

## SQUARE LAKE, WASHINGTON COUNTY: 2024 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:** Square (DOW# 82004600)

**Lake Surface Area:** 203 acres

**Littoral Area:** 65 acres

**County:** Washington

**Survey Type:** Point-intercept

**Date of Survey (most recent):** August 20,  
2024

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### 2024 Summary:

The first aquatic vegetation point-intercept survey on Square Lake (DOW #82004600) was completed on August 20, 2024. Submersed aquatic plants were identified out to a maximum depth of 3.0 meters (10 feet). Within the littoral zone [zone in the lake from the 0 – 15-foot depth range (0 – 4.5 meters)], 96% of sampled survey points contained native taxa (groups of submersed aquatic plant species or genera). Twenty submersed native taxa were observed during the 2024 survey, and the average number of taxa per sample point was 3.8. Offshore herbicide treatments targeting the invasive aquatic plant, curly-leaf pondweed, have historically been organized by the Square Lake Association.

## Lake Description:

Square Lake is a 203- acre lake located eight miles north of Stillwater, MN in Washington County. The lake has one known invasive plant species, curly-leaf pondweed. The maximum depth in Square Lake is 68 feet, and 32% of the lake is classified as littoral (areas of water depth between 0 to 15 feet, where aquatic plants are most likely to grow). Water clarity during the summer averaged 13.5-22.6 feet in 2021 ([Minnesota LakeBrowser \(umn.edu\)](https://lakebrowser.umn.edu/)). According to surveys from the Minnesota Pollution Control Agency (MPCA, 2023), Square Lake is classified as a moderately clear mesotrophic lake, based on its Trophic State Index (TSI) of approximately 39. For more information on water quality, go to [Square Lake water quality](https://webapp.pca.state.mn.us/surface-water/impairment/82-0046-00) on the MPCA website (<https://webapp.pca.state.mn.us/surface-water/impairment/82-0046-00>).

## Management History:

Invasive aquatic plant management in Square Lake has focused on Curly-leaf pondweed using an endothall herbicide. The most recent treatment targeted curly-leaf pondweed in 2021 (2.9 acres), organized by the Square Lake Association. Past treatments have ranged from 1.25 to 2.9 acres all using the contact aquatic herbicide Endothall. See **Table 1 – Invasive Plant Management Summary** for a recent history of herbicide treatments for Square Lake.

**Table 1 – Invasive Plant Management Summary.** Characteristics and history of herbicide treatments for Square Lake, Washington County, Minnesota (DOW# 82004600; total acres: 203, littoral acres: 65, 15% littoral acres: 4.58).

Date	Treatment [W, P, N]	Target Species	Total Acres Treated	Herbicide	Licensed Commercial Applicator
2016	P	CLP	1.25	Endothall	Square Lake Association
May 2018	N	CLP	2.4	Endothall	Square Lake Association
2019	P	CLP	2.4	Endothall	Square Lake Association
May 2021	P	CLP	2.9	Endothall	Square Lake Association

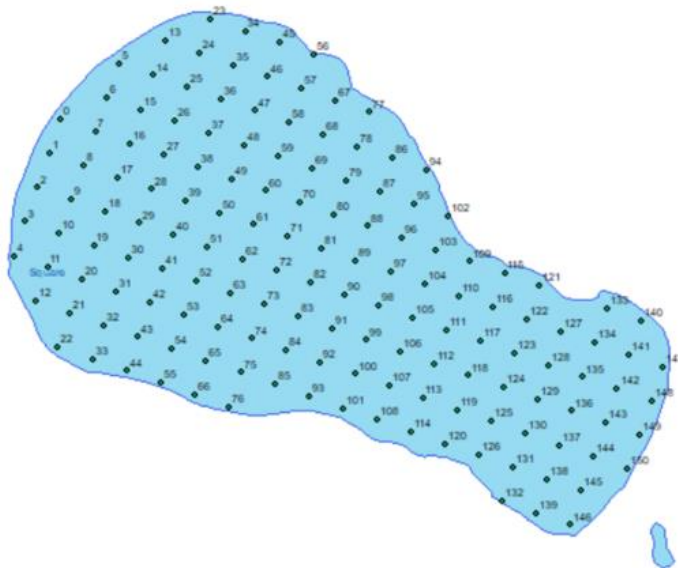
Treatment: W (whole lake), P (partial lake), N (no treatment)  
CLP is an abbreviation for curly-leaf pondweed

## Survey Objectives:

Point-intercept surveys were used to assess the distribution of submersed aquatic plants in Square 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 (using 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 from invasive aquatic plant management efforts. It is important to note that distributions of aquatic plants may vary from year to year due to biotic and abiotic factors, 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 75 meters apart using a Geographic Information System (GIS), allowing for the placement of 150 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 as a surrogate for density (a scale of zero [no plants] to 4 [dense, matted on the surface] was used in 2012 – 2017, and



a zero to 3 scale from 2018 and all years thereafter). Frequency 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 first point intercept survey to be conducted on Square Lake occurred in 2024, so historical data on aquatic vegetation is limited. Results from 2024 will act as a baseline measurement to compare subsequent surveys. Maximum depth of rooted aquatic vegetation was 3 meters (10 feet). Native submersed plant diversity and frequency was 3.8 mean submersed taxa/point and 96% frequency of occurrence (FOO), respectively. In total, 20 different submersed native aquatic plants were identified during the survey. Refer to **Table 2 – Point Intercept Metrics** for all point intercept survey metrics from 2024. It should be noted that several points were not surveyed due to submersed diving platforms and a public swimming beach, which could have impacted our diversity calculations by excluding shallower growing species.

The native plant community in Square Lake is currently dominated by chara, richardson’s pondweed, northern watermilfoil, Illinois pondweed, and naiads (see **Table 3**). Less dominant species include two species of bladderworts, very small pondweed and white stemmed pondweed which should be monitored in subsequent surveys . Overall, Square Lake exhibits a diverse assemblage of native aquatic plants that often provide an abundant amount of lake bottom coverage. Curly-leaf pondweed (CLP) is currently the only know aquatic invasive species in the lake. In 2024, no CLP was identified during the point intercept survey likely due to the timing of survey occurring shortly after when CLP normally senesces. Refer to **Table 3 – Plant Frequency of Occurrence** for data on all species found during the 2024 survey.

**Table 2 – Point Intercept Metrics.** Summary of point intercept metrics for Square Lake, Washington County, Minnesota (DOW # 82004600). Shaded values were calculated from the littoral depth range (0 – 15 feet).

Survey Metrics	AUG 2024
Treated (Y/N)	N
Surveyor	MN DNR
Total # Points Sampled	50
Max Depth of Growth (95%)	10
# Point in Max Depth Range	47
# Points in Littoral (0-15 feet)	50
% Points w/ Submersed Native Taxa	96
Mean Submersed Native Taxa/ Point	3.8
# Submersed Native Taxa	20
# Submersed Non-Native Taxa	0

**Table 3 – Plant Frequency of Occurrence.** Historic percent frequency of occurrence for submersed aquatic vegetation within the littoral zone (0 – 15 feet) in Square Lake, Washington County, Minnesota (DOW # 82004600).

<b>Taxonomic Name</b>	<b>Common Name</b>	<b>AUG 2024</b>
<i>C. demersum</i>	Coontail	18
<i>Chara (genus)</i>	Muskgrass	88
<i>Elodea canadensis</i>	Canadian waterweed	16
<i>Heteranthera dubia</i>	Water stargrass	14
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	30
<i>Najas (genus)</i>	Naiad	30
<i>Potamogeton gramineus</i>	Grass-leaved pondweed	16
<i>P. illinoensis</i>	Illinois pondweed	30
<i>P. richardsonii</i>	Richardson’s pondweed	40
<i>P. robbinsii</i>	Robbins pondweed	16
<i>P. zosteriformis</i>	Flat-stemmed pondweed	20
<i>Ranunculus aquatilis var. diffusus</i>	White water buttercup	16
<i>Stuckenia pectinata</i>	Sago pondweed	12
<i>Vallisneria americana</i>	Wild celery	22

**Floating, free-floating, and emergent plants observed:** *Lemna trisulca* (star duckweed), *Nuphar variegata* (yellow waterlily)

**Less common (< 5% frequency) submersed vegetation observed:** *Nitella* genus (stonewort), *Potamogeton praelongus* (white-stemmed pondweed), *Potamogeton pusillus* (very small pondweed), *Sagittaria* genus (arrowhead), *Utricularia intermedia* (intermediate bladderwort), *Utricularia vulgaris* (common bladderwort)

\* Denotes an invasive aquatic plant

- Denotes no detection during the survey

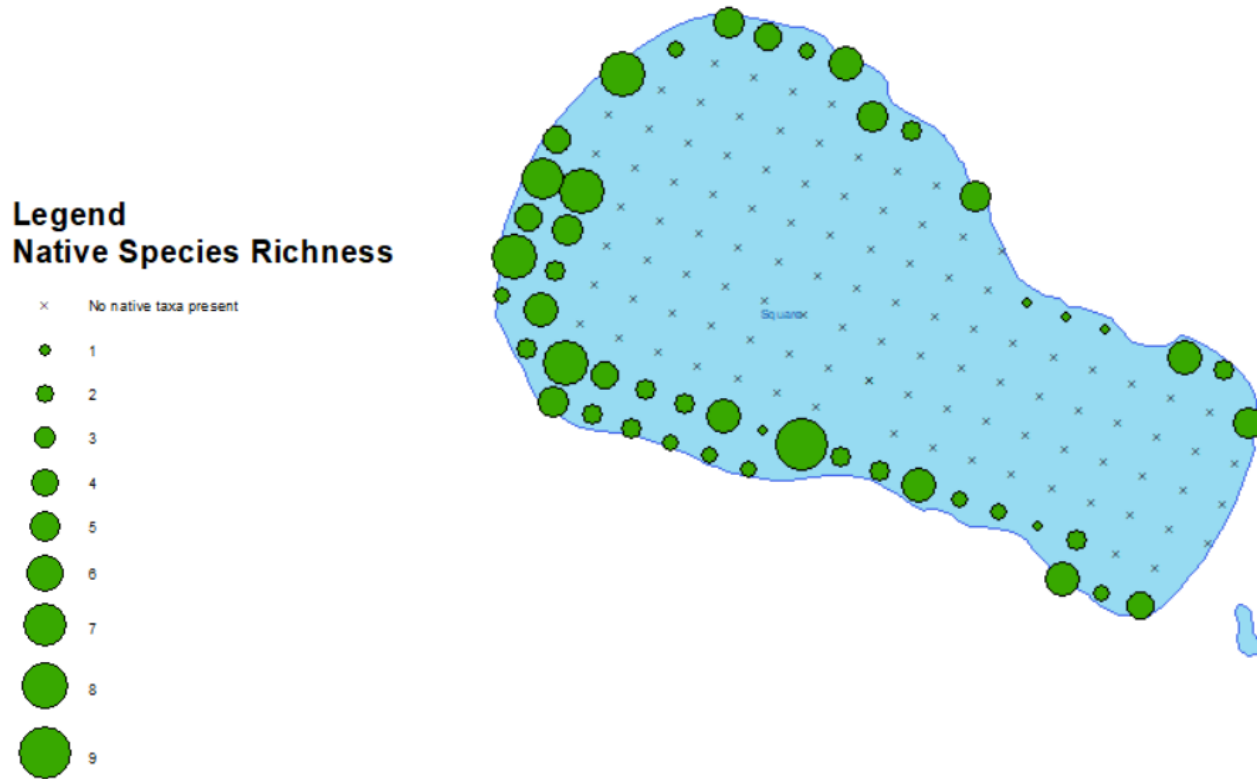




**Photos 1 & 2. Left (1):** Rake sample showing a diverse assemblage of native vegetation in the lake. **Right (2):** Rake sample showing abundant *Chara spp.* This species had the highest percent frequency of occurrence as it was found at 88% of surveyed locations. Square Lake, Washington County, Minnesota. (DOW # 82004600)



**Figure 1 – Native Species Density.** Spatial distribution and species richness (# of native species per sample point) for submersed aquatic plants sampled during the 2024-point intercept survey. The survey was conducted by the Minnesota Department of Natural Resources (MNDNR). Square Lake, Washington County, Minnesota (DOW #82004600)



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