

## LAKE GEORGE, ANOKA 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:** George (DOW# 2009100)

**Lake Surface Area:** 517 acres

**Littoral Area:** 383 acres

**County:** Anoka

**Survey Type:** Point-intercept

**Date of Survey (most recent):** August 26, 2024

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### 2024 Summary:

The most recent aquatic vegetation point-intercept survey on Lake George (DOW #2009100) was completed on August 26, 2024. Submersed aquatic plants were identified out to a maximum depth of 2.71 meters (8.9 feet). Within the littoral zone [zone in the lake from the 0 – 15-foot depth range (0 – 4.5 meters)], 86% of sampled survey points contained native taxa (groups of submersed aquatic plant species or genera). Eighteen submersed native taxa were observed during the 2024 survey, and the average number of taxa per sample point was 2.8. Offshore herbicide treatments targeting two invasive aquatic plants, curly-leaf pondweed and Eurasian watermilfoil, have historically been organized by the Lake George Improvement District.

**Summary Table.** Summary of aquatic submersed plants in Lake George, Anoka County, Minnesota (DOW# 2009100) 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%] <sup>†</sup>	% Points w/ Native Submersed Taxa	Mean Native Submersed Taxa/ Point	# Submersed Taxa
JUL 19 2010	23	14	98	2.9	16
SEPT 15 2011	20	15	79	1.9	17
AUG 15 2012	3	13	84	2.8	19
SEPT 11 2013	13	8	73	1.9	16
AUG 12 2014	30	11	85	2.7	19
AUG 31 2015	27	9	86	2.7	18
SEPT 1 2016	4	8	79	1.7	18
AUG 21 2017	15	10	82	2.0	16
SEPT 5 2018	4	8	81	2.3	15
AUG 21 2019	11	8	82	2.2	20
JUL 28 2020	12	9	85	2.4	20
AUG 16 2021	33	9	84	2.4	16
AUG 17 2022	28	8	81	2.4	17
AUG 17 2023	18	10	90	2.3	18
AUG 26 2024	17	8.9	86	2.8	18

\*EWM is short for Eurasian watermilfoil

<sup>†</sup>95th percentile calculated based on all vegetated sampling points

Taxa refers to groups of submersed aquatic plant species or genera

## Lake Description:

Lake George is a 517-acre lake located near St. Francis, 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 9.72 meters (32 feet).

Approximately 74% of the lake is littoral (the littoral zone is the area where submersed aquatic plants are likely to be found due to light penetration). For information on Lake George water quality see

<https://webapp.pca.state.mn.us/surface-water/station/02-0091-00-201> and

<https://arcgis.dnr.state.mn.us/ewr/whaflakes/lakedetails/02009100/topic/summary>

## Management History:

The most recent herbicide treatment (37.1 acres) targeted Eurasian watermilfoil using a contact herbicide. Curly-leaf pondweed was not the main target for the 2024 treatment but may have been impacted. Historically, Endothall and 2,4-D have been utilized to treat curly-leaf pondweed and Eurasian watermilfoil respectively but have also been used in combination (2016). Following the 2016 dual treatment and previous sustained use of Endothall, initial declines in native aquatic plants were observed, but have rebounded in recent years, following two years of 2,4-D and six years of Diquat treatments. Invasive aquatic plant treatments have been organized by the Lake George Improvement District. See **Table 1 – Invasive Plant Management Summary** for a recent history of herbicide treatments for Lake George. Known invasive plant management began in 2010. Historical management data is available upon request.

**Table 1 – Invasive Plant Management Summary.** Characteristics and history of herbicide treatments for Lake George, Anoka County, Minnesota (DOW# 2009100; total acres: 517, littoral acres: 383, 15% littoral acres: 57.49).

<b>Date</b>	<b>Treatment [W, P ,N]</b>	<b>Target Species</b>	<b>Total Acres Treated</b>	<b>Herbicide</b>	<b>Licensed Commercial Applicator</b>
<b>MAY 2017</b>	P	CLP	29	Endothall	Lake Restoration Inc.
<b>JUN 2017</b>	P	EWM	40.1	2,4-D	Lake Restoration Inc.
<b>JUN 2018</b>	P	EWM	56.7	2,4-D	Lake Restoration Inc.
<b>MAY 2019</b>	P	CLP	25.2	Diquat	Lake Restoration Inc.
<b>MAY 2020</b>	P	CLP	47	Diquat	Lake Restoration Inc.
<b>MAY 2021</b>	P	CLP	28	Diquat	Lake Restoration Inc.
<b>MAY 2022</b>	P	EWM	37.7	Diquat	Lake Restoration Inc.
<b>MAY 2023</b>	P	EWM	39.81	Diquat	Lake Restoration Inc.
<b>MAY 2024</b>	P	EWM	37.1	Diquat	Lake Restoration 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

## Survey Objectives:

Point-intercept surveys were used to assess the distribution of submersed aquatic plants in Lake George. 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 100-125 meters apart using a Geographic Information System (GIS), allowing for the placement of 125-213 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 maximum depth of rooted aquatic vegetation ranged between 2.4 – 4.6 meters (8 – 15 feet) from 2010 to 2024. Native submersed plant diversity and frequency ranged from 1.7 – 2.9 mean submersed taxa/point and 73 – 98% frequency of occurrence (FOO) respectively during the same 15-year period. The number of aquatic native plants observed has ranged from 14 – 18 species since 2010. The highest native species count within the last fourteen years was observed during the 2019, 2020, and 2024 surveys, with a total of 18 different submersed native aquatic plants. Refer to **Table 2 – Point Intercept Metrics** for all historical point intercept survey metrics.

In the 2024 survey, eighteen native submersed aquatic plant species were observed. Historically, the native plant community has been dominated by coontail, macroalgae, and naiad species. In 2024, these three species were again the most abundant in the lake. Native species that continue to improve in abundance since previous endothall and 2,4-D usage include small pondweed, Illinois pondweed, flat-stem pondweed, and macroalgae. Conversely, fern-leaf pondweed and water marigold have yet to rebound since the earlier treatments. Variability in the lesser observed species should continue to be monitored as their abundances have been trending downward for several years.

Eurasian watermilfoil (EWM) frequencies have varied throughout the fourteen surveyed years but have primarily stayed below nuisance levels (**Figure 2**). However, in 2021 and 2022 the frequency of EWM (33% and 28% FOO, respectively) was the highest observed since 2014 (see **Photo 3**). In the 2024 survey, frequency of occurrence of EWM decreased to 18% FOO, but additional surveys will track temporal changes. No curly-leaf pondweed was observed at the time of the survey in August 2024, although point intercept surveys are conducted in the summer when curly-leaf pondweed has already senesced.

**Table 2 – Point Intercept Metrics.** Summary of point intercept metrics for Lake George, Anoka County, Minnesota (DOW # 2009100). Shaded values were calculated from the littoral depth range (0 – 15 feet).

<b>Survey Metrics</b>	<b>AUG 21 2017</b>	<b>SEPT 5 2018</b>	<b>AUG 21 2019</b>	<b>JUL 28 2020</b>	<b>AUG 16 2021</b>	<b>AUG 17 2022</b>	<b>AUG 17 2023</b>	<b>Aug 26 2024</b>
Treated (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y
Surveyor	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR
Total # Points Sampled	124	194	123	124	114	111	88	80
Max Depth of Growth (95%)	10	8	8	9	9	8	10	8.9
# Point in Max Depth Range	79	120	72	78	65	71	78	66
# Points in Littoral (0-15 feet)	95	145	94	94	81	89	88	80
% Points w/ Submersed Native Taxa	82	81	82	85	84	81	90	86
Mean Submersed Native Taxa/ Point	2.0	2.3	2.2	2.4	2.4	2.4	2.3	2.8
# Submersed Native Taxa	14	15	18	18	14	17	16	18
# Submersed Non-Native Taxa	2	2	2	2	2	2	2	1

**Table 3 – Plant Frequency of Occurrence.** Historic percent frequency of occurrence for submersed aquatic vegetation within the littoral zone (0 – 15 feet) in Lake George, Anoka County, Minnesota (DOW # 2009100).

Taxonomic Name	Common Name	AUG 21 2017	SEPT 5 2018	AUG 21 2019	JUL 28 2020	AUG 16 2021	AUG 17 2022	AUG 17 2023	AUG 26 2024
<i>Myriophyllum spicatum</i> *	Eurasian watermilfoil*	15	4	11	12	33	28	18	18
<i>Potamogeton crispus</i> *	Curly-leaf pondweed*	1	4	3	6	1	1	1	-
<i>C. demersum</i>	Coontail	43	40	35	35	36	34	47	48
<i>Macroalgae</i>	Muskgrass/Stonewort	46	53	49	65	67	55	65	60
<i>Elodea canadensis</i>	Canadian waterweed	53	37	28	12	4	2	1	-
<i>Megalodonta beckii</i>	Water marigold	2	4	-	1	-	-	-	-
<i>Myriophyllum tenellum</i>	Dwarf watermilfoil	5	6	9	5	9	7	7	5
<i>Najas spp.</i>	Naiad	12	20	24	20	23	20	30	30
<i>P. amplifolius</i>	Large-leaf pondweed	-	-	2	-	-	-	1	-
<i>P. foliosus</i>	Leafy pondweed	-	-	3	-	16	10	15	1
<i>P. gramineus</i>	Variable-leaf pondweed	9	14	11	20	15	25	13	14
<i>P. illinoensis</i>	Illinois pondweed	1	1	11	6	6	3	1	16
<i>P. pusillus</i>	Small pondweed	-	-	2	10	-	6	6	20
<i>P. praelongus</i>	White-stem pondweed	9	19	13	17	10	4	2	1
<i>P. richardsonii</i>	Clasping-leaf pondweed	1	6	6	11	16	20	6	9
<i>P. robbinsii</i>	Fern-leaf pondweed	-	-	-	-	-	-	-	-
<i>P. zosteriformis</i>	Flat-stem pondweed	-	-	-	5	25	31	20	26
<i>Utricularia macrorhiza</i>	Common bladderwort	-	-	-	1	-	-	-	-
<i>Vallisneria americana</i>	Water celery	19	19	20	20	10	17	10	29

**Floating, free-floating, and emergent plants observed:** *Brasenia schreberi* (watershield), *Lemna minor* (small duckweed), *Lemna trisulca* (forked duckweed), *Nuphar variegata* (bullhead pond lily), *Nymphaea odorata* (white water lily), *Persicaria amphibia* (water smartweed), *Sagittaria spp.* (arrowhead), *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), and *Typha spp.* (cattail).

**Less common (< 5% frequency) submersed vegetation observed:** *Potamogeton epihydrus* (ribbon-leaf pondweed) in 2010 and 2019, *Potamogeton strictifolius* (narrowleaf pondweed) in 2010-2016 and 2019, *Myriophyllum sibiricum* (northern watermilfoil) in 2011, 2012, and 2016, *Stuckenia pectinata* (sago pondweed) in 2010-2017, 2019-2020, and 2023, *Heteranthera dubia* (water stargrass) 2011, 2014-2020, and 2023, *Potamogeton foliosus* (leafy pondweed) in 2012, 2015 and 2019, and *Eleocharis acicularis* (needle spikerush) in 2013-2014, and 2017-2022.

\* Denotes an invasive aquatic plant

- Denotes no detection during the survey





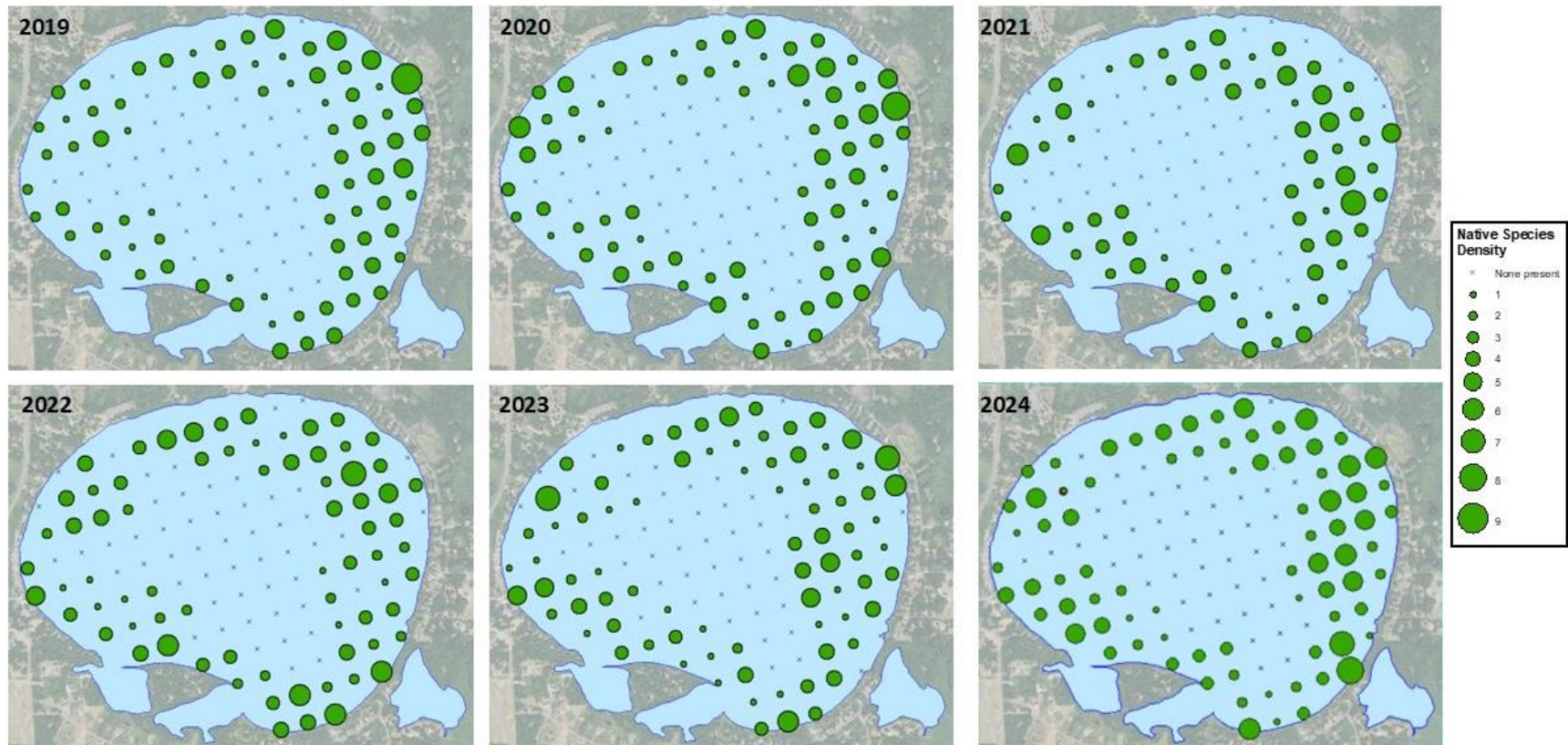
**Photos 1 & 2. Left (1):** Rake sample showing when Eurasian watermilfoil was growing in high densities in the 2014-point intercept survey in Lake George. **Right (2):** Rake sample showing minimal Eurasian watermilfoil and abundant native submersed aquatic plants, such as variable pondweed and coontail, from the Lake George 2019-point intercept survey. Lake George, Anoka County, Minnesota. (DOW # 2009100).



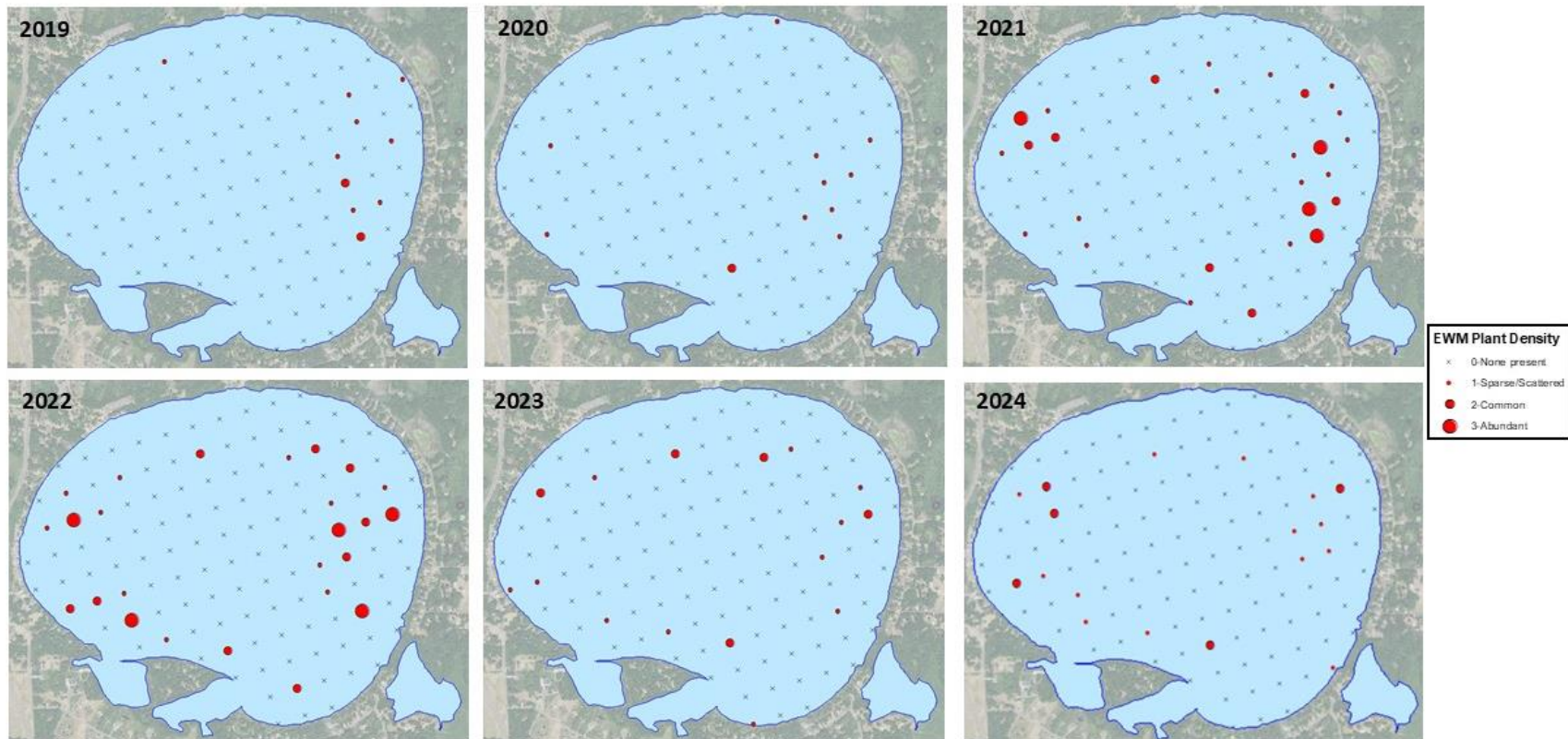


**Photos 3 & 4. Upper (3):** Abundant Eurasian watermilfoil located on the eastern perimeter of Lake George in 2021. **Lower (4):** Dwarf watermilfoil found at several point intercept locations in 2019. Lake George, Anoka County, Minnesota. (DOW # 2009100).





**Figure 1 – Native Species Density.** Spatial distribution and species richness (# of native species per sample point) for submersed aquatic plants sampled during point intercept surveys (2019 – 2024). Surveys were conducted by the Minnesota Department of Natural Resources (MNDNR). Lake George, Anoka County, Minnesota (DOW # 02009100).



**Figure 2 – Eurasian Watermilfoil Density (EWM).** Spatial distribution and rake density per sample point for submersed Eurasian watermilfoil sampled during point intercept surveys (2019 – 2024). Surveys were conducted by the Minnesota Department of Natural Resources (MNDNR). Lake George, Anoka County, Minnesota (DOW # 02009100).

*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.*