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# Alexander Lake, Morrison County

## 2004- 2020 Aquatic Vegetation Management Report

Report by the Invasive Species Program - Division of Ecological and Water Resources  
Minnesota Department of Natural Resources

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**Prepared by:**

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March 24, 2021

## Project Details

**Lake:** Alexander (DOW# 49007900)

**Lake Surface Area:** 2,709 acres

**Littoral Area:** 842 acres

**County:** Morrison County

**Survey Type:** Point-intercept

**Date of Survey (most recent):** 2020 (RMB Labs)

**Observer[s]:**

MN DNR, Invasive Species Program (ISP): 2014: Chris Jurek, Courtney Millaway, Steven

Rodenberg and Conservation Corps of Minnesota, 2007: Dan Swanson

MN DNR, Lake Ecology Unity (LEU): 2004: Donna Perleberg and Nicole Brown

RMB Environmental Laboratories, Inc. (RMB): 2020: Ellie Kriese and Aria Kapsner, 2018: Phillip

Oswald and Garrett Brossart, 2016: Emelia Hauck and Cameron Knoll

**Report Updated:** March 24, 2021

**Author[s]:**

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## Report Details

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## Summary

The purpose of this report is to provide an overview of aquatic plant distribution and the management of invasive aquatic plants in Lake Alexander, Morrison County between 2004 and 2020. Aquatic plant surveys were conducted by MN DNR in 2004, 2007, 2014 and RMB Labs in 2016, 2018, and 2020. Historical data on water quality, invasive aquatic plant management permits and point-intercept surveys are all summarized in this report. These summaries will guide future invasive aquatic plant control projects and can evaluate changes in native plant communities.

## Lake Description

Lake Alexander is a 2,709 acre lake located near Randall, Minnesota in Morrison County. The maximum depth of water in Lake Alexander is 64 feet, and 31 % of the lake is classified as littoral (areas of water depth between 0 to 15 feet, where aquatic plants are most likely to grow). Lake Alexander has a high diversity of submersed aquatic plant growth providing important fish habitat and shoreline protection from erosion. Aquatic plants have been observed in deeper depths (up to 24 feet) in Lake Alexander likely due to the high water clarity in the lake. Lakes with high water clarity allow light to penetrate into deep waters enabling plant growth. During 2020, the water clarity during the summer averaged 15.2 feet (RMB Environmental Laboratories, Inc. Database, 2020).

Lake Alexander is located in the Northern Lakes and Forests Ecoregion in the Upper Mississippi River drainage basin. Lake Alexander is classified as a mesotrophic lake, based on its Trophic State Index (TSI) of approximately 42.2 (RMB Environmental Laboratories, Inc. Database, 2021). Mesotrophic lakes are lakes with an intermediate level of productivity and are typically clear water lakes with some summer algal blooms. The three parameters that are factored into the trophic state index are total phosphorus (nutrients in the water), chlorophyll-a (measure of the amount of algae growing in the water) and Secchi depths (water transparency). Data collected between 2007- 2020 (RMB), indicates that chlorophyll-a and phosphorus are within the expected range based on the Minnesota Pollution Control Agency (MPCA), while Secchi depth is

greater than the expected range. More information on water quality characteristics is available at [RMB Environmental Laboratories, Inc. Database](https://www.rmbel.info/data/) (https://www.rmbel.info/data/) and [MPCA Database](https://cf.pca.state.mn.us/water/watershedweb/wdip/waterunit.cfm?wid=49-0079-00&tab=Assessments) (https://cf.pca.state.mn.us/water/watershedweb/wdip/waterunit.cfm?wid=49-0079-00&tab=Assessments)

### Management History

The lake has two invasive plant species: curly-leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*). Invasive aquatic plant management in Lake Alexander has focused on curly-leaf pondweed using an endothall herbicide and auxin-mimic herbicides on Eurasian watermilfoil (Table 1). Eurasian watermilfoil was first documented in Lake Alexander in 2003 and the first documentation of curly-leaf pondweed is unknown. Herbicide treatments for Eurasian watermilfoil were first initiated in 2003, totaling 6 acres near the east public water access. No herbicide treatments took place in 2004. The Lake Alexander Lake Improvement District has continued to manage Eurasian watermilfoil since 2005 and curly-leaf pondweed since 2008. The most recent treatment in 2020 for curly-leaf pondweed was 15.4 acres and the Lake Alexander Improvement District did not treat the Eurasian watermilfoil in 2020. Past treatments have ranged from 3 to 92 acres for curly-leaf pondweed and 4 to 183 acres for Eurasian watermilfoil. The permitted acreage reflects the proposed areas dominated by invasive aquatic plants that were either delineated by MN DNR Fisheries and/or Ecological and Water Resources staff or approved by MN DNR after pre-treatment inspections.

The initial Lake Vegetation Management Plan was written in 2006. This plan included a variance to apply herbicides to areas that were an avoidable nuisance, areas adjacent to undeveloped shoreline, and areas in excess of the 100' limitation per shoreline site when properties were a part of an offshore treatment. However, it did not allow herbicide treatment to exceed the 15% limit. In June of 2011, a new Lake Vegetation Management Plan, with a variance to apply herbicides to control more than 15% of the littoral area (approx. 126 acres), was approved. When this LVMP expired in 2016, a renewal plan was implemented. The main goal of this plan was to control Eurasian watermilfoil and curly-leaf pondweed by reducing annual delineated acres and the frequency of invasive aquatic plants lakewide. Other objectives included: 1)

increasing the lakewide native plant frequency of occurrence, 2) maintaining or increasing the species richness in the lake and 3) evaluate effective herbicide treatments and long-term management of invasive species in Lake Alexander. Since the implementation of this plan, no year of management exceeded the 15% pesticide threshold and management has shown to be successful at reducing the abundance and distribution of invasive aquatic plants in Lake Alexander. Pre-treatment survey data (i.e. point-intercept surveys or lake-wide delineations that can be repeatable), collected over time, would be a recommended course of action for analyzing plant abundance and distribution trends into the future.

**Table 1. Invasive Plant Management Summary.** Characteristics and history of partial lake invasive plant treatments for Lake Alexander, Morrison County (DOW# 49007900). Total acres: 2,709, Littoral acres: 842, 15% of Littoral acres: 126). Abbreviations are as followed: curly-leaf pondweed (CLP) and Eurasian watermilfoil (EWM). Note: Total acres permitted does not reflect the actual treatment or known acreage of the taxa in the lake. Acreage is rounded to the nearest whole number.

Date	Total Acres Permitted (EWM)	Total Acres Permitted (CLP)	Total Acres Permitted
2003	6	0	6
2004	0	0	0
2005	20	0	20
2006	55	0	55
2008	103	9	112
2009	78	33*	111
2010	100	20	120
2011	183	13*	196
2012	172	15	187
2013	119 (113**)	43	162 (156**)
2014	52	43 (34**)	95 (86**)
2015	126	43	169
2016	28 (19**)	137 (92**)	165 (111**)
2017	28	92	120
2018	14	5	19
2019	4	3	7
2020	0	15	15

**\*\*Indicates the actual acreage treated noted from treatment record**

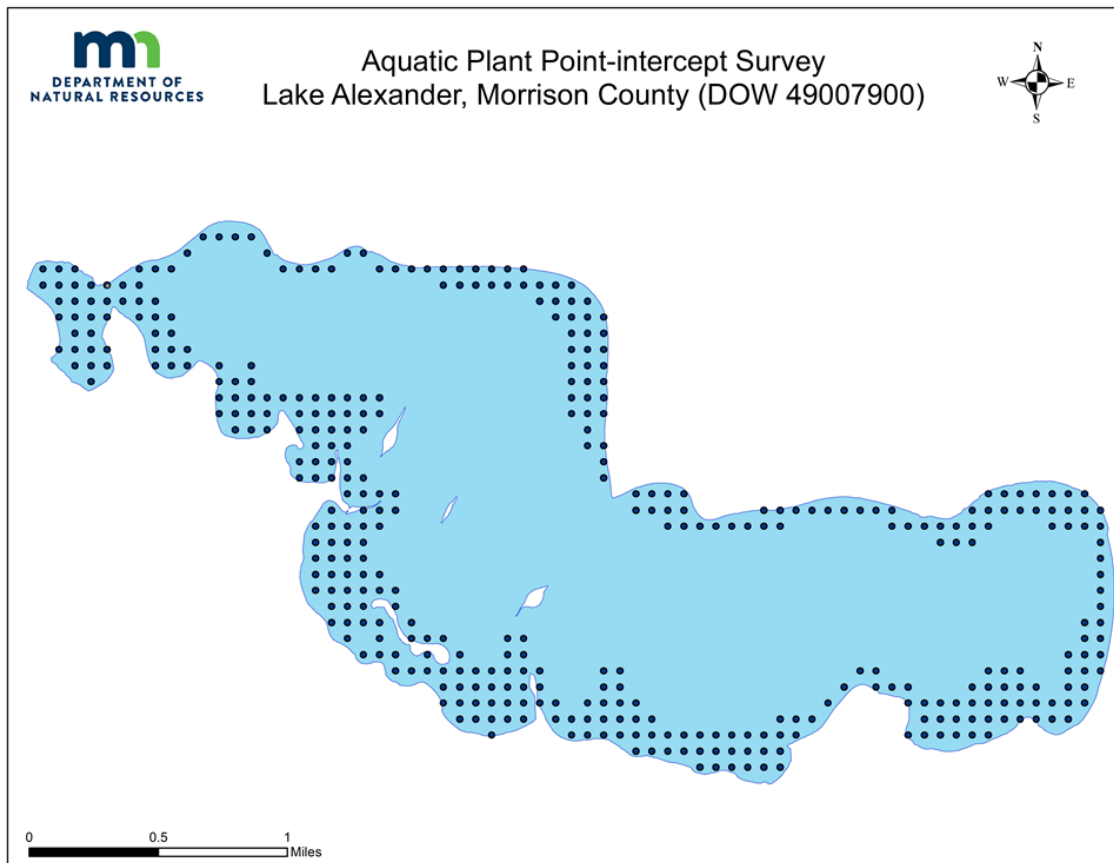
### Survey Objectives

A point-intercept survey was used to assess the distribution of aquatic plants in Lake Alexander. The primary purpose for this type of survey is to 1) develop baseline knowledge of the current plant community in a lake, and over time, 2) compare year to year plant variation (in plant presence and spatial location) and track invasive aquatic plants. Moreover, this survey will help the DNR and our partners to monitor native plant communities and evaluate possible responses to invasive aquatic plant management via herbicide control. It is important to note that

distributions and occurrences of aquatic plants may vary from year to year due to natural variations (water clarity, snow cover, water temperatures, and natural fluctuation in plant species) or human induced alterations, such as, herbicide and shoreline management activities.




## Survey Methods

We used a point-intercept survey method developed by John Madsen in “Aquatic Plant Control Technical Note MI-02, 1999”. Sampling points were placed between 100-120 meters apart, depending on surveyor (MN DNR or RMB), using a Geographic Information System (Figure 1). Sampling points varied among survey year, although were based on the depth of rooted vegetation. Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point. All plant taxa (submerged, floating-leaf, emergent and free floating) were recorded to species or genera during the survey following Crow and Hellquist (2000). Plant samples were assessed on the boat to determine species presence-absence and abundance. The abundance rake rating are as follows: 1: sparse, 2: common/ frequent/ occasional, and 3: abundant/matted (Table 2). Frequencies of occurrence percentages (i.e., how often a plant species was sampled in the lake) were calculated based on the littoral zone.



**Figure 1. Point-intercept Survey Grid.** MN DNR point-intercept survey grid for Lake Alexander, Morrison County (DOW# 49007900).

**Table 2. Quantitative rake abundance ranking (0-3) used to estimate plant abundance for each species based on rake coverage and/or visual observation (MN DNR). A zero (0) ranking indicates no target plants were retrieved or observed in a sample.**

Abundance Ranking	Rake Coverage	Description
1		Sparse; plants covering <25% of the rake head
2		Common; plants covering 25%-75% of the rake head
3		Abundant; plants covering >75% of the rake head



## Survey Observations

The most recent aquatic vegetation point-intercept survey of Lake Alexander (DOW #49007900) occurred on August 11, 2020 by RMB Laboratories. Plant growth was the most abundant within depths of 6 to 11 feet and no plants were found to be growing beyond 16 feet. Lake Alexander has up to 17 submersed native taxa and two non-native submersed taxa (curly-leaf pondweed and Eurasian watermilfoil), although curly-leaf pondweed was not found during the August survey. Most of the milfoil in Lake Alexander is its native counterpart, northern watermilfoil (18%). Surveys conducted by the MN DNR (2004, 2007, and 2014) and RMB Laboratories (2016, 2018, and 2020) show a change in the invasive aquatic plant distribution for both species over time (Figures 2-8). Because the timing of the point-intercept surveys (after management), the comparison among years is not feasible. Although, generally the delineated management areas in the lake have declined for both species since 2017 (Table 1). During the 2020 survey, 10% of the littoral area had points with submersed non-native taxa compared to 78% of the points with submersed native taxa (Table 3). Up to a total of 23 submersed aquatic plants, four floating- leaf aquatic plants, three free-floating species and eight types of emergent aquatic plants have been identified in Lake Alexander between 2004 and 2020 (Table 4).

**Table 3. Point-intercept Metrics.** Summary of point-intercept metrics for Lake Alexander, Morrison County (DOW# 49007900). Shaded values were calculated from littoral depth range (0-15 feet). Not available (NA) indicates not reported.

Metric	JUNE 2004	JUNE 2007	JULY/AUG 2014	JULY 2016	JULY/AUG 2018	AUG 2020
Surveyor	MN DNR (LEU)	MN DNR (ISP)	MN DNR (ISP)	RMB	RMB	RMB
Total # Points Sampled	486	453	332	309	309	440
Depth Range of Rooted Veg (ft.)	2- 24	1- 25	2- 22	2-24	2-17	1-16
Max Depth of Growth	24	25	22	24	17	16
# Points in Littoral (0-15 feet)	346	322	266	247	242	261
% Points w/ Submersed Native Taxa	69	75	91	90	86	81
Mean Submersed Native Taxa/ Point	1.6	1.7	2.4	2.7	2.7	2.2
# Submersed Native Taxa	20	19	22	18	16	17
# Submersed Non-Native Taxa	2	2	2	2	2	1
% Points w/ Submersed Non- native Taxa	42	71	20	20	9	10

Based on the 2020 point-intercept survey, the native plant community within the littoral area in Lake Alexander was primarily dominated by coontail (*Ceratophyllum demersum*), Fries pondweed (*Potamogeton friesii*), muskgrass (*Chara* sp.), bushy pondweed (*Najas flexilis*) and northern watermilfoil (*Myriophyllum sibiricum*). These aquatic plants are central to a healthy fish population, offering shelter and providing food and habitat to wildlife. Lake Alexander has a diverse aquatic plant community, including a variety of species of emergent vegetation. These emergent plants are especially good at preventing shoreline erosion, habitat and providing food sources for waterfowl. Plants also absorb nutrients and reduce algae, thereby improving water quality.

#### Comparison to previous years

When comparing survey years, it is important to note when the survey was conducted. For example, curly- leaf pondweed peak abundance is June, although for most native aquatic plants, surveys are conducted in mid to late summer when it is the best time to evaluate native aquatic plant communities. Over time, the percent frequencies of native aquatic plant species had fluctuated, with the exception of flat-stem pondweed which had declined. Between 2014 and 2020 during the mid to late summer surveys, the frequency of submersed aquatic vegetation and mean submersed native taxa per point had declined. During this same time, there has been a 10% decrease in the frequency of sampling points with non-native aquatic plants.

**Table 4. Plant Frequency of Occurrence.** Percent frequency of occurrence for observed plant species) in Lake Alexander, Morrison County (DOW #49007900).

Taxonomic Name	Common Name	JUNE/JULY 2004 <sup>a</sup>	JUNE 2007 <sup>b</sup>	JULY/AUG 2014 <sup>c</sup>	JULY 2016 <sup>d</sup>	JULY/AUG 2018 <sup>e</sup>	AUG 2020 <sup>f</sup>
<b>SUBMERSED NON-NATIVE</b>							
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	1	24	14	9	8	10
<i>Potamogeton crispus</i>	curly-leaf pondweed	30	35	4	10	1	0
<b>SUBMERSED NATIVE</b>							
<i>Bidens beckii</i>	water marigold	<1	<1	2	1	<1	1
<i>Ceratophyllum demersum</i>	coontail	24	33	37	32	30	38
<i>Chara</i>	muskgrass	14	7	30	45	29	24
<i>Elodea canadensis</i>	Canadian waterweed	8	24	16	19	6	14
<i>Heteranthera dubia</i>	water star-grass	4	8	2	3	0	<1
<i>Myriophyllum sibiricum</i>	northern watermilfoil	6	11	8	5	10	18
<i>Najas</i> sp.	naiad species	0	1	20	18	18	24
<i>Nitella</i> sp.	stonewort species	2	2	8	0	0	0
<i>Potamogeton amplifolius</i>	large-leaf pondweed	2	2	2	0	0	1
<i>Potamogeton friesii</i>	Fries' pondweed	2	0	4	<1	3	34
<i>Potamogeton gramineus</i>	variable pondweed	1	1	10	3	12	12
<i>Potamogeton illinoensis</i>	Illinois pondweed	2	<1	2	1	<1	0
<i>Potamogeton praelongus</i>	whitestem pondweed	4	5	11	7	2	7
<i>Potamogeton richardsonii</i>	clasping-leaved pondweed	5	2	13	5	10	10
<i>Potamogeton robbinsii</i>	Robbin's pondweed	5	2	1	<1	0	0
<i>Potamogeton</i> spp.	narrow-leaf pondweed	8	2	2	0	5	3
<i>Potamogeton zosteriformis</i>	flat-stem pondweed	18	18	33	11	12	2
<i>Ranunculus</i> sp.	white water crowfoot	4	3	2	3	0	0
<i>Stuckenia pectinata</i>	sago pondweed	P	0	2	2	<1	2
<i>Utricularia vulgaris</i>	common bladderwort	1	0	1	2	<1	2
<i>Vallisneria americana</i>	water celery	P	P	4	2	1	7
<b>FLOATING LEAF</b>							

Taxonomic Name	Common Name	JUNE/JULY 2004 <sup>a</sup>	JUNE 2007 <sup>b</sup>	JULY/AUG 2014 <sup>c</sup>	JULY 2016 <sup>d</sup>	JULY/AUG 2018 <sup>e</sup>	AUG 2020 <sup>f</sup>
<i>Brasenia schreberi</i>	watershield	<1	<1	0	0	0	0
<i>Nuphar variegata</i>	yellow waterlily	2	2	2	4	5	5
<i>Nymphaea odorata</i>	white waterlily	2	<1	6	4	5	5
<i>Potamogeton natans</i>	floating-leaf pondweed	1	0	P	<1	0	0
<b>FREE FLOATING</b>							
<i>Lemna</i> sp.	duckweed species	1	0	0	0	0	0
<i>Lemna trisulca</i>	star duckweed	16	12	5	11	6	0
<i>Spirodela polyrhiza</i>	greater duckweed	P	0	0	0	0	0
<b>EMERGENT</b>							
<i>Alisma gramineum</i>	water plantain	P					
<i>Eleocharis</i> sp.	spikerush species	1	0	0	0	0	0
<i>Eleocharis acicularis</i>	Needlerush	3	1	0	0	0	<1
<i>Lysimachia</i> sp.	loosestrife species	0	0	0	0	0	0
<i>Schoenoplectus</i> sp.	bulrush species	P	1	1	5	3	4
<i>Sparganium</i> sp.	burreed species	0	1	0	0	0	0
<i>Typha</i> sp.	cattail species	P	<1	0	0	<1	6
<i>Sagittaria</i> sp.	arrowhead	0	0	0	<1	0	0
<i>Zizania aquatica</i>	wild rice	0	0	0	<1	0	0

p – Indicates taxon was present in the lake but not observed in any sample sites.

<sup>a</sup> –Percent frequency values for 2004 are calculated for the 0-25 feet depths (Perleberg, 2004).

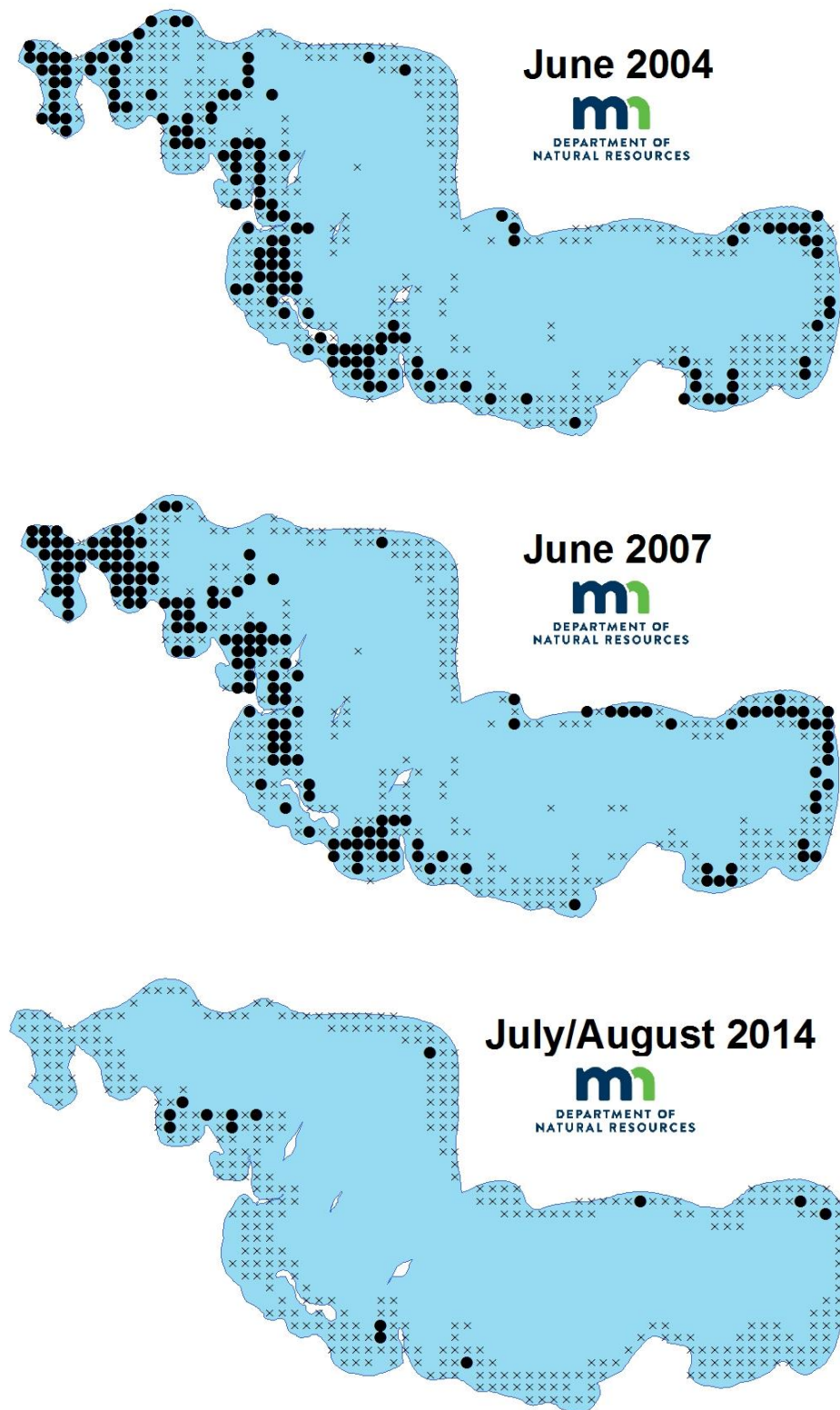
<sup>b</sup> –Percent frequency values for 2007 are calculated for the 0-25 feet depths (Swanson, 2007).

<sup>c</sup> – Percent frequency values for 2014 are calculated for samples in the 0-20 feet depths (Jurek and Millaway, 2014)

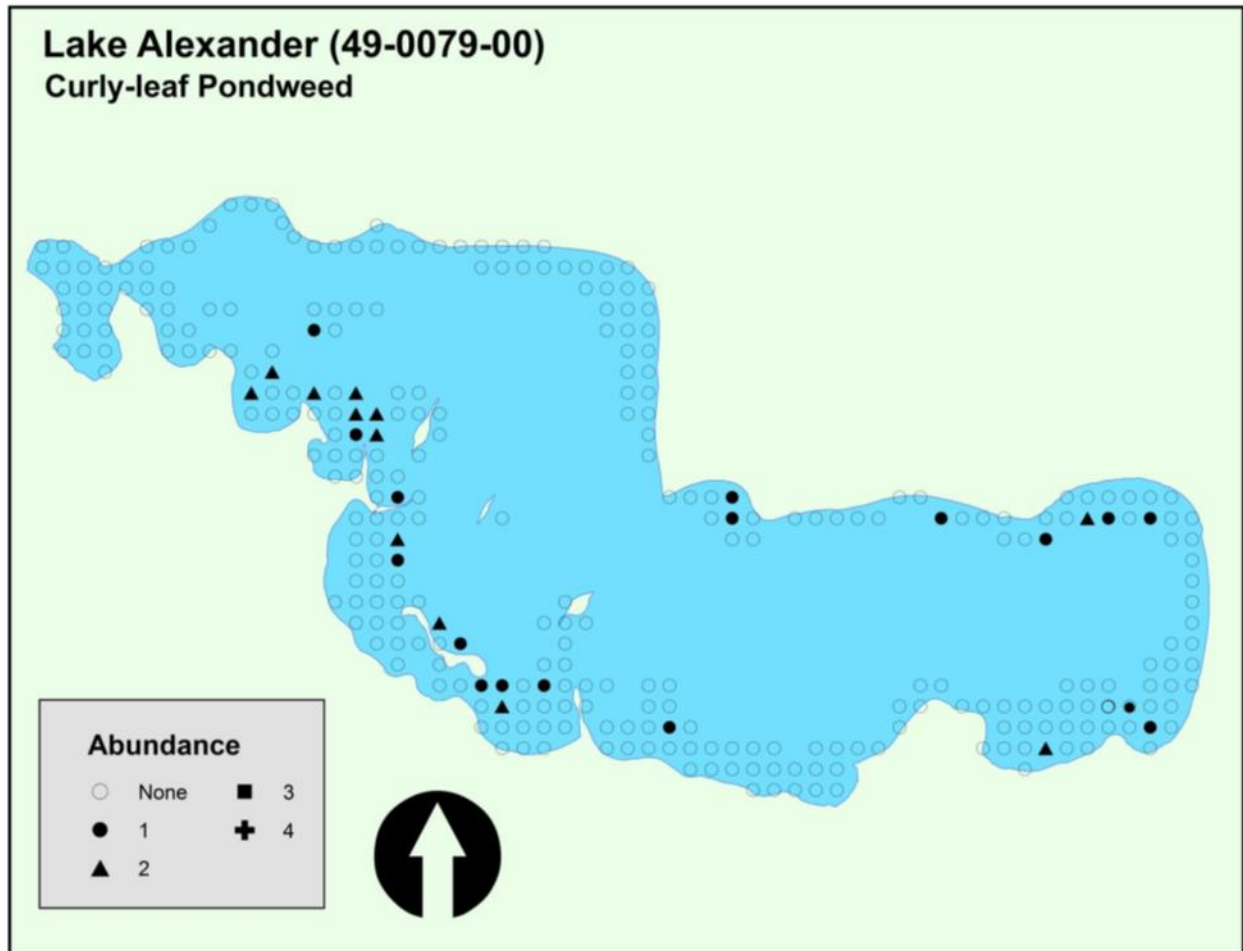
<sup>d</sup> – Percent frequency values for 2016 are calculated for samples in the 0-23 feet depths (RMB Laboratories, 2016)

<sup>e</sup> – Percent frequency values for 2018 are calculated for samples in the 0-18 feet depths (RMB Laboratories, 2018)

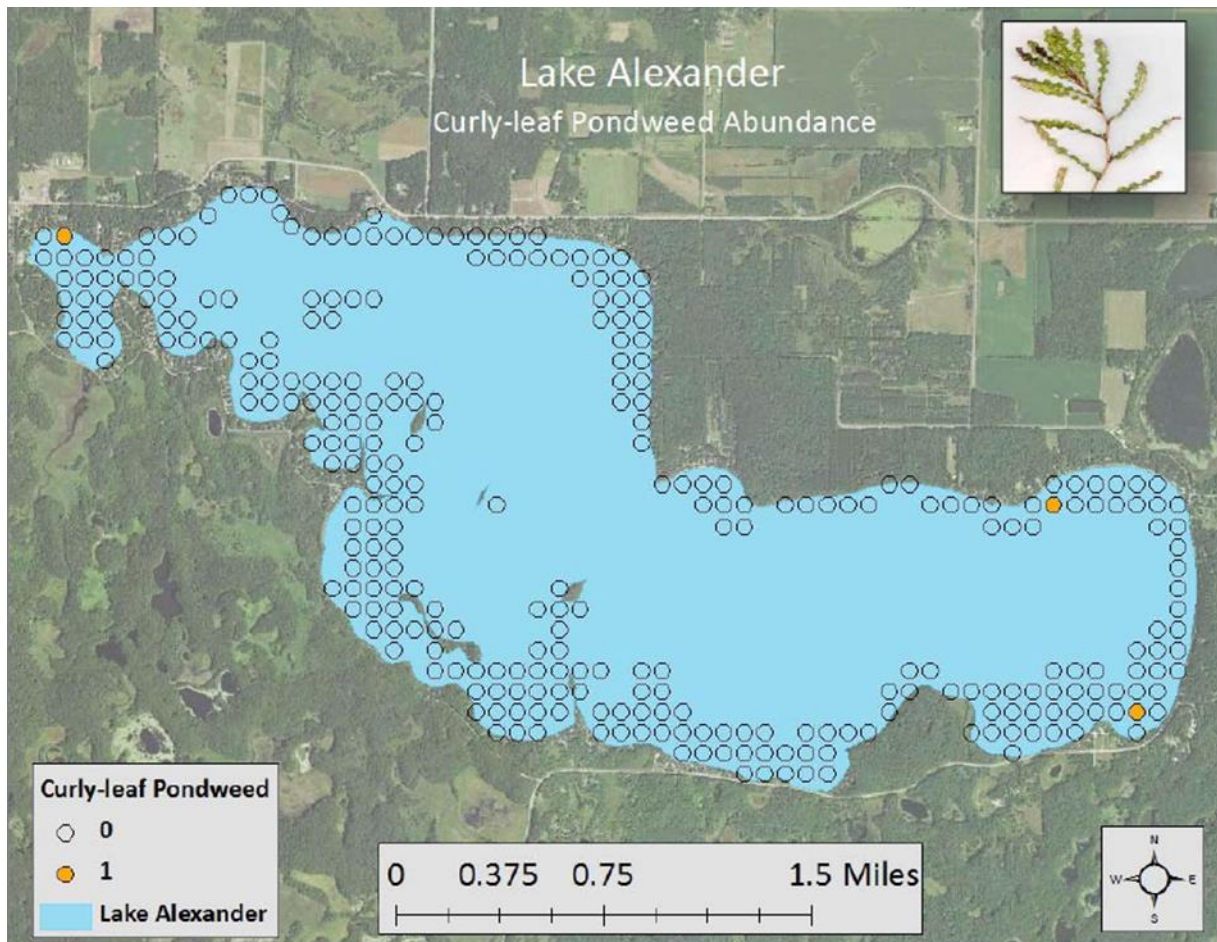
<sup>f</sup> – Percent frequency values for 2020 are calculated for samples in the 0-14 feet depths (RMB Laboratories, 2020).



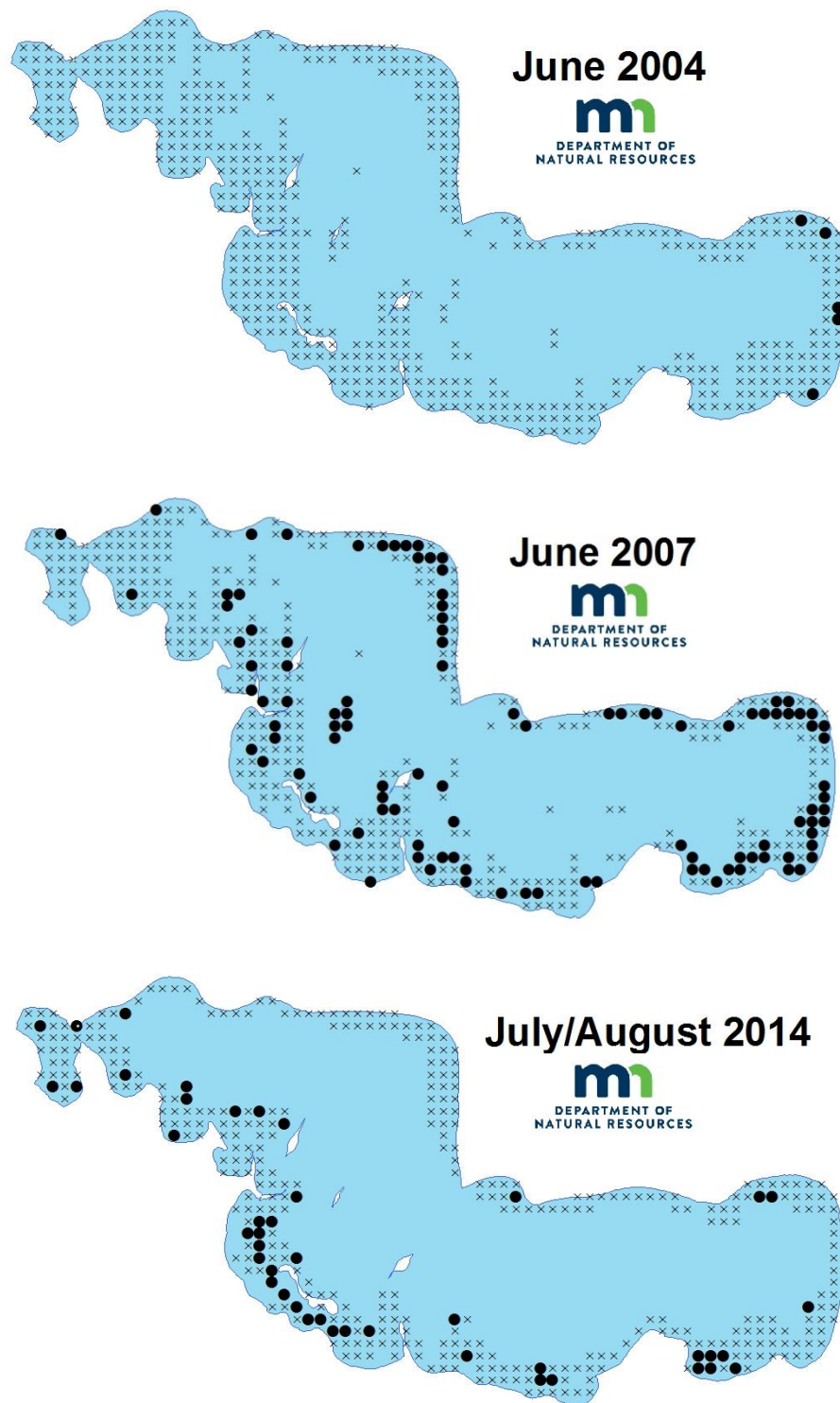
**Figure 2. Curly-leaf pondweed Distribution among Years in Lake Alexander.** Plant distribution from MN DNR point intercept surveys in 2004, 2007 and 2014 for curly-leaf pondweed in Lake Alexander, Morrison County (DOW#49007900). Black circles indicate species is present.



**Figure 3. Curly- leaf pondweed Distribution in 2016 for Lake Alexander, Morrison County (DOW#49007900).** Plant distribution from RMB Laboratories point- intercept surveys.

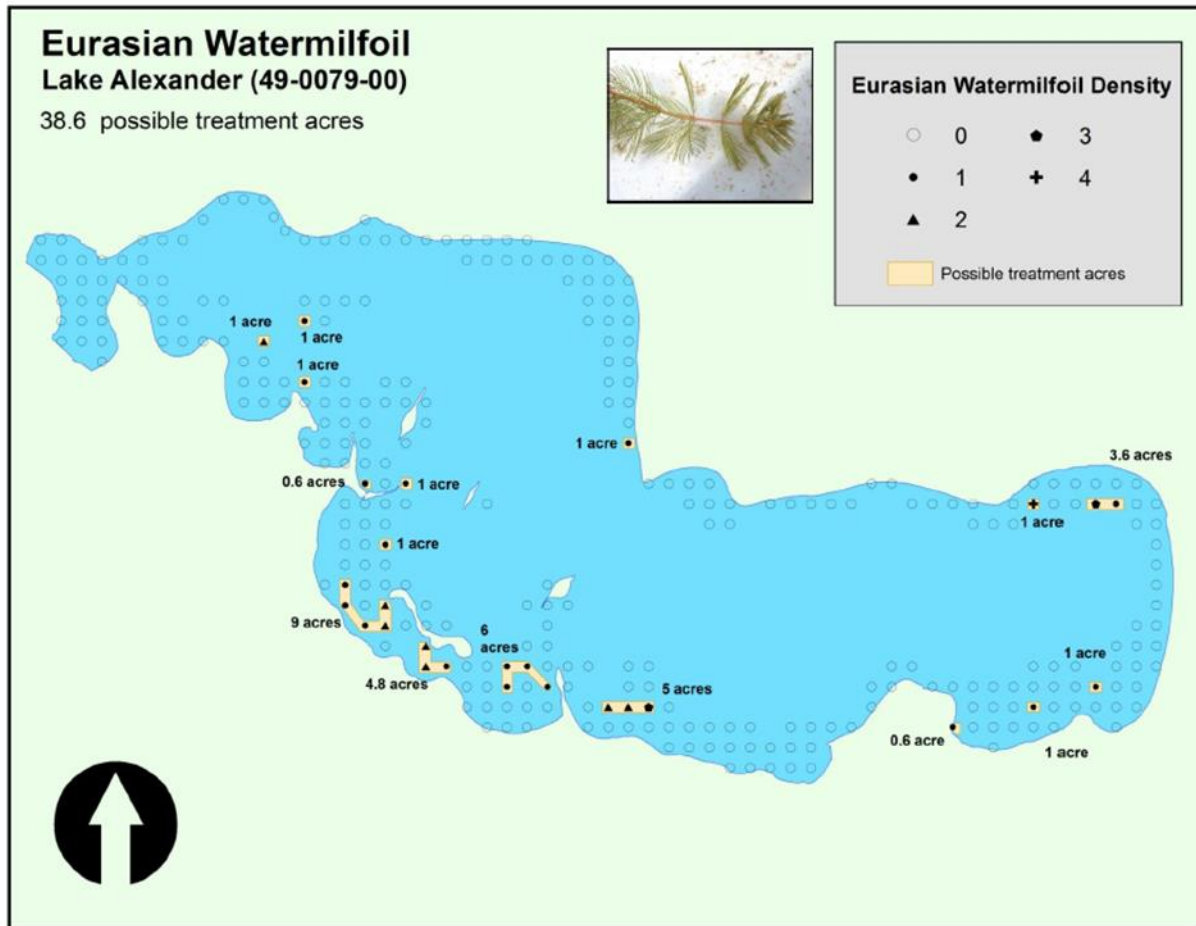


**Figure 4. Curly- leaf pondweed Distribution in 2018 for Lake Alexander, Morrison County (DOW#49007900).** Plant distribution from RMB Laboratories point- intercept surveys.

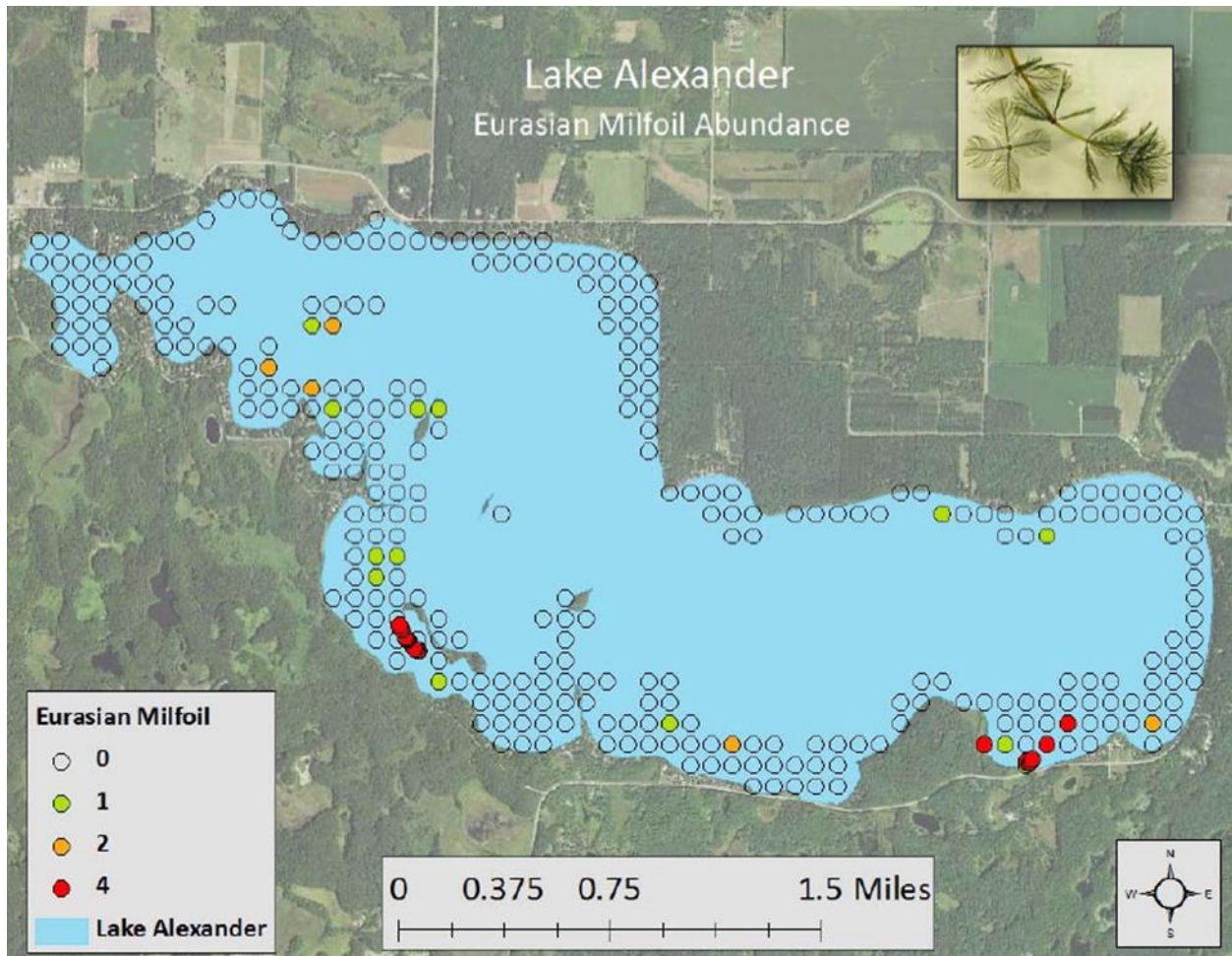


**Figure 5. Eurasian watermilfoil Distribution during 2004, 2007 and 2014 in Lake Alexander, Morrison County (DOW#49007900).** Plant distribution from MN DNR point- intercept surveys. Black circles indicate species is present.

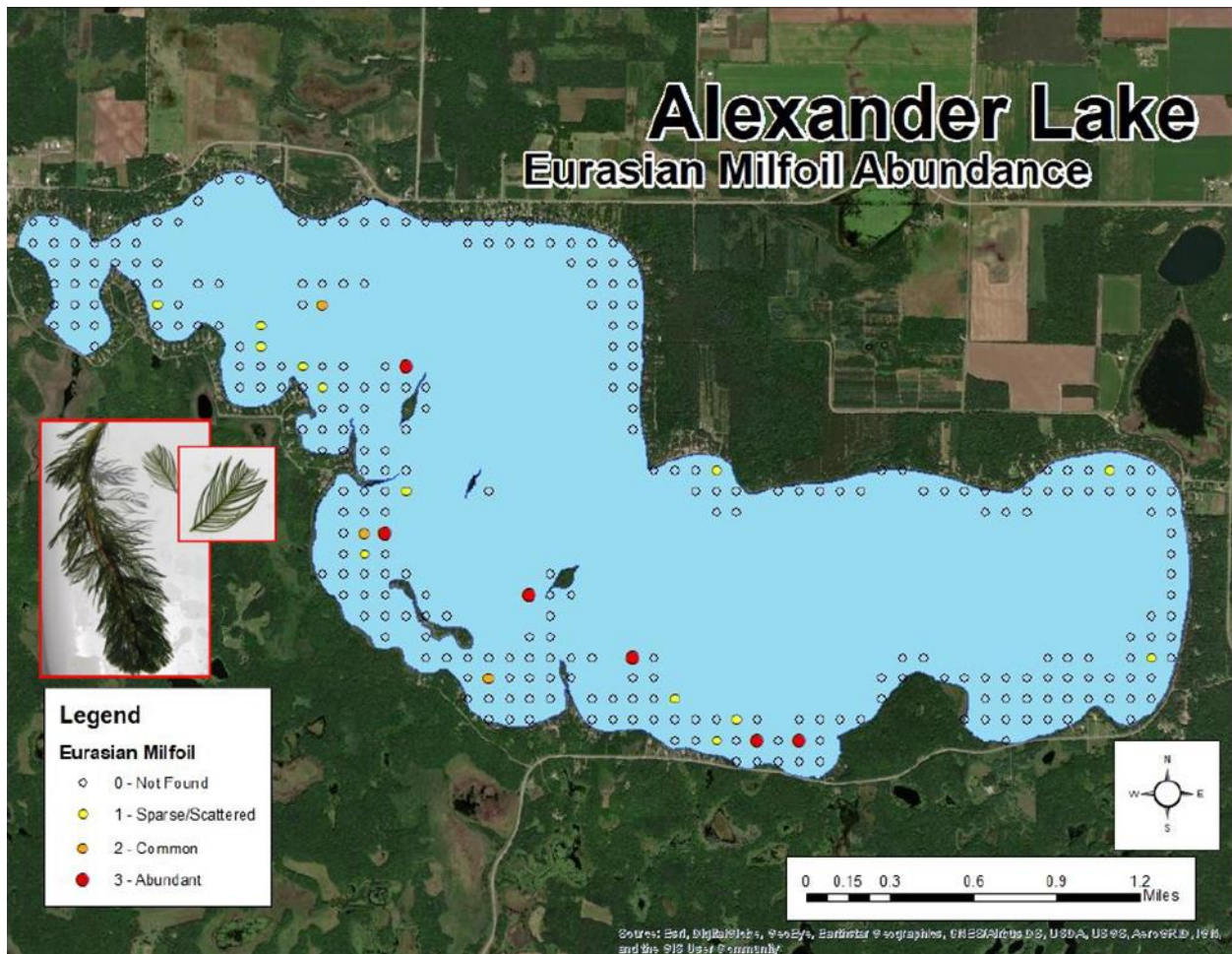




**Figure 6. Eurasian watermilfoil Distribution in 2016 for Lake Alexander, Morrison County (DOW#49007900).** Plant distribution from RMB Laboratories point- intercept surveys.



**Figure 7. Eurasian watermilfoil Distribution in 2018 for Lake Alexander, Morrison County (DOW#49007900).** Plant distribution from RMB Laboratories point- intercept surveys.



**Figure 8. Eurasian watermilfoil Distribution in 2020 in Lake Alexander, Morrison County (DOW#49007900). Plant distribution from RMB Laboratories point- intercept surveys.**

## Literature Cited

Crow, G.E. and C.B. Hellquist. (2000). *Aquatic and wetland plants of Northeastern North America*. (Vols. 1 & 2). Madison, WI: The University of Wisconsin Press.

Hauck, E. and C. Knoll. 2016. 2016 Lake Alexander Vegetation Survey. RMB Environmental Laboratories, Inc. 17pp.

Kriese, E. and A. Kapsner. 2020. 2020 Lake Alexander Vegetation Survey. RMB Environmental Laboratories, Inc. 18pp.

Madsen, J. (1999). *Point-intercept and line intercept methods for aquatic macrophytes management*. APCRP Technical Notes Collection (TN APCRP-M1-02). Vicksburg, MS: U.S. Army Engineer Research and Development Center

Oswald, P. and G. Brossart. 2018 Lake Alexander Vegetation Survey. RMB Environmental Laboratories, Inc. 17pp.

Perleberg, D. and N. Brown. 2005. Aquatic vegetation of Lake Alexander, Morrison County, Minnesota (DOW 49-0079-00-00), June 29-30 July 1 and 7 2004. Minnesota Department of Natural Resources, Division of Ecological Services, 1,601 Minnesota Dr. Brainerd, MN 56401