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## BALD EAGLE LAKE, RAMSEY COUNTY: 2017 AQUATIC VEGETATION REPORT

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

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**Lake:** Bald Eagle (DOW# 62000200)

**Lake Surface Area:** 1097 acres

**Littoral Area:** 589 acres

**County:** Ramsey

**Survey Type:** Point-intercept

**Date of Survey (most recent):** September 7, 2017

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**Summary Table.** Summary of aquatic submersed plants in Bald Eagle Lake, Ramsey County (DOW# 62000200) as indicated by results of point-intercept surveys. Values were calculated from littoral depth range (0-15 feet).

YEAR	Treatment Date	CLP* Acres Treated	PI Survey Date	Max Depth of Growth in feet [95%]†	% Points w/ Native Submersed Taxa	Mean Native Submersed Taxa/ Point	# Submersed Taxa	AVG Secchi Depth [m]
2010	APR	241	AUG	11	74	1.6	11	1.6
2011	MAY	125	AUG	13	71	1.4	13	2.0
2012	MAY	97	AUG	11	54	0.9	13	1.3
2013	MAY	62.5	-	-	-	-	-	2.0
2014	MAY	92	SEPT	10	59	1.5	15	2.0
2015	MAY	92	SEPT	13	50	1.3	16	3.1
2016	APR	14	AUG	14	77	2.1	16	2.7
2017	APR	28.6	SEPT	12	67	1.9	18	-

\*CLP is short for Curly-leaf pondweed

†95<sup>th</sup> percentile calculated based on all vegetated sampling points

Taxa refers to groups of submersed aquatic plant species or genera

AVG- average Secchi depth (water clarity measurement) from May-September

## **2017 Summary:**

The most recent aquatic vegetation point intercept survey of Bald Eagle Lake (DOW #62000200) was completed on September 7, 2017. Plants were present throughout the lake to a depth of 3.96 meters (13.0 feet). Within the littoral zone (zone in lake from the 0-15 foot depth range (0-4.5 meters), 67% contained native submersed taxa. The average number of native submersed taxa per sample point was 1.9. Eighteen submersed taxa were observed during the 2017 survey (see **Summary Table** above for historic data summary). In spring of 2014 and 2016, the lake was treated with alum (organized by Rice Creek Watershed District) to reduce phosphorus and control algal growth and an increase in water clarity and also submersed aquatic vegetation has been observed.

## **Lake Description:**

Bald Eagle Lake is a 1097-acre lake located near White Bear Lake in Minnesota. It has four invasive aquatic plant species: the submersed plants Eurasian watermilfoil (*Myriophyllum spicatum*, abbreviated as EWM) and curly leaf pondweed (*Potamogeton crispus*, abbreviated as CLP) as well as the emergent plants flowering rush (*Butomus umbellatus*) and purple loosestrife (*Lythrum salicaria*).

The maximum depth of water is 11 meters (37 feet). Approximately 54% of the lake is littoral. Water clarity has historically fluctuated from May to September but has increased since the recent alum treatments (see **Table 1-Secchi Averages** below for historic Secchi disk observations). For more information concerning Bald Eagle Lake water quality see

<http://cf.pca.state.mn.us/water/watershedweb/wdip/waterunit.cfm?wid=62-0002-00>.

**Table 1-Secchi Averages.** Average Secchi disk observations in meters for Bald Eagle Lake, Ramsey County (DOW# 62000200). Data gathered from the Minnesota Pollution Control Agency.

YEAR	MAY	JUNE	JULY	AUG	SEPT	Secchi Depth Average [May-Sept]
2010	3.2	1.4	1.3	0.9	1.2	1.6
2011	2.9	2.5	2.2	1.2	1.1	2.0
2012	2.6	1.7	1	0.6	0.5	1.3
2013	1.9	2.1	1.6	-	1.1	1.7
2014	2.6	2.7	1.9	1.4	1.6	2.0
2015	4.9	3.2	2.8	-	1.7	3.2
2016	3.2	3.4	3.0	1.9	2.1	2.7

## Management History:

Invasive aquatic plant management in Bald Eagle Lake has historically targeted curly-leaf pondweed (CLP) using an endothall formulated herbicide. Bald Eagle Lake was a DNR pilot project lake from 2010-2012 and received a variance to treat more than 15% littoral area for lakewide CLP control. Since then, only partial-lake treatments to control the invasive plant have been requested. The most recent herbicide treatments of 28.6 and 19.36 surface acres, respectively for CLP and EWM control was organized by the Rice Creek Watershed District (RCWD) and Bald Eagle Area Association in 2017 (see **Table 2-Invasive Plant Management Summary** for a recent history of herbicide treatments). Prior to this year, EWM has not been historically managed. In 2014, RCWD in coordination with the Minnesota Pollution Control Agency (MPCA) applied aluminum sulfate (alum) to Bald Eagle Lake. The focus was to reduce phosphorus levels in the lake and control seasonal algal growth. Another alum treatment occurred in 2016. Since the alum treatment, submersed native plant growth overall as well as EWM growth has increased.

Flowering rush is an emergent invasive plant that has been managed on the central west shoreline of Bald Eagle Lake since 2013. Each year, flowering rush plants are removed by hand and disposed of in late summer (August-September; see Figure 1 and 2). Since the discovery of the plant in August 2013, a

reduction in the density and distribution of flowering rush has been achieved through the management efforts of the Rice Creek Watershed District and the DNR.



Photos of hand-removal of Flowering Rush. Rice Creek Watershed District staff removing flowering rush from Bald Eagle Lake, Ramsey County in 2016 (Left). Flowering rush plant showing root mass and stems in Bald Eagle Lake, DOW # 62000200 (Right).

**Table 2-Invasive Plant Management Summary.** Characteristics and history of herbicide treatment for Bald Eagle Lake (DOW# 62000200, Total acres: 1097, Littoral acres: 589, 15% Littoral acres: 88).

Date	Treatment [W,P,N]	Target Species	Total Acres Treated	Herbicide	Licensed Commercial Applicator
APR 2010	W*	CLP	241	Endothall	Lake Restoration Inc.
MAY 2011	W*	CLP	125	Endothall	Lake Restoration Inc.
MAY 2012	P	CLP	97	Endothall	Lake Restoration Inc.
MAY 2013	P	CLP	62.5	Endothall	Lake Restoration Inc.
MAY 2014	P	CLP	92	Endothall	PLM Lake and Land Mgmt Corp.
MAY 2015	P	CLP	92	Endothall	Lake Restoration Inc.
APR 2016	P	CLP	14	Endothall	Lake Restoration Inc.
APR 2017	P	CLP	28.6	Endothall	PLM Lake and Land Mgmt Corp.
JUL 2017	P	EWM	19.4	2,4-D	Lake Restoration Inc.

Treatment: W (whole lake ), P (partial lake), N (no treatment)

CLP is an abbreviation for curly-leaf pondweed. EWM is an abbreviation for Eurasian watermilfoil

\* use asterisk to indicate variance year

## Survey Objectives:

Point-intercept surveys were used to assess the distribution of aquatic plants in Bald Eagle Lake. 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). Moreover, this survey will help the DNR and our partners monitor native plant communities and evaluate possible responses to invasive aquatic plant management efforts. It is important to note that distributions of aquatic plants may vary from year to year due to effects such as differences in weather, as well as the effects from management.



## Survey Methods:

We used a point intercept survey method developed by John Madsen in [“Aquatic Plant Control Technical Note MI-02, 1999”](#). Survey points were placed 125-200 meters apart using a Geographic Information System (GIS). This spacing allowed for placement of 108-268 points. Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point. Plant samples were assessed on the boat to determine species and density (scale of zero [no plants] to 3 [abundant or matted on the surface]). Frequencies of occurrence percentages (i.e. how often a plant species was found in the lake) were calculated based on the littoral zone (the portion of the lake is less than 15 feet in depth).

## Survey Observations:

Maximum depth of rooted vegetation was observed between 3.0-4.2 meters (10-14 feet) from 2010-2017 (see [Table 3-Point Intercept Metrics](#) below for historical point-intercept survey calculations and [Figure 3](#) below for maximum depth data from the 2017 survey). For 2017 submersed native vegetation was observed at 67% of all sampling points v. 77% in 2016 and 50% in 2015. The most abundant plant species found were Eurasian watermilfoil, Coontail, Macroalgae, Water stargrass, and Water celery. Variable pondweed was observed at greater frequencies than previous years, while Northern Watermilfoil, a native plant species, was observed less frequently. Species recorded at lower frequencies (<5% FOQ) included Canadian waterweed, Sago pondweed, Small bladderwort, and Needle spikerush (See [Table 4](#)).

Low occurrences of CLP are typically observed during late season (August-September) MN DNR surveys due to its biological growth pattern as it senesces and dies off in early summer. Early season surveys focusing on CLP management reductions have been conducted by Blue Water Science but are not presented in this report.

EWM has been found at higher frequencies than CLP during the late summer surveys, which would be expected due to the survey timing. Over the past 3 years, EWM abundance has increased with nuisance levels observed in 2016 and 2017.



Photos of healthy native plants, including Claspingleaf pondweed and Canadian waterweed in Bald Eagle Lake in 2016 (Left). Rake sample with a high density of Eurasian watermilfoil from the 2016 survey (Right).



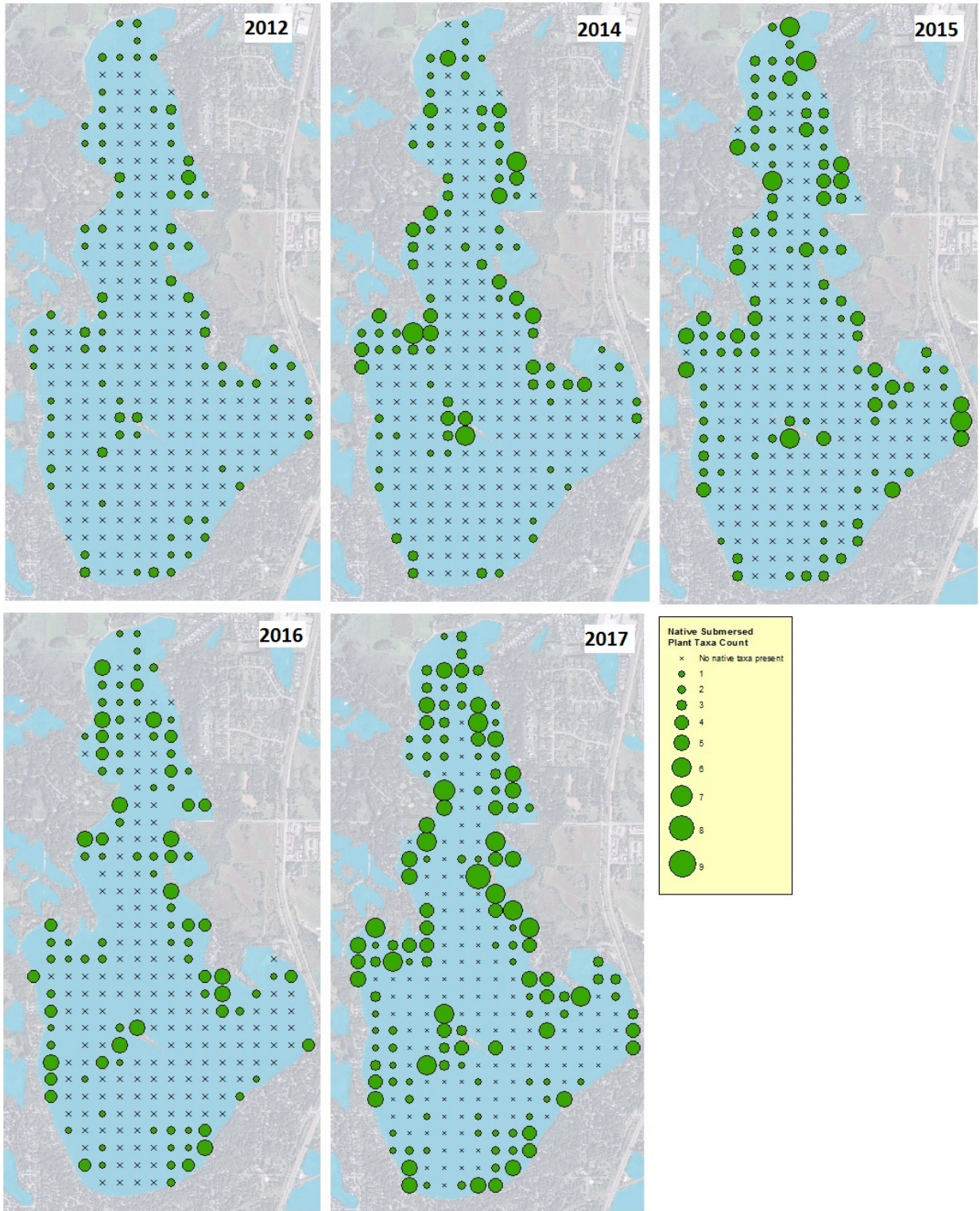
**Table 3- Point Intercept Metrics.** Summary of point intercepts metrics for Bald Eagle Lake, Ramsey County (DOW# 62000200). Shaded values were calculated from littoral depth range.

<b>Surveyor Metrics</b>	<b>AUG 2010</b>	<b>AUG 2011</b>	<b>AUG 2012</b>	<b>2013</b>	<b>SEPT 2014</b>	<b>SEPT 2015</b>	<b>AUG 2016</b>	<b>SEPT 2017</b>
Treated (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y
Surveyor	MNDNR	MNDNR	MNDNR	-	MNDNR	MNDNR	MNDNR	MNDNR
Total # Points Sampled	58	251	268	-	261	262	267	266
Max Depth of Growth (95%) in feet	11	13	11	-	10	13	14	12
# Point in Max Depth Range	43	106	101	-	105	128	139	149
# Points in Littoral (0-15 feet)	57	137	154	-	157	150	158	174
% Points w/ Submersed Native Taxa	74	71	54	-	57	50	77	67
Mean Submersed Native Taxa/ Point	1.6	1.4	0.9	-	1.5	1.3	2.1	1.9
# Submersed Native Taxa	9	11	12	-	13	15	16	16
# Submersed Non-Native Taxa	2	2	1	-	2	1	2	2

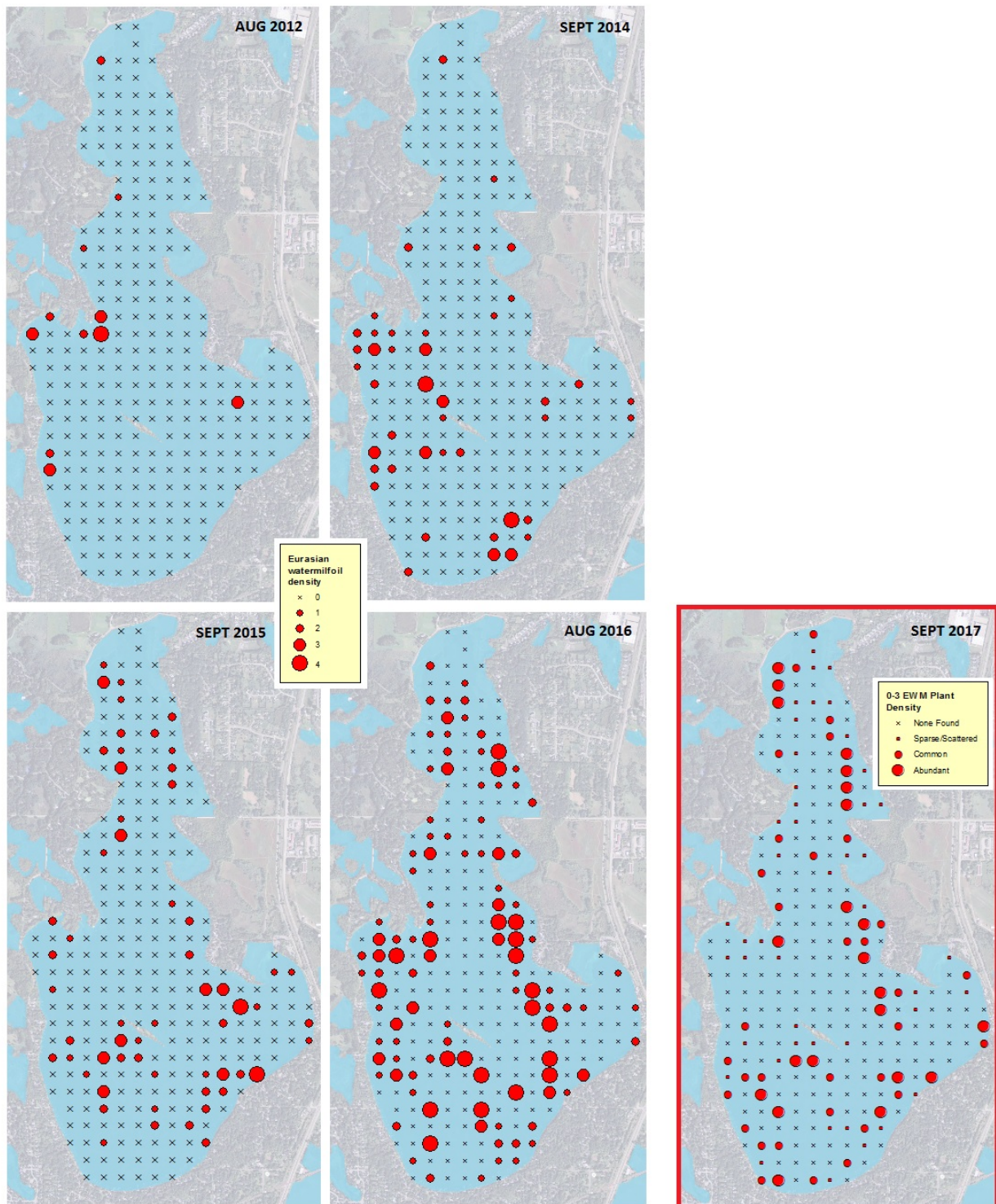
**Table 4- Plant Frequency Occurrence.** Historic percent frequency of occurrence for submersed vegetation within the littoral zone (0-15 feet) in Bald Eagle Lake, Ramsey County (DOW# 62000200).

Taxonomic Name	Common Name	AUG 2010	AUG 2011	AUG 2012	SEPT 2014	SEPT 2015	AUG 2016	SEPT 2017
<b>SUBMERSED PLANTS</b>								
<i>Myriophyllum spicatum</i> *	Eurasian watermilfoil*	16	9	2	27	29	37	41
<i>Ceratophyllum demersum</i>	Coontail	42	36	6	29	23	26	22
<i>Macroalgae</i>	Muskgrass and Stonewort	26	0	13	11	17	12	19
<i>Heteranthera dubia</i>	Water stargrass	19	15	9	26	18	15	17
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	33	9	4	24	23	23	13
<i>Najas spp.</i>	Naiad	4	10	2	3	1	1	0
<i>Potamogeton gramineus</i>	Variable pondweed	0	0	0	0	1	2	14
<i>Potamogeton illinoensis</i>	Illinois pondweed	4	7	5	13	11	8	6
<i>Potamogeton praelongus</i>	White-stem pondweed	5	1	2	4	3	6	5
<i>Ranunculus aquatilis</i>	White-water crowfoot	0	0	3	4	5	12	9
<i>Utricularia macrohiza</i>	Common bladderwort	0	0	0	3	1	6	2
<i>Vallisneria americana</i>	Water celery	21	26	12	22	20	15	18
Floating, Free-floating & Emergent plants observed: <i>Nuphar advena</i> (Yellow pond lily), <i>Nymphaea odorata</i> (White water lily), <i>Nuphar variegata</i> (Bullhead pond lily), Lemna trisulca (Forked duckweed), <i>Drepanocladus spp.</i> (Aquatic mosses), <i>Typha sp.</i> (Cattail species)								
Less common (< 5% frequency) submersed vegetation observed: <i>POTAMOGETON CRISPUS</i> (CURLY-LEAF PONDWEED)* in 2010, 2011, 2014, 2016 and 2017, <i>Bidens beckii</i> (Water marigold) 2010, 2015-2017, <i>Potamogeton zosteriformis</i> (Flat-stem pondweed) in 2011, <i>Potamogeton richardsonii</i> (Clasping-leaf pondweed) and <i>Stuckenia pectinata</i> (Sago pondweed) in 2011-2107, <i>Potamogeton nodosus</i> (Long-leaf pondweed) in 2012, <i>Elodea canadensis</i> (Canadian waterweed) in 2014, 2016 and 2017, <i>Potamogeton friesii</i> (Fries' pondweed) in 2015, <i>Utricularia minor</i> (Small bladderwort) in 2016 and 2017, <i>Eleocharis acicularis</i> (Needle spikerush) in 2017								

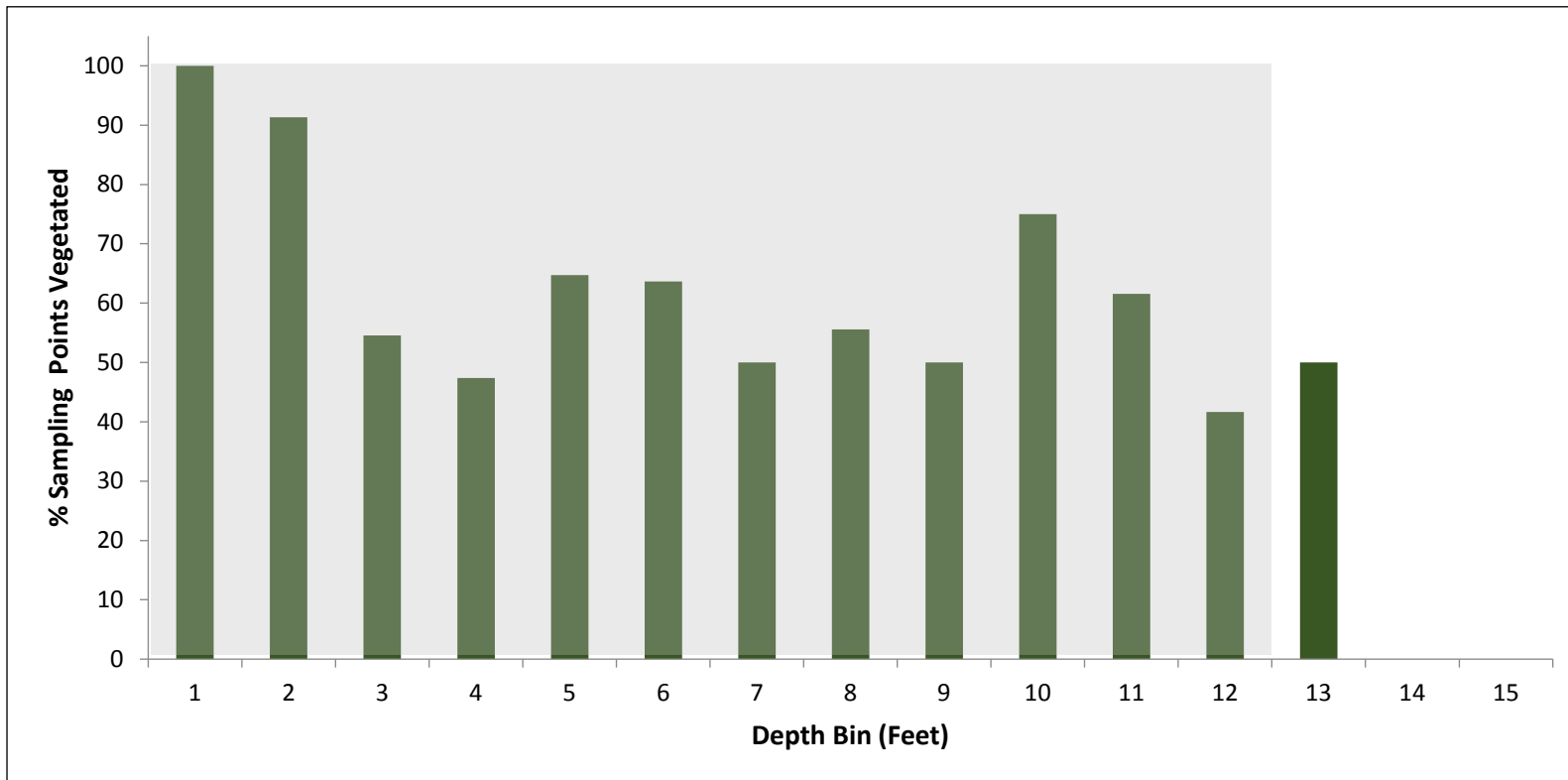
\* denotes invasive aquatic plant



**Figure 1.** Spatial distribution and species richness (# of native submersed taxa per sample point) for 2012, 2014-2017. Dates correspond to month of point intercept survey. Bald Eagle Lake, Ramsey County (DOW# 62000200).



**Figure 2.** Spatial distribution and rake density rating of Eurasian watermilfoil for 2012, 2014- 2017. Dates correspond to month of point intercept survey. Years 2012, 2014-2016 were surveyed on a 1-4 density rake rating scale while 2017 was rated on a 1-3 density rake rating. Bald Eagle Lake, Ramsey County (DOW# 62000200).



**Figure 3.** Maximum depth of plant colonization in feet during 2017 point intercept survey. Depths were binned in feet. Percent sampling points vegetated is defined as the number of sampling points with submersed vegetation divided by the total number of sampling points for each depth. Shaded area represents depth range of the 95th percentile of all submersed plants observed.

This information can be made available in alternative formats such as large print, braille or audio tape by emailing [info.dnr@state.mn.us](mailto:info.dnr@state.mn.us) or by calling 651-259-5016.