

LAKE JOSEPHINE, RAMSEY COUNTY: 2018 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 21, 2018

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2018 Summary:

The most recent aquatic vegetation point-intercept survey of Lake Josephine (DOW# 62005700) was completed on August 21, 2018. Plants were present throughout the lake to a maximum depth of 2.1 meters (7 feet). Within the littoral zone [zone in lake from the 0-15 foot depth range (0-4.5 meters)], 59% of sampled points contained native submersed taxa. The average number of native submersed taxa per sample point was 0.9. Twelve submersed plant species were documented during the 2018 survey. Lake Josephine has received historical variances and more recently a Lake Vegetation Management Plan was developed in 2016 to manage Eurasian watermilfoil beyond the 15% littoral with herbicides while also monitoring responses to the native aquatic plant community. No herbicide treatment occurred in 2018.

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] |
|----------------|---------------------|--|-----------------------------------|-----------------------------------|------------------|----------------------|
| 2009 JUL 15 | 0 | 11 | 81 | 1.3 | 7 | 2.2 |
| 2013 SEPT 10 | 56 | 9 | 81 | 1.9 | 11 | 2.2 |
| 2014 JUL 29 | 24 | 13 | 93 | 2.3 | 13 | 2.3 |
| 2015 AUG 28 | 5 | 10 | 81 | 2.0 | 14 | 1.8 |
| 2016 AUG 15 | 17 | 10 | 83 | 2.1 | 13 | 2.0 |
| 2017 AUG 7 | 15 | 7 | 63 | 1.3 | 11 | 2.2 |
| 2018 AUG 21 | 22 | 7 | 59 | 0.9 | 12 | - |

*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

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 |
| 2018 | 2.9 | 3.4 | 1.5 | 0.8 | - | *2.2 |

*data collected by RCPW

Management History:

Historically, Eurasian watermilfoil has been treated with 2,4-D formulated herbicides in Lake Josephine on an annual basis since nuisance conditions developed in 2013. The Lake Josephine Improvement Association coordinated both CLP and EWM management efforts. Variances were historically granted to allow treatment in more than 15% of the littoral area of the lake from 2014-2017 (see **Table 2** below). In 2017, a 28 acre area was treated early season with diquat, targeting both CLP and EWM. Although the treatment controlled both invasive plants, the treated area was too large and possibly timed late and unforeseen damage to the native plant community resulted. In an effort to monitor the diquat treatment and to allow native plants to recover, no subsequent herbicide treatment was conducted in 2018 and native plant recovery appears slow. Hybrid milfoil (Eurasian watermilfoil x northern

watermilfoil) was confirmed in 2016 via genetic testing and all samples collected were hybrid.

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. |
| 2018 | N | - | - | - | - |

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

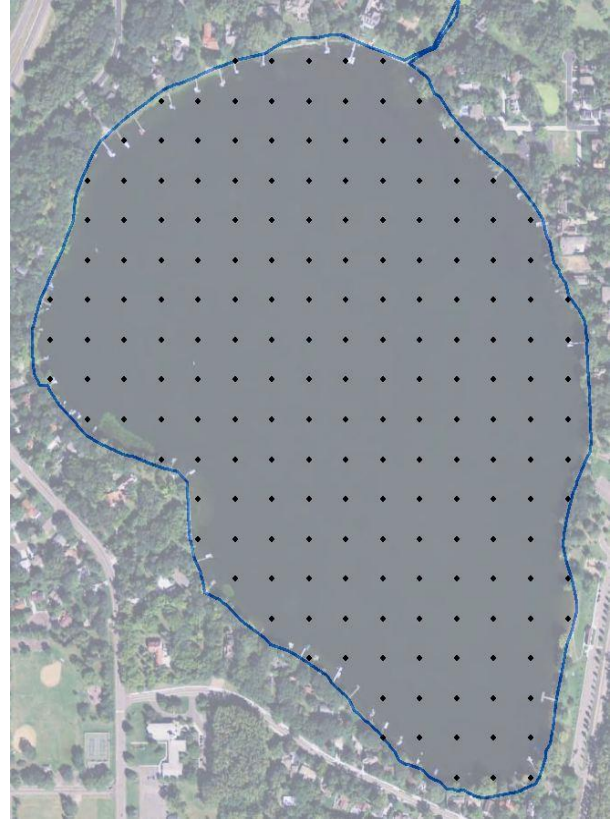
* indicates variance year

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 meters apart using a Geographic Information System (GIS). This spacing allowed for placement of 192 points. Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point for approximately 3 meters. Plant samples were assessed on the boat to determine species and rake fullness (scale of zero [no plants] to 3 [abundant or fully covering the rake head]). 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 that is less than 15 feet in depth).



Survey Observations:

The most recent survey was conducted on August 21, 2018 by the MnDNR. Maximum depth of rooted vegetation was observed between 2.13-4 meters (7-13 feet) from 2009-2018 (see **Table 3-Point Intercept Metrics** for historical point-intercept survey calculations and **Figure 3** for plant growth depth ranges). Native submersed plant's frequency has historically been high (~80-90%), but declined after the diquat treatment in 2017 (~60%) and remained low in 2018. The mean submersed native taxa per point decreased from 1.3 (2017) to 0.9 (2018). In the past five years, dominant taxa have stayed consistent (coontail, macroalgae, naiads, and invasive plants; see **Table 4-Plant Frequency Occurrence** for historical plant frequency observations). Eurasian watermilfoil and curly-leaf pondweed were observed at 22% and 13% frequency in Lake Josephine, respectively.

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 15 2009 | SEPT 10 2013 | JUL 29 2014 | AUG 28 2015 | AUG 15 2016 | AUG 7 2017 | AUG 21 2018 |
|-----------------------------------|----------------|-----------------|----------------|----------------|----------------|---------------|----------------|
| Treated (Y/N) | N | Y | Y | Y | Y | Y | N |
| Surveyor | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR |
| Total # Points Sampled | 72 | 190 | 190 | 190 | 190 | 188 | 189 |
| Max Depth of Growth (95%) | 11 | 9 | 13 | 10 | 10 | 7 | 7 |
| # Point in Max Depth Range | 62 | 127 | 133 | 119 | 118 | 105 | 99 |
| # Points in Littoral (0-15 feet) | 68 | 149 | 142 | 144 | 143 | 144 | 151 |
| % Points w/ Submersed Native Taxa | 81 | 81 | 93 | 81 | 83 | 63 | 59 |
| Mean Submersed Native Taxa/ Point | 1.3 | 1.9 | 2.3 | 2.0 | 2.1 | 1.3 | 0.9 |
| # Submersed Native Taxa | 6 | 9 | 11 | 12 | 11 | 9 | 10 |
| # Submersed Non-Native Taxa | 1 | 2 | 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 15 2009 | SEPT 10 2013 | JUL 29 2014 | AUG 28 2015 | AUG 15 2016 | AUG 7 2017 | AUG 21 2018 |
|---|------------------------|----------------|-----------------|----------------|----------------|----------------|---------------|----------------|
| SUBMERSED PLANTS | | | | | | | | |
| <i>Myriophyllum spicatum</i> * | Eurasian watermilfoil* | 0 | 34 | 15 | 5 | 17 | 15 | 22 |
| <i>Potamogeton crispus</i> * | Curly-leaf pondweed* | 79 | 6 | 2 | 1 | 20 | 6 | 13 |
| <i>Ceratophyllum demersum</i> | Coontail | 58 | 43 | 45 | 78 | 62 | 43 | 34 |
| <i>Macroalgae</i> ** | Muskgrass | 37 | 4 | 10 | 23 | 27 | 38 | 24 |
| <i>Elodea canadensis</i> | Canadian waterweed | 7 | 1 | 0 | 1 | 0 | 0 | 0 |
| <i>Heteranthera dubia</i> | Water stargrass | 0 | 1 | 0 | 3 | 6 | 0 | 1 |
| <i>Myriophyllum sibiricum</i> | Northern watermilfoil | 10 | 0 | 2 | 0 | 1 | 0 | 0 |
| <i>Najas spp.</i> | Naiad | 0 | 32 | 27 | 27 | 33 | 11 | 25 |
| <i>Potamogeton amplifolius</i> | Large-leaf pondweed | 0 | 6 | 5 | 8 | 5 | 5 | 5 |
| <i>Potamogeton praelongus</i> | White-stem pondweed | 0 | 1 | 2 | 6 | 9 | 2 | 1 |
| <i>Potamogeton pusillus</i> | Small pondweed | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| <i>Potamogeton zosteriformis</i> | Flat-stem pondweed | 31 | 24 | 30 | 47 | 58 | 22 | 2 |
| 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 and 2018, <i>Stuckenia pectinata</i> (Sago pondweed) in 2014, <i>Eleocharis acicularis</i> (Needle spikerush) in 2015, 2017 and 2018, <i>Potamogeton illinoensis</i> (Illinois pondweed) and <i>Vallisneria americana</i> (Water celery) in 2015- 2018. | | | | | | | | |

* denotes invasive aquatic plant

** Muskgrass and Nitella combined in 2015 to present



Figure 1

Photo of abundant native submersed plants observed in 2015 and 2018 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).

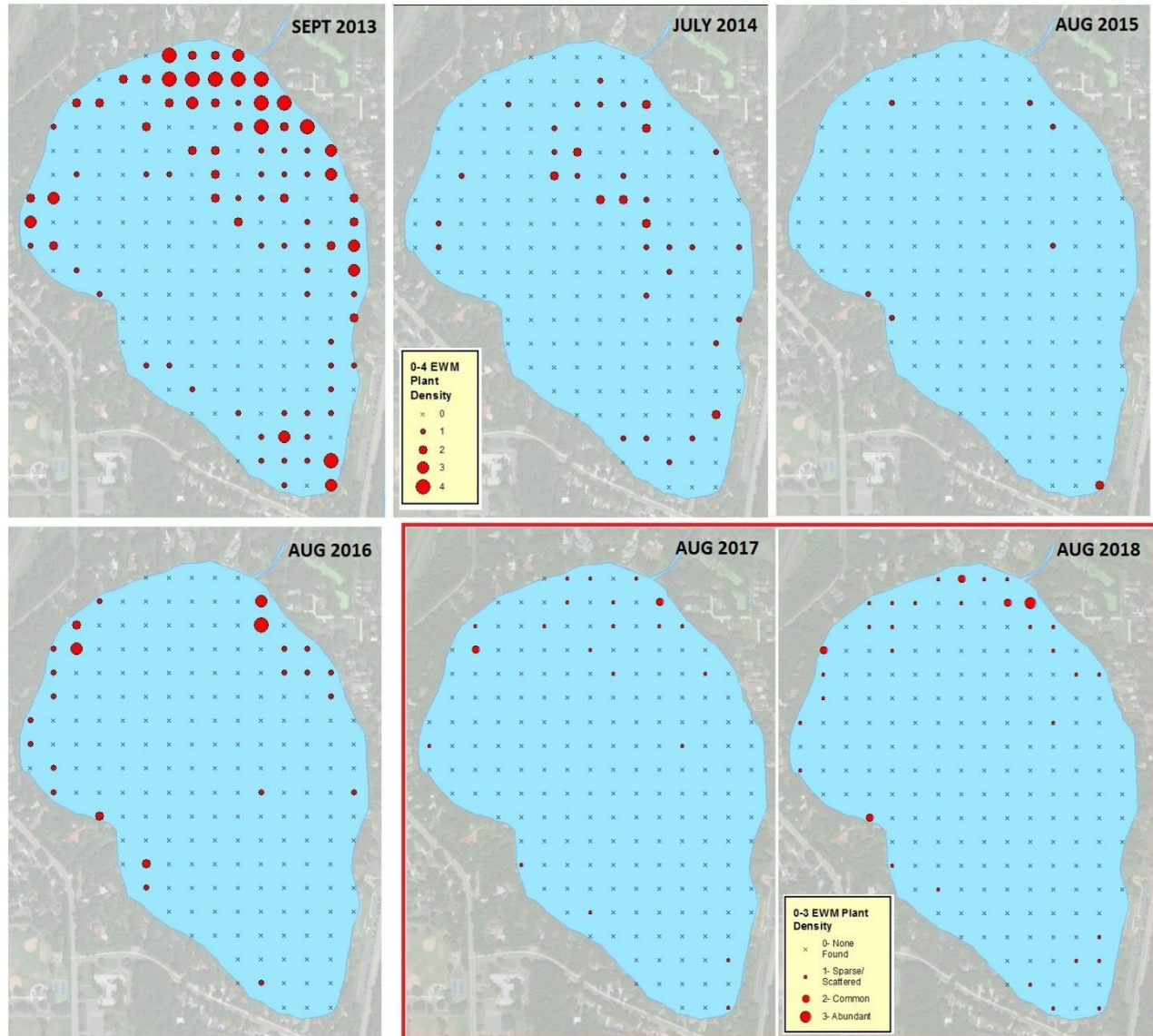


Figure 1. Spatial distribution and rake density rating of Eurasian watermilfoil. Maps prior to herbicide treatment years (before 2013) are not shown. Densities were based on a 0-4 scale in 2010-2016 and a 0-3 scale in 2018. Lake Josephine, Ramsey County (DOW# 62005700).

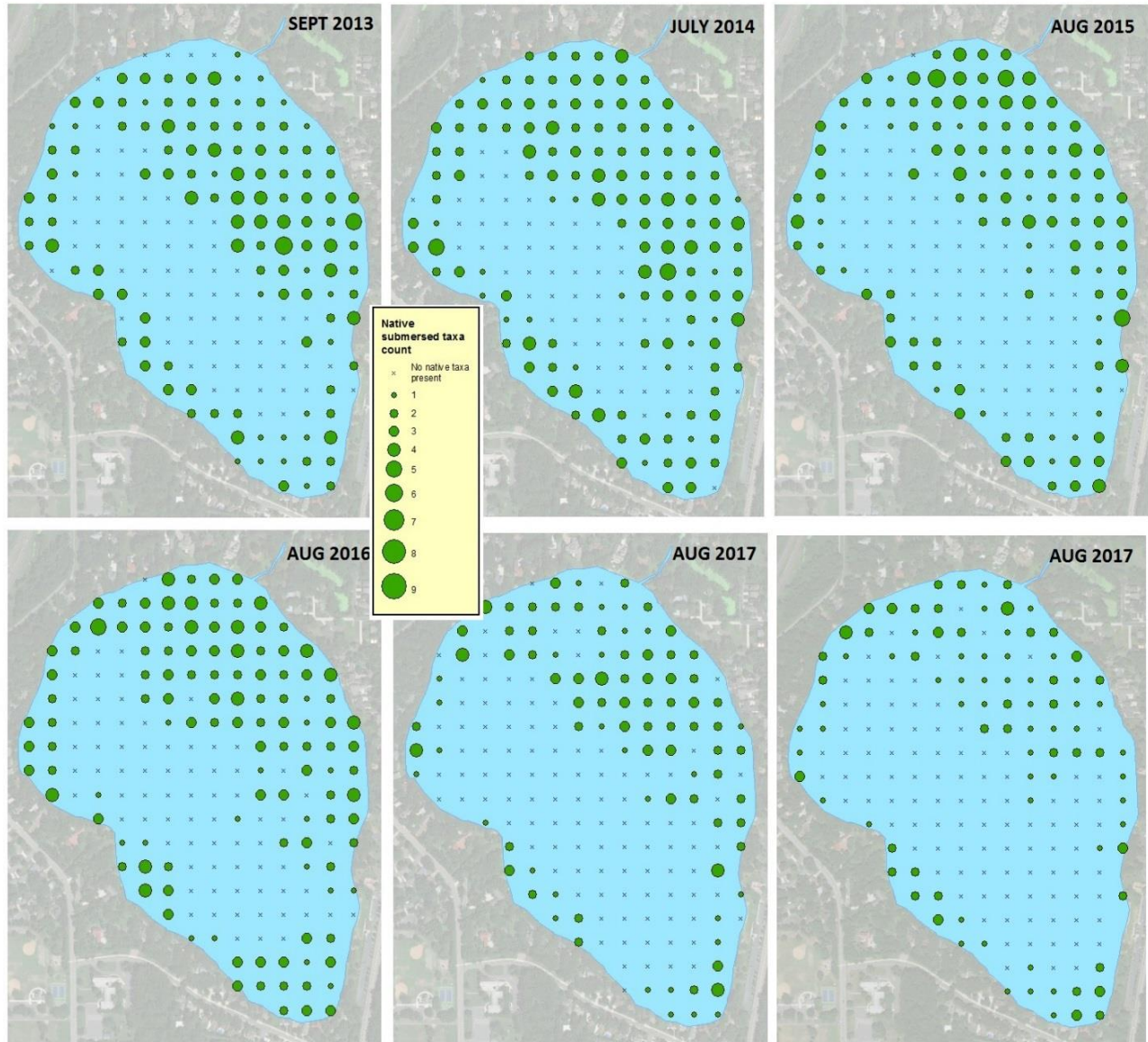


Figure 2. Spatial distribution and species richness (# of native species per sample point) of all native submersed plant species. Maps prior to herbicide treatment years (before 2013) are not shown. Lake Josephine has an active Lake Vegetation Management Plan. Lake Josephine, Ramsey County (DOW# 62005700).

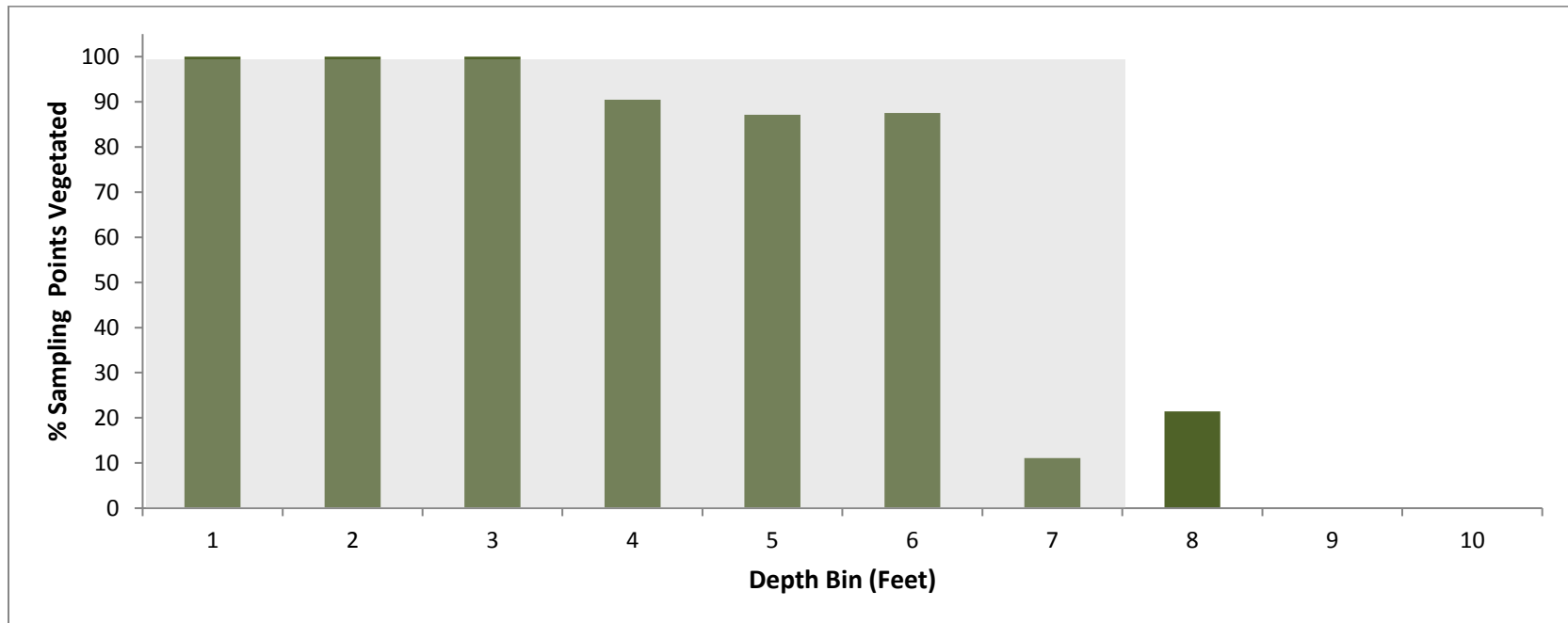


Figure 3. Maximum depth of plant colonization in feet during 2018 point intercept survey. Depths were binned in feet. Percent sampling points vegetated is defined as the number of sampling points with submersed vegetation divided by the total number of sampling points for each depth. Shaded area represents depth range of the 95th percentile of all submersed plants observed. Lake Josephine, Ramsey County (DOW# 620005700).

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