
LAKE JOSEPHINE, RAMSEY COUNTY: 2017 AQUATIC VEGETATION REPORT

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

Lake: Josephine (DOW# 62005700)

Lake Surface Area: 117 acres

Littoral Area: 79 acres

County: Ramsey

Survey Type: Point-intercept

Date of Survey (most recent): August 7, 2017

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Summary Table. Summary of aquatic submersed plants in Lake Josephine, Ramsey County, Minnesota (DOW# 62005700) as indicated by results of Point-Intercept surveys. Values were calculated from littoral depth range (0-15 feet).

PI Survey Date	% Frequency of EWM*	Max Depth of Growth in feet [95%] [†]	% Points w/ Native Submersed Taxa	Mean Native Submersed Taxa/ Point	# Submersed Taxa	AVG Secchi Depth [m]
JUL 2009	0	11	81	1.3	7	2.2
SEPT 2013	56	9	81	1.9	11	2.2
JUL 2014	24	13	93	2.3	13	2.3
AUG 2015	5	10	81	2.0	14	1.8
AUG 2016	17	10	83	2.1	13	2.0
AUG 2017	15	7	63	1.3	11	2.2

*EWM is short for Eurasian watermilfoil

[†]95th 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 Lake Josephine (DOW# 62005700) was completed on August 7, 2017. Plants were present throughout the lake to a maximum depth of 2.74 meters (9 feet). Within the littoral zone [zone in lake from the 0-15 foot depth range (0-4.5 meters)], 63% of sampled points contained native submersed taxa. The average number of native submersed taxa per sample point was 1.3. Eleven submersed plant species were documented during the 2017 survey. Lake Josephine received a variance (2014-2015) to manage the invasive plant Eurasian watermilfoil through herbicide treatments as it had become a large-scale nuisance. A Lake Vegetation Management Plan was developed in 2016 to continue management efforts and to monitor the aquatic plant community over the next 5 years.

Lake Description:

Lake Josephine is a 117 acre lake located near the city of Roseville in Ramsey County, Minnesota. Two invasive aquatic plant species are present in the lake: Eurasian watermilfoil (*Myriophyllum spicatum*, abbreviated as EWM) and curly-leaf pondweed (*Potamogeton crispus*, abbreviated as CLP). The maximum depth of water is 13.1 meters (43.1 feet). Approximately 67% of the lake is littoral (zone where aquatic plants are likely to be found). Lake Josephine is nutrient-rich and water clarity appears to fluctuate annually between 1.8—2.3 meters (see **Table 1-Secchi Averages** below for historic Secchi disk observations). For information on Lake Josephine water quality see <http://cf.pca.state.mn.us/water/watershedweb/wdip/waterunit.cfm?wid=62-0057-00>.

Table 1-Secchi Averages. Average Secchi disk observations in meters for Lake Josephine (DOW #62005700). Data gathered from the Minnesota Pollution Control Agency and Ramsey County Public Works (RCPW).

YEAR	MAY	JUNE	JULY	AUG	SEPT	Secchi Depth Average [May-Sept]
2009	-	2.7	2.3	1.9	1.7	2.2
2010	2.9	3.0	2.7	1.3	1.6	2.3
2011	2.1	2.5	2.2	0.9	1.3	1.8
2012	2.5	2.8	1.8	1.2	1.6	2.0
2013	-	3.3	2.5	1.7	1.3	2.2
2014	3.0	2.9	2.3	1.6	1.7	2.3
2015	2.9	2.6	2.1	1.1	0.6	1.8
2016	2.6	2.4	2.6	1.5	1.2	2.0
2017	3.4	3.2	1.9	1.0	0.9	*2.2

*data collected by RCPW

Management History:

The most recent herbicide treatment (2017) in Lake Josephine was coordinated by the Lake Josephine Improvement Association and consisted of an early season, dual treatment targeting EWM and CLP (see Table 2 below). A total of 27.95 acres was treated with diquat due to the late stage growth of CLP. This is the first year CLP has been managed at a large scale and with diquat. Potential damage to native plants likely resulted and this approach will not be taken in future years. Historically, variances have been granted to allow for more than 15% of the littoral area of the lake to be treated with herbicide for EWM. Speculation of hybrid milfoil (Eurasian watermilfoil x northern watermilfoil) was confirmed in 2016 via genetic testing. All samples taken resulted in hybrid watermilfoil.

Table 2-Invasive Plant Management Summary. Characteristics and history of herbicide treatment for Lake Josephine (DOW# 62005700, Total acres: 118, Littoral acres: 79, 15% Littoral acres: 11.8).

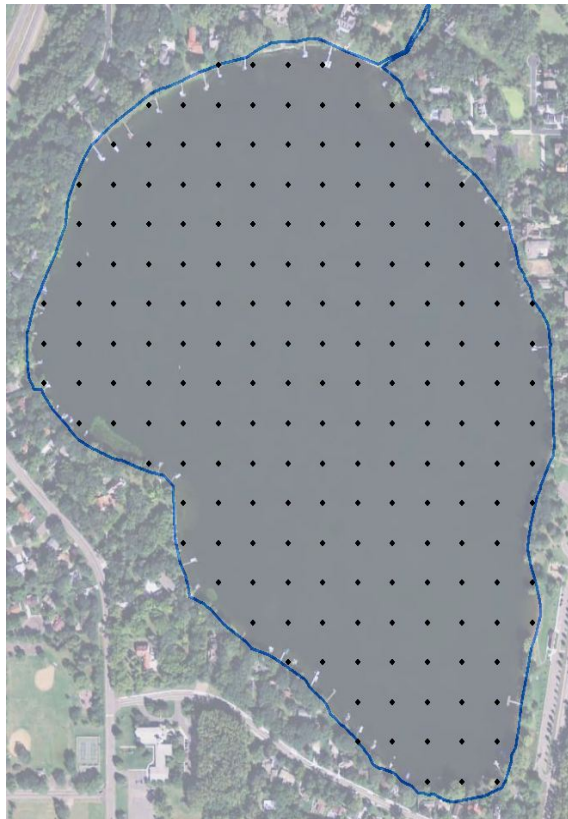
Date	Treatment [W,P,N]	Target Species	Total Acres Treated	Herbicide	Licensed Commercial Applicator
JUN 2013	P	EWM	8	DMA-4	Lake Management Inc.
JUL 2014*	W	EWM	20	DMA-4	Lake Management Inc.
JUN 2015*	W	EWM	25	DMA-4	Lake Management Inc.
JUN 2016	P	EWM	4.77	DMA-4	Lake Management Inc.
MAY 2017*	P	EWM & CLP	28	Diquat	Lake Management 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

* indicates variance year

Survey Objectives:



Point-intercept surveys were used to assess the distribution of aquatic plants in Lake Josephine. 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 50-70 meters apart using a Geographic Information System (GIS). This spacing allowed for placement of 82-192 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 2.7-4 meters (9-13 feet) from 2009-2017 (see Table 3-Point Intercept Metrics for historical point-intercept survey calculations and **Figure 3** for plant growth depth ranges). In recent years, following herbicide treatment for EWM, native submersed plants have fluctuated from 93% in 2014 to 63% in 2017 and occurrence of Curly-leaf pondweed was greatly reduced following post-treatment surveys.

The most recent survey was conducted on August 7, 2017 by the MnDNR. All native plant were observed at lower occurrences compared to the 2016 survey except for macroalgae. Native plant assemblages were primarily dominated by coontail, macroalgae, naiads, and flat-stem pondweed (see Table 4-Plant Frequency Occurrence for historical plant frequency observations). Additional species recorded in 2015 and 2017 include needle spike rush, Illinois pondweed, sago pondweed, and water celery. In 2017, Eurasian watermilfoil was observed at 15% frequency in Lake Josephine.

Table 3- Point Intercept Metrics. Summary of point intercepts metrics for Lake Josephine, Ramsey County (DOW# 62005700). Shaded values were calculated from littoral depth range.

Survey Metrics	JUL 2009	SEPT 2013	JUL 2014	AUG 2015	AUG 2016	AUG 2017
Treated (Y/N)	N	Y	Y	Y	Y	Y
Surveyor	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR
Total # Points Sampled	72	190	190	190	190	188
Max Depth of Growth (95%)	11	9	13	10	10	7.2
# Point in Max Depth Range	62	127	133	119	118	105
# Points in Littoral (0-15 feet)	68	149	142	144	143	144
% Points w/ Submersed Native Taxa	81	81	93	81	83	63
Mean Submersed Native Taxa/ Point	1.3	1.9	2.3	2	2.1	1.3
# Submersed Native Taxa	6	9	11	12	11	9
# Submersed Non-Native Taxa	1	2	2	2	2	2

Table 4- Plant Frequency Occurrence. Historic percent frequency of occurrence for submersed vegetation within the littoral zone (0-15 feet) in Lake Josephine, Ramsey County (DOW# 62005700).

Taxonomic Name	Common Name	JUL 2009	SEPT 2013	JUL 2014	AUG 2015	AUG 2016	AUG 2017
SUBMERSED PLANTS							
<i>Myriophyllum spicatum</i> *	Eurasian watermilfoil*	0	34	15	5	17	15
<i>Potamogeton crispus</i> *	Curly-leaf pondweed*	79	6	2	1	20	6
<i>Ceratophyllum demersum</i>	Coontail	58	43	45	78	62	43
<i>Macroalgae</i>	Muskgrass	37	4	10	23	27	38
<i>Elodea canadensis</i>	Canadian waterweed	7	1	0	1	0	0
<i>Heteranthera dubia</i>	Water stargrass	0	1	0	3	6	0
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	10	0	2	0	1	0
<i>Najas spp.</i>	Naiad	0	32	27	27	33	11
<i>Nitella spp.</i>	Nitella	37	20	23	**	**	**
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	0	6	5	8	5	5
<i>Potamogeton praelongus</i>	White-stem pondweed	0	1	2	6	9	2
<i>Potamogeton pusillus</i>	Small pondweed	0	0	5	0	0	0
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	31	24	30	47	58	22
Floating, Free-floating & Emergent plants observed: <i>Lemna trisulca</i> (Forked duckweed), <i>Nuphar advena</i> (Yellow pond lily), <i>Nuphar variegata</i> (Bullhead pondlily), <i>Lythrum salicaria</i> (Purple-loosestrife)							
Less common (< 5% frequency) submersed vegetation observed: <i>Potamogeton gramineus</i> (Variable-leaf pondweed) in 2009, <i>Potamogeton foliosus</i> (Leafy pondweed) in 2013, 2015 & 2016, <i>Stuckenia pectinata</i> (Sago pondweed) in 2014, <i>Eleocharis acicularis</i> (Needle spikerush) in 2015 and 2017, <i>Potamogeton illinoensis</i> (Illinois pondweed) and <i>Vallisneria americana</i> (Water celery) in 2015- 2017.							

* denotes invasive aquatic plant

** Muskgrass and Nitella combined for 2015 through 2017



Photo of abundant native submersed plants observed in 2015 and 2017 surveys include coontail, large-leaf pondweed (left photo) and flat-stem pondweed (middle photo). Bare stems of Eurasian watermilfoil were observed in August of 2017 post diquat treatment (right photo).

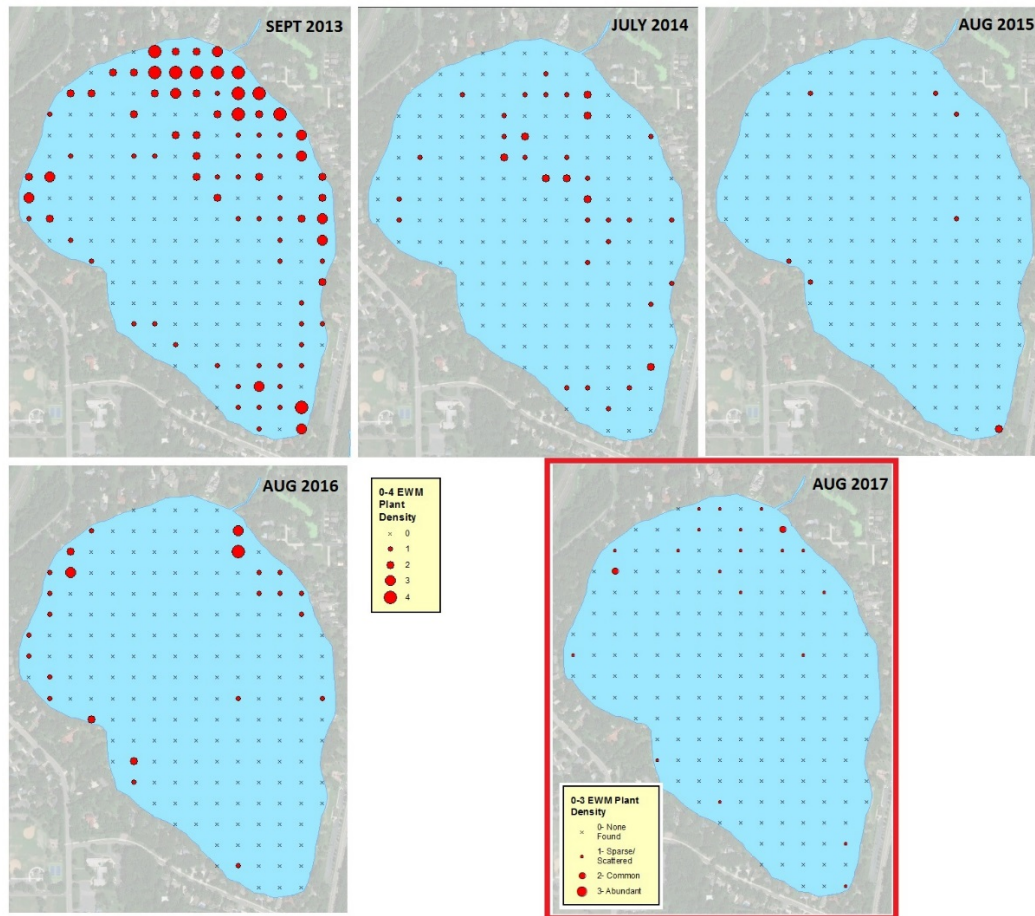


Figure 1. Spatial distribution and rake density rating of Eurasian watermilfoil. Maps prior to herbicide treatment years (before 2013) are not shown. Densities were based on a 0-4 scale in 2010-2016 and a 0-3 scale in 2017. Lake Josephine, Ramsey County (DOW# 62005700).

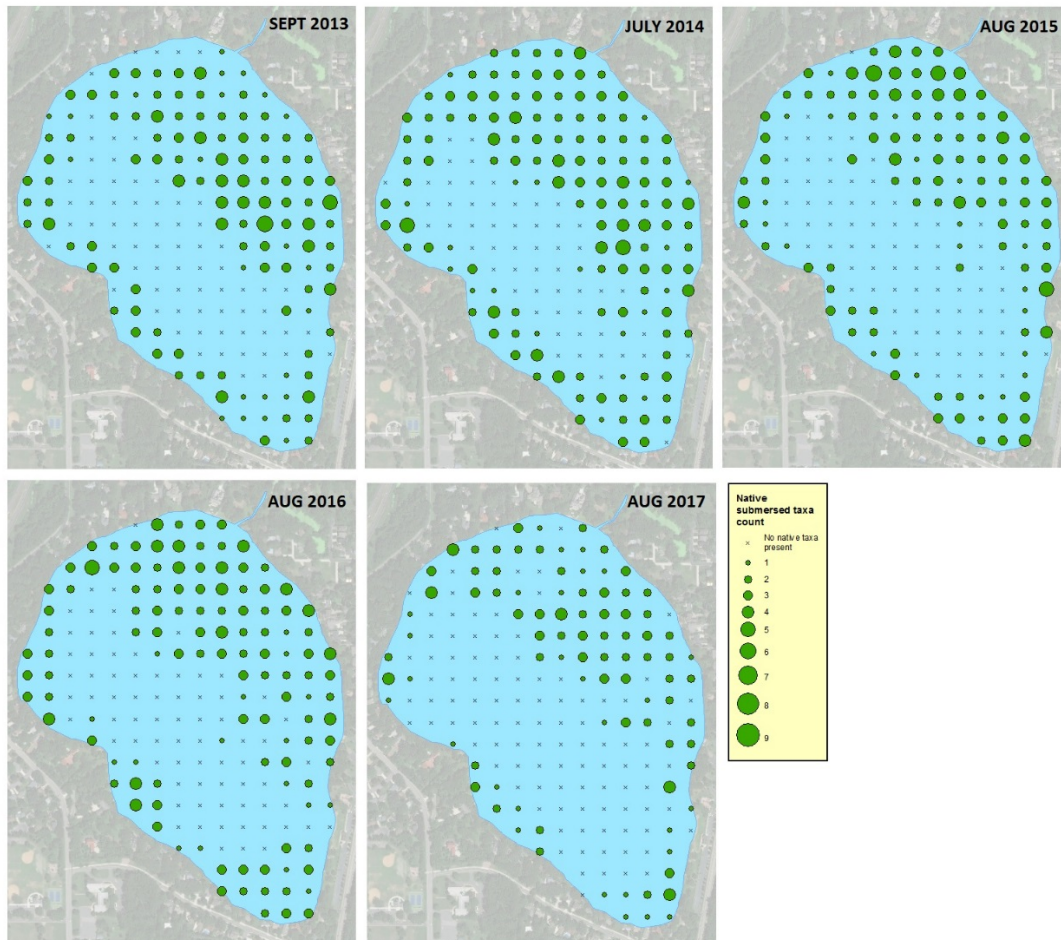


Figure 2. Spatial distribution and species richness (# of native species per sample point) of all native submersed plant species. Maps prior to herbicide treatment years (before 2013) are not shown. Lake Josephine has an active Lake Vegetation Management Plan. Lake Josephine, Ramsey County (DOW# 62005700).

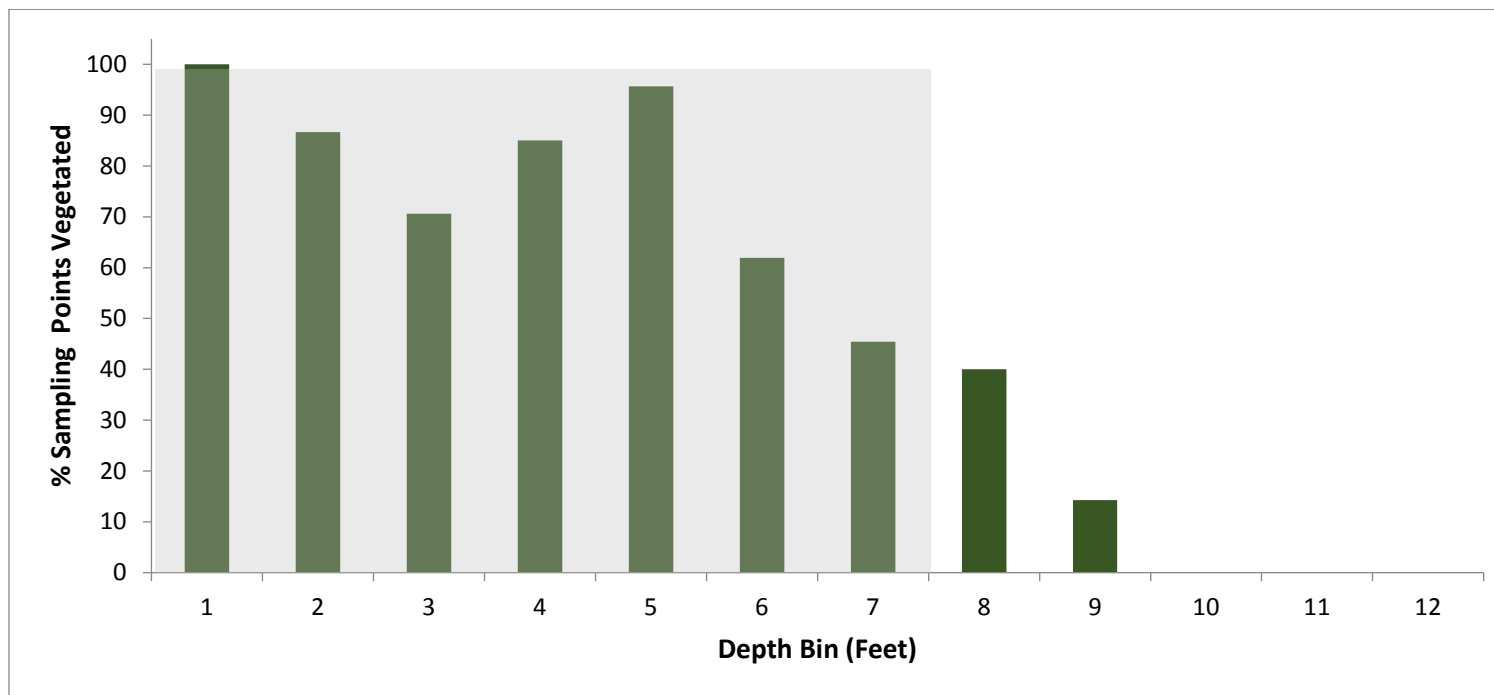


Figure 3. Maximum depth of plant colonization in feet during 2017 point intercept survey. Depths were binned in feet. Percent sampling points vegetated is defined as the number of sampling points with submersed vegetation divided by the total number of sampling points for each depth. Shaded area represents depth range of the 95th percentile of all submersed plants observed. Lake Josephine, Ramsey County (DOW# 620005700).

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