
HAM LAKE, ANOKA COUNTY: 2018 AQUATIC VEGETATION REPORT

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

Lake: Ham (DOW# 02005300)

Lake Surface Area: 203 acres

Littoral Area: 190.5 acres

County: Anoka

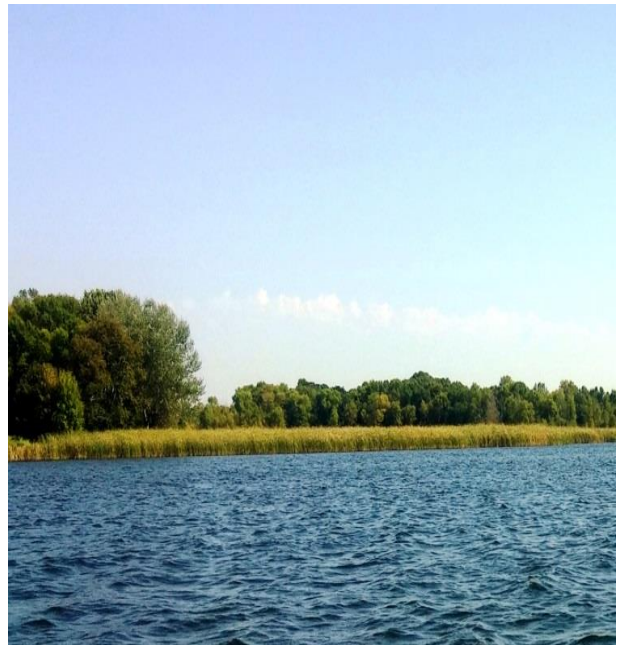
Survey Type: Point-intercept

Date of Survey (most recent): August 8, 2018

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Report updated: March 22, 2019

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2018 Summary:

The most recent aquatic vegetation point-intercept survey of Ham Lake (DOW# 02005300) was completed on August 8, 2018. Plants were present throughout the lake to a maximum depth of 3.7 meters (12 feet). Within the littoral zone (zone in lake from the 0-15 foot depth range (0-4.5 meters), 77% of sampling points contained native submersed taxa. The average number of native submersed taxa per sample point was 1.8. Seventeen submersed plant species were documented during the 2018 survey and include two invasive plant species. Management efforts to control the invasive plant Eurasian watermilfoil on Ham Lake began in 2014, one year after the initial discovery. Various herbicide formulations have been used to target Eurasian and hybrid watermilfoil; DMA-4 (2,4-D), Renovate OTF (granular triclopyr), Tribune (diquat) and most recently ProcellaCOR (Florpyrauxifen-benzyl) in 2018.

Summary Table. Summary of aquatic submersed plants in Ham Lake, Anoka County, Minnesota (DOW# 02005300) 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] |
|---------------------|---------------------|--|-----------------------------------|-----------------------------------|------------------|----------------------|
| 2014 JUL 24 | 22 | 13 | 87 | 2.7 | 17 | 2.9 |
| 2015 SEPT 14 | 7 | 13 | 94 | 2.8 | 19 | 2.8 |
| 2016 JUL 20 | 14 | 11 | 72 | 1.4 | 13 | 2.1 |
| 2017 JUL 19 | 10 | 8 | 59 | 1.1 | 13 | 2.3 |
| 2018 AUG 8 | 36 | 11 | 77 | 1.8 | 15 | NA |

*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:

Ham Lake is a 203 acre lake located in the city of Ham Lake, Minnesota. It has two invasive aquatic plant species: Eurasian watermilfoil (*Myriophyllum spicatum*, abbreviated as EWM) and curly-leaf pondweed (*Potamogeton crispus*, abbreviated as CLP). The maximum depth of water is 6.7 meters (22 feet).

Approximately 94% of the lake is littoral (littoral zone is the area where aquatic plants are likely to be found due to light penetration). Ham Lake contains a moderate level of nutrients and is considered a mesotrophic lake. Overall seasonal water clarity has remained constant in recent years (see **Table 1-Secchi Averages** below for historic Secchi disk observations). For more information concerning Ham Lake water quality see <http://cf.pca.state.mn.us/water/watershedweb/wdip/waterunit.cfm?wid=02-0053-00>.

Table 1-Secchi Averages. Average Secchi disk observations in meters for Ham Lake (DOW #02005300). Data gathered from the Minnesota Pollution Control Agency and Anoka Conservation District (ACD).

| YEAR | MAY | JUNE | JULY | AUG | SEPT | Secchi Depth Average [May-Sept] |
|------|-----|------|------|-----|------|------------------------------------|
| 2011 | 3.2 | 3.0 | 2.5 | 1.8 | 1.5 | 2.4 |
| 2012 | 3.8 | 3.0 | 2.7 | 2.5 | 2.7 | 2.9 |
| 2013 | 3.9 | 3.6 | 3.3 | 3 | 2.2 | 3.2 |
| 2014 | 3.4 | 3.1 | 3.1 | 2.9 | 2.3 | 3.0 |
| 2015 | 3.7 | 2.1 | 2.9 | 2.5 | 2.9 | 2.8 |
| 2016 | 2.3 | 2.1 | 2.4 | 1.7 | 1.8 | 2.1 |
| 2017 | 3.1 | 2.6 | 2.0 | 2.1 | 1.7 | *2.3 |
| 2018 | - | - | - | - | - | NA |

* data collected by ACD

Management History:

The most recent hybrid watermilfoil herbicide treatment of 5.5 & 13.3 acres was organized by the Ham Lake Association in 2018. ProcellaCOR, a new herbicide registered by the EPA, was applied on July 18 and later in September (see **Table 2** below). The first treatment's dosing was inadequate so re-application was required later in the season by the pesticide applicator. In addition, 0.06 acres of non-native *Phragmites*, an emergent plant, located on the eastern shoreline was treated with Glyphosate & Imazapyr for the first time on September 11, 2018. Due to the low abundance observed in the spring, Curly-leaf pondweed was not managed in 2018.

Historically, efforts to manage invasive watermilfoil (EWM & hybrid) have included; the use of auxin-mimic herbicide (2,4-D in 2014) which was reported to be largely ineffective according to the herbicide applicator, granular triclopyr in 2015 which showed significant lake-wide reductions, and finally, targeting small patches of EWM using diquat in the fall of 2016. No treatment of EWM occurred in 2017 as EWM nuisance areas were small and did not surface mat. Impact to floating leaf species such as white waterlily and yellow pond lily was observed following the larger scale granular triclopyr treatment (2015), however according to PI surveys floating leaf species have returned to pre-treatment levels.



Photo 1. Dense 0.06 acre patch of Common Reed (*Phragmites australis* subsp. *australis*; also known as non-native Phragmites) located on the east side of Ham Lake, Anoka County. Non-native Phragmites was treated for the first time in 2018.

Table 2-Invasive Plant Management Summary. Characteristics and history of herbicide treatment for Ham Lake (DOW# 02005300, Total acres: 203, Littoral acres: 190.5, 15% Littoral acres: 28.56).

| Year | Month | Treatment [W,P,N] | Target Species | Total Acres Treated | Herbicide | Licensed Commercial Applicator |
|------|-------|-------------------|----------------|---------------------|-----------------------|------------------------------------|
| 2014 | JUL | P | EWM | 6.1 | 2,4-D | PLM Lake and Land Management Corp. |
| 2015 | JUN | P | EWM | 19.4 | Tricolpyr (granular) | PLM Lake and Land Management Corp. |
| 2016 | APRIL | P | CLP | 13.5 | Endothall | PLM Lake and Land Management Corp. |
| | OCT | P | EWM | 11.3 | Diquat | PLM Lake and Land Management Corp. |
| 2017 | MAY | P | CLP | 13.5 | Endothall | PLM Lake and Land Management Corp. |
| 2018 | JUL | P | EWM | 5.5 | ProcellaCOR | PLM Lake and Land Management Corp. |
| | SEPT | P | | 13.3 | ProcellaCOR & diquat | PLM Lake and Land Management Corp. |
| | SEPT | P | Phrag | 0.06 | Glyphosate & Imazapyr | PLM Lake and Land Management Corp. |

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

EWM is an abbreviation for Eurasian watermilfoil

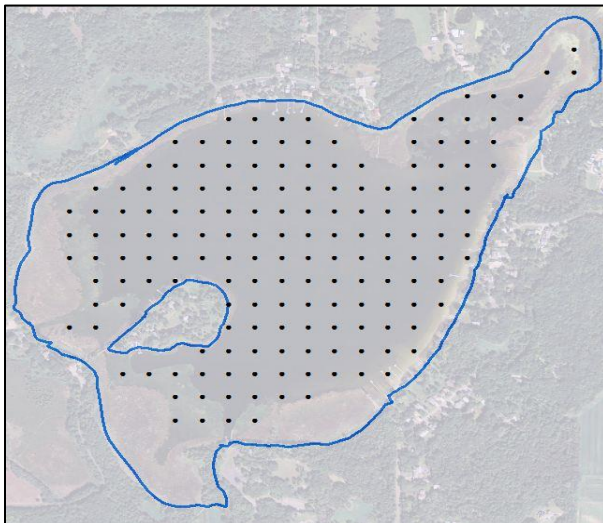
CLP is an abbreviation for Curly-leaf pondweed

Survey Objectives:

Point-intercept surveys were used to assess the distribution of aquatic plants in Ham 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 60 meters apart using a Geographic Information System (GIS). This spacing allowed for placement of 166 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:

During the most recent survey in 2018, 95% of all plant growth was observed between 0 and 3.35 meters (0-11 feet; **Figure 3** for plant growth depth ranges) and similar to previous years. When compared with historic surveys, the number of taxa observed was higher in 2018 (See **Table 3- Point Intercept Metrics**). Lake wide hybrid watermilfoil was observed at its highest frequency (36% frequency of occurrence) in 2018. Following the initial 2018 milfoil treatment, the ProcellaCOR application appeared to be ineffective, possibly due to low application rates. A second application that included a larger treatment area and greater application rates was conducted in the fall. Signs of epinasty to both hybrid milfoil and native coontail were observed post treatment (see **Photo 2**). Pre and post ProcellaCOR treatment point intercept data are available upon request. Follow up surveys in 2019 are needed to evaluate the effectiveness of ProcellaCOR on hybrid milfoil in Ham Lake.

Fifteen native submersed plants were observed in 2018, which included Fries' pondweed, creeping bladderwort, and flat-leaf bladderwort documented for the first time. Macroalgae and Coontail continue to be the most dominant species in Ham Lake. Overall, native submersed plant abundance and species richness has remained constant (see **Table 4- Plant Frequency Occurrence**).



Photo 2. Elongated stems and sparse leaves observed on EWM (left) and Coontail (right), a change in plant growth often seen following ProcellaCOR treatments. Photos taken August 29, 2018 on Ham Lake, Anoka County.

Table 3- Point Intercept Metrics. Summary of point intercepts metrics for Ham Lake, Anoka County (DOW# 02005300). Shaded values were calculated from littoral depth range.

| Survey Metrics | JUL 24 2014 | SEPT 14 2015 | JUL 20 2016 | JUL 19 2017 | AUG 8 2018 |
|--------------------------------------|------------------------|-------------------------|------------------------|------------------------|-----------------------|
| Treated (Y/N) | Y | Y | Y | Y | Y |
| Surveyor | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR |
| Total # Points Sampled | 153 | 159 | 148 | 158 | 162 |
| Max Depth of Growth (95%) in feet | 13 | 13 | 11 | 8 | 11 |
| # Point in Max Depth Range | 107 | 114 | 92 | 83 | 107 |
| # Points in Littoral (0-15 feet) | 129 | 124 | 128 | 143 | 142 |
| % Points w/ Submersed Native Taxa | 87 | 94 | 72 | 59 | 77 |
| Mean Submersed Native Taxa/ Point | 2.7 | 2.8 | 1.4 | 1.1 | 1.8 |
| # Submersed Native Taxa | 15 | 17 | 11 | 11 | 15 |
| # Submersed Non-Native Taxa | 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 Ham Lake, Anoka County (DOW# 02005300).

| Taxonomic Name | Common Name | JUL 24 2014 | SEPT 14 2015 | JUL 20 2016 | JUL 19 2017 | AUG 8 2018 |
|---|-------------------------|----------------|-----------------|----------------|----------------|---------------|
| SUBMERSED PLANTS | | | | | | |
| <i>Myriophyllum spicatum</i> * | Eurasian watermilfoil* | 22 | 7 | 14 | 10 | 36 |
| <i>Potamogeton crispus</i> * | Curly-leaf pondweed* | 2 | 2 | 2 | 3 | 6 |
| <i>Ceratophyllum demersum</i> | Coontail | 67 | 79 | 58 | 43 | 63 |
| <i>Macroalgae</i> | Muskgrass and Stonewort | 17 | 21 | 23 | 15 | 28 |
| <i>Eleocharis acicularis</i> | Needle spikerush | 13 | 0 | 1 | 0 | 0 |
| <i>Elodea canadensis</i> | Canadian waterweed | 0 | 29 | 27 | 11 | 10 |
| <i>Myriophyllum sibiricum</i> | Northern watermilfoil | 22 | 6 | 0 | 2 | 0 |
| <i>Najas spp.</i> | Naiad | 8 | 4 | 2 | 1 | 2 |
| <i>Potamogeton amplifolius</i> | Large-leaf pondweed | 9 | 16 | 0 | 0 | 2 |
| <i>Potamogeton illinoensis</i> | Illinois pondweed | 0 | 6 | 2 | 0 | 3 |
| <i>Potamogeton praelongus</i> | White-stem pondweed | 12 | 3 | 0 | 1 | 0 |
| <i>Potamogeton pusillus</i> | Small pondweed | 18 | 0 | 0 | 0 | 0 |
| <i>Potamogeton robbinsii</i> | Fern pondweed | 3 | 10 | 1 | 0 | 0 |
| <i>Potamogeton zosteriformis</i> | Flat-stem pondweed | 60 | 49 | 2 | 4 | 4 |
| <i>Ranunculus aquatilis</i> | White water crowfoot | 2 | 0 | 9 | 0 | 0 |
| <i>Stuckenia pectinata</i> | Sago pondweed | 2 | 6 | 0 | 4 | 10 |
| <i>Utricularia macrorhiza</i> | Common bladderwort | 32 | 26 | 9 | 16 | 24 |
| <i>Utricularia minor</i> | Small bladderwort | 0 | 8 | 1 | 0 | 0 |
| <i>Vallisneria americana</i> | Water celery | 0 | 9 | 5 | 4 | 5 |
| Floating, Free-floating & Emergent plants observed: <i>Nuphar advena</i> (Yellow pond lily), <i>Nuphar variegata</i> (Bullhead pond lily), <i>Nymphaea odorata</i> (White water lily), <i>Lemna trisulca</i> (Forked duckweed), <i>Typha sp.</i> (Cattail). | | | | | | |
| Less common (< 5% frequency) submersed vegetation observed: *POTAMOGETON CRISPUS (CURLY-LEAF PONDWEED) in 2014-2017, <i>Potamogeton gramineus</i> (Variable-leaf pondweed) in 2014, 2015 and 2018, <i>Potamogeton richardsonii</i> (Clasping-leaf pondweed) in 2015 and 2016, <i>Heteranthera dubia</i> (Water stargrass) in 2015-2018, <i>Potamogeton friesii</i> (Fries' pondweed), <i>Utricularia gibba</i> (Creeping bladderwort), and <i>Utricularia intermedia</i> (Flat-leaf bladderwort) in 2018. | | | | | | |

* denotes invasive aquatic plant

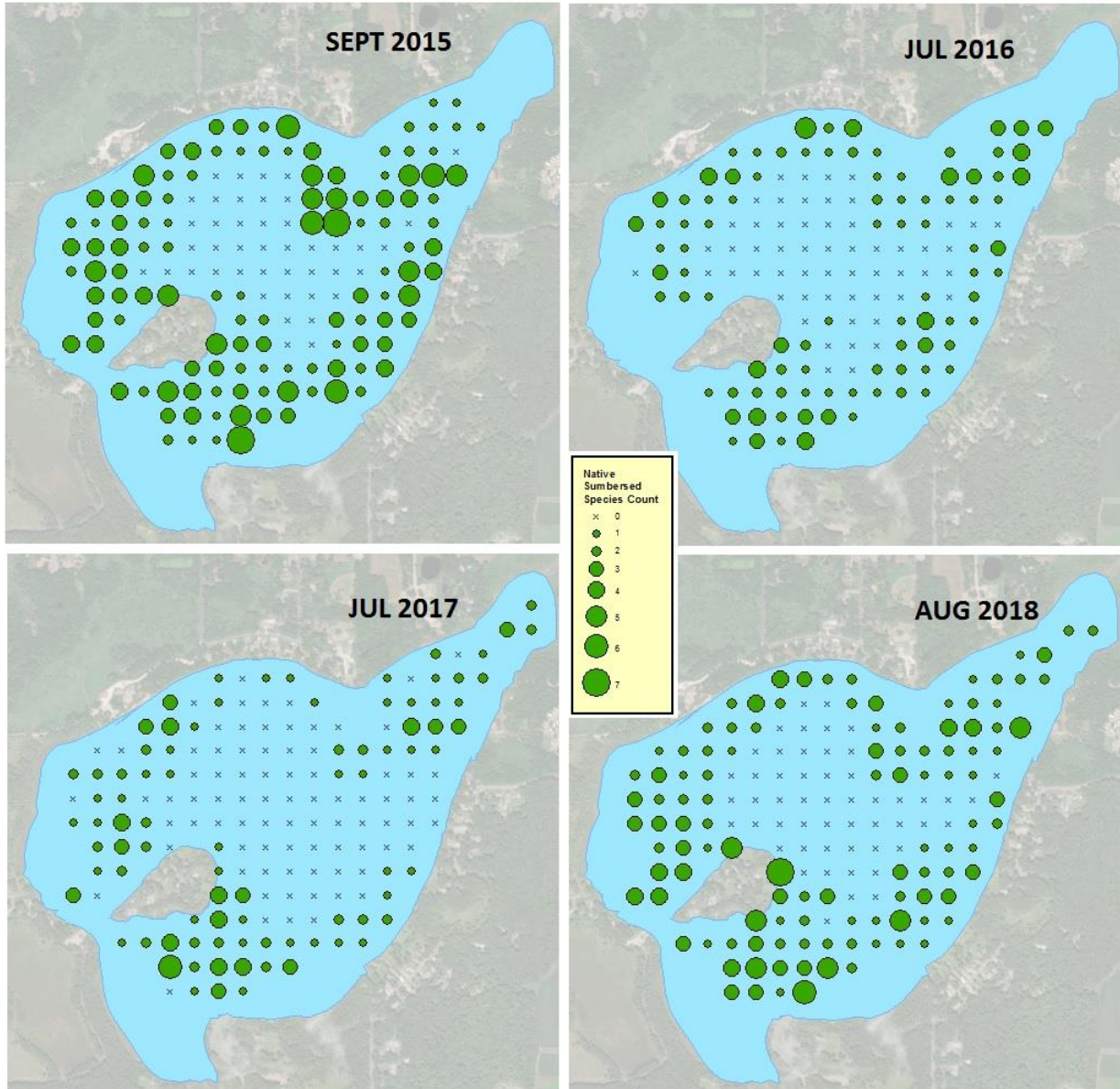


Figure 1. Spatial distribution and species richness (# of native species per sample point) of all native submersed plant species from DNR PI surveys (2014-2018). Ham Lake, Anoka County (DOW# 02005300).

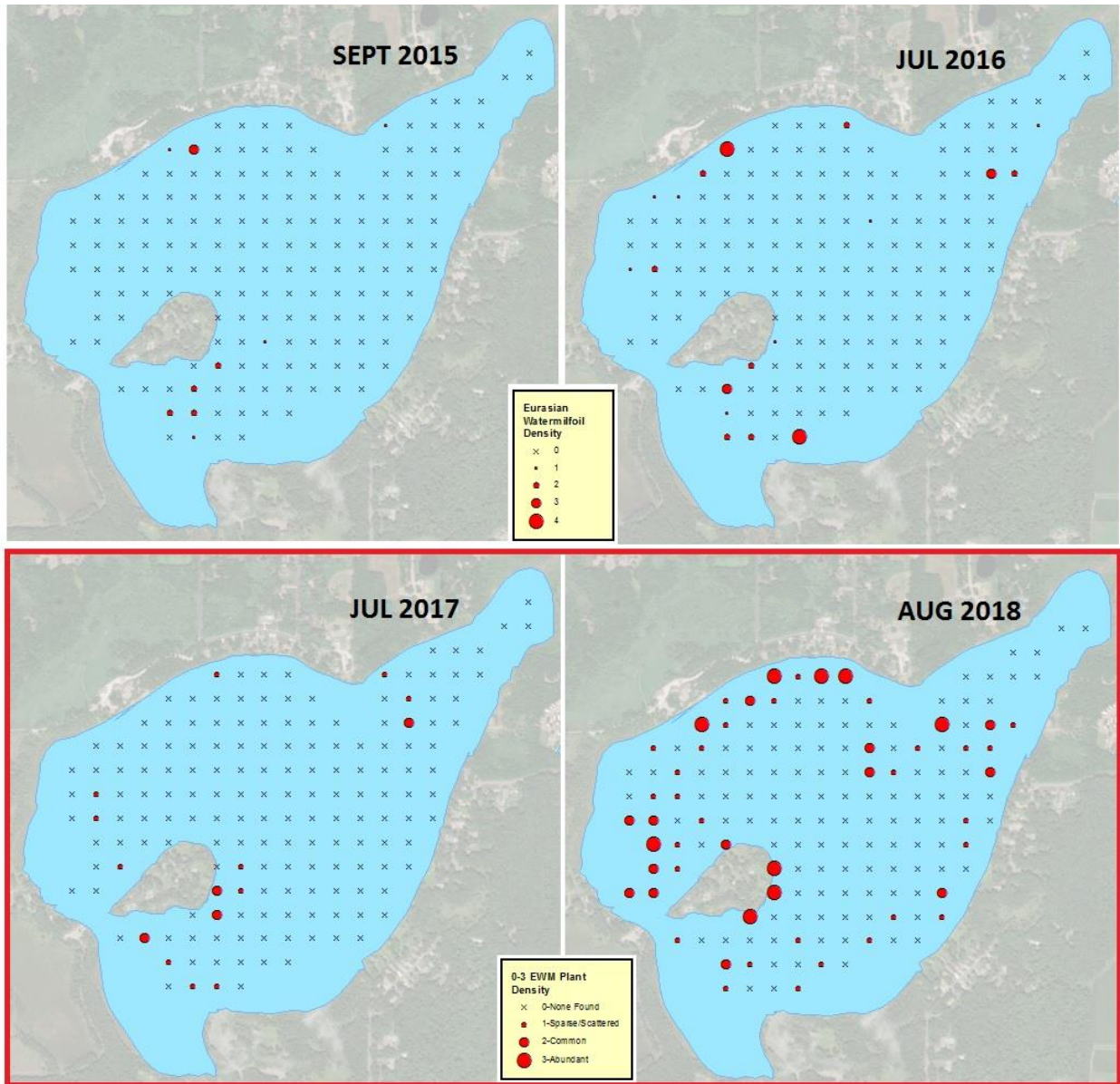


Figure 2. Spatial distribution and rake density rating of Eurasian watermilfoil from DNR PI surveys (2014-2018), Ham Lake, Anoka County (DOW # 02005300). Years 2015 and 2016 were surveyed on a 1-4 density rake rating scale while 2017 and 2018 were rated on a 1-3 density rake rating.

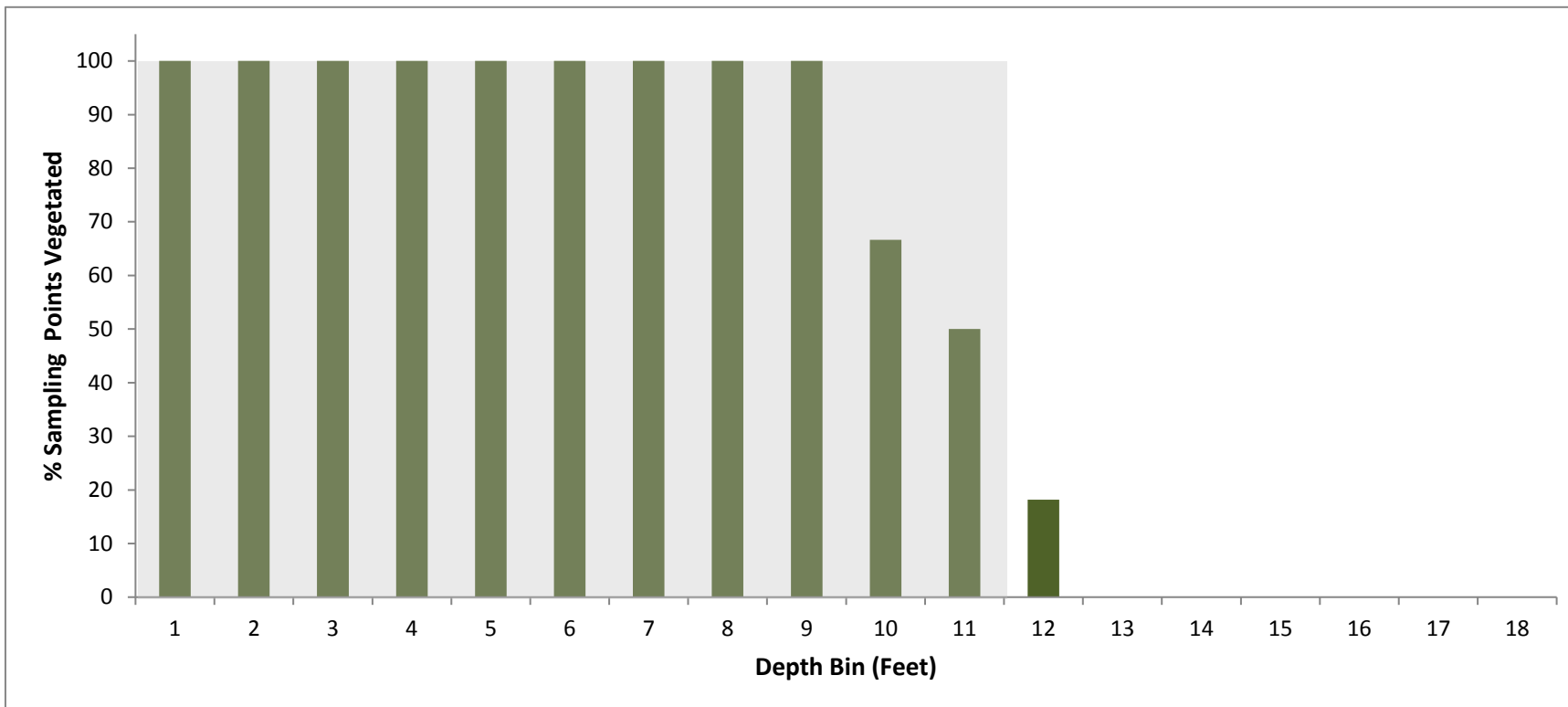


Figure 3. Maximum depth of plant colonization in feet during 2018 point intercept survey. Depths were binned in feet. Percent sampling points vegetated is defined as the number of sampling points with submersed vegetation divided by the total number of sampling points for each depth. Shaded area represents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

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