Farlain Lake Aquatic Macrophyte Inventory Report

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Table of Contents

2022 Aquatic Macrophyte Inventory Report

Introduction

Farlain Lake is a 271 acre lake located in Tiny Township, Ontario, Canada, surrounded by residences, forests, and inflowing wetlands and springs. The lake is generally shallow and has an average depth of 2.3 meters. There is no outlet to the lake; water loss is primarily due to evaporation. The lake's level has been rising since 2016 and is currently above historic normal levels. SŌLitude Lake Management was hired to conduct vegetation monitoring in July 2022 to improve the unbalanced aquatic macrophyte growth throughout the lake. Survey results can be used to track changes in the vegetation community, and also to determine future management methods within the waterbody.

The following report will discuss: methodology, results & analysis, summary of findings, recommendations, and references. Associated raw data and distribution maps can be found in Appendices A and B, respectively.

Methodology

The Farlain Lake Community Association (FLCA) provided SŌLitude with a historical 100-meter transect GPS point-intercept survey containing approximately 283 points. During the survey, each predetermined georeferenced point was accessed by boat in a feasible locational order. At each point, a single rake toss was executed to determine the present macrophyte species. The following data was collected for each rake toss: water depth, aquatic vegetation composition, including species identification and dominant species, coverage and density information for each species, and percentage of cover and distribution of Eurasian watermilfoil. No emergent/wetland vegetation was recorded unless the data point was directly within that habitat zone.

The survey was conducted via pontoon boat provided by the FLCA. A group of members of the FLCA drove the surveyors to each predetermined point. Not all points were able to be surveyed due to several factors, including weather conditions, inability to access the point with a pontoon boat successfully, and general navigational error.

The survey was conducted by SOLitude Biologist Kristen Veinotte, and SePRO GIS Administrator, Technical Development Specialist, and Alaska Technical Specialist, JT Gravelie.

Species Identification

The rake toss method, based on protocols developed by Cornell University, was used to retrieve submersed aquatic vegetation from either side of the survey vessel. Each species found on the rake will be identified and recorded. Plant species observed in the immediate area, but not found on either rake toss, were also recorded. Any species not readily identified *in situ* was placed into a plastic bag labeled with the data point number and preserved for further analysis. Once all species were recorded, the most prevalent species was noted as dominant for later use in presence/absence maps.

Relative Abundance

The abundance scale, developed by the US Army Corps of Engineers and modified by Cornell, was used to categorize total growth.

Notation	Description
Z	*Zero*: no plants on rake
T	*Trace*: fingerful on rake
S	*Sparse*: handful on rake
M	*Moderate*: rakeful of plants
D	*Dense*: difficult to bring into boat

Overall Cover (%)

Overall cover is defined as the percentage of bottom sediments obscured by vegetation. In general, an area in which no sediments are visible was classified at 100% cover; at times however bottom sediments are not visible due to water clarity, regardless of vegetative growth. These points will be given a null (⌀) designation, for data recording purposes.

Biovolume Index

The biovolume for each data point was recorded on a scale from zero to four:

0	No biovolume	No plants
1	Low biovolume	Very low growth
2	Moderate biovolume	Growth extending up, into water column
3	High biovolume	Growth in water column and possibly to surface, may be considered a recreational or habitat nuisance
4	Very high biovolume	Growth filling the water column and covering the surface

Results & Analysis

Macrophyte Abundance

A total of 265 sites were surveyed on July 20-21, 2022 (Appendix B), where seven aquatic macrophytes and macroalga were identified during the survey (Table 1). The weather was overcast, windy and rainy on the first day of the survey, developing into thunderstorms and strong wind later in the day. The second day of the survey was more calm but still remained drizzly and damp. The survey was undertaken prior to a confirmed blue-green algae bloom in the lake. Water clarity may have been compromised due to the presence of dense algae in the water column. Raw data and macrophyte distribution maps can be found in Appendices A and B, respectively. A macrophyte library is included further in this report.

Table 1: Aquatic macrophyte abundance observed on July 20-21, 2022 at Farlain Lake.

Common Name	Scientific Name	Total		Trace		Sparse		Medium		Dense	
		Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites		265									
Overall		89	34%	64	72%	12	13%	10	11%	3	3%
Muskgrass	*Chara spp.*	56	21%	33	59%	12	21%	11	20%	0	0%
Northern Naiad	*Najas gracillima*	33	12%	2	6%	7	21%	2	6%	0	0%
Illinois Pondweed	*Potamogeton illinoiensis*	22	8%	13	59%	7	32%	2	9%	0	0%
Tapegrass	*Vallisneria americana*	8	3%	3	38%	4	50%	1	13%	0	0%
Eurasian Watermilfoil	*Myriophyllum spicatum*	5	2%	2	40%	0	0%	0	0%	3	60%
White Waterlily	*Nymphaea odorata*	4	2%	2	50%	1	25%	1	25%	0	0%
Spikerush	*Eleocharis spp.*	2	1%	2	100%	0	0%	0	0%	0	0%
Waterweed	*Elodea spp.*	1	0%	0	0%	1	100%	0	0%	0	0%

Red indicates an invasive species

Overall aquatic macrophytes were observed at 34% of the sites. Only 14% of the sites were considered nuisance densities. The overall macrophyte community was dominated by muskgrass (macroalga), present at 21% of sites. Waternymph (*Najas spp.*) was the most abundant plant species, present at 12%, or 33 sites. Based on the survey point data, Eurasian watermilfoil was present at only 2% of sites (5). However, 3 data points were considered dense. Additional species such as Illinois pondweed and tapegrass were present at 8% and 2% of sites, respectively. Vegetation that impedes recreational activity such as swimming or boating is considered to be a nuisance density.

The average overall percent (%) cover of vegetation at the data points was 8%. The overall cover of Eurasian watermilfoil where it was present at the data points was 1.2%.

Additional GPS points were collected throughout Farlain Lake where Eurasian watermilfoil was observed outside of the predetermined data points.

Several beds of Eurasian watermilfoil were identified between the data points and the additional GPS points. In total, seven (7) beds were identified all ranging under 1-acre in size (see Map: Eurasian Watermilfoil Beds).

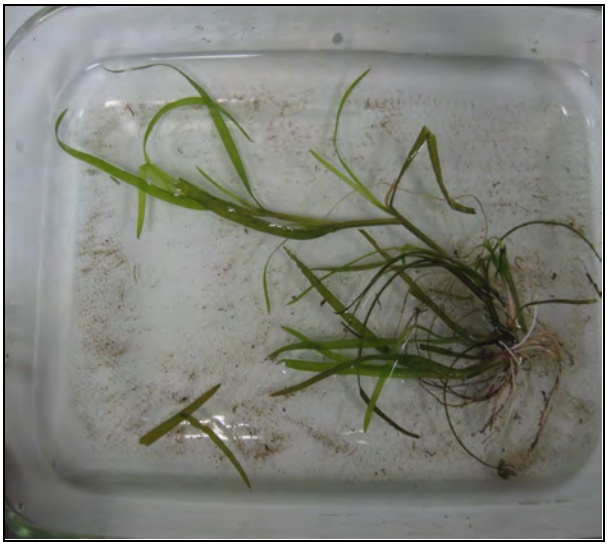
Macrophyte Library

In order by **Table 1: Aquatic macrophyte abundance observed on July 20-21, 2022**

Muskgrass (*Chara spp*. Common Names: muskgrass, skunkweed): Chara is often called muskgrass because of its foul, musty odor. Chara is a gray-green branched multicellular alga that is often confused with submerged flowering plants. However, Chara has no flower, will not extend above the water surface, and often has a "grainy" or "crunchy" texture. Chara has cylindrical, whorled branches with 6 to 16 branchlets around each node.

Northern naiad **Native** (*Najas gracillima*. Common Names: Thread-like naiad, slender water nymph.): Northern naiad is similar in shape and form to slender naiad. It has fine-branched stems that can taper to lengths of one meter, originating from delicate rootstalks. Plant shape varies; sometimes compact and bushy, other times long and slender, depending on growing conditions. It prefers softer water and is highly sensitive to pollutants. The leaves are short (1-4 cm long) and serrated, tapering to a point with a jagged lobe at the leaf base. It is a true annual, and dies off in the fall, relying on seed dispersal to return the next year. It is an important food source for waterfowl.

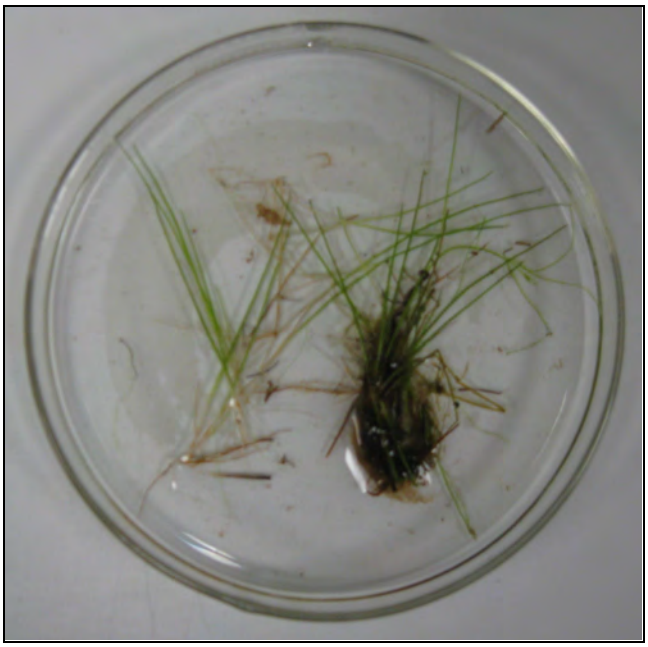
Illinois Pondweed **Native** (*Potamogeton illinoensis*). Illinois pondweed has stout stems up to 2 meters long that emerge from thick rhizomes. The submerged leaves are lance-shaped with a needle-like point, attached directly to the stem or on a short stalk. The stipules are free, and have two prominent ridges called keels. Sometimes ellipse-shaped floating leaves are produced on a thick stalk usually shorter than the blade. Flower and fruit are arranged in a tight cylindrical spike on a stalk thicker than the stem. It tends to grow in shallow water up to depths of 3 meters, and prefers water with high clarity. Illinois pondweed fruit is valuable as waterfowl food, and the large leaves create suitable shade and cover for many fish and invertebrates.



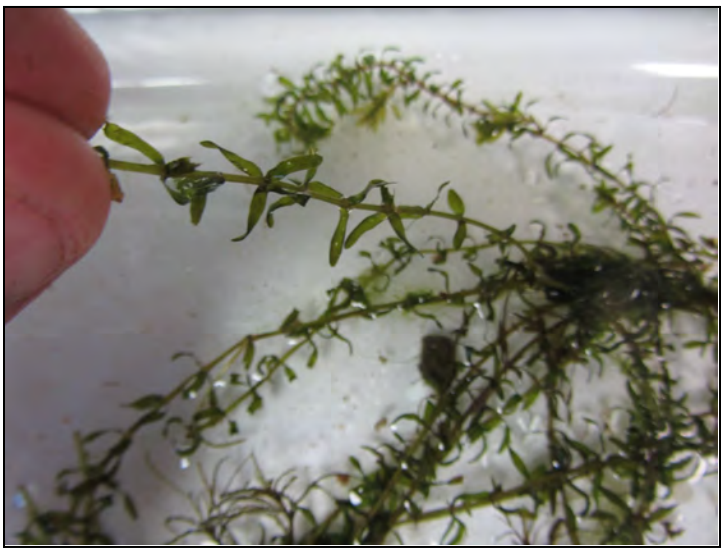
Tapegrass (*Vallisneria americana*. Common Names: Wild celery **Native**.): Tapegrass has long flowing ribbon-like leaves that have a basal arrangement from a creeping rhizome. The leaves can be up to two meters long, have a cellophane-like texture, with a prominent center stripe and finely serrated edges. The leaves are mostly submersed, although they can reach the surface allowing the tips to trail. Male and female flowers are produced on separate plants, but reproduction is usually via over-wintering rhizomes and tubers. Tapegrass usually inhabits hard substrate bottoms in shallow to deep water. It can tolerate a wide variety of water chemistries. Tape-grass is the premiere food source for waterfowl, which greedily consume all parts of the plant. Canvasback ducks (*Aythya valisneria*) enjoy a strong relationship with tape-grass, going so far to alter their migration routes based on tape-grass abundance. Extensive beds of tape-grass are considered good shade, habitat and feeding opportunities for fish.

Eurasian watermilfoil Invasive (*Myriophyllum spicatum)*. Eurasian watermilfoil has long (2 meters or more) spaghetti-like stems that grow from submerged rhizomes. The stems often branch repeatedly at the water's surface creating a canopy that can crowd out other vegetation, and obstruct recreation and navigation. The leaves are arranged in whorls of 4 to 5, and spread out along the stem. The leaves are divided like a feather, resembling the bones on a fish spine. Eurasian water milfoil is an exotic originating in Europe and Asia, but its range now includes most of the United States. Its ability to grow in cool water and at low light conditions gives it an early season advantage over other native submersed plants. In addition to reproducing via fruit production, it can also reproduce via fragmentation.

White water-lily **Native** (*Nymphaea* sp. Common Name: white water-lily, fragrant water-lily.): White water-lily leaf stalks emerge directly from a submerged fleshy rhizome. White water-lilies have round floating leaves. Flowering occurs during the summer, and the flowers open during the day, and close during the night. Water-lilies typically inhabit quiet water less than two meters deep, such as ponds, shallow lakes and slow-moving streams. The leaves offer shade and protection for fish, and the leaves, stems, and flowers are grazed upon by muskrats, beaver, and sometimes even deer.



Spikerush Native (*Eleocharis spp.)*: Spikerush is a type of sedge. They may be encountered as floating tangled mats or dense clumps in the mud or as rooted green spikes emersed from a few feet of water, covering many acres. Stems are unbranched with an inflorescence born at the tip of the stem. Stem length varies by species. Common to see multiple species within a single habitat.



Common Waterweed Native (*Elodea Canadensis*: Common Names: elodea, common waterweed.): Common waterweed has slender stems that can reach a meter in length, and a shallow root system. The stem is adorned with lance-like leaves that are attached directly to the stalk that tend to congregate near the stem tip. The leaves are populated by a variety of aquatic invertebrates. Male and female flowers occur on separate plants, but it can also reproduce via stem fragmentation. Since common waterweed is disease resistant, and tolerant to low-light conditions, it can reach nuisance levels, creating dense mats that can obstruct fish movement, and the operation of boat motors.

Errors and Uncertainties

There were several causes for errors or uncertainty in the survey, including deviations from the Point-Intercept Method (PIM), boat operation, inconsistent field personnel, reliance on historical surveys that contained several plant identification errors, and an inappropriately styled boat for the survey. Weather conditions were also a challenge, but that could happen anytime at any body of water.

Changes to the PIM include: surveying the area too far from the points, not stopping at points, and not surveying the points at a certain depth. These changes all culminated to skew the data away from the accuracy expected in a Point-Intercept survey. Within the PIM, the suggested maximum distance from a survey point is within 10 meters, but many points were surveyed within 10-20 meters. While the PIM is a good and widely used industry method, it often does not capture the entire plant community within a body of water.

Since there were several boat operators during the survey, it was difficult to know which points had been surveyed, and therefore many points were missed. Each boat operator had a different style of operating the boat where many times the boat was unable to be stopped, and therefore the point was not thoroughly surveyed.

After the initial survey, the results were compared by the Association to a historical survey from 1970 that contained several species identification errors and should not have been considered as completely reliable data from Farlain Lake. Species composition can change from year to year or even season to season. Thus, this historical data is valueless other than a baseline capture of what the system was like in 1970.

Conclusions

Overall, Farlain Lake has low vegetation diversity and this suggests it is dominated by Eurasian watermilfoil. Once the watermilfoil is controlled, it is likely that the native vegetation will rebound and the Lake will once again become healthy and diverse.

Since many of the errors encountered within the survey event in July have been identified, they can certainly be amended moving forward. Future informal visual surveys should be conducted by the Association in order to observe areas not covered by the point surveys, which should be conducted by SŌLitude staff. The visual surveys should include the entire shoreline and the littoral zone, which extends to approximately 12-14 feet in water depth.

Recommendations

A ProcellaCOR FX treatment is recommended to control the established areas and also any future spread of Eurasian watermilfoil in Farlain Lake.

Water quality assessments should be performed at regular intervals, as this is a way to catalog changes in water quality and better understand the health of the Lake. There are many reasons for regular water quality monitoring, including getting ahead of a problem such as an algal bloom or generally understanding waterbody health.

Considering the season-to-season changes often observed in lake ecosystems, we recommend that a yearly formal survey be completed by SŌLitude staff, as well as surveys done in spring and fall by the Farlain Lake Community Association.

Simple changes to behaviors by visitors can help avoid introduction of invasive species, such as the Clean-Drain-Dry principle: Clean boats, propellers, trailers, and any other equipment; Drain the trailer and motor of water; and allow all equipment to Dry for five days before using on another body of water.

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Appendix A: Raw Data

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
1	4.2	2	10	5	T				S				2
2	4.3	2	20	0					S		S		2
4	4.1	2	40	0			S	S					2
6	7.1	0	0	0									0
11	7.0	1	5	0					T				1
13	6.8	3	40	0		T	T	S	S				4
14	8.7	0	0	0									0
15	4.6	2	30	0		S							1
16	4.8	2	45	0				T	T			S	3
17	6.9	1	10	0					T				1
19	7.4	1	15	0					T				1
23	4.5	0	0	0									0
26	7.4	1	20	0					S				1
28	8.3	0	0	0									0
30	8.6	0	0	0									0
32	9.3	0	0	0									0
33	3.5	0	0	0									0
34	6.0	1	5	0					T			T	2
36	9.4	0	0	0									0
38	9.2	0	0	0									0
40	8.8	2	10	0		T							1
42	3.7	0	0	0									0
45	9.3	0	0	0									0
47	9.7	0	0	0									0
49	9.1	0	0	0									0
51	9.6	0	0	0									0
53	3.9	0	0	4.6									0
54	7.7	1	20	0				S	T				2
56	11.1	0	0	0									0
58	11.4	0	0	0									0
60	9.6	1	5	0					T				1
62	11.3	0	0	0									0
65	10.7	0	0	0									0
67	12.0	0	0	0									0
69	11.5	0	0	0									0

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
71	10.0	1	5	0					T				1
73	4.6	1	10	0				S					1
74	7.2	2	30	0				M	T				2
76	11.8	0	0	0									0
78	10.9	0	0	0									0
80	10.5	1	5	0					T				1
82	5.2	1	10	0		T							1
84	10.6	1	20	0					S				1
86	12.7	0	0	0									0
88	12.4	0	0	0									0
90	13.1	0	0	0									0
91	3.6	1	5	0				T					1
92	4.2	0	0	0									0
93	10.1	1	55	0					M				1
95	13.7	0	0	0									0
97	12.2	0	0	0									0
99	11.9	0	0	0									0
100	3.6	1	10	0				T					1
102	10.2	0	0	0									0
104	11.5	0	0	0									0
106	11.7	0	0	0									0
108	14.2	0	0	0									0
111	7.2	1	10	0					T				1
113	10.8	0	0	0									0
115	10.6	0	0	0									0
117	12.7	0	0	0									0
119	9.2	0	0	0									0
120	2.7	1	10	0				T					1
122	8.4	0	0	0									0
124	10.9	0	0	0									0
125	12.9	0	0	0									0
127	13.3	0	0	0									0
129	13.6	0	0	0									0
131	4.8	3	40	0			S	M	M				3
133	11.0	0	0	0									0

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
135	13.8	0	0	0									0
137	13.0	0	0	0									0
139	12.0	0	0	0									0
140	3.5	0	0	0									0
141	6.4	1	5	0								T	1
144	15.4	0	0	0									0
145	14.7	0	0	0									0
147	14.7	0	0	0									0
150	2.4	2	20	0			S	S					2
153	15.2	0	0	0									0
155	12.4	0	0	0									0
157	12.6	0	0	0									0
158	4.3	0	0	0									0
160	14.2	0	0	0									0
162	14.4	0	0	0									0
164	15.2	0	0	0									0
166	12.4	0	0	0									0
170	7.7	0	0	0									0
171	9.9	0	0	0									0
173	13.9	0	0	0									0
175	14.1	0	0	0									0
177	17.2	0	0	0									0
179	13.9	0	0	0									0
181	10.5	1	5	0					T				1
182	11.8	0	0	0									0
184	14.4	0	0	0									0
186	15.7	0	0	0									0
188	15.5	0	0	0									0
190	17.9	0	0	0									0
193	5.1	0	0	0									0
195	13.2	0	0	0									0
197	16.8	0	0	0									0
200	14.7	0	0	0									0
202	13.8	0	0	0									0
205	2.1	1	10	0				T					1

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
206	7.8	0	0	0									0
209	10.3	1	5	5	T	T		T					3
210	19.8	0	0	0									0
211	16.7	0	0	0									0
212	15.3	0	0	0									0
216	22.8	0	0	0									0
218	14.1	0	0	0									0
221	7.1	1	10	0				T					1
223	18.7	0	0	0									0
225	14.2	0	0	0									0
226	15.4	0	0	0									0
230	18.9	0	0	0									0
231	15.5	0	0	0									0
233	14.0	0	0	0									0
234	5.1	1	15	0				T					1
236	10.9	1	20	0				S					1
238	12.8	0	0	0									0
240	14.8	0	0	0									0
244	14.8	0	0	0									0
245	14.8	0	0	0									0
246	13.8	1	5	0					T				1
247	11.7	0	0	0									0
250	6.5	1	15	0				T					1
251	8.0	1	10	0					T				1
253	13.4	0	0	0									0
254	8.0	2	100	95	D	S			T				3
255	13.7	0	0	0									0
257	13.7	0	0	0									0
260	13.7	0	0	0									0
261	12.8	0	0	0									0
263	6.4	1	10	0				S	T				2
264	3.7	1	10	0				T					1
266	10.9	0	0	0									0
268	11.8	0	0	0									0
270	12.6	0	0	0									0

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
272	12.9	0	0	0									0
274	14.1	0	0	0									0
279	7.2	1	10	0					T				1
280	11.0	0	0	0									0
284	12.4	0	0	0									0
286	12.5	0	0	0									0
288	11.8	0	0	0									0
290	4.7	1	15	0		T		S					2
291	5.2	1	30	0				M					1
292	4.5	1	55	0				M					1
293	7.0	0	0	0									0
295	12.5	0	0	0									0
299	11.2	0	0	0									0
301	6.0	2	20	0		S		T					2
302	6.2	1	10	0					T				1
305	8.9	0	0	0									0
307	13.3	0	0	0									0
309	11.3	0	0	0									0
311	11.5	0	0	0									0
313	3.6	1	60	0				M	T				2
316	9.3	0	0	0									0
318	13.1	0	0	0									0
320	12.3	0	0	0									0
322	7.2	1	55	0				M					1
324	2.3	1	10	0				T					1
328	11.9	0	0	0									0
330	15.7	0	0	0									0
334	1.5	1	10	0				T					1
335	3.1	3	10	0		T							1
336	6.8	1	20	0				T	T				2
337	9.6	3	25	0		T		T					2
339	9.4	0	0	0									0
341	17.5	0	0	0									0
343	12.1	0	0	0									0
344	9.3	1	10	0				T					1

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
346	5.4	1	65	0				M					1
348	18.1	0	0	0									0
350	19.0	0	0	16									0
351	18.1	0	0	0									0
353	15.3	0	0	0									0
354	3.7	0	0	0									0
355	4.7	1	20	0		T		S					2
356	11.6	0	0	0									0
358	19.6	0	0	0									0
359	19.5	0	0	0									0
360	16.6	0	0	0									0
361	13.6	0	0	0									0
362	11.3	0	0	0									0
364	10.3	0	0	0									0
366	18.7	0	0	0									0
368	16.3	0	0	0									0
370	10.6	0	0	0									0
371	3.2	1	15	0				T	T				2
372	6.2	1	15	0		T		T					2
373	16.4	0	0	0									0
374	18.6	0	0	0									0
376	17.4	0	0	0									0
378	10.0	0	0	0									0
379	3.3	2	20	0		T		T					2
380	10.2	2	10	0		T							1
381	14.7	0	0	0									0
383	18.5	0	0	0									0
385	11.7	0	0	0									0
386	6.7	1	10	0				T					1
388	9.6	1	10	0				T					1
390	17.4	0	0	0									0
392	11.9	0	0	0									0
394	6.0	1	30	0		T	S	T					3
395	12.8	0	0	0									0
397	16.1	0	0	0									0

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
399	9.8	0	0	0									0
400	2.1	1	10	0				T					1
402	13.6	0	0	0									0
404	16.2	0	0	0									0
406	9.1	0	0	0									0
407	3.0	0	-	-									0
408	14.5	0	0	0									0
410	16.8	0	0	0									0
413	5.3	4	60	0		M		T					2
415	14.1	0	0	0									0
417	16.7	0	0	0									0
418	13.6	1	10	0					T				1
420	8.2	2	50	0			M						1
421	13.5	0	0	0									0
422	16.9	0	0	0									0
424	12.9	0	0	0									0
425	5.5	3	60	0		M		S					2
427	13.1	0	0	0									0
429	15.3	0	0	0									0
430	10.6	0	0	0									0
432	3.2	1	50	0				M					1
433	13.3	0	0	0									0
434	16.6	0	0	0									0
436	12.0	0	0	0									0
437	7.0	1	45	0				M					1
439	10.3	1	20	0					S				1
441	12.6	0	0	0									0
442	10.7	1	10	0					T				1
444	10.3	0	-	0									0
445	15.0	0	0	0									0
446	12.9	0	0	0									0
447	9.1	1	5	0				T					1
448	5.1	1	20	0				S	T				2
449	6.9	1	10	0						T			1
450	12.6	0	0	0									0

DATA POINT	DEPTH (M)	BIOVOLUME (BMI)	OVERALL % COVER	OVERALL COVER OF EWM	M. SPICATUM	P. ILLINOENSIS	V.AMERICANA	CHARA SPP.	NAJAS SPP.	ELEOCHARIS SPP.	ELODEA SPP.	N. ODORATA	SPECIES RICHNESS
451	10.6	0	0	0									0
453	4.2	1	10	0				T					1
454	10.5	0	0	0									0
455	9.5	0	0	0									0
457	5.2	1	10	0				T					1
458	7.8	1	5	0			T						1
459	3.7	1	55	0		S		M					2
461	4.1	1	20	0			T	T					2
462	8.6	1	5	0		T							1
463	7.2	0	0	0									0
464	8.1	1	25	0				S					1
465	6.3	1	10	0				T					1
466	3.5	1	10	0				T					1
467	4.2	2	20	0		S		T					2
468	6.3	1	70	0				M					1
469	2.4	1	15	0				T		T			2
470	4.3	4	100	100	D								1
471	2.3	2	20	0		S		T	S				3
472	4.4	4	100	100	D	S						M	3

Appendix B: Distribution Maps

Data Points

Farlain Lake
Ontario, Canada

N

0 100 200
Feet

Legend

- Data Points Surveyed

Map Date: 09/30/2022
Map Creator: AM
Office: Shrewsbury, MA

Depth of Data Points

Farlain Lake
Ontario, Canada

0 100 200
Feet

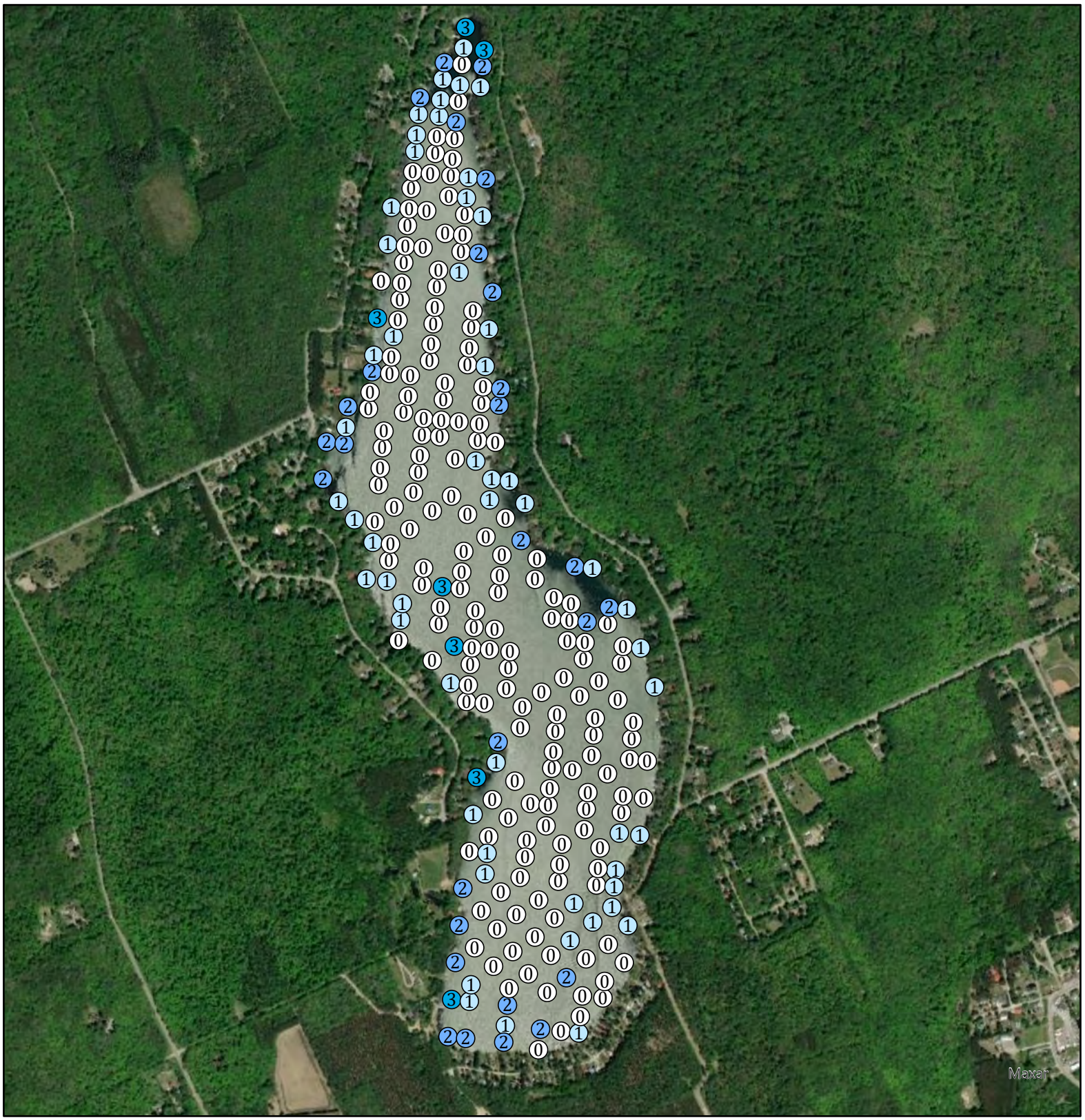
N

Legend
Depth (m)

- 0
- 1-2
- 6-7
- 7-8
- 8-9
- 9-10
- 10-11
- 11-12
- 12-13

Map Date: 09/30/2022
Map Creator: AM
Office: Shrewsbury, MA

Species Richness of Data Points
(# of species/point)



Farlain Lake
Ontario, Canada

0 100 200
Feet

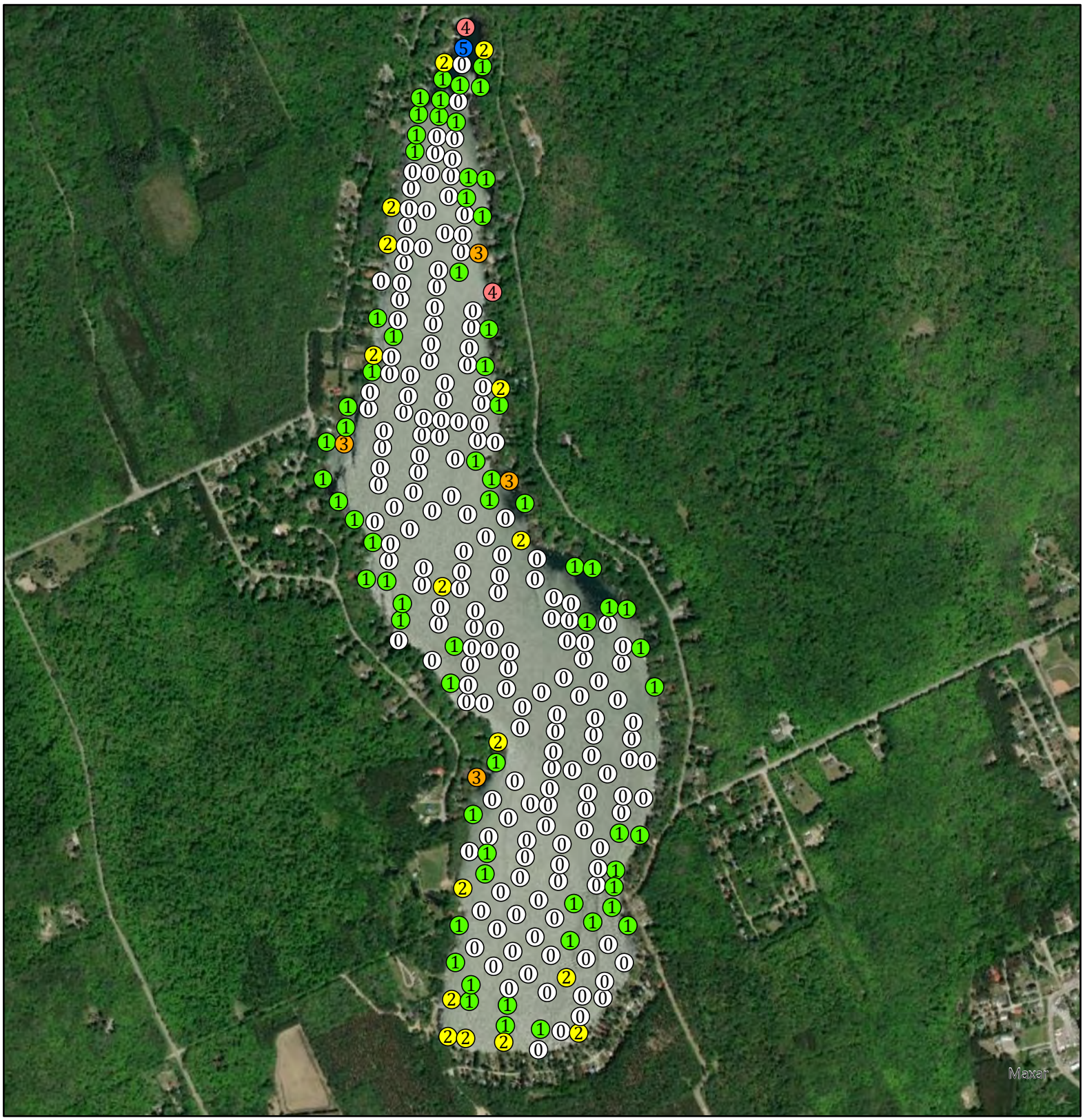
N

Legend
Species Richness

0 0
1 1
2 2
3 3

Map Date: 08/15/2022
Map Creator: AM
Office: Shrewsbury, MA

Biovolume of Data Points
(Height of plants in water column)



Farlain Lake
Ontario, Canada

N

0 100 200
Feet

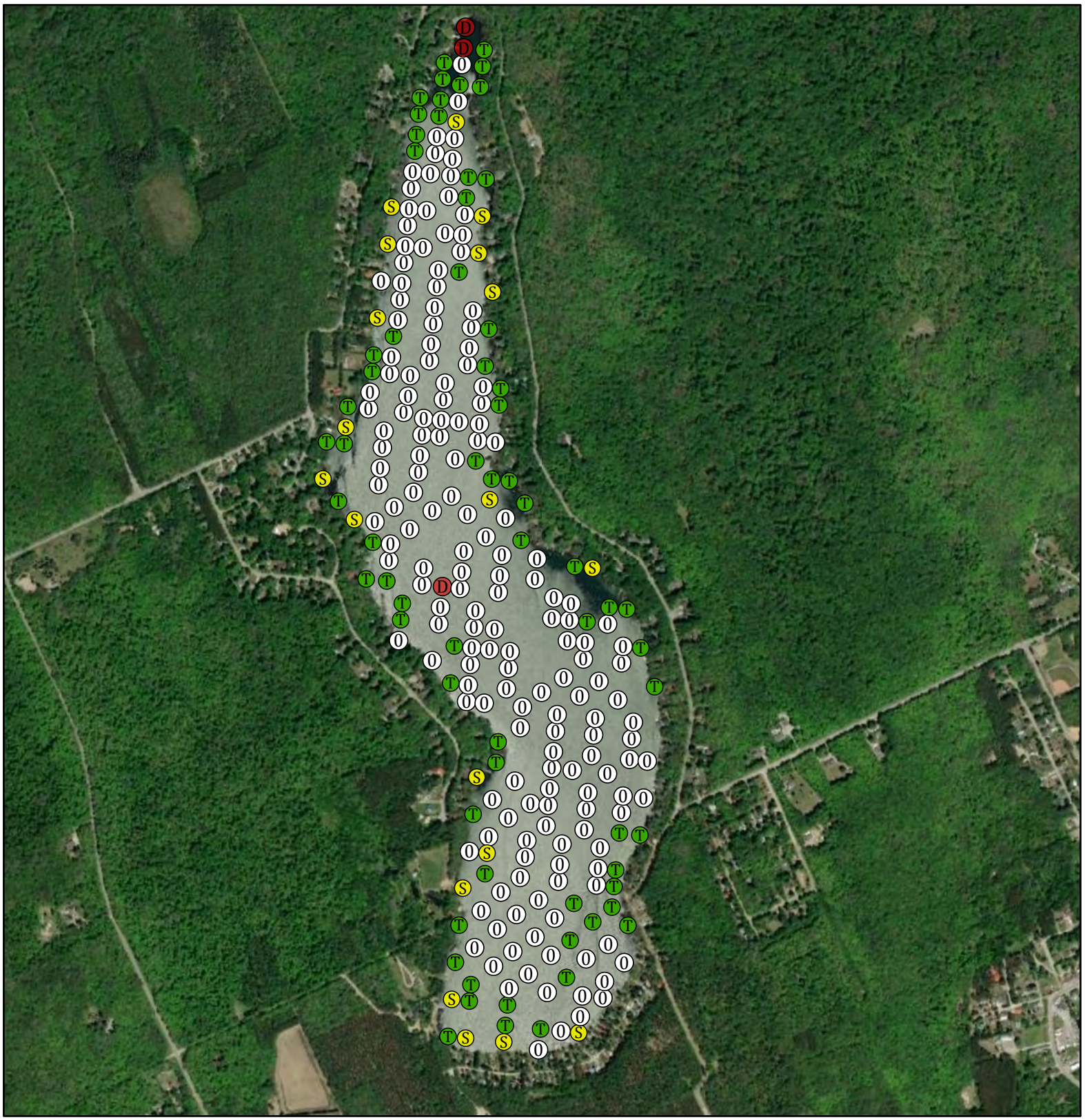
Legend

Biomass Index

- 0 - No plants present
- 1 - Plants present at bottom
- 2 - Plants entering water column
- 3 - Plants below surface
- 4 - Plants at surface
- 5 - Plants above surface

Map Date: 08/15/2022
Map Creator: AM
Office: Shrewsbury, MA

Overall Percent (%) Cover of Aquatic Vegetation



Farlain Lake
Ontario, Canada

0 100 200 Feet

N

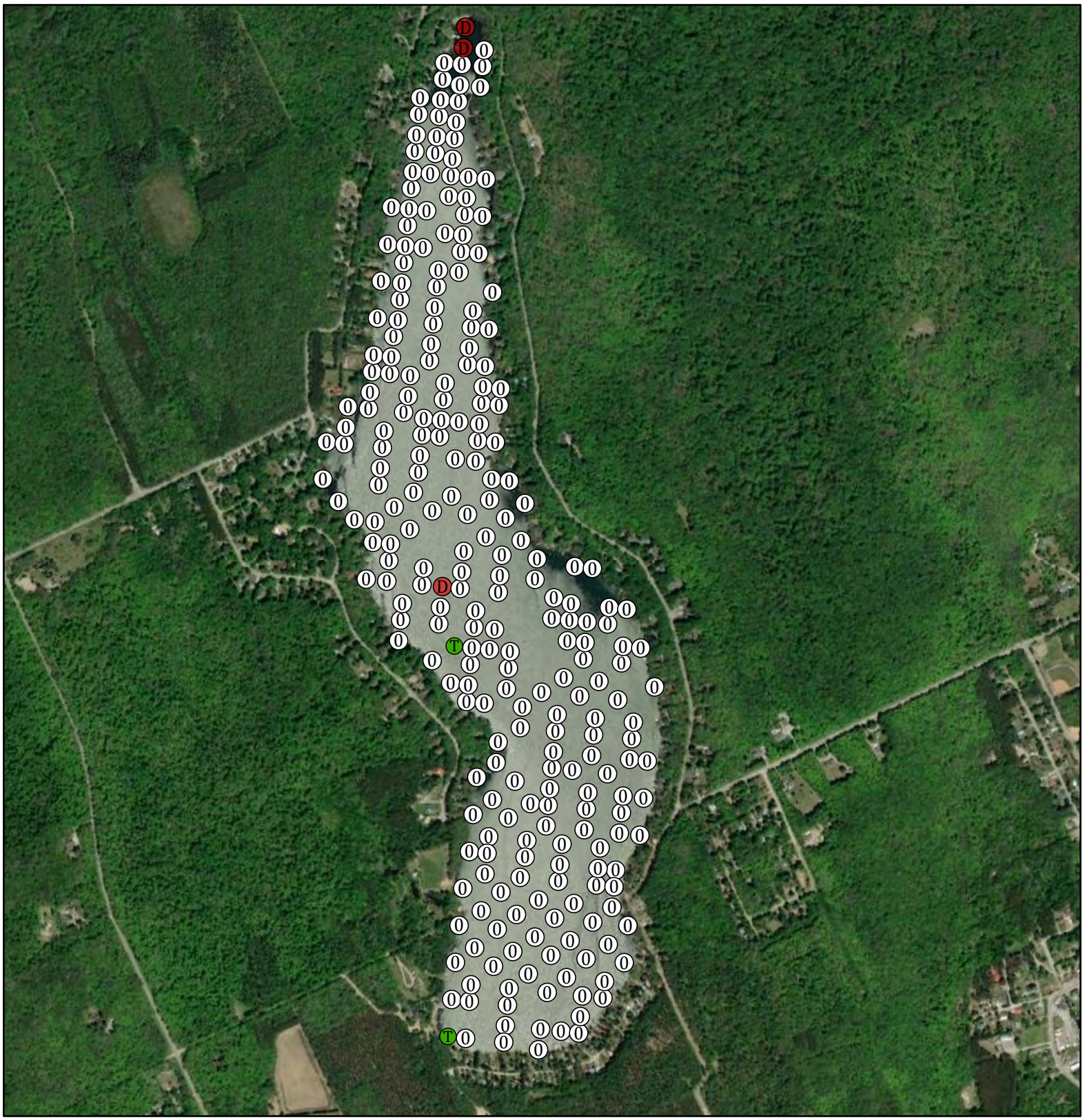
Legend

Layer
Percent Cover

- 0 Zero (0%)
- T Trace (1-24%)
- S Sparse (26-50%)

Map Date: 08/15/2022
Map Creator: AM
Office: Shrewsbury, MA

Overall Cover (%) of Eurasian Watermilfoil



Farlain Lake
Ontario, Canada

0 100 200 Feet

N

Legend

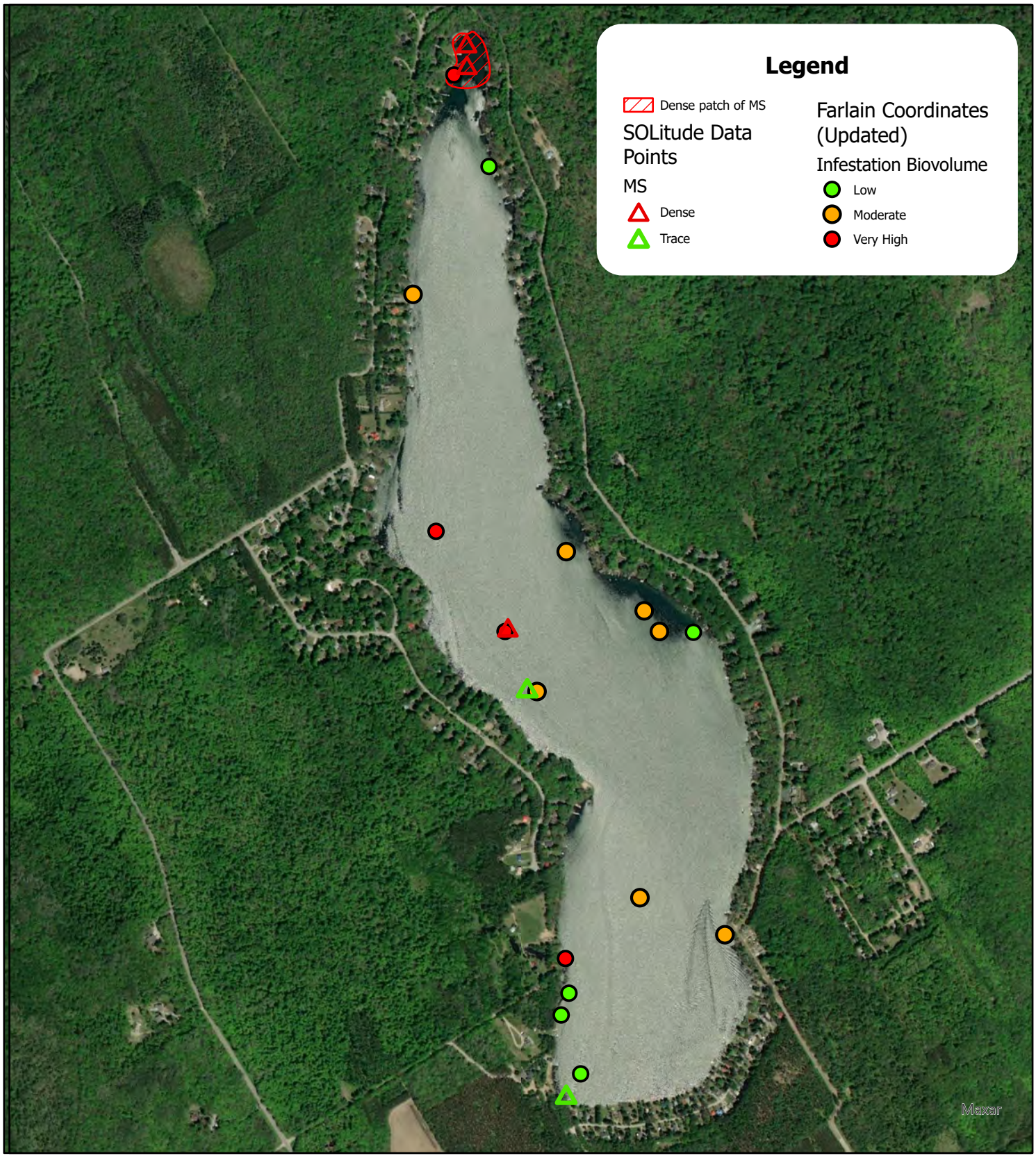
Overall Cover of EWM at Data Points

- 0 Zero (0%)
- T Trace (1-25%)
- D Dense (76-100%)

Map Date: 08/15/2022
Map Creator: AM
Office: Shrewsbury, MA

Figure 2: Watermilfoil Density (Client & SOLitude Points)

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Farlain Lake
Ontario, Canada

N

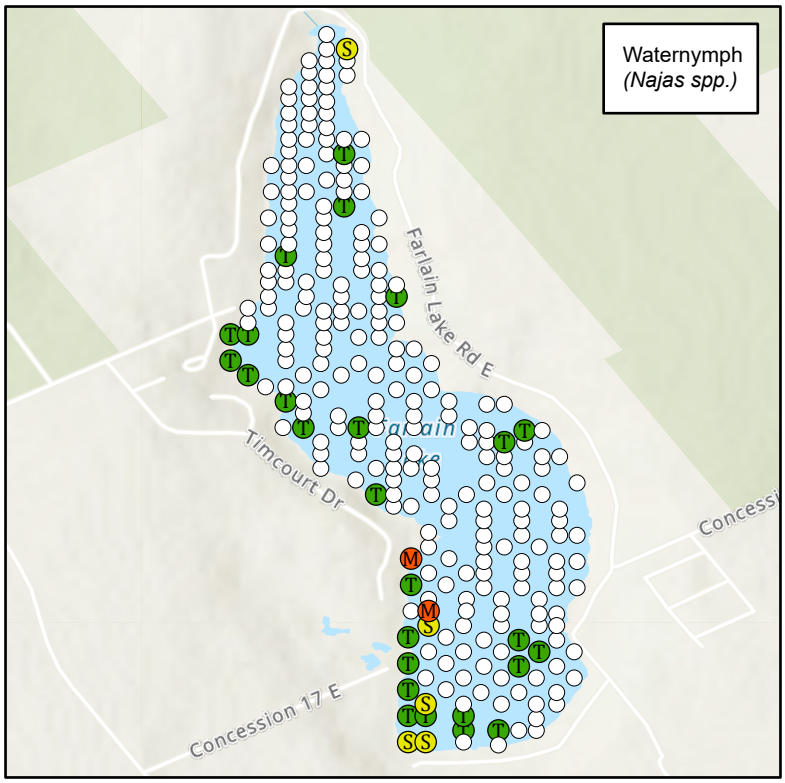
Farlain Lake

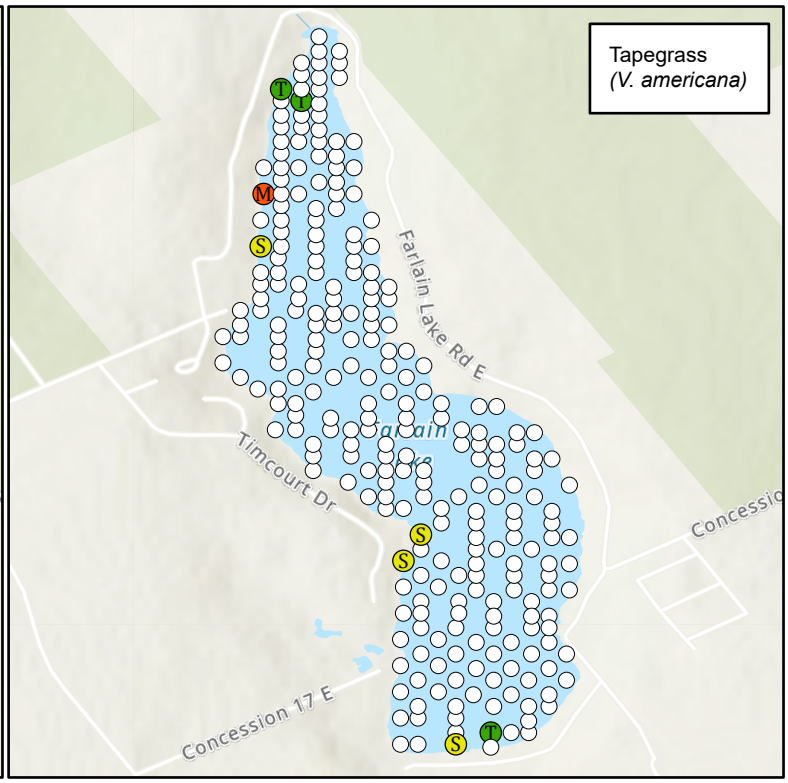
0 980 1,960

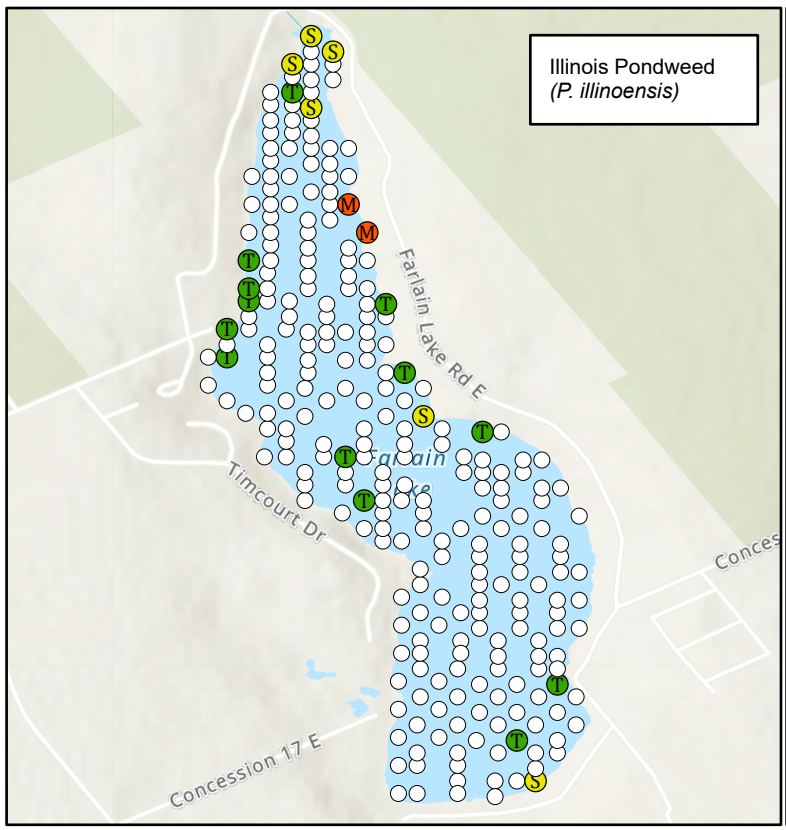
1:14,355 Feet

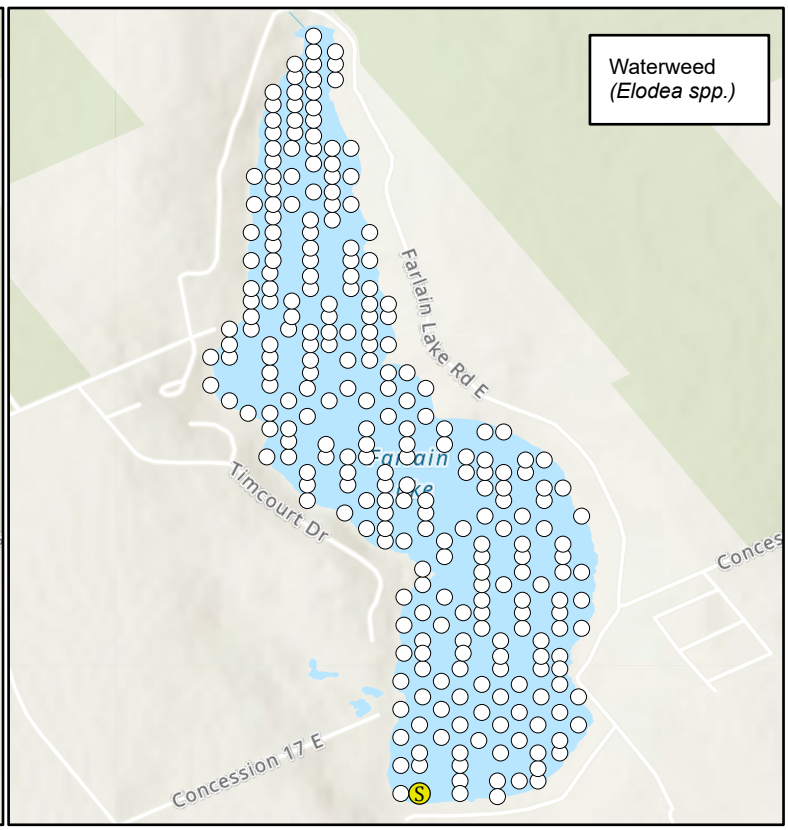
Map Date: 1/27/2022
Prepared by: EV/DM/KV
Office: SHREWSBURY, MA

Abundance & Distribution of Native Species (1 of 2)









Farlain Lake
Ontario, Canada

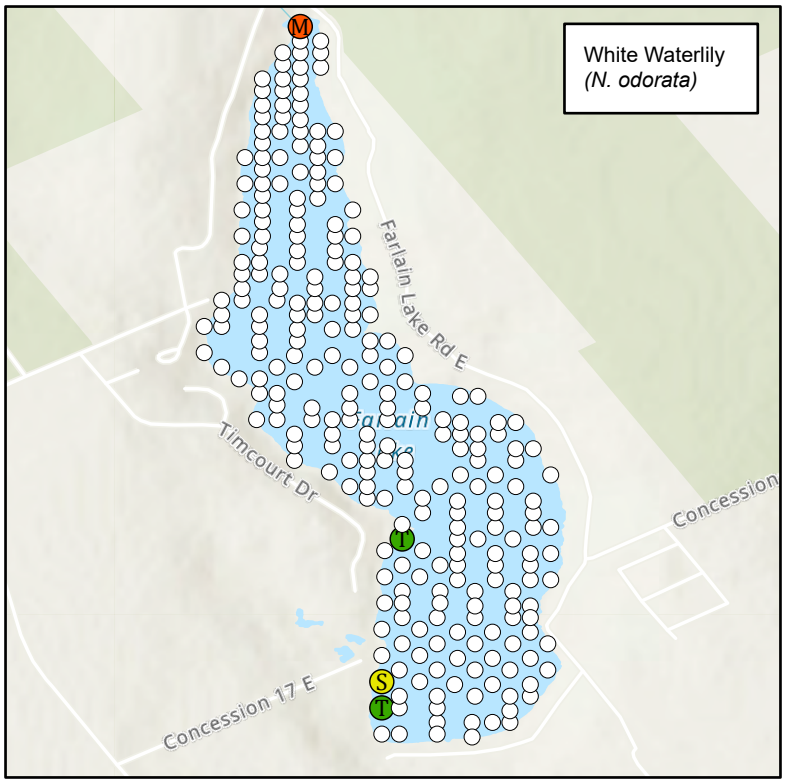
N

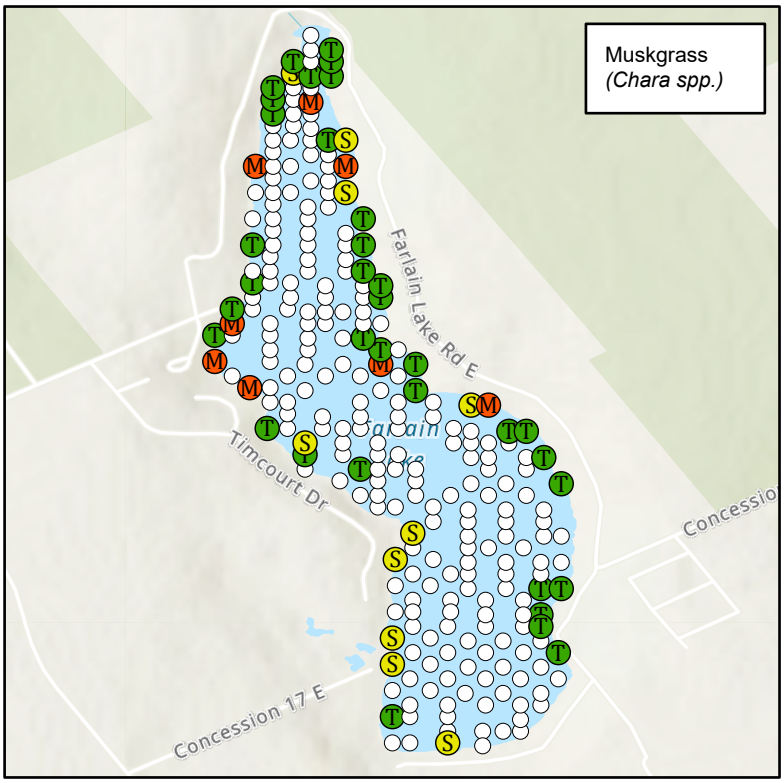
0 200 400 Feet

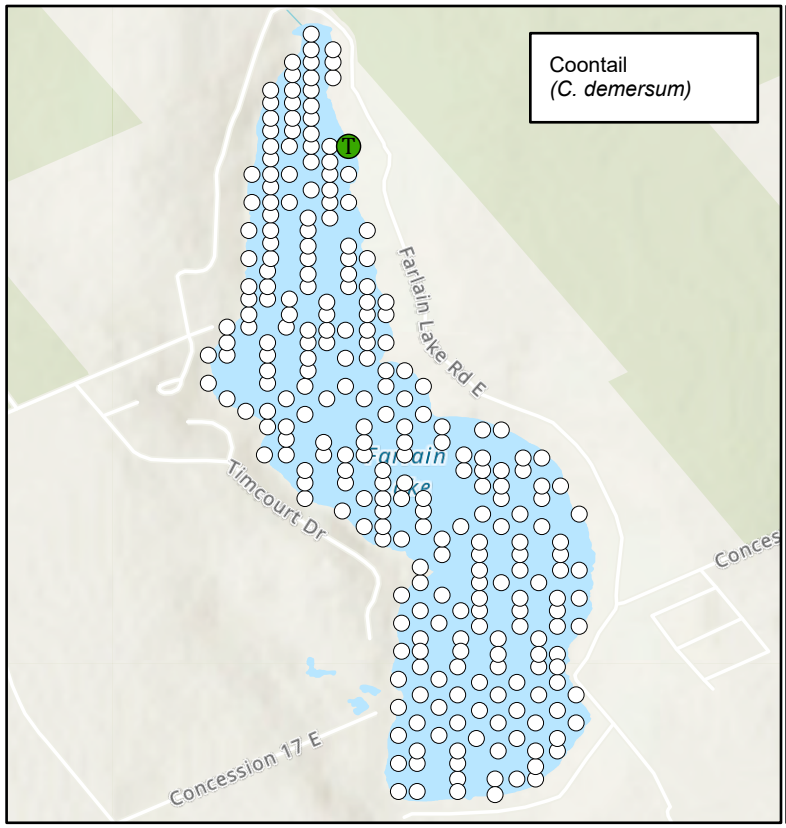
- Zero: 0%
- Trace: 1-24.9%
- Sparse: 25-49.9%
- Moderate: 50-74.9%
- Dense: 75-100%
- Present

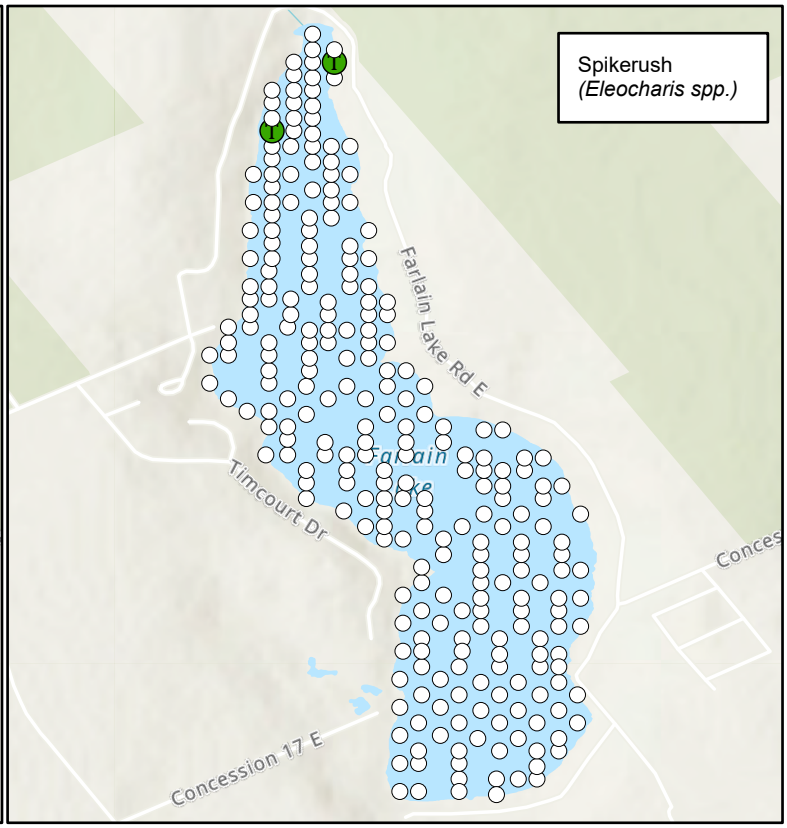
Map Date: 09/30/2022
Map Creator: AM
Office: Shrewsbury, MA

Abundance & Distribution of Native Species (2 of 2)









Farlain Lake
Ontario, Canada

N

0 200 400 Feet

- Zero: 0%
- T Trace: 1-24.9%
- S Sparse: 25-49.9%
- M Moderate: 50-74.9%
- D Dense: 75-100%
- P Present

Map Date: 08/15/2022
Map Creator: AM
Office: Shrewsbury, MA