Interim Report on the Aquatic Vegetation of Lake Iroquois, Chittenden County, Vermont

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1. Background.

At the request of the Lake Iroquois Association, Spring quantitative aquatic plant surveys were undertaken for Lake Iroquois, Vermont. The surveys occurred three years post-treatment following aquatic plant management efforts employing the herbicide ProcellaCOR EC in 2021 for Eurasian watermilfoil control. The survey largely duplicated the 2017, 2019, 2021, 2022 and 2023 surveys conducted by the author (Eichler 2017, 2019, 2021, 2022 and 2023). Frequency of occurrence and relative abundance data were recorded for all aquatic plant species present in points distributed throughout the lake. The Point-Intercept Rake Toss method presently used by the US Army Corps of Engineers and others was employed. The assessment ultimately will include the distribution and density of existing aquatic plant communities, the extent of exotic species infestation and a review of ongoing management efforts to control Eurasian watermilfoil (*Myriophyllum spicatum*).

2. Methods

2a. Species List and Herbarium Specimens. As the lake was surveyed, the occurrence of each aquatic plant species observed in the lake was recorded and herbarium specimens collected where necessary. Herbarium specimens were pressed, dried, and mounted (Hellquist 1993); and became part of the permanent collection at the Darrin Fresh Water Institute Laboratory in Bolton Landing, NY. All taxonomy is based on Crow & Hellquist, 2000.

2b. Point Intercept. The frequency and diversity of aquatic plant species were evaluated using a point intercept method (Madsen 1999). At each grid point intersection, all species located at that point were recorded, as well as water depth. Species were located by a visual inspection of the point and by deploying a rake to the bottom, and examining the plants retrieved. A total of 76 points were surveyed for Lake Iroquois, based on a 100 m grid. A global positioning system (GPS) was used to navigate to each point for the survey observation. Point intercept plant frequencies were surveyed on June 4, 2024 to provide three year post-treatment data. Data presented in the summary are on a whole-lake basis, and have not been adjusted for the littoral zone only.

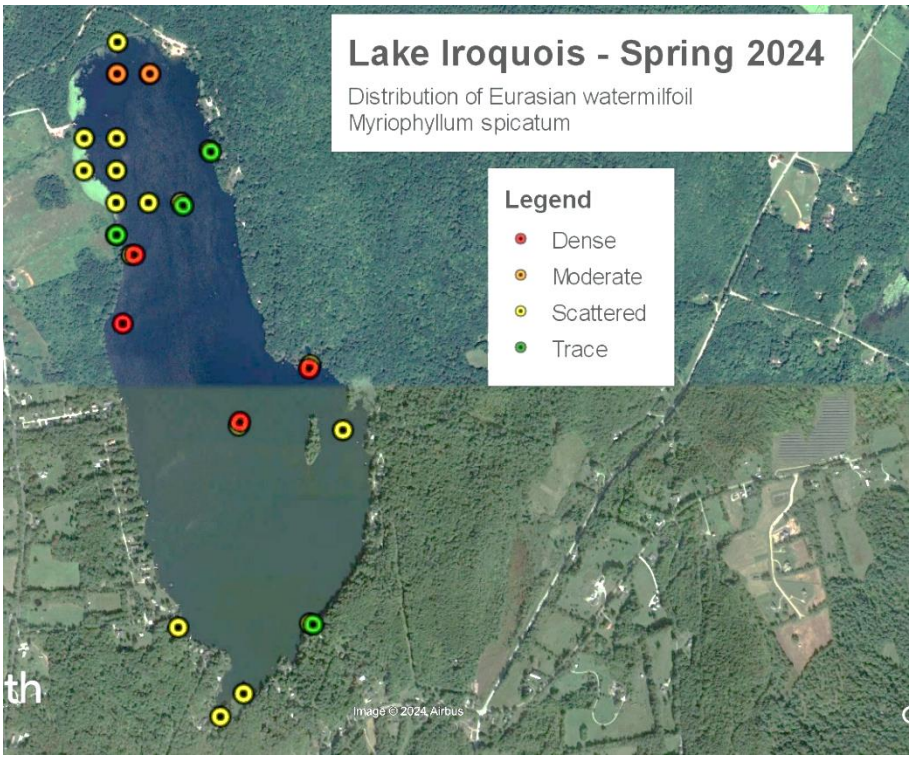
3. Results

3a. Species List. A total of 34 species of aquatic plants have been observed in Lake Iroquois (Table 1). The aquatic plant community of Lake Iroquois included twenty-four submersed species, three floating-leaved species, one floating species and six emergent species. Twenty-one species were reported for the Spring 2024 survey. This number of species exceeds the 15 species typically reported for moderately productive lakes in our region and indicates good water quality and a variety of habitat types. Two of the species present in Lake Iroquois, Humped

Bladderwort (*Utricularia gibba*) and White Watercrowfoot (*Ranunculus longirostris*) are found on Vermont's rare plant list (VT DEC 2022).

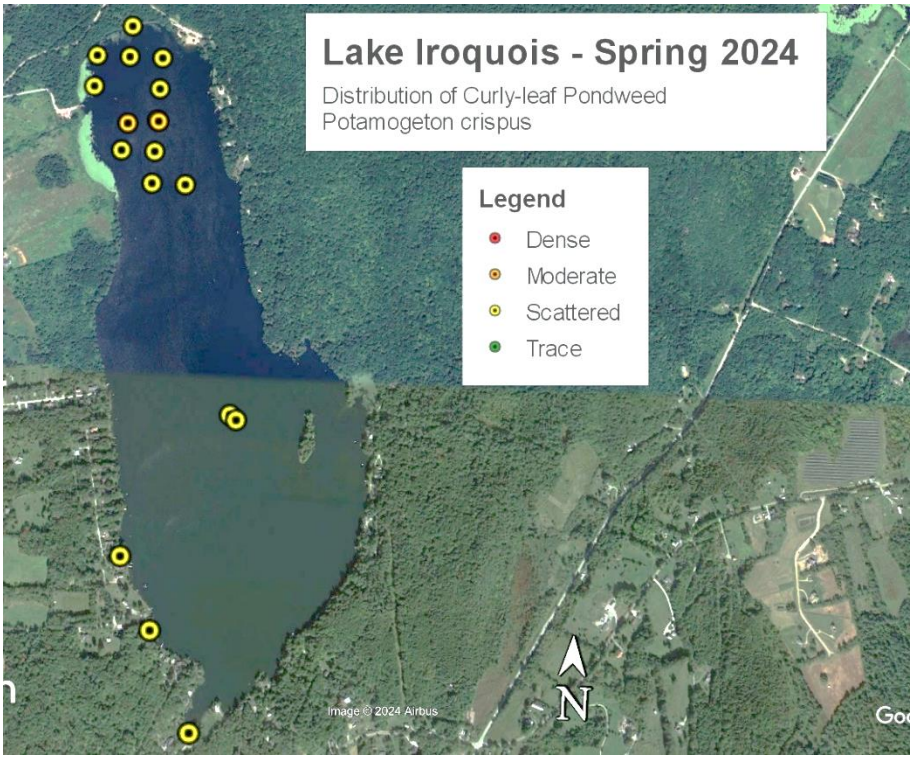
3b. Species Frequency. Species richness in Lake Iroquois remains high, with a number of species occurring in more than 5% of survey points (Table 2). For the June, three year post-treatment survey, waterweed (*Elodea canadensis*) was the most common plant (45% of survey points). Eurasian watermilfoil (*Myriophyllum spicatum*) was present in 28% of the survey points (Figure 1). Curly-leaf Pondweed, another invasive species, was present in 22% of survey points (Figure 2). Common native species in the June 2024 survey for Lake Iroquois included *Chara* (37% of survey points), *Zosterella dubia* (25%), *Potamogeton zosteriformis* (15%), *Potamogeton amplifolius* (12%), *Potamogeton foliosus* (11%), *Ceratophyllum demersum* (9%), *Potamogeton praelongus* (8%), *Nymphaea odorata* (8%), and *Eleocharis acicularis* (7%).

Figure 1. Distribution of Eurasian watermilfoil (*Myriophyllum spicatum*) in Lake Iroquois in June 2024.



3c. Distribution of Eurasian watermilfoil. Eurasian watermilfoil occurred throughout Lake Iroquois in the 2024 Spring survey prior to treatment, with scattered growth found from a minimum depth of 2 feet (0.5 m) to a maximum depth of 11 feet (3.5 m). Eurasian watermilfoil was absent from all survey points post-treatment in September of 2021 and June of 2022. In June of 2023, Eurasian watermilfoil was reported at 2 survey points (3%) at the south end of the lake (Figure 1). By the Spring 2024 survey, Eurasian watermilfoil had expanded to 28% of survey

Figure 2. Distribution of Curly-leaf Pondweed (*Potamogeton crispus*) in Lake Iroquois in June 2024.



points. Dense growth of Eurasian watermilfoil was found along the west shore from the north end of the waterski course southward along the shoreline. Dense growth was also observed around the rocky island in the center of the lake, in the bay north of the large island and in the southeastern bay. Moderate and scattered Eurasian watermilfoil growth also occurred at the north end of the lake.

A second invasive species, Curly-leaf Pondweed (*Potamogeton crispus*) was present in Lake Iroquois in the Spring 2024 survey. Reported in 22% of survey points, results indicate a slight increase from the 19% of survey points reported in 2023 and 16% reported in 2022. This species was found lake-wide, but most commonly at the north end of the lake (Figure 2). Curly-leaf Pondweed typically dominates early season samples, but completes it's life cycle by mid-July and dies back.

4. References

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Table 1. Species list for Lake Iroquois.

Species Name	Common Name	Lake Iroquois
Brasenia schreberi	water shield	fl
Ceratophyllum demersum L.	Coontail	s
Chara sp.	muskgrass, chara	s
Eleocharis acicularis (L.) Roemer & Schultes	needle spike-rush	e
Elodea canadensis Michx.	Elodea	s
Isoetes echinospora Dur.	Quillwort	e
Lemna minor L.	Duckweed	f
Lemna trisulca L.	Duckweed	s
Megalodonta (Bidens) beckii Torr.	water marigold	s
Myriophyllum spicatum L.	Eurasian watermilfoil	s
Najas flexilis (Willd.) Rostk. & Schmidt.	bushy pondweed	s
Najas guadalupensis L.	southern naiad	s
Nuphar variegata	yellow pondlily	fl
Nymphaea odorata Ait.	white waterlily	fl
Polygonum amphibium	Smartweed	e
Pontederia cordata L.	pickerelweed	e
Potamogeton amplifolius Tuckerm.	largeleaf pondweed	s
Potamogeton crispus L.	curlyleaf pondweed	s
Potamogeton foliosus Raf.	Pondweed	s
Potamogeton natans L.	floating-leaf pondweed	s
Potamogeton perfoliatus L.	clasping-leaf pondweed	s
Potamogeton praelongus Wulfen	white-stem pondweed	s
Potamogeton pusillus L.	small pondweed	s
Potamogeton richardsonii Oakes	Richardsons' pondweed	s
Potamogeton spirillus Tuckerm.	Pondweed	s
Potamogeton zosteriformis Fern.	flat-stem pondweed	s
Ranunculus longirostris Godron	white watercrowfoot	s
Sparganium sp.	Burred	e
Typha sp.	cattail	e
Utricularia gibba L.	humped bladderwort	s
Utricularia vulgaris L.	great bladderwort	s
Vallisneria americana L.	wild celery	s
Zosterella dubia (Jacq.) Small	water stargrass	s

fl=floating leaved f=free floating e=emergent s=submersed

Table 2. Aquatic plant percent frequency by species for surveys of Lake Iroquois.

Species Name	Common Name	Spring 2021	Spring 2022	Spring 2023	Spring 2024
Ceratophyllum demersum L.	coontail	6.0%	5.5%	6.8%	9.2%
Chara sp.	muskgrass, chara	17.9%	42.5%	37.0%	36.8%
Eleocharis acicularis (L.) Roemer & Schultes	needle spike-rush	1.5%	6.8%	6.8%	6.6%
Elodea canadensis Michx.	elodea	26.9%	37.0%	27.4%	44.7%
Isoetes echinospora Dur.	quillwort		4.1%	2.7%	1.3%
Lemna trisulca L.	duckweed	3.0%	2.7%	5.5%	1.3%
Myriophyllum spicatum L.	Eurasian watermilfoil	23.9%		2.7%	27.6%
Nuphar variegata	yellow waterlily				1.3%
Nymphaea odorata Ait.	white waterlily	7.5%	8.2%	9.6%	7.9%
Polygonum amphibium	smartweed			1.4%	1.3%
Potamogeton amplifolius Tuckerm.	large-leaf pondweed	11.9%	9.6%	9.6%	11.8%
Potamogeton crispus L.	curly-leaf pondweed	19.4%	16.4%	19.2%	22.4%
Potamogeton foliosus Raf.	pondweed	1.5%	16.4%	13.0%	10.5%
Potamogeton perfoliatus L	clasping-leaf pondweed				2.6%
Potamogeton praelongus Wulfen	white-stem pondweed	7.5%	9.6%	12.3%	7.9%
Potamogeton zosteriformis Fern.	flat-stem pondweed	1.5%	8.2%	12.3%	14.5%
Ranunculus longirostris Godron	white watercrowfoot	1.5%	2.7%	2.7%	3.9%
Sparganium sp.	bBurreed	4.5%	1.4%	6.8%	1.3%
Typha sp.	Cattail	1.5%	1.4%	1.4%	1.3%
Utricularia vulgaris L.	great bladderwort	4.5%	5.5%	2.7%	1.3%
Vallisneria americana L.	wild celery	1.5%	4.1%	19.2%	3.9%
Zosterella dubia (Jacq.) Small	water stargrass	25.4%	19.2%	9.6%	25.0%