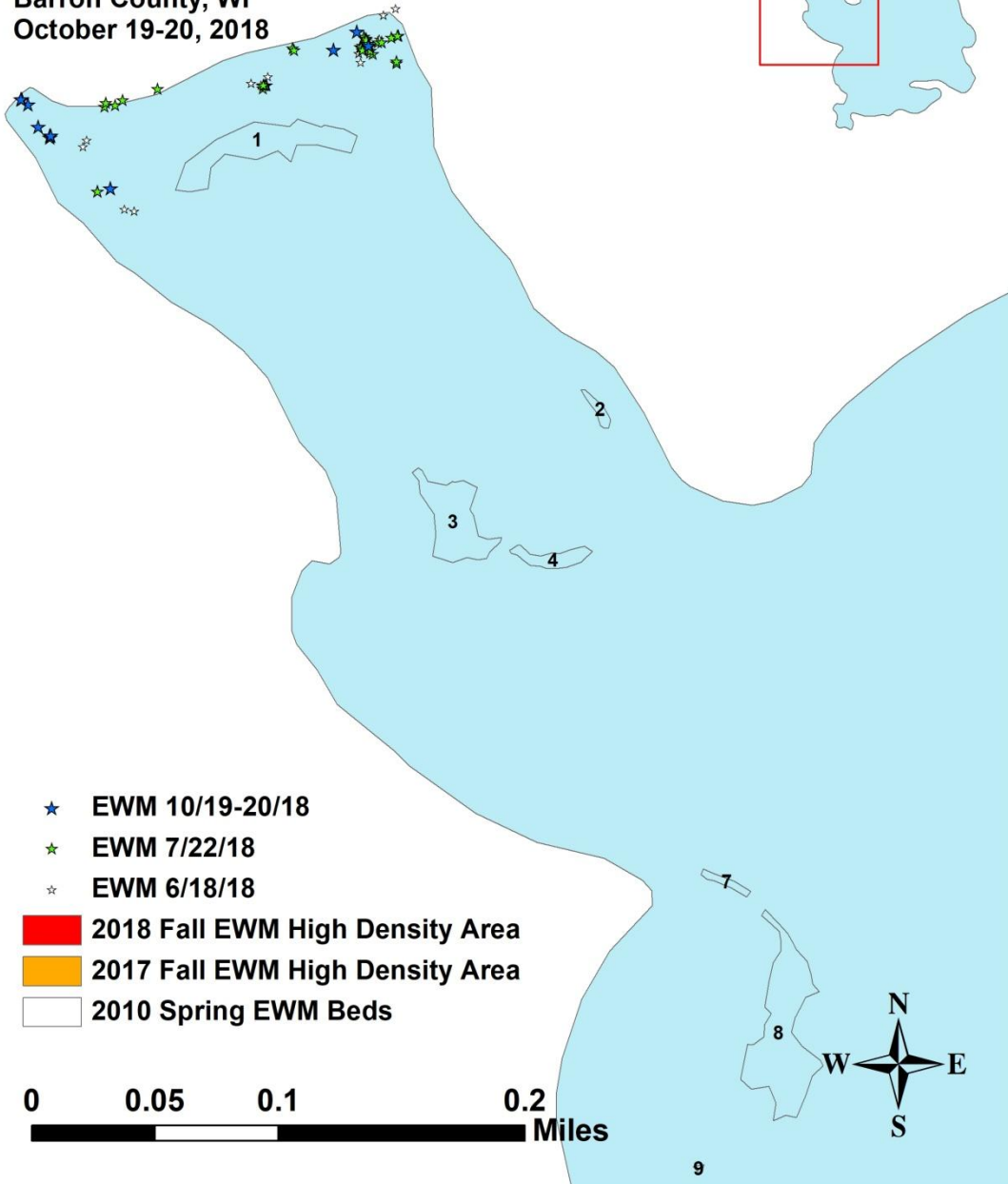
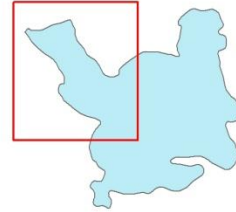
# Eurasian water-milfoil (*Myriophyllum spicatum*)

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



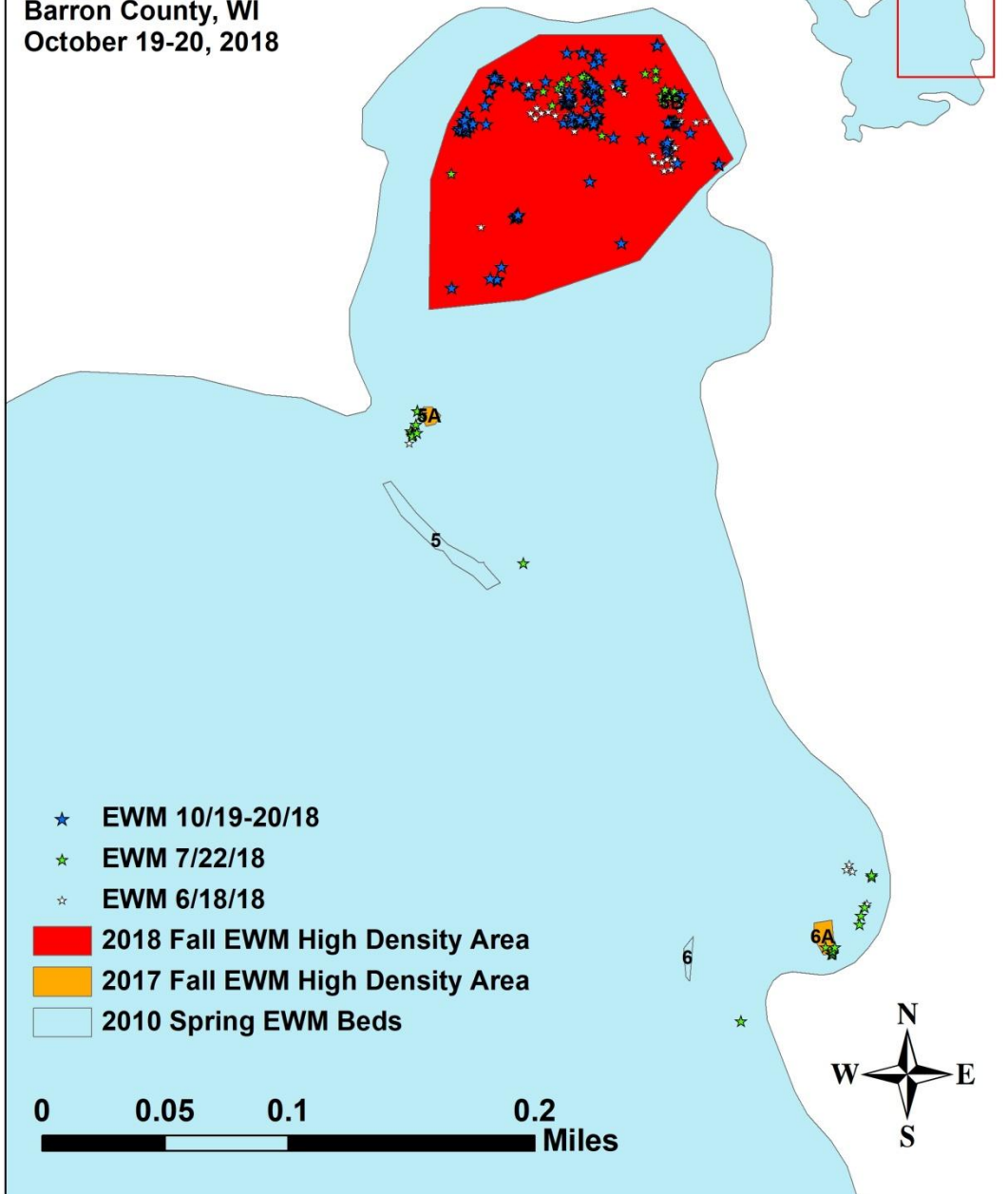
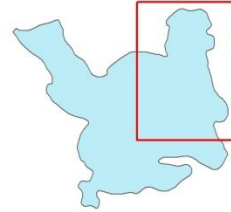
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Echo Lake - Northwest Bay  
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October 19-20, 2018



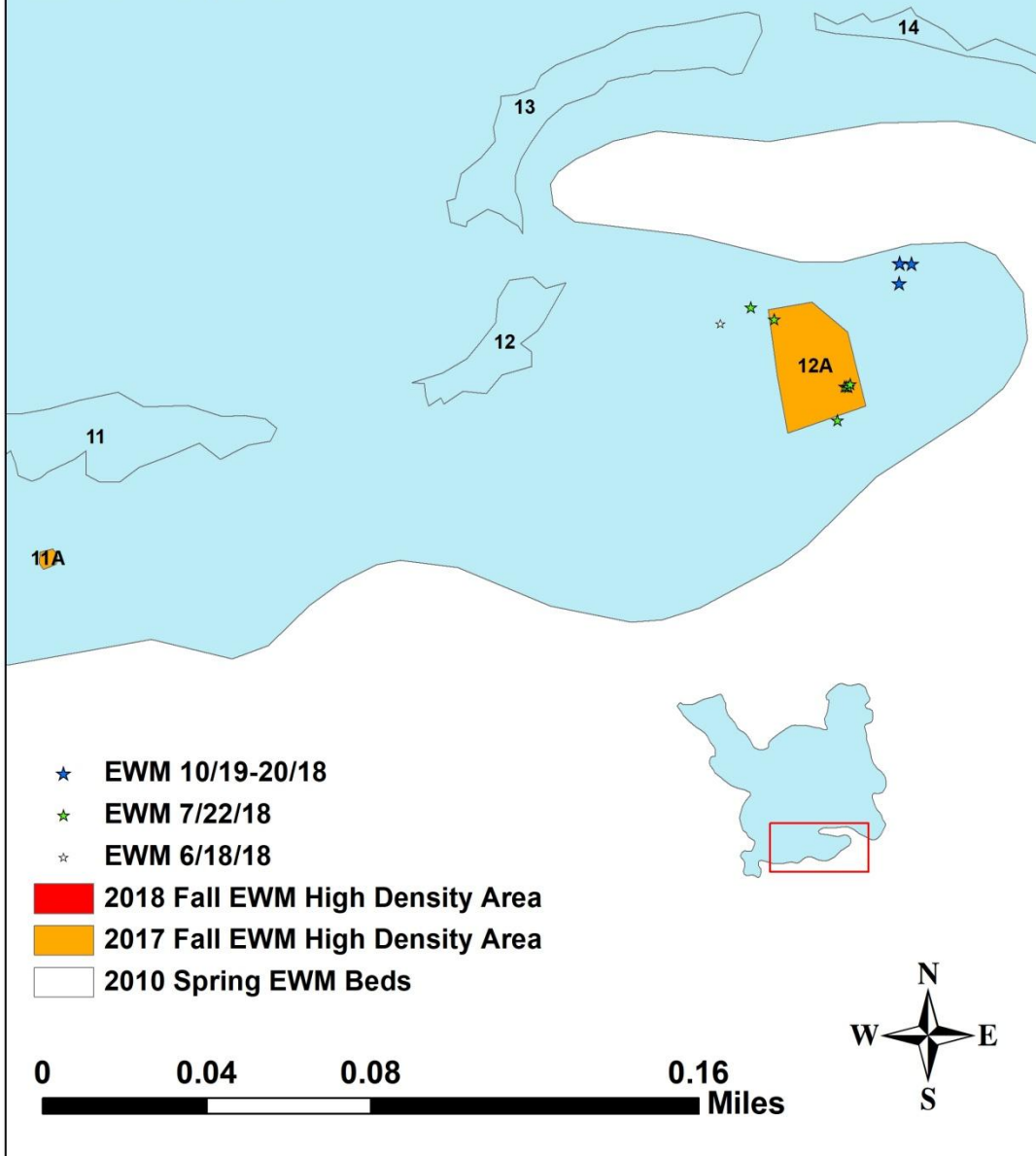
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Echo Lake - Northeast Bay  
Barron County, WI  
October 19-20, 2018



# 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

