
TURTLE LAKE, RAMSEY COUNTY: 2022 AQUATIC VEGETATION REPORT

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

Lake: Turtle (DOW# 62006100)

Lake Surface Area: 454 acres

Littoral Area: 284 acres

County: Ramsey

Survey Type: Point-intercept

Date of Survey (most recent): July 21, 2022

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2022 Summary:

The most recent aquatic vegetation point-intercept survey of Turtle Lake (DOW# 62006100) was completed on July 21, 2022. Submersed plants were identified out to a maximum depth of 3.35 meters (11 feet). Within the littoral zone (area in the lake from the 0 – 15-foot depth range [0 – 4.5 meters]), 72% of sampled points contained native submersed taxa. The average number of native submersed taxa per sample point was 1.9. Thirteen submersed plant species were documented during the 2022 survey including one invasive plant species, Eurasian watermilfoil. Offshore herbicide treatments targeting the invasive submersed plant Eurasian watermilfoil have been organized since 2002 by the Turtle Lake Homeowners Association.

Summary Table. Summary of aquatic submersed plants in Turtle Lake, Ramsey County, Minnesota (DOW# 62006100) as indicated by the 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] |
|----------------|--------------------|------------------------------------------------|-----------------------------------|-----------------------------------|------------------|----------------------|
| JUN 2 2010 | 5 | | | | 14 | **6.2 |
| JUN 4 2014 | 3 | | | | 17 | **4.4 |
| JUL 12 2016 | 5 | 12 | 54 | 1.2 | 19 | *1.8 |
| JUL 13 2017 | 5 | 11 | 70 | 1.6 | 15 | *3.2 |
| JUL 23 2018 | 3 | 11 | 72 | 1.9 | 14 | **3.3 |
| JUL 21 2022 | 0 | 8 | 49 | 1.3 | 13 | |

[†]95th percentile calculated based on all vegetated sampling points

* Data collected by MnDNR during survey

** Data collected by Ramsey Conservation District & Ramsey County Public Works Environmental Resources

EWM is short for Eurasian watermilfoil

Taxa refers to groups of submersed aquatic plant species or genera

Lake Description:

Turtle Lake is a 454-acre lake located in Shoreview, Minnesota and contains one public access. The maximum depth of water is 8.5 meters (28 feet). Approximately 63% of the lake is littoral (water depth zone from 0 – 15 feet where aquatic plants are likely to be found). Turtle Lake is mesotrophic and contains a moderate level of nutrients. For more information on Turtle Lake water quality, see <https://cf.pca.state.mn.us/water/watershedweb/wdip/waterunit.cfm?wid=62-0061-00>

Management History:

A pre-treatment delineation survey was conducted by Freshwater Scientific Services and organized by the Turtle Lake Homeowners Association in 2022. Significant Eurasian watermilfoil (abbreviated as EWM) growth was observed in seven separate locations in the littoral area. The most recent invasive plant management herbicide treatment targeted 42.6 acres of EWM. Treatment size has ranged from 5-42 acres in the past 7 years using four different herbicides. 2,4-D has been historically used to target EWM in Turtle Lake (2012 – 2018), while a combination treatment using Diquat and ProcellaCOR has been used the past three seasons. Additionally, non-native Phragmites (an invasive emergent reed) has been historically managed by mechanical and herbicide means, treating <1 acre from 2014-2016. See **Table 1-Invasive Plant Management Summary** below for more information on invasive plant management activities.

Table 1-Invasive Plant Management Summary. Characteristics and history of herbicide treatment for Turtle Lake, Ramsey County, Minnesota (DOW# 62006100, total acres: 454.0, littoral acres: 284.2, 15% littoral acres: 42.6).

| Date | Treatment [W, P, N] | Target Species | Total Acres Treated | Herbicide | Licensed Commercial Applicator |
|------|---------------------|----------------|---------------------|---------------------|--------------------------------|
| 2012 | P | EWM | 20 | 2,4-D | Midwest Aquacare |
| 2013 | P | EWM | 25 | 2,4-D | Midwest Aquacare |
| 2014 | P | EWM | 5 | 2,4-D | Midwest Aquacare |
| 2015 | P | EWM | 25 | 2,4-D | Midwest Aquacare |
| 2016 | P | EWM | 8.9 | 2,4-D | Midwest Aquacare |
| 2017 | P | EWM | 9.7 | 2,4-D | Lake Management |
| 2018 | P | EWM | 21.8 | 2,4-D | PLM Lake & Land Mgmnt |
| | P | EWM | 7.9 | Triclopyr | PLM Lake & Land Mgmnt |
| 2019 | P | EWM | 8.3 | Diquat | PLM Lake & Land Mgmnt |
| 2022 | P | EWM | 16.6 | ProcellaCOR, Diquat | PLM Lake & Land Mgmnt |
| 2021 | P | EWM | 31.4 | ProcellaCOR, Diquat | PLM Lake & Land Mgmnt |
| 2022 | P | EWM | 42.6 | ProcellaCOR, Diquat | PLM Lake & Land Mgmnt |
| 2014 | P | Phrag | 3 | Imazapyr | Lake Management |
| 2015 | P | Phrag | 1 | Imazapyr | Lake Management |
| 2016 | P | Phrag | 0.1 | Imazapyr | Lake Management |

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

EWM is an abbreviation for Eurasian watermilfoil

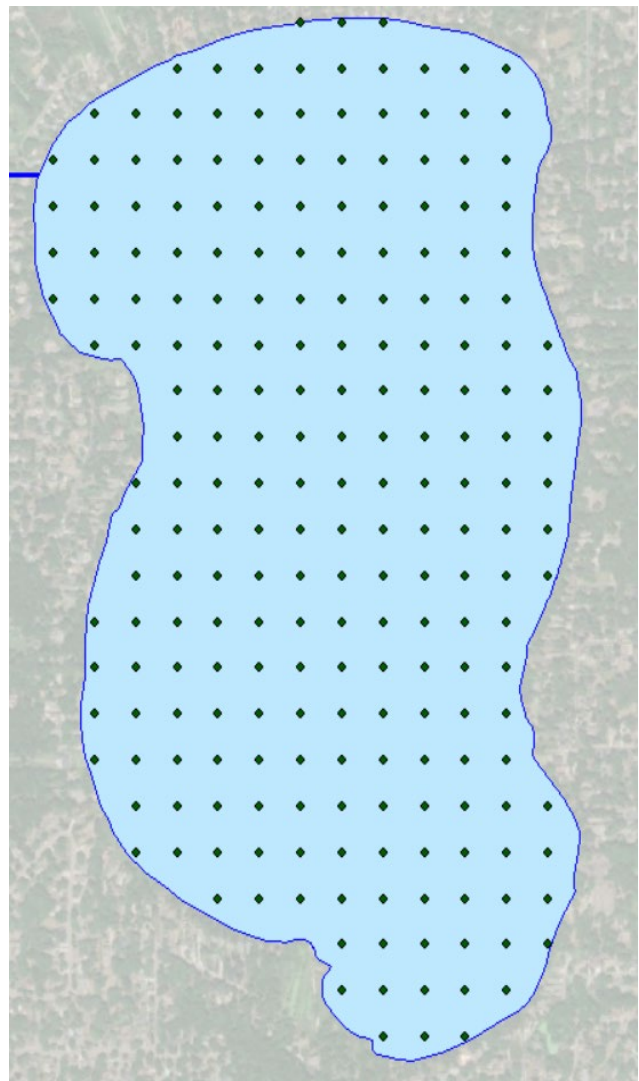
Phrag is an abbreviation for non-native Phragmites.

Survey Objectives:

Point-intercept surveys were used to assess the distribution of aquatic plants in Turtle 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 Minnesota Department of Natural Resources 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 plant and water quality 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 70 meters apart using a Geographic Information System (GIS). This spacing allowed for placement of 335 points in years prior to 2022. In 2022, a new grid was created where survey points were placed 90 meters apart allowing for placement of 225 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 4 [dense plants, matted on the surface] was used in 2012 – 2017, and a zero to 3 scale in 2018 and all years thereafter). 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:

The Minnesota Department of Natural Resources Invasive Species Program has conducted point intercept surveys on Turtle Lake in 2016, 2017, 2018 and 2022. Maximum depth of rooted vegetation remains relatively consistent (between 3.3 – 3.6 meters [11 – 12 feet]; see **Table 2 – Point Intercept Metrics** for historical point-intercept survey calculations). In 2022, thirteen species of native submersed aquatic plants were observed. In addition, plant diversity has remained constant ranging from 12 to 18 species observed.

Eurasian watermilfoil was not detected in the most recent survey, but atypical growth characteristics were observed, possibly impeding identification (see Photos 1 – 3). Identification of northern watermilfoil was based on leaflet count. Both pure genetic Eurasian watermilfoil and northern watermilfoil strains have been recorded in Turtle Lake.

The most common native taxa included macroalgae, naiad, clasping-leaf pondweed, and water celery (see **Table 3 – Plant Frequency Occurrence** for historical plant frequency observations). Native plant frequency has stayed consistent from 2010 to 2022 with Macroalgae and Naiads peak frequencies occurring in 2010 and 2014, while water celery has increased from 2018 to 2022.

The Ramsey Conservation District (RCD) & Ramsey County Public Works Environmental Resources (RCPW) have aquatic plant data from surveys conducted in June of 2010 and 2014. Most native submersed plant taxa have remained the same across all surveys, except for variable-leaf pondweed and water stargrass (found by Minnesota Department of Natural Resources only), whitewater crowfoot (found by RCD & RCPW only). Additionally, curly-leaf pondweed has only been documented in the 2010 and 2014 surveys, likely due to time of year. More information on either survey can be provided upon request.

Table 2 – Point Intercept Metrics. Summary of point intercepts metrics for Turtle Lake, Ramsey County, Minnesota (DOW # 62006100). Shaded values were calculated from littoral depth range (0 – 15ft).

| Survey Metrics | JUN 2 2010 | JUN 4 2014 | JUL 12 2016 | JUL 13 2017 | JUL 23 2018 | JUL 21 2022 |
|-----------------------------------|---------------|---------------|----------------|----------------|----------------|----------------|
| Treated (Y/N) | - | Y | Y | Y | Y | Y |
| Surveyor | RCD | RCD | MN DNR | MN DNR | MN DNR | MNDNR |
| Total # Points Sampled | 110 | 336 | 332 | 335 | 300 | 170 |
| Max Depth of Growth (95%) in feet | - | - | 12 | 11 | 11 | 8 |
| # Point in Max Depth Range | - | - | 156 | 164 | 168 | 100 |
| # Points in Littoral (0-15 feet) | - | - | 182 | 191 | 189 | 136 |
| % Points w/ Submersed Native Taxa | - | - | 54 | 70 | 72 | 49 |
| Mean Submersed Native Taxa/Point | - | - | 1.2 | 1.6 | 1.9 | 1.3 |
| # Submersed Native Taxa | 12 | 15 | 18 | 14 | 13 | 13 |
| # Submersed Non-Native Taxa | 2 | 2 | 1 | 1 | 1 | 0 |

Table 3 – Plant Frequency Occurrence. Historic percent frequency of occurrence for submersed vegetation within the littoral zone (0-15 feet) in Turtle Lake, Ramsey County, Minnesota (DOW # 62006100). 2010 and 2014 surveys were conducted by the Ramsey Conservation District & Ramsey County Public Works Environmental Resources. Surveys in 2016-2018 and 2022 were conducted by Minnesota Department of Natural Resources.

| Taxonomic Name | Common Name | JUN 2010 | JUN 2014 | JUL 2016 | JUL 2017 | JUL 2018 | JUL 2022 |
|----------------------------------|-------------------------|----------|----------|----------|----------|----------|----------|
| SUBMERSED PLANTS | | | | | | | |
| <i>Myriophyllum spicatum</i> * | Eurasian watermilfoil* | 5 | 3 | 5 | 5 | 3 | 0 |
| <i>Ceratophyllum demersum</i> | Coontail | 2 | 3 | 2 | 2 | 7 | 3 |
| <i>Elodea canadensis</i> | Canada waterweed | 9 | 2 | 1 | 2 | 4 | 2 |
| <i>Macroalgae</i> | Muskgrass and Stonewort | 59 | 70 | 27 | 36 | 39 | 29 |
| <i>Myriophyllum sibiricum</i> | Northern watermilfoil | 8 | 8 | 2 | 2 | 1 | 7 |
| <i>Najas spp.</i> | Naiad | 54 | 51 | 13 | 11 | 33 | 17 |
| <i>Potamogeton amplifolius</i> | Large-leaf pondweed | 18 | 5 | 1 | 0 | 0 | 3 |
| <i>Potamogeton gramineus</i> | Variable-leaf pondweed | 0 | 0 | 7 | 4 | 14 | 2 |
| <i>Potamogeton illinoensis</i> | Illinois pondweed | 1 | 11 | 7 | 5 | 6 | 11 |
| <i>Potamogeton praelongus</i> | White-stem pondweed | 0 | 32 | 4 | 9 | 6 | 1 |
| <i>Potamogeton richardsonii</i> | Clasping-leaf pondweed | 15 | 5 | 5 | 12 | 15 | 14 |
| <i>Potamogeton zosteriformis</i> | Flat-stem pondweed | 0 | 2 | 2 | 3 | 4 | 7 |
| <i>Stuckenia pectinata</i> | Sago pondweed | 0 | 7 | 1 | 1 | 2 | 0 |
| <i>Vallisneria americana</i> | Water celery | 4 | 3 | 3 | 3 | 2 | 10 |

*Denotes invasive aquatic plant

Floating, free-floating & emergent plants observed: *Phragmites australis subsp. Australis* (non-native common reed) and *Phragmites australis subsp. Americanus* (native common reed), *Nymphaea odorata* (white waterlily)

Less common (< 5% frequency) submersed vegetation observed: *Ranunculus aquatilis* (white water crowfoot) in 2010, *Potamogeton crispus* curly-leaf pondweed) in 2010 and 2014, *Potamogeton foliosus* (leafy pondweed), *Potamogeton pusillus* (small pondweed), *Potamogeton robbinsii* (fern-leaf pondweed) and *Urticularia macroriza* (common bladderwort) in 2016, *Myriophyllum tenellum* (dwarf watermilfoil) and *Potamogeton strictifolius* (narrowleaf pondweed) in 2017. *Eleocharis acicularis* (needle spikerush) in 2017 and 2018, *Heteranthera dubia* (water stargrass) in 2022.



Photos: 1 – 4. Three plant samples taken from three separate locations in Turtle Lake, Ramsey County, Minnesota. All three plant samples show an atypical growth of northern watermilfoil. Photos 1 & 2 show bare stems and leaflet fusion. Photo 3 displays plant degradation. Photo 4 is of an abundant rake sample showing northern milfoil with several other native plants (*e.g.*, clasp pondweed). Photos captured on July 21, 2022, by Minnesota Department of Natural Resources AIS staff, Turtle Lake, Ramsey County, Minnesota.

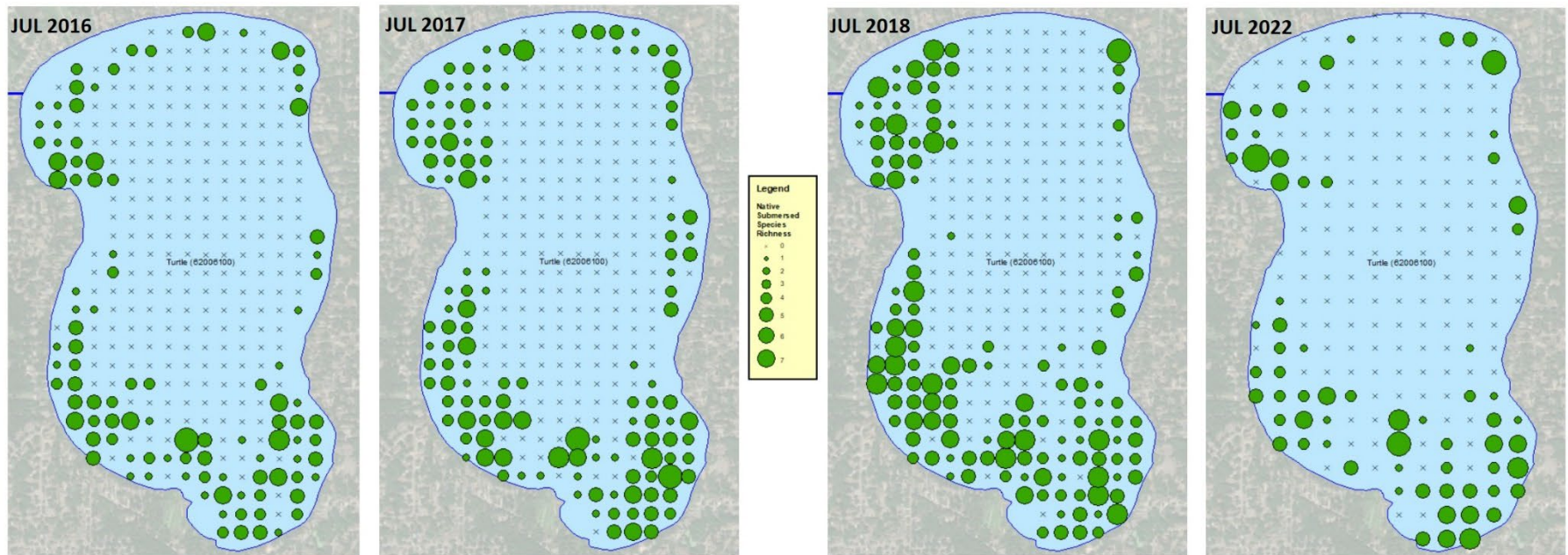


Figure 1 – Native Species Taxa Density. Spatial distribution and species richness (# of native species per sample point) of all native submersed plant species from 2016-2018 and 2022 surveys in Turtle Lake, Ramsey County (DOW#62006100). Surveys conducted in 2016 – 2018 used 300 to 335 sampling points, while 170 points were sampled in 2022 based on the new sampling grid.

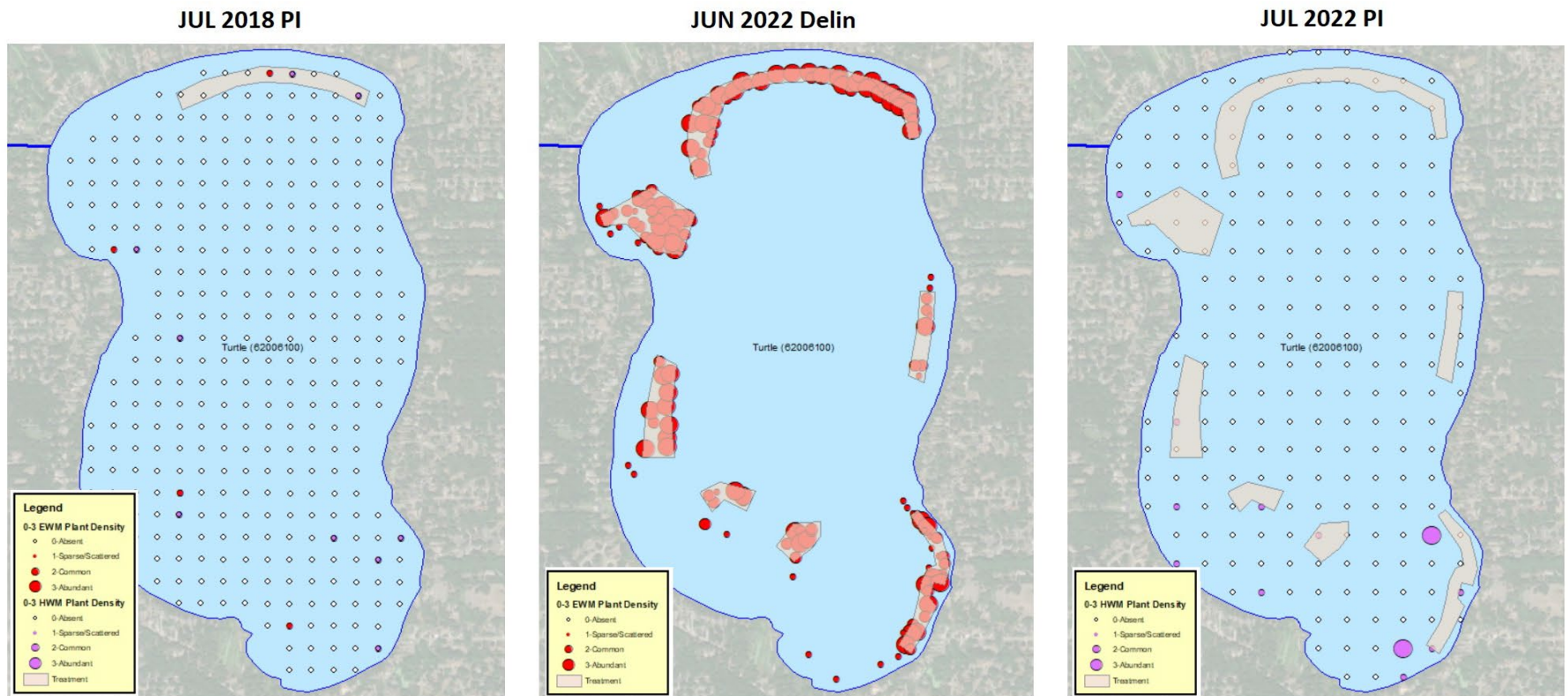


Figure 2 – Hybrid Watermilfoil Density Spatial distribution and rake density rating of Eurasian watermilfoil and northern watermilfoil with treatment area. July 2018 displays the spring Triclopyr treatment (peach polygon) overlaying the 2018 point intercept survey data. June 2022 displays the spring ProcellaCOR and Diquat combination treatment (peach polygons) overlaying the 2022 spring meandering delineation survey data targeting Eurasian watermilfoil growth. July 2022 displays the spring ProcellaCOR and Diquat combination treatment (peach polygons) overlaying the 2022 point intercept survey data. Purple dots denote northern watermilfoil, while red dots denote Eurasian watermilfoil. Dot sizes are based on a 1-3 density rake rating. Turtle Lake, Ramsey County, Minnesota (DOW# 62006100).

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