

Cazenovia Lake Aquatic Plant Survey, 2024 Results



Report to:

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Table of Contents

List of Tables	2
List of Figures	2
1. INTRODUCTION.....	3
2. METHODS.....	3
2.1 Macrophyte sampling	3
3. RESULTS.....	5
3.1 Macrophytes	5
4. CONCLUSIONS AND RECOMMENDATIONS.....	9
REFERENCES.....	10

List of Tables

Table 1. Abundance categories used to describe rake-toss drag samples and assumed dry weight (g/m^2). Table values were used to obtain an estimate of abundance for individual species and overall abundance estimates. Table modified from Racine-Johnson (2021).	4
Table 2. Summary of species richness and Eurasian watermilfoil changes in the yearly plant community influenced by management from 2009 to 2024 as documented by late summer surveys each year.	7

List of Figures

Figure 1. Sample point locations in Cazenovia Lake where rake-toss measurements were collected annually from 2009 to 2024.....	3
Figure 2. Dual-headed rake and nylon rope used for macrophyte sampling.	4
Figure 3. UFI Research Scientist processing collected macrophyte.....	4
Figure 4. Number of locations where Eurasian watermilfoil (<i>Myriophyllum spicatum</i>) was present from 2009 through 2024. Years when triclopyr (Renovate®) was applied are identified with a single asterisk (*) and years when floryprazifen-benzyl (ProcellaCOR®) was applied are identified with a double asterisk (**).	8

1. INTRODUCTION

This report summarizes the August 1 – August 22, 2024 aquatic macrophyte (plant) community survey conducted by the Upstate Freshwater Institute (UFI) for the Town of Cazenovia, New York, at Cazenovia Lake. The purpose of the survey was to evaluate the distribution and abundance of aquatic macrophytes, to evaluate any impact of aquatic plant management on the lake's ecosystem, and to assist the Town in planning future management decisions.

Previous aquatic plant management in Cazenovia Lake included applications of the herbicide triclopyr (Renovate®) in 2009, 2010, 2012, 2014, 2017, and 2019. Mechanical harvesting was implemented in 2015, 2016, 2018, and 2020 with selective harvesting in dense macrophyte areas conducted in 2023. The intention of the previous management actions was to control the growth and expansion of the invasive macrophyte *Myriophyllum spicatum* (Eurasian watermilfoil). In 2021 and 2024 Cazenovia Lake was treated with the herbicide floryprauzifen-benzyl (ProcellaCOR®), in addition to selective mechanical harvesting.

2. METHODS

2.1 Macrophyte sampling

A total of 304 locations were sampled to evaluate the macrophyte community in 2024 (**Figure 1**), similar to previous surveys conducted in Cazenovia Lake annually since 2009. We used GPS to navigate to sampling locations using latitude and longitude coordinates with a Lowrance Hook 5. The depth of each sample location was determined by sonar and recorded in meters.

Dual-headed rakes tied to 50 feet of nylon rope were used to collect macrophytes (**Figure 2**). Two rake-toss drags occurred at each location by tossing rakes from the boat until approximately 40 feet of rope was extended. Rakes were slowly retrieved at the same time back to the boat by dragging the rake along the bottom for at least 10 meters (~33 ft.) to adequately sample the lake bottom, and to limit macrophytes from falling off the rake.

Research scientists assigned an overall plant abundance estimate to the amount of macrophytes on each rake, as follows (**Table 1**):

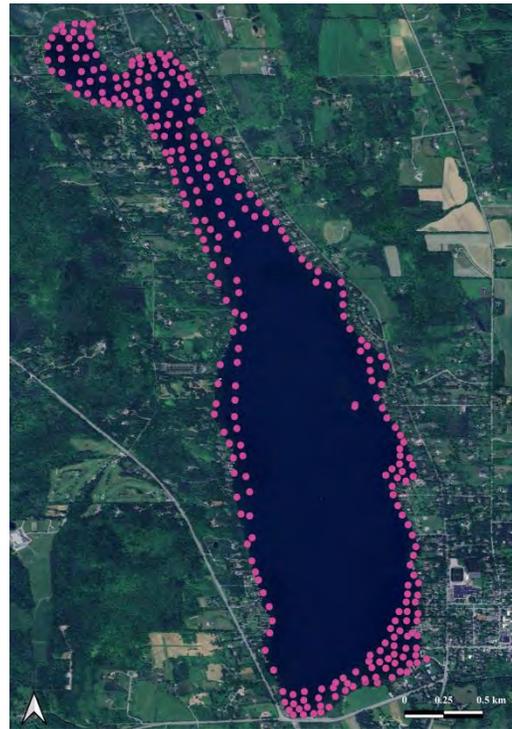


Figure 1. Sample point locations in Cazenovia Lake where rake-toss measurements were collected annually from 2009 to 2024.

- Dense (D) – more than an armful and difficult to get into the boat
- Medium (M) – an armful
- Spare (S) – two hands full
- Trace (T) – a small handful or less
- Zero (O) – bare rake

All individual species from each rake were then separated (**Figure 3**), identified (Borman et al. 1997; Crow and Hellquist 2000) and assigned an abundance estimate (**Table 1**) and mass percentage (based on the relative abundance per rake, summing to 100). An average of the two rake tosses was calculated to obtain an abundance value at each sample location.



Figure 2. Dual-headed rake and nylon rope used for macrophyte sampling.



Figure 3. UFI Research Scientist processing collected macrophyte.

Table 1. Abundance categories used to describe rake-toss drag samples and assumed dry weight (g/m^2). Table values were used to obtain an estimate of abundance for individual species and overall abundance estimates. Table modified from Racine-Johnson (2021).

Abundance Categories for Mass on Rake Toss	Rake-toss Abundance Rating	Dry Weight (g/m^2) Ranges with Total Plant Abundance	Mean Dry Biomass (g/m^2)	Dry Weight (g/m^2) Ranges with Single Species
"O" = no plant(s)	0	0.0	0.0	same
"T" = trace plant(s)	1	~0.0001 - 0.9999	0.5	same
"S" = sparse plant(s)	2	~1.0000 - 24.9999	13.0	same
"M" = medium plant(s)	3	~25.0000 - 99.9999	62.5	same
"D" = dense plant(s)	4	~100.0000 - 400.0000+	250.0	same

3. RESULTS

3.1 Macrophytes

As documented in previous annual surveys, Cazenovia Lake was found to have a very diverse assemblage of aquatic plants. In 2024, a total of 31 species were observed with an average species richness of 6 per sampling location.

Appendix A includes maps depicting the location and relative abundance (mass) of macrophytes found in 2024.

Appendix B includes tabulated results from rake-toss samples in 2024 at each of the sample locations (*Table A*), the conversion of rake-toss data to abundance (mass) categories (*Table B*), and the presence of macrophyte species at each location to species' total occurrences for all locations (*Table C*).

Table 2 shows the change of Eurasian watermilfoil (*Myriophyllum spicatum*) over time, influenced by management from mechanical harvesting and herbicide (triclopyr) in selected years from 2009-2020, and florpyrauxifen-benzyl (ProcellaCOR®) in 2021 and 2024. In 2015, 2016, 2018 and 2020 only mechanical harvesting occurred. In the past, suppression of Eurasian watermilfoil was observed in the year of herbicide application followed by an increase in occurrence a year after application. Following the application of ProcellaCOR® in 2024, a reduction of Eurasian watermilfoil was observed across sampled sites (*i.e.*, from 29% in 2023 down to 0.3% in 2024) (**Table 2**), with a notable decrease in the number of sampling locations

with Medium and Dense abundances – 29% of sites in 2023 compared to only 0.3% of sites in 2024 (**Table 2**). The number of sights with Eurasian watermilfoil in 2024 is slightly greater than 2021 when ProcellaCOR® was first applied – 25 sites in 2021 compared to 42 sites in 2024 (**Figure 4**).

Table 2. Summary of species richness and Eurasian watermilfoil changes in the yearly plant community influenced by management from 2009 to 2024 as documented by late summer surveys each year.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Species richness	36	32	33	32	31	33	37	35	33	33	33	34	33	32	35 ^a	31
Occurrences of watermilfoil out of a total of 302 sampling points	122	86	221	123	225	204	284	288	166	282	115	236	25	114	229 ^a	41
Percentage watermilfoil presence out of a total of 302 sampling points	40%	29%	73%	41%	85%	68%	94%	95%	55%	93%	38%	78%	8%	38%	76% ^a	14%
Percentage of medium and dense watermilfoil abundances out of 302 sampling points	6%	1%	19%	5%	28%	10%	32%	54%	2%	23%	0%	13%	0%	4%	29% ^a	0.3%

NOTES:

Yellow = Designates the years when triclopyr (Renovate®) was applied to regions in Cazenovia Lake.

Blue = Designates the year when floryprazufen-benzyl (ProcellaCOR®) was applied to regions in Cazenovia Lake.

^a Values based on 300 sampling points in 2023

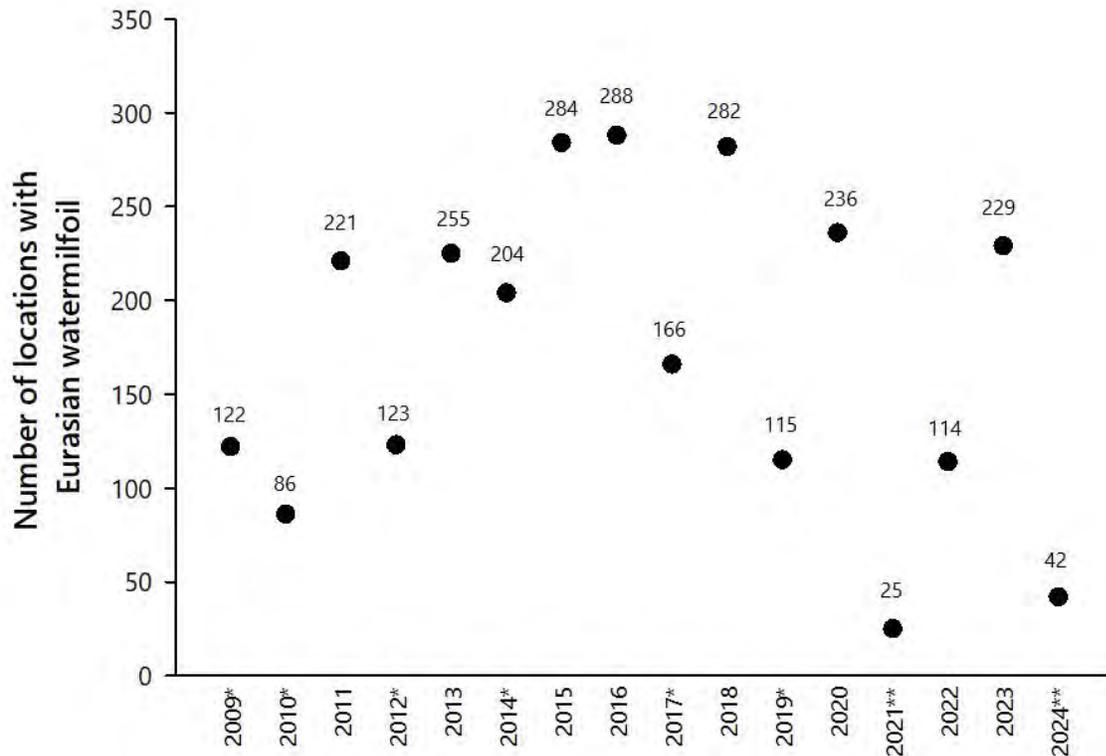


Figure 4. Number of locations where Eurasian watermilfoil (*Myriophyllum spicatum*) was present from 2009 through 2024. Years when triclopyr (Renovate®) was applied are identified with a single asterisk (*) and years when florpurauzifen-benzyl (ProcellaCOR®) was applied are identified with a double asterisk (**).

ProcellaCOR® additionally targets the native species *Ceratophyllum demersum* (coontail) (Racine-Johnson 2021). Following the application of ProcellaCOR® in 2024, 148 sites were observed to have coontail present with only 26 of those sites having medium or dense abundance. This represents an overall reduction from the 2023 survey, in which coontail was recorded at 176 sites, with 93 of those sites categorized as having medium or dense abundance. Similarly, during the 2021 survey, following the first application of ProcellaCOR® in Cazenovia Lake, a significant reduction in the occurrence of coontail was observed – from 213 sites in 2020 to 119 sites in 2021. In 2022, the year following ProcellaCOR® application, there was once again a notable increase in observed presence of coontail with recordings at 165 sites.

The invasive macroalgae *Nitellopsis obtusa* (starry stonewort) also experienced a slight shift in its presence throughout Cazenovia Lake. In 2024, starry stonewort had a recorded presence at 49% of sampled sites, an increase from 2023 when only 37% of sites had a recorded presence. Interestingly, the total percent of sites with dense or medium recorded presence remained similar, with 13% in 2023 and a slight increase to 14% in 2024. In previous surveys, starry stonewort saw an increase in sites with dense or medium recorded presence with only 2% of all sites in 2021, and 7% in 2022. This indicates an increasing density of starry stonewort occurring

each year. Starry stonewort can form dense mats that displace native macrophytes (Brainard et al. 2017) and may contribute to declines in dissolved oxygen levels as its biomass decays.

As in previous years, the invasive *Hydrocharis morsus-ranae* (European frog-bit) remained restricted to the northern end of the lake. In 2024, European frog-bit was observed at only one site near the outlet, similar in location to the two sites where it was recorded in 2021 and 2023. In 2022, there were no recorded observations of European frog-bit.

Notably for the first time in the past five years, *Polygonum amphibium* (water smartweed) presence was recorded at one site in the northern end near the outlet.

4. CONCLUSIONS AND RECOMMENDATIONS

While the overall species richness and diversity of Cazenovia Lake remain high, there was an 11% decrease in species richness from 2023 to 2024, decreasing from 35 species to 31 species. From 2009 to 2024, the lake has averaged a species richness of 33 species (± 1.7). As observed in previous years, the application of ProcellaCOR® resulted in the significant reduction of *Myriophyllum spicatum* (Eurasian watermilfoil).

Following the application of ProcellaCOR® in 2021, only 25 sites had an observed presence of Eurasian watermilfoil in Cazenovia Lake, with no sites recorded as having dense or medium abundance. In 2022, a resurgence of Eurasian watermilfoil was recorded, although the percentage of sites with medium or dense abundance remained comparatively low. By 2023, Eurasian watermilfoil had rebounded in both presence and abundance, being recorded at 229 sites, with 87 sites recorded as dense or medium. In 2024 following another application of ProcellaCOR®, Eurasian watermilfoil was observed at a total of 42 sites in. None of these sites exhibited a dense presence, and only one recorded with a medium presence, representing a significant decline.

It is recommended that management of the non-native Eurasian watermilfoil remains a priority, as it typically demonstrates higher abundance in years without herbicide treatment. Biannual ProcellaCOR® treatments should be considered, with continued annual surveys to assess application necessity. Continuing mechanical harvesting is also recommended targeting areas with high Eurasian watermilfoil density during the off-year of herbicide application.

Continued monitoring of starry stonewort's increasing density across the lake is advised. Starry stonewort can be found in a range of depths, often forming dense mats that displace native macrophytes (Brainard et al. 2017), and may contribute to declines in oxygen levels.

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Brainard, A.S. and K.L. Schulz. 2017. Impacts of the cryptic macroalgal invader, *Nitellopsis obtusa*, on macrophyte communities. *Freshwater Science* 36(1): 55-62.

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APPENDIX A

Maps of individual macrophyte species and relative abundance (mass) observed in 2024.

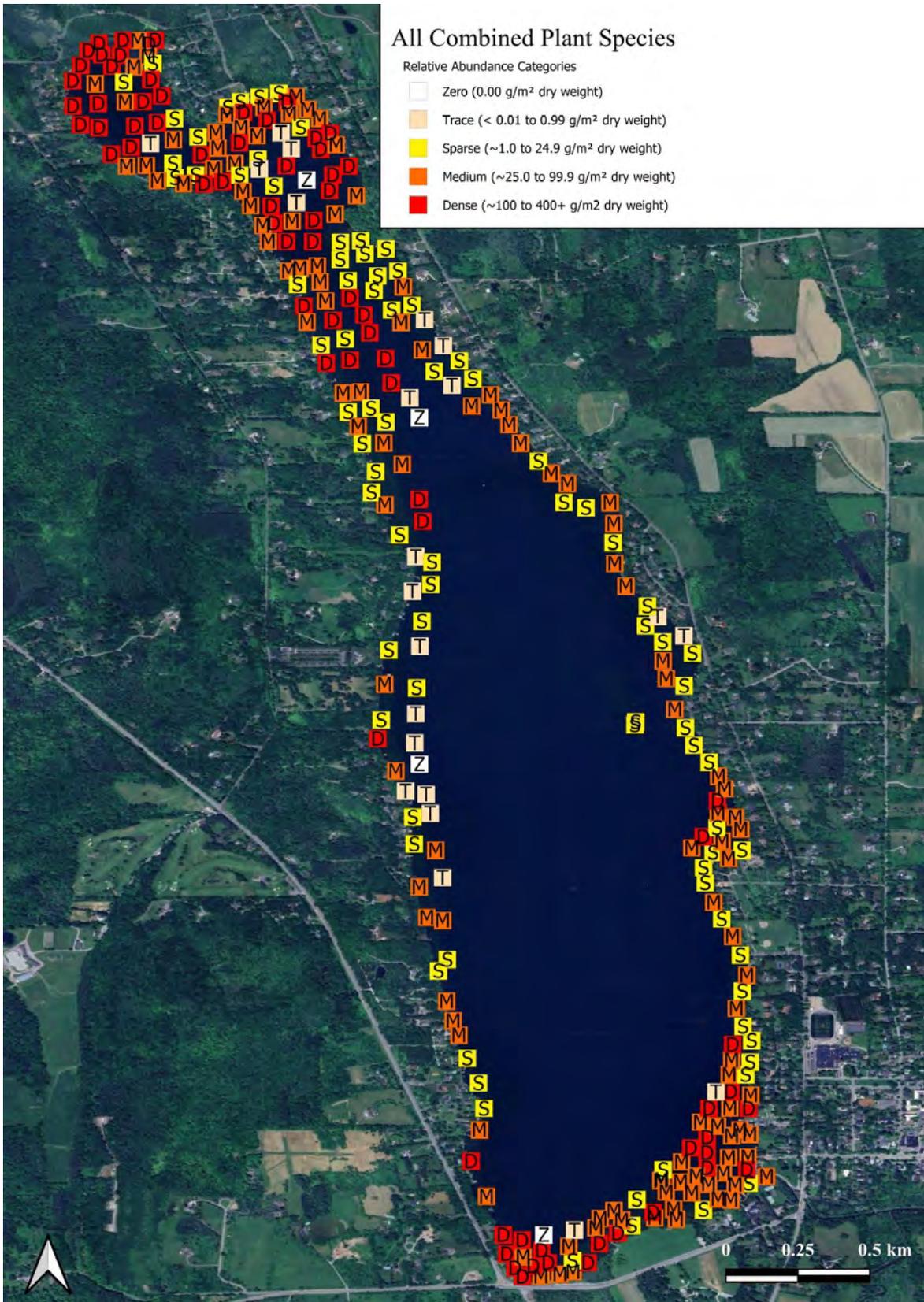


Figure 1. All species combined as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

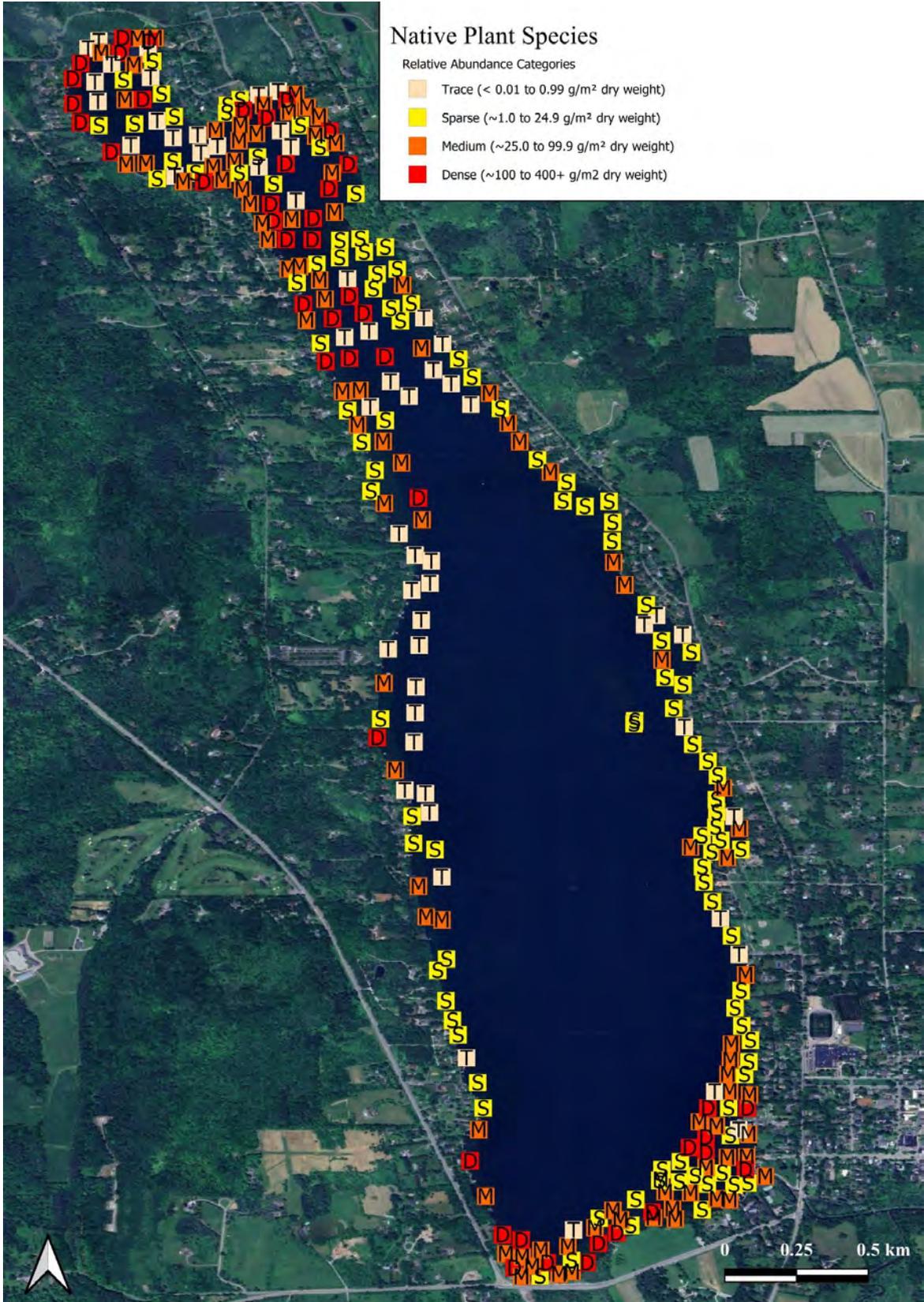


Figure 2. Native species as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

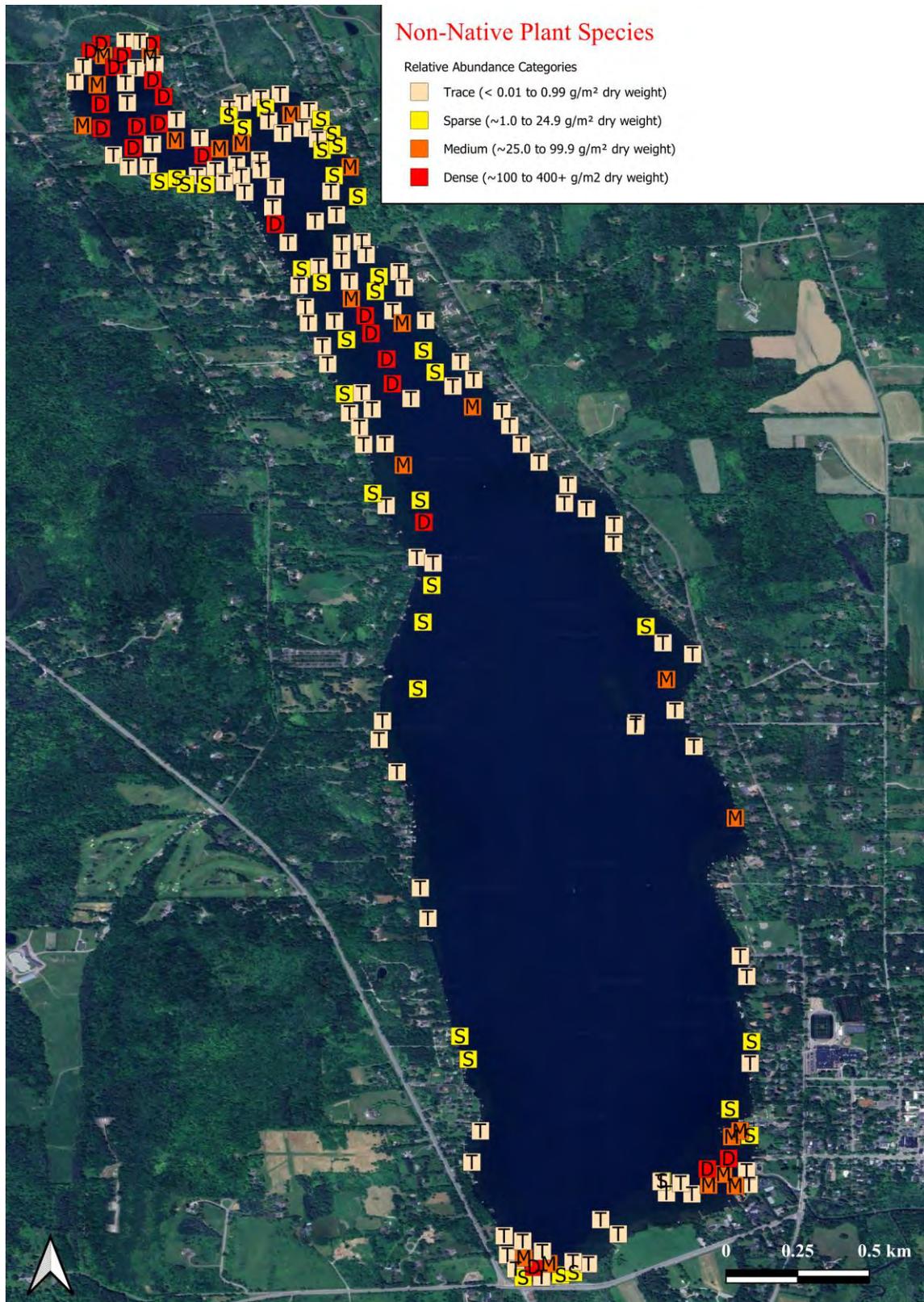


Figure 3. Non-native species combined as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

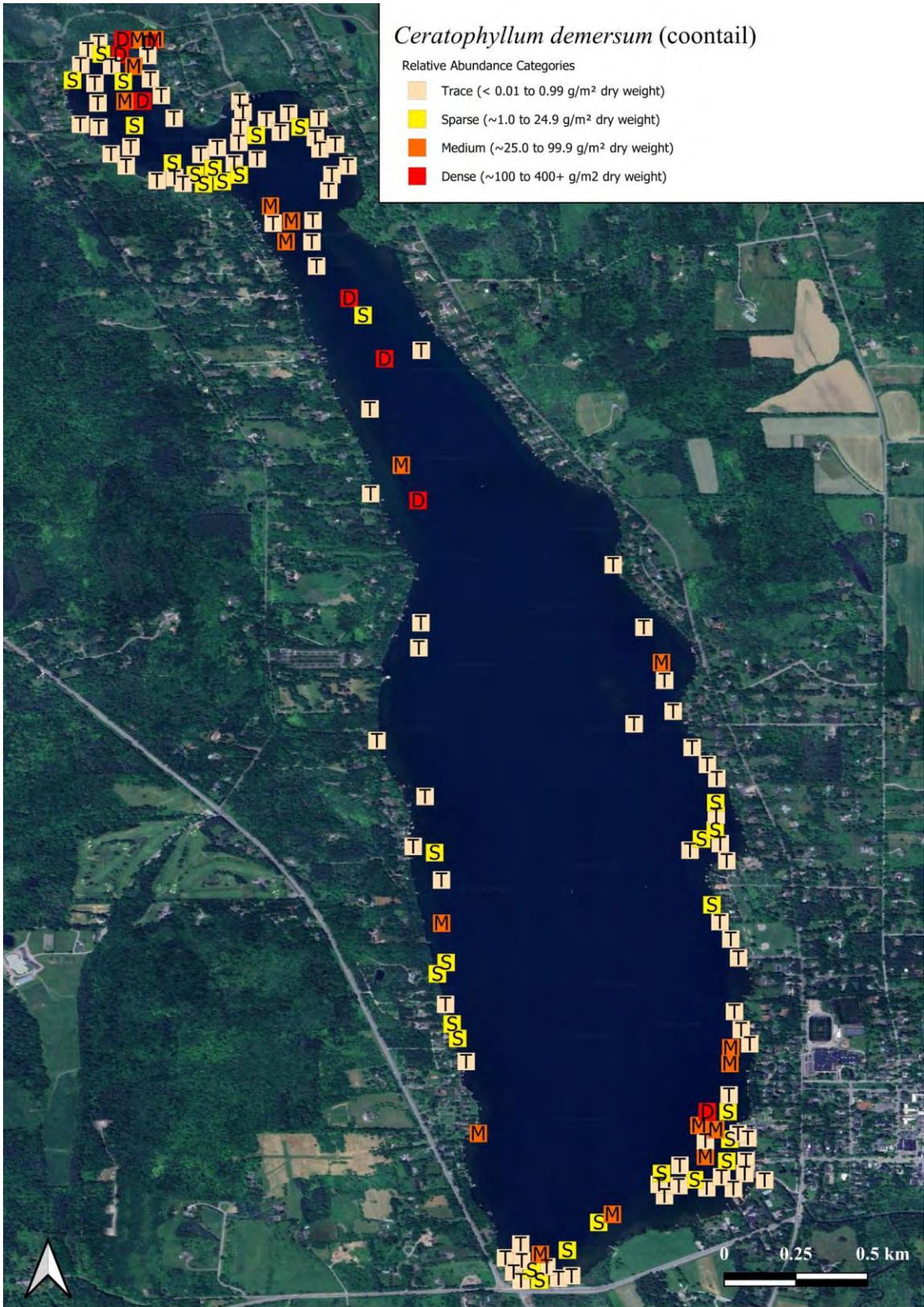


Figure 4. *Ceratophyllum demersum* (coontail) as abundance by two-rake toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

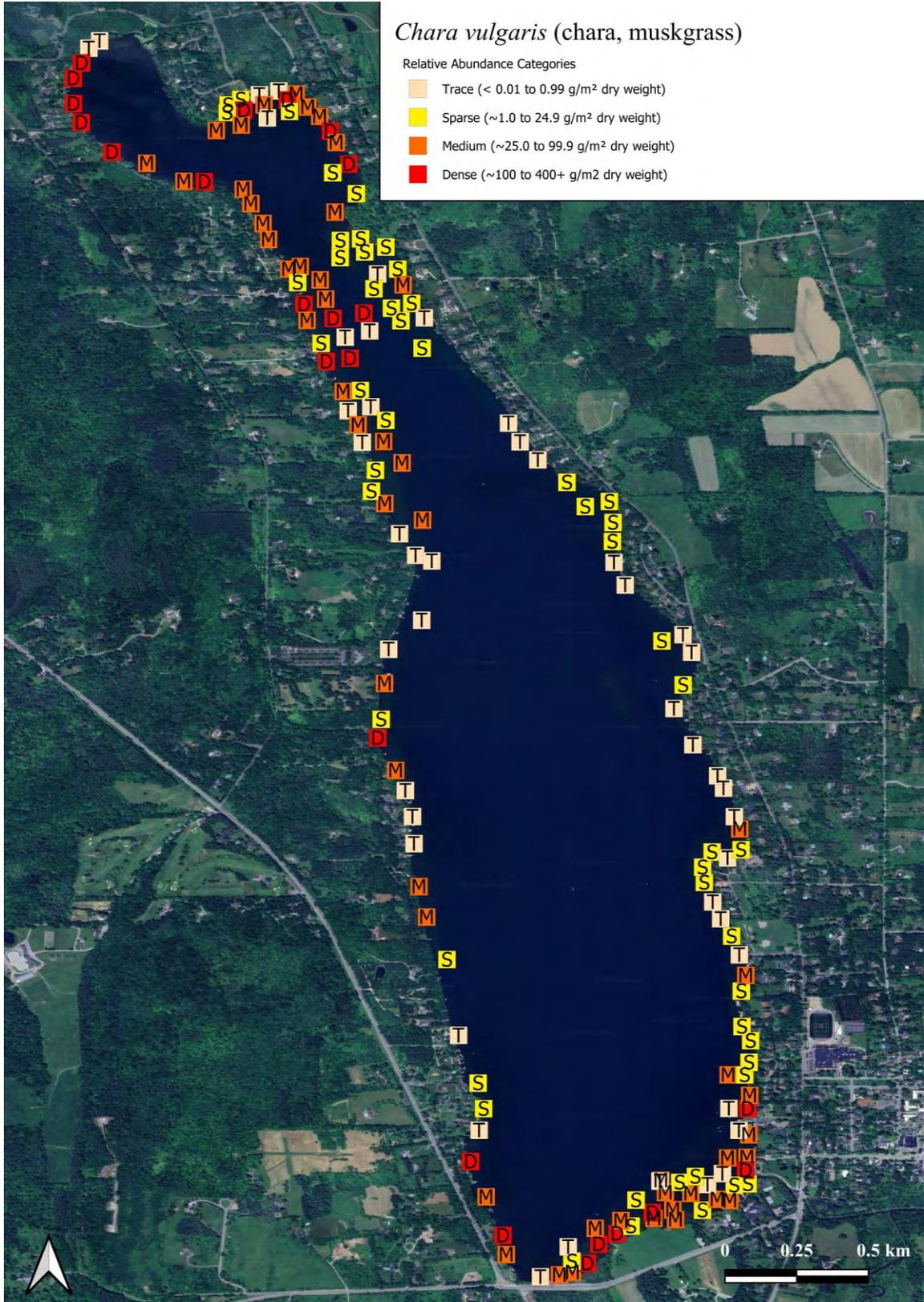


Figure 5. *Chara vulgaris* (chara, muskgrass) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

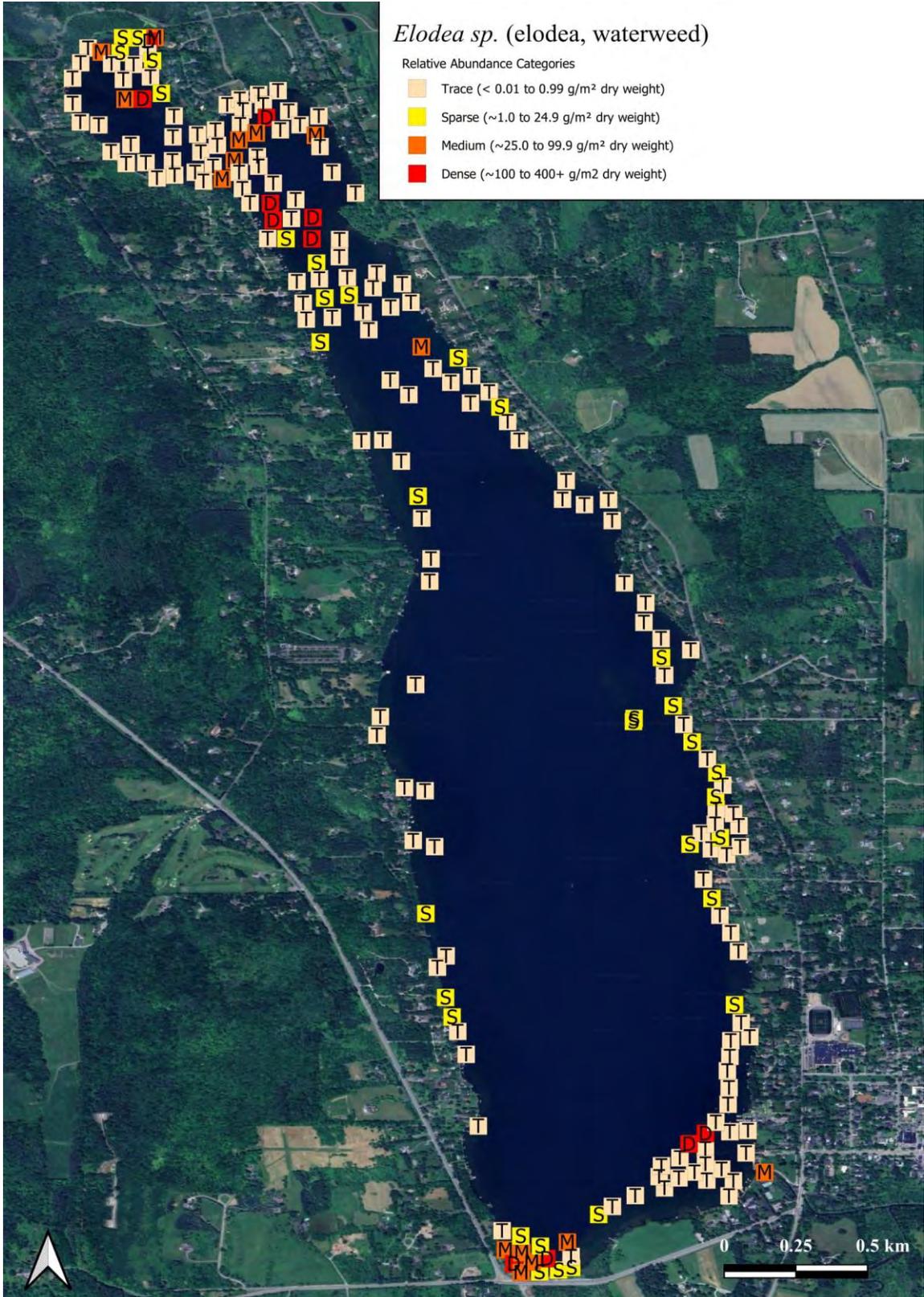


Figure 6. *Elodea sp.* (Elodea, waterweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

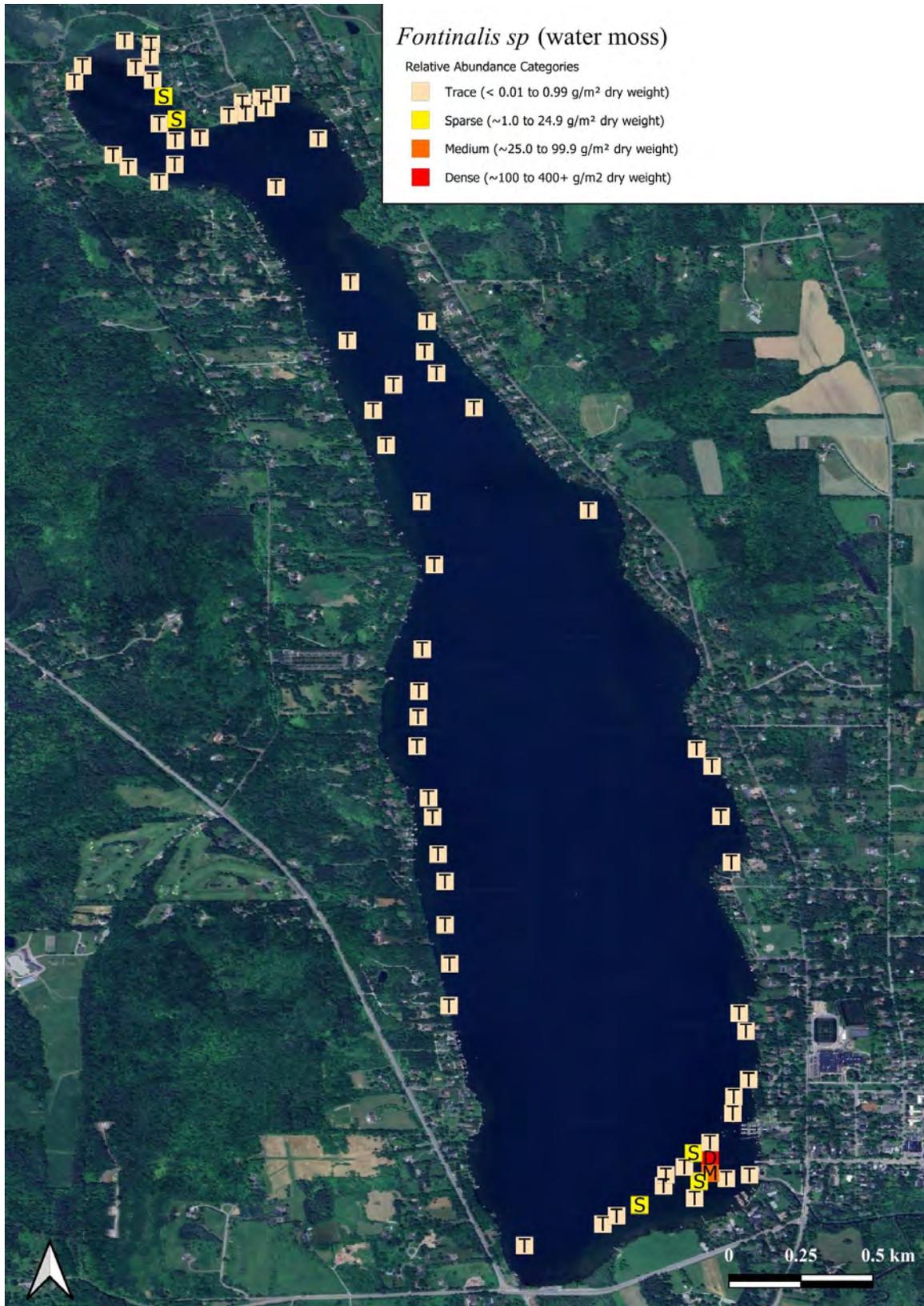


Figure 7. *Fontinalis sp.* (water moss) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

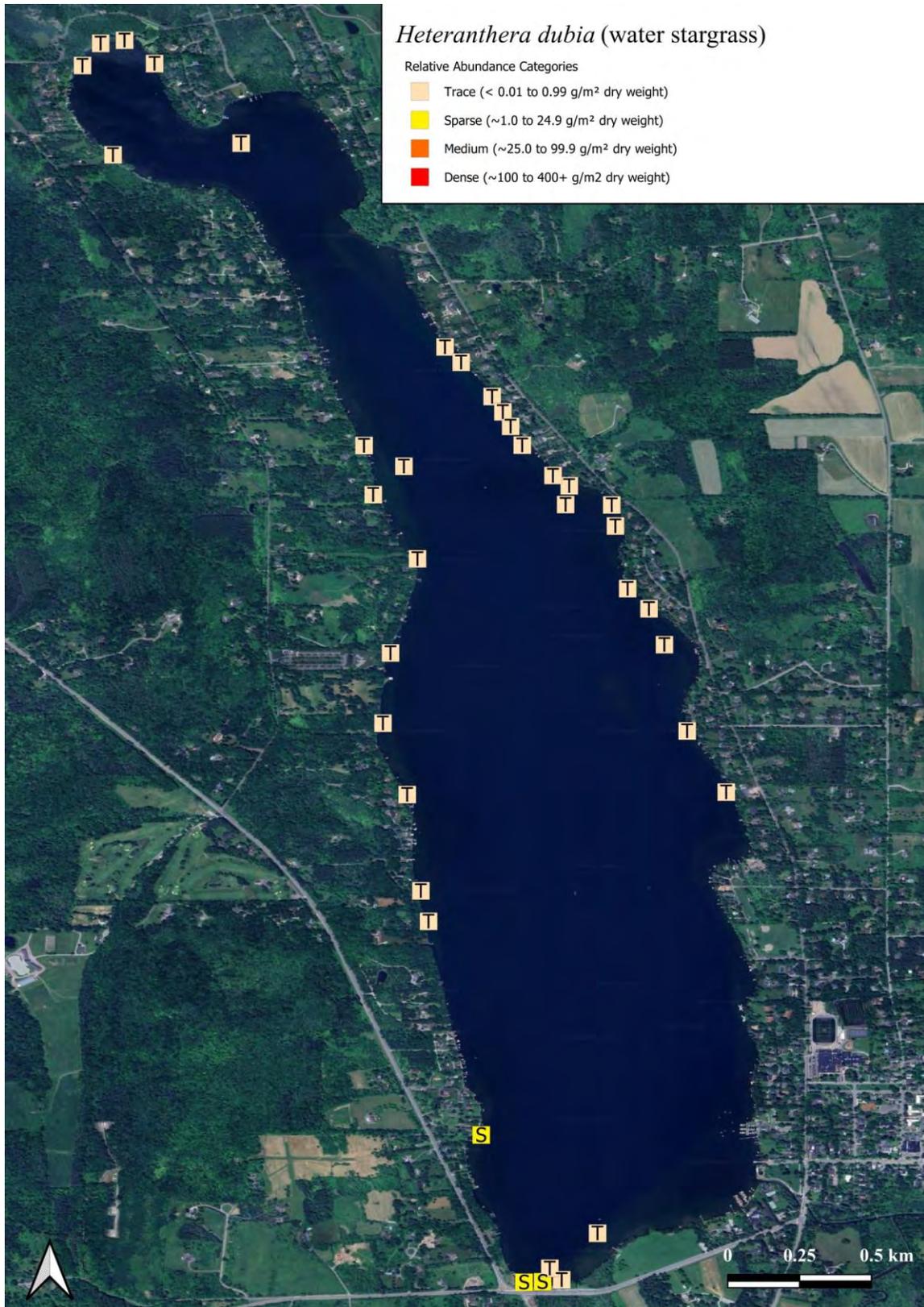


Figure 8. *Heteranthera dubia* (water stargrass) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

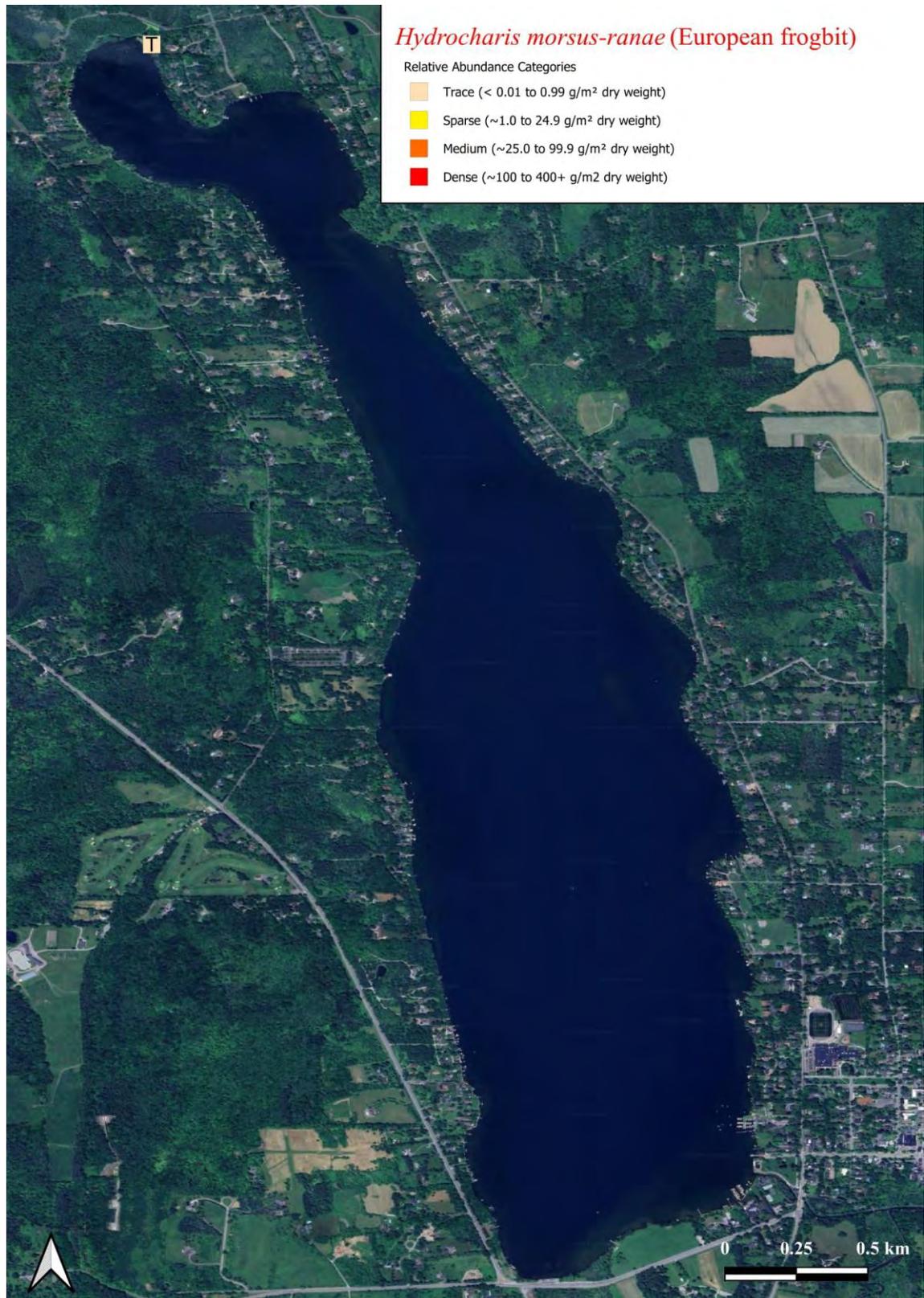


Figure 9. *Hydrocharis morsus-ranae* (European frogbit) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

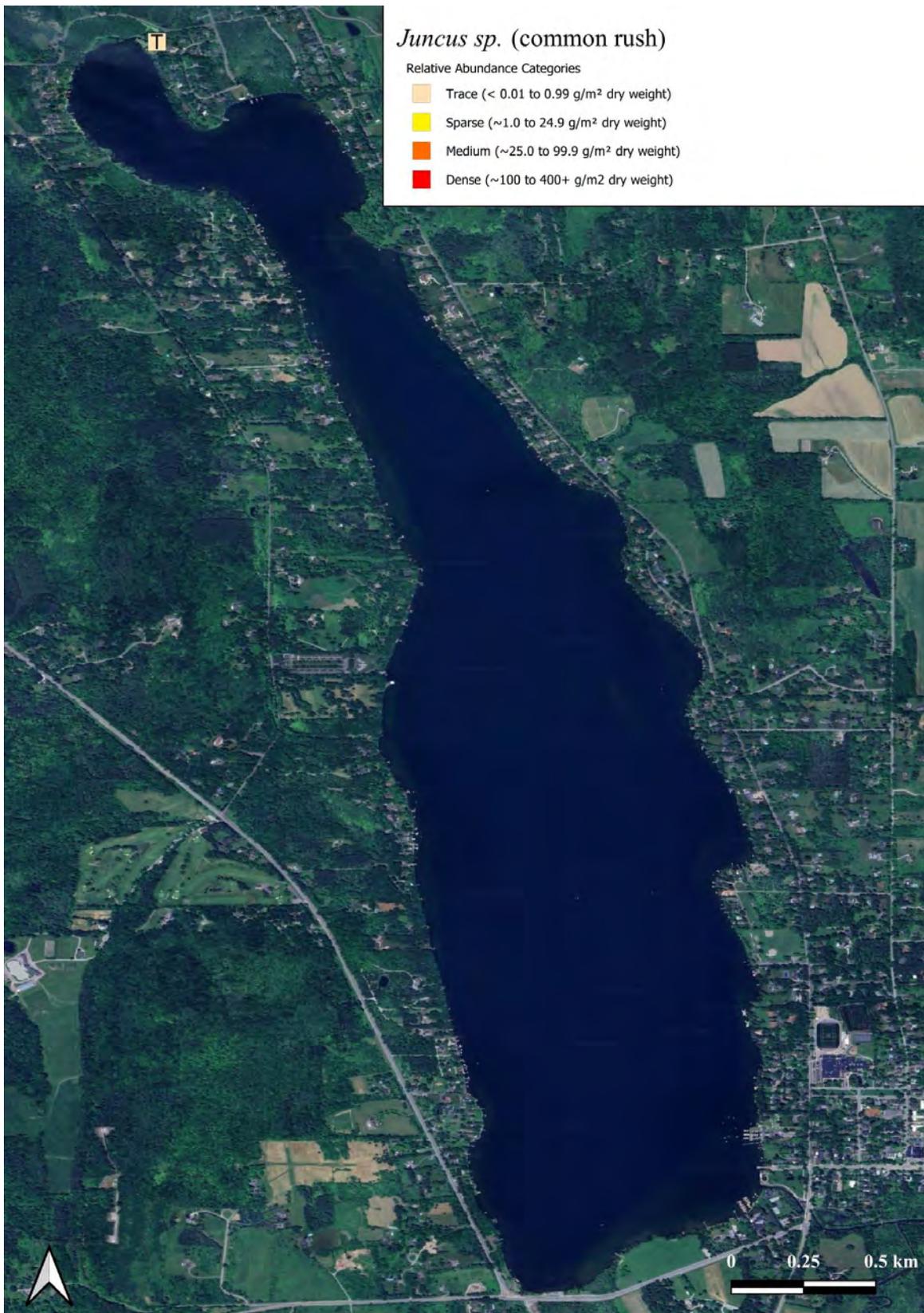


Figure 10. *Juncus sp.* as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

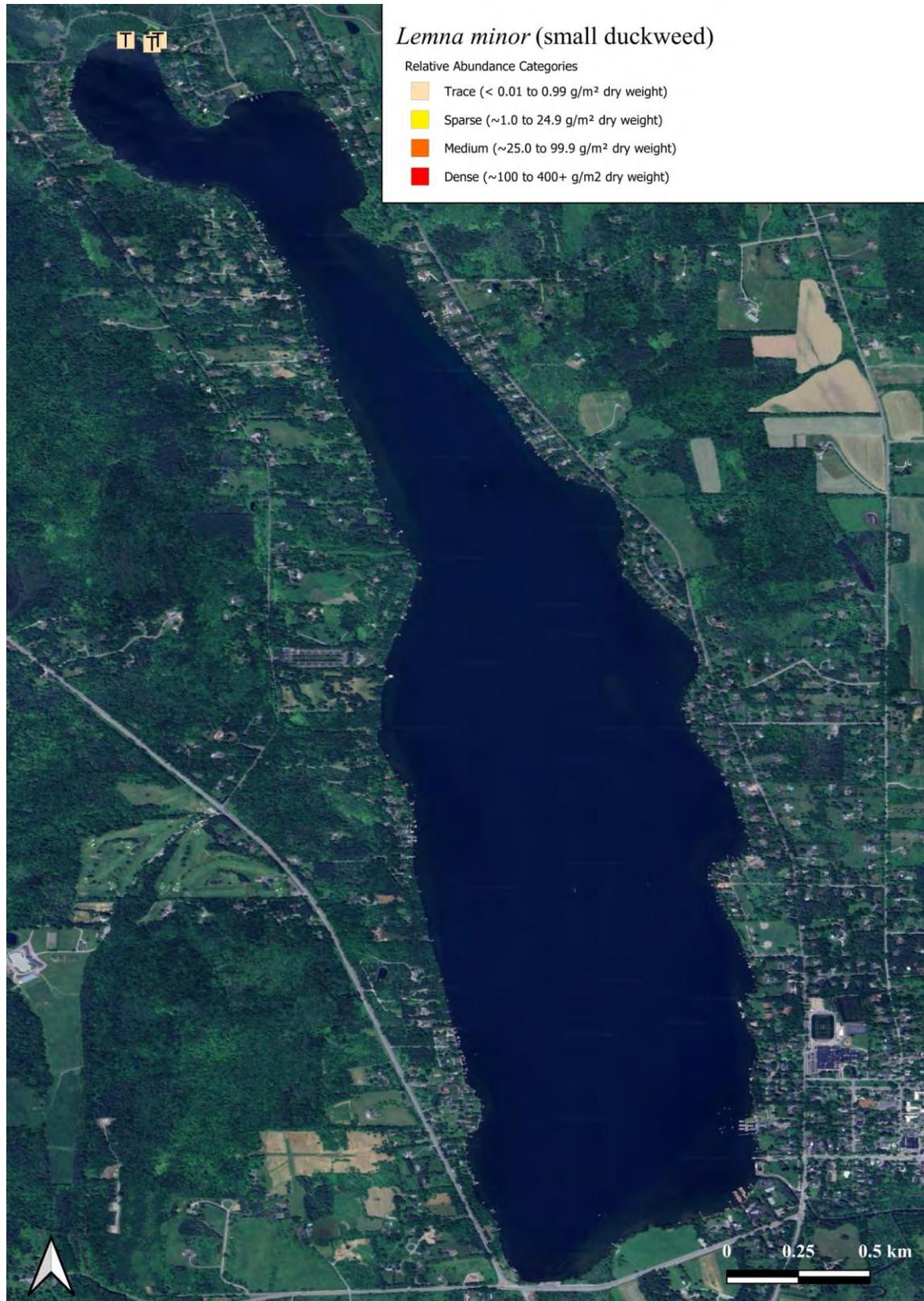


Figure 11. *Lemna minor* (small duckweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

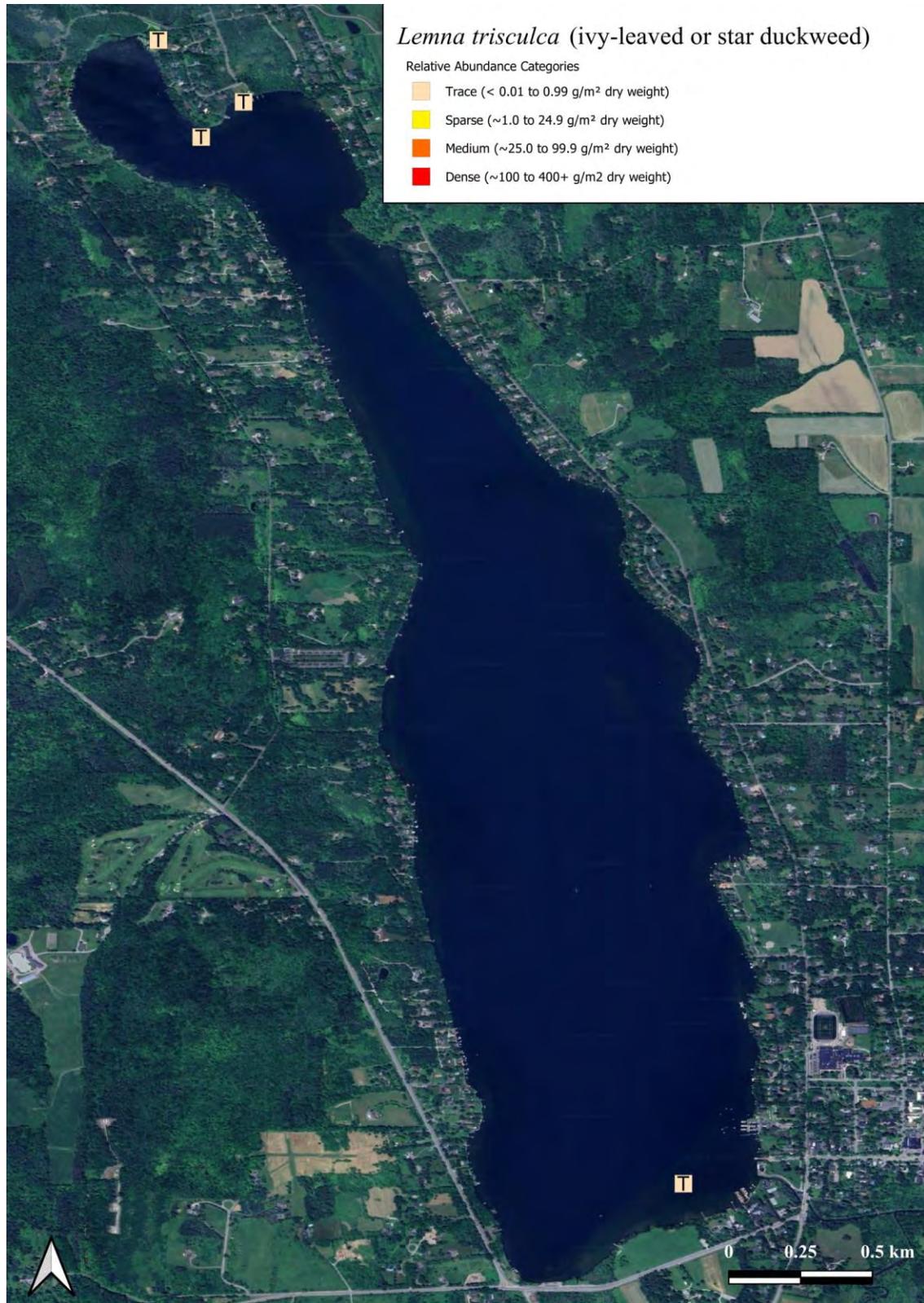


Figure 12. *Lemna trisulca* (ivy-leaved, star duckweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

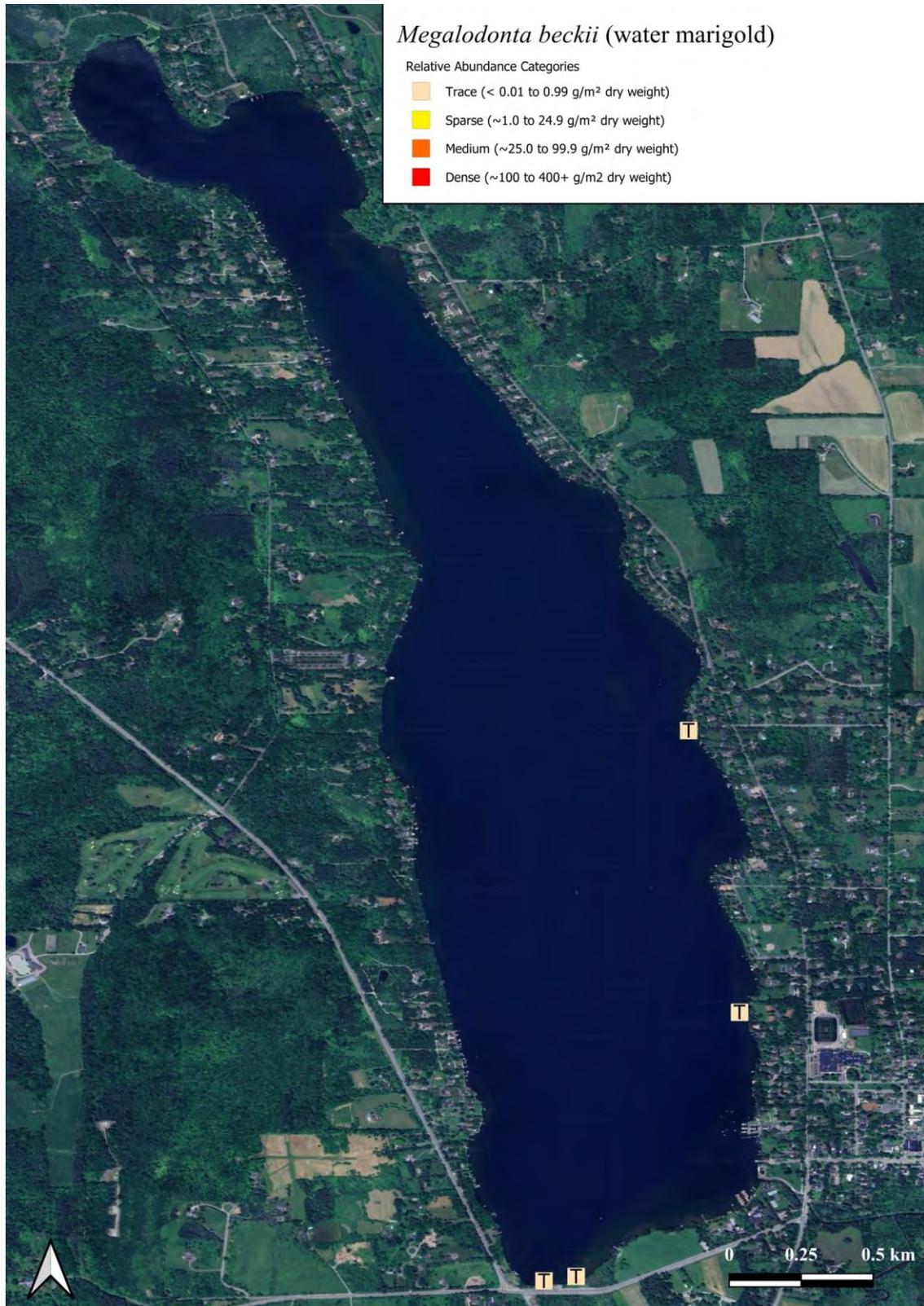


Figure 13. *Megalodonta beckii* (water marigold) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

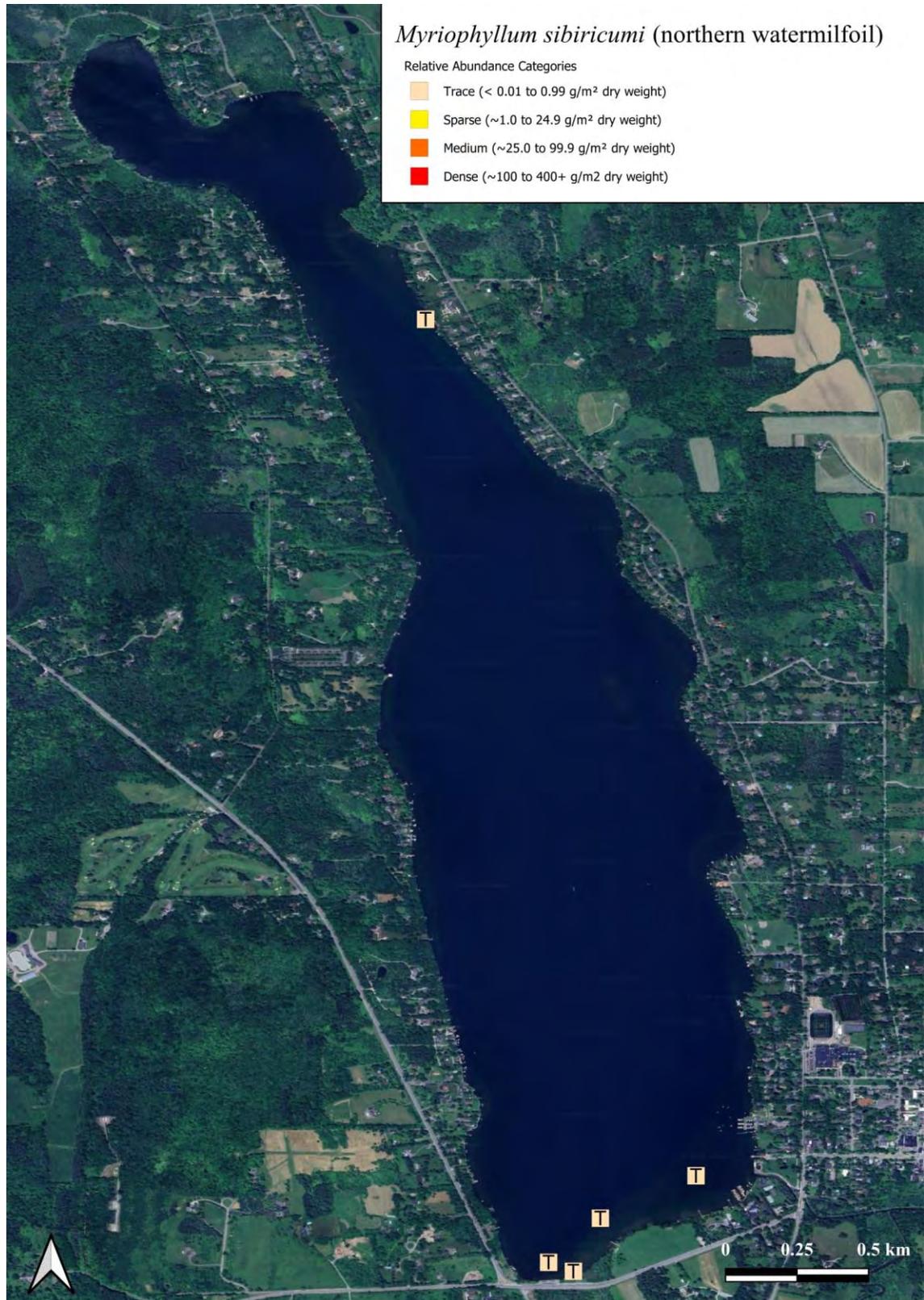


Figure 14. *Myriophyllum sibiricum* (northern watermilfoil) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

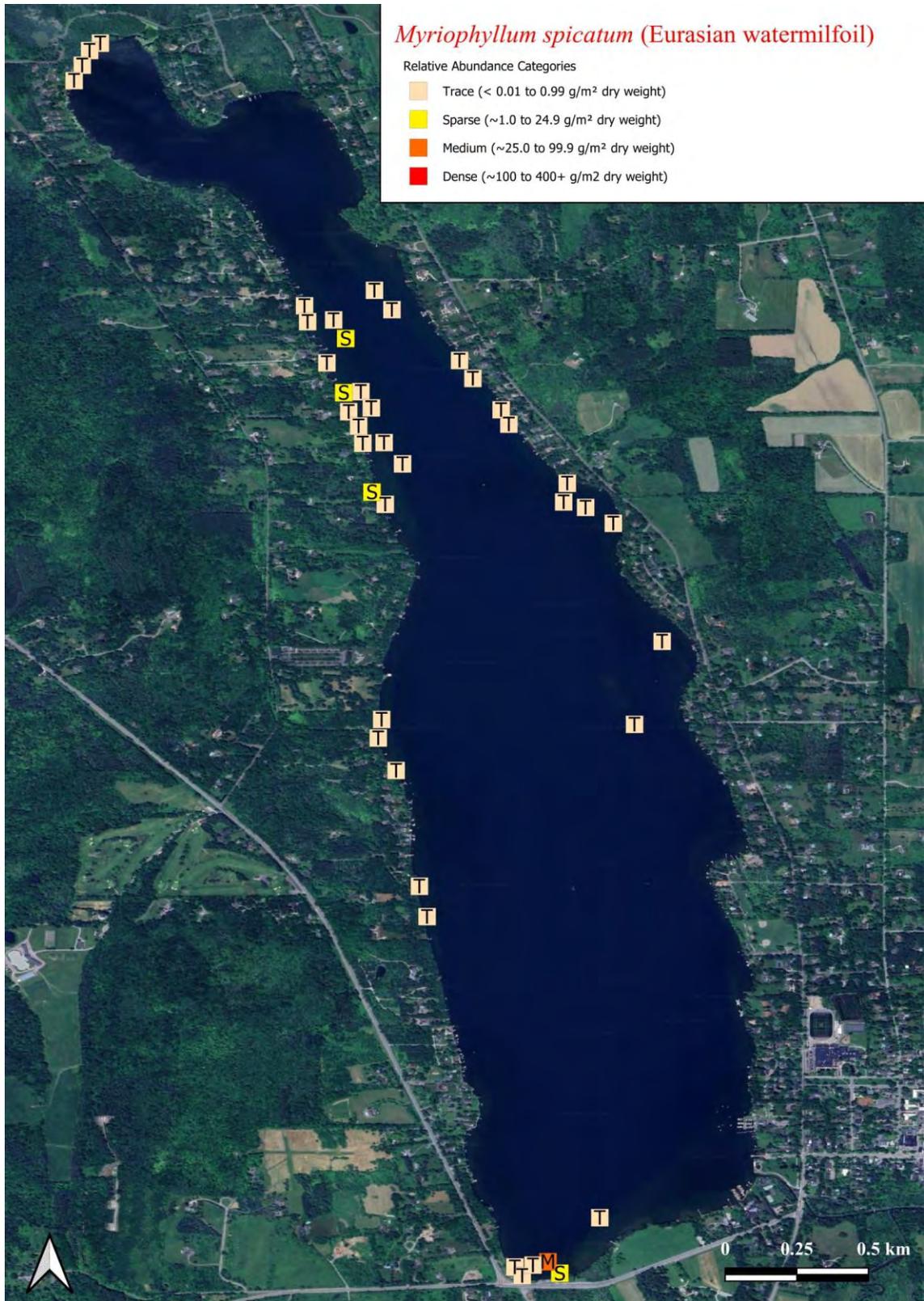


Figure 15. *Myriophyllum spicatum* (Eurasian watermilfoil) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

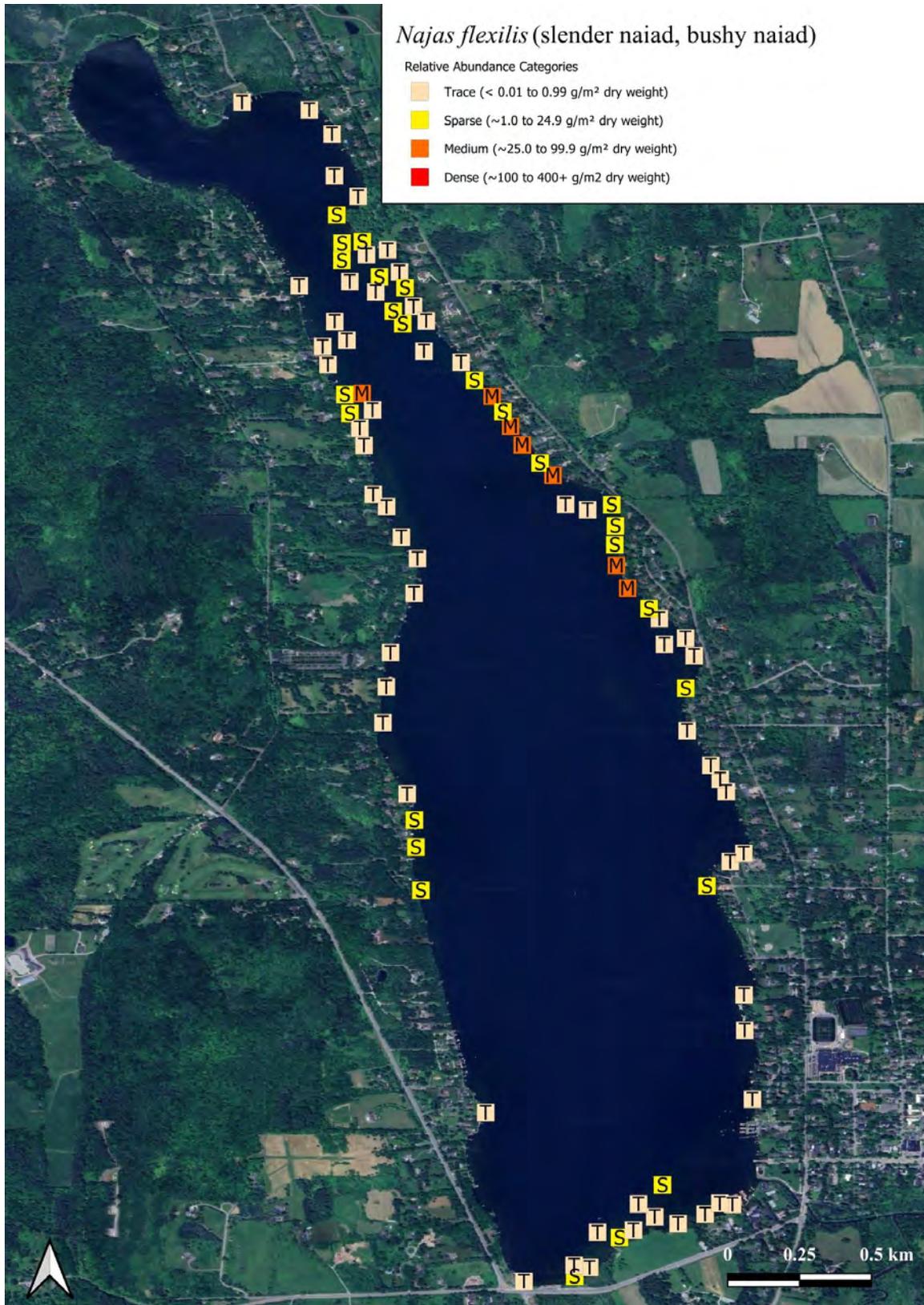


Figure 16. *Najas flexilis* (slender, bushy naiad) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

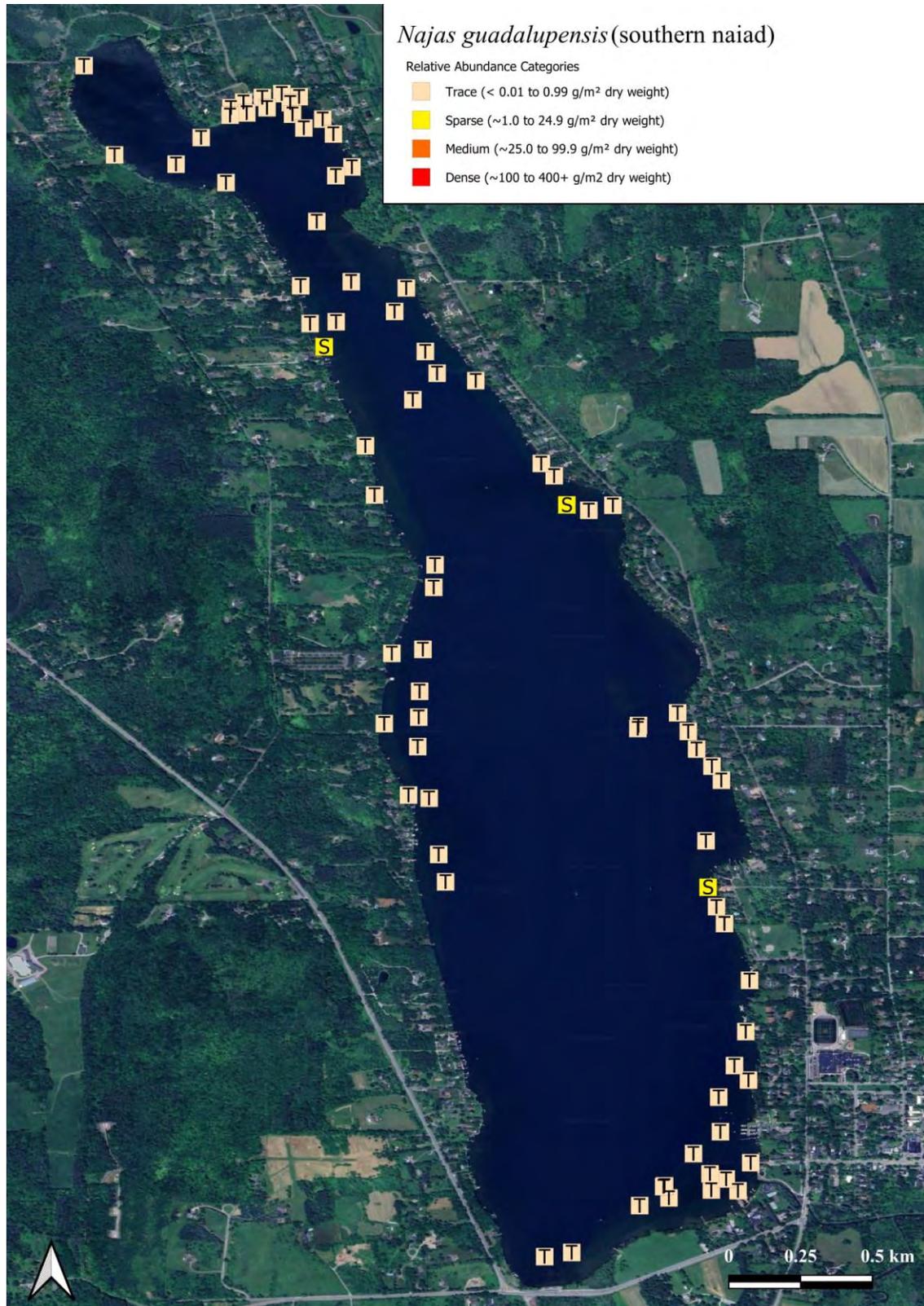


Figure 17. *Najas guadalupensis* (southern naiad) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

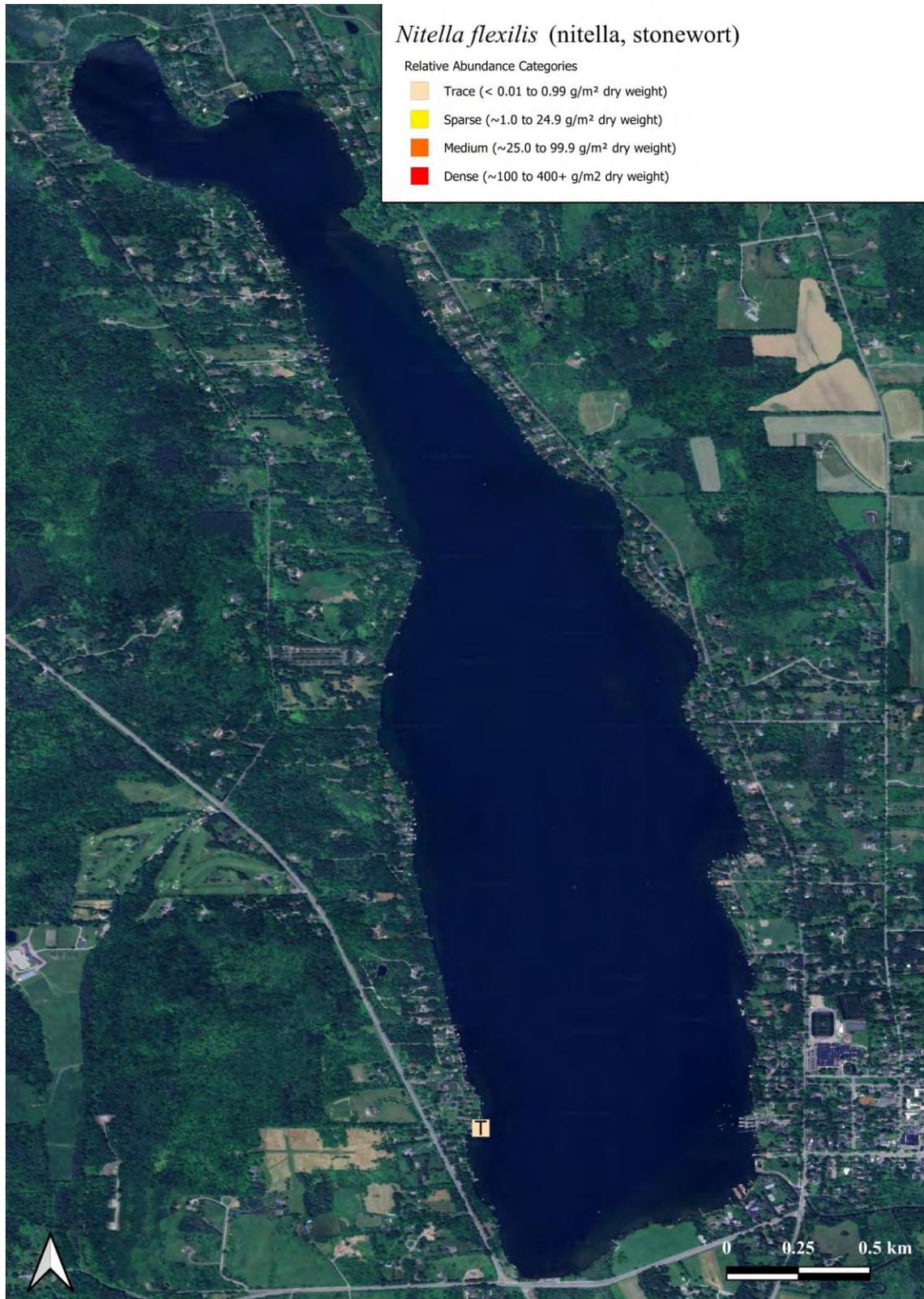


Figure 18. *Nitella flexilis* (nitella, stonewort) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

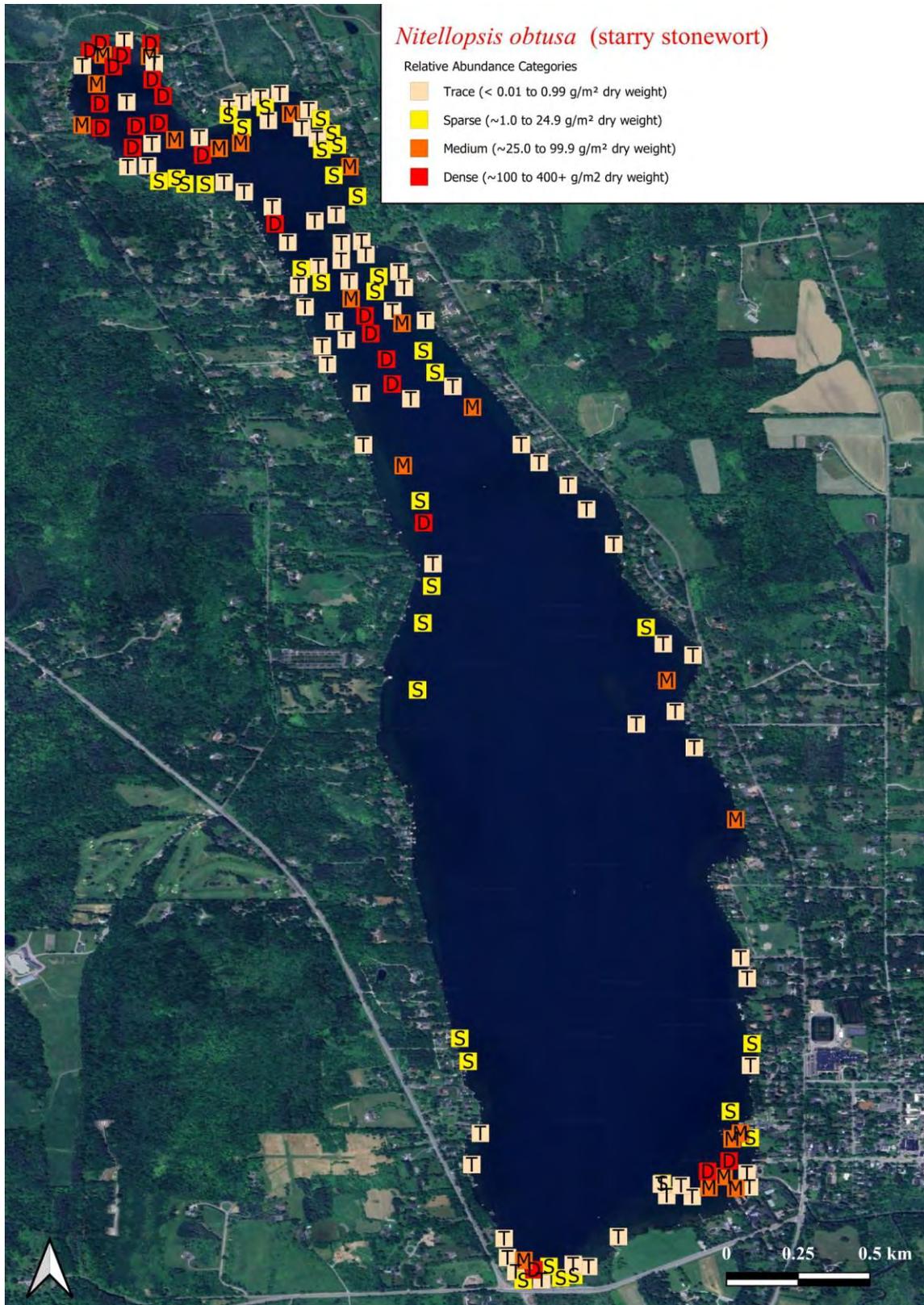


Figure 19. *Nitellopsis obtusa* (starry stonewort) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

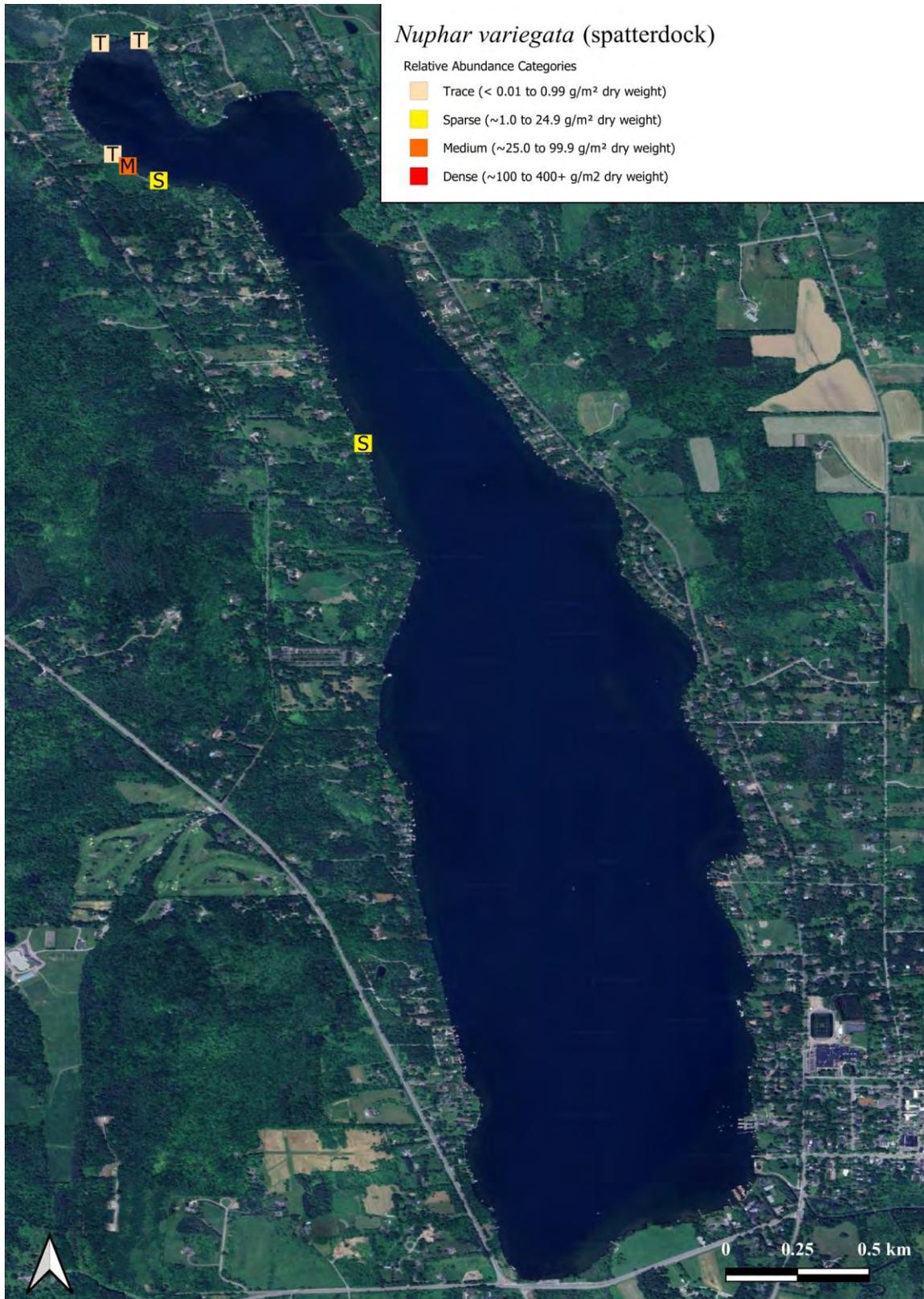


Figure 20. *Nuphar variegata* (spatterdock) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

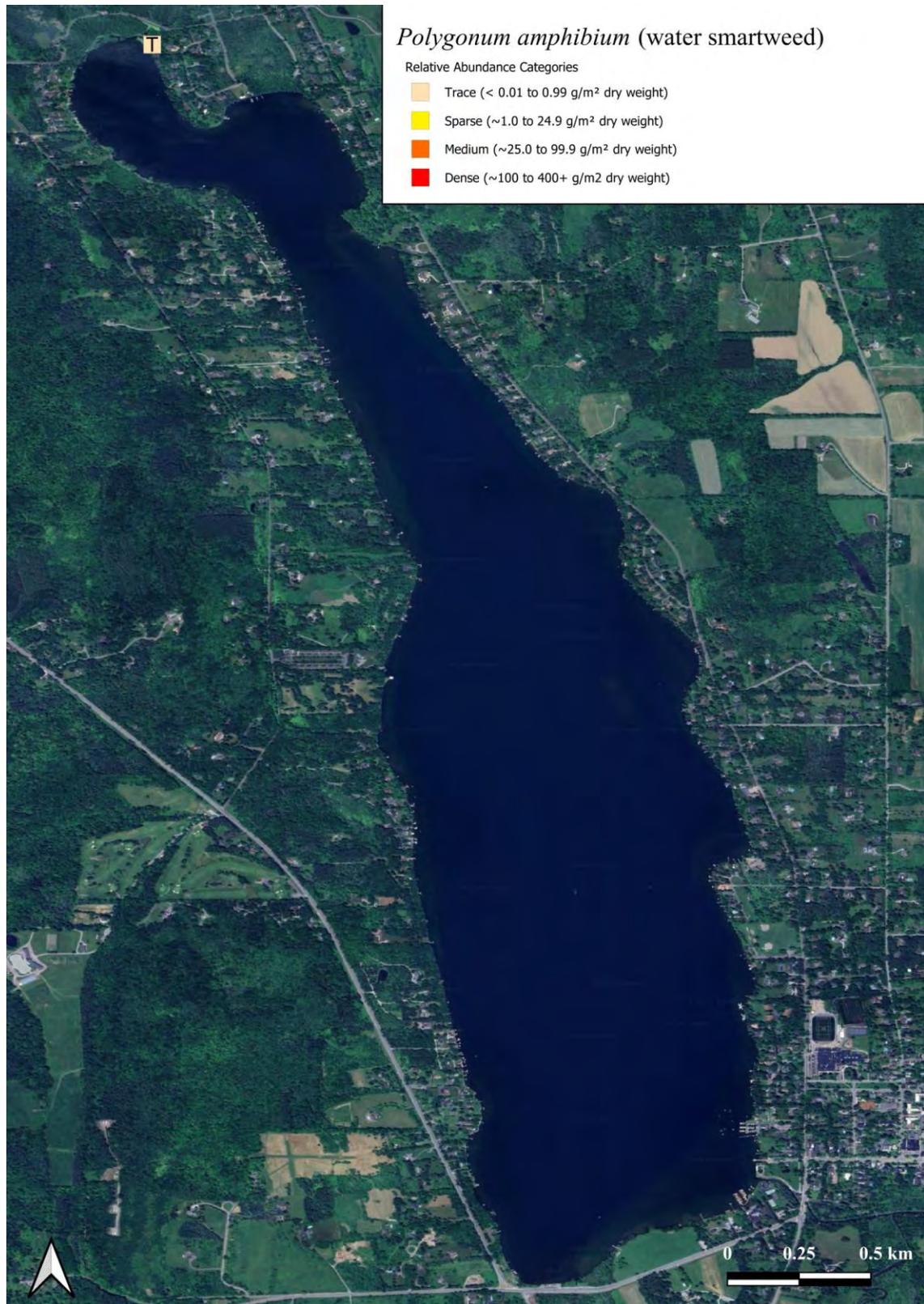


Figure 21. *Polygonum amphibium* (water smartweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

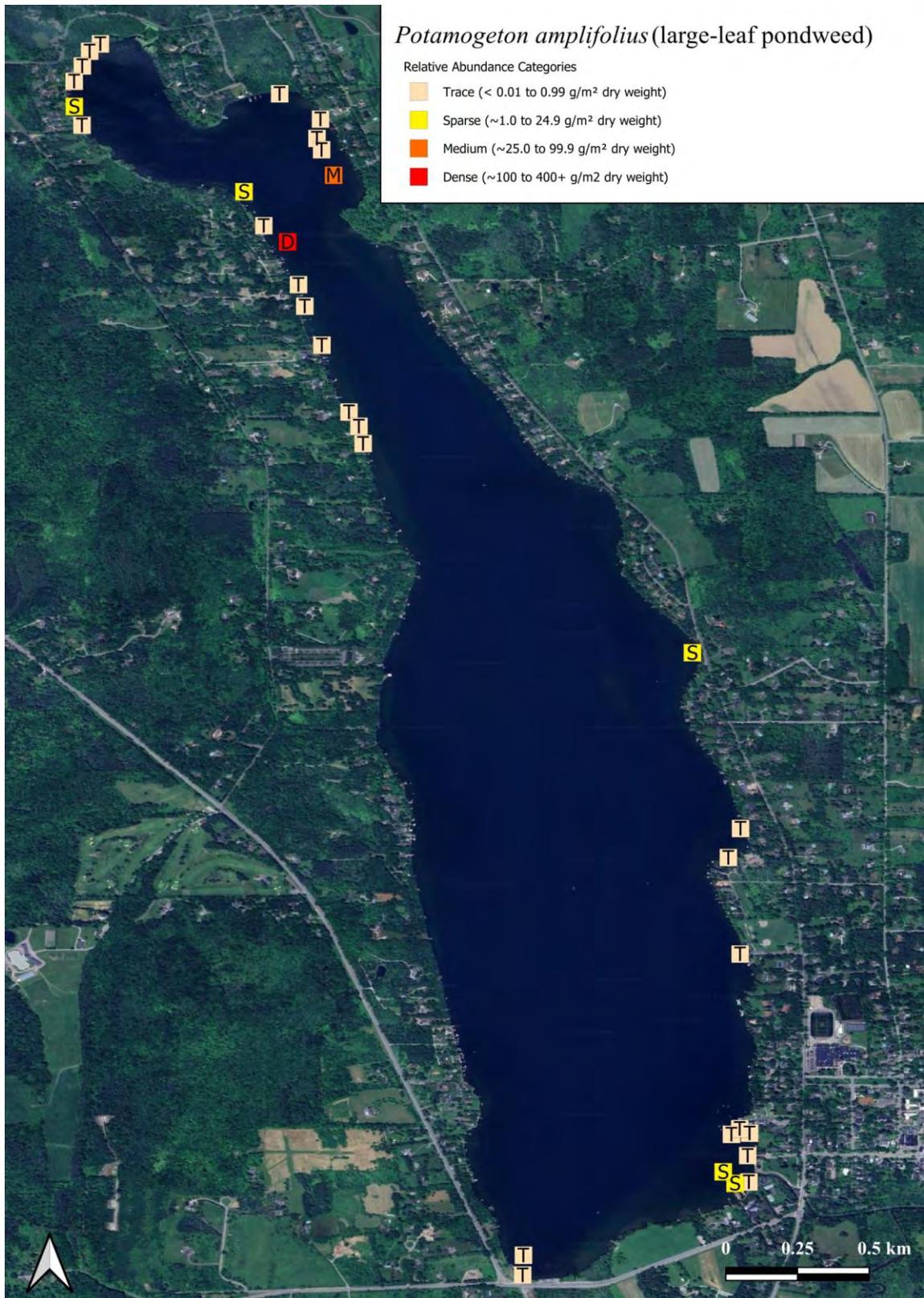


Figure 22. *Potamogeton amplifolius* (large-leaf pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

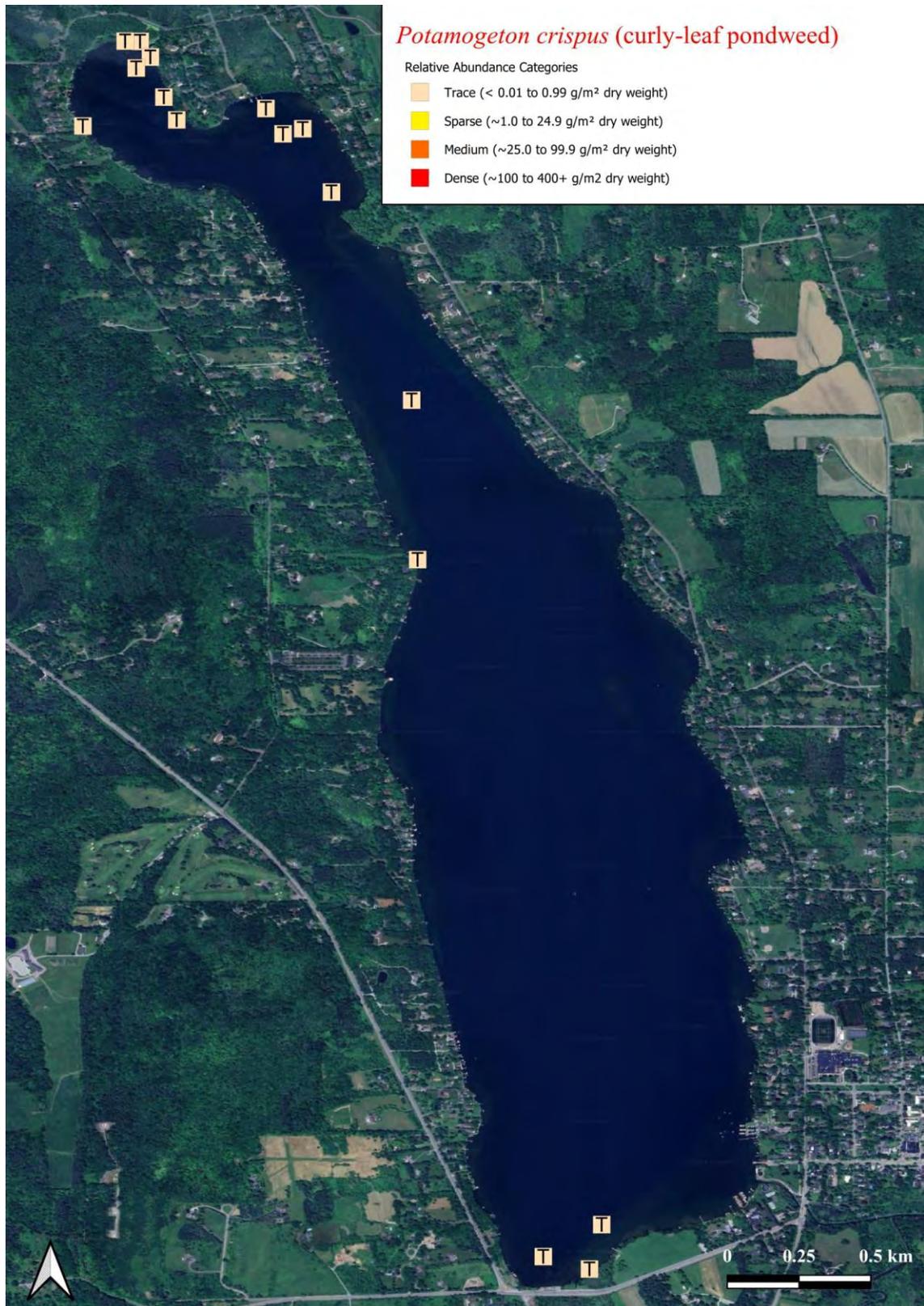


Figure 23. *Potamogeton crispus* (curly-leaf pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

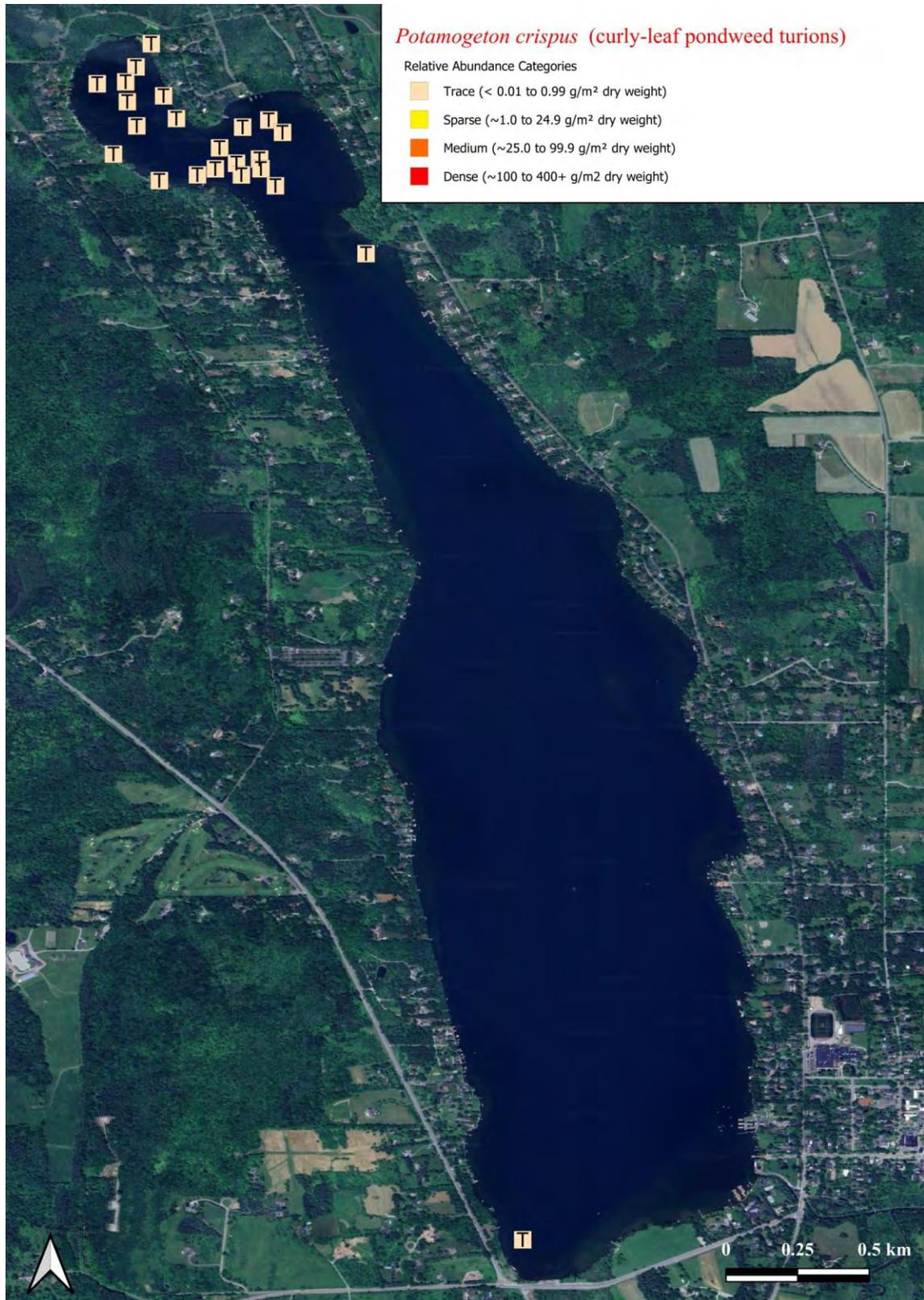


Figure 24. *Potamogeton crispus* (curly-leaf pondweed turions) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

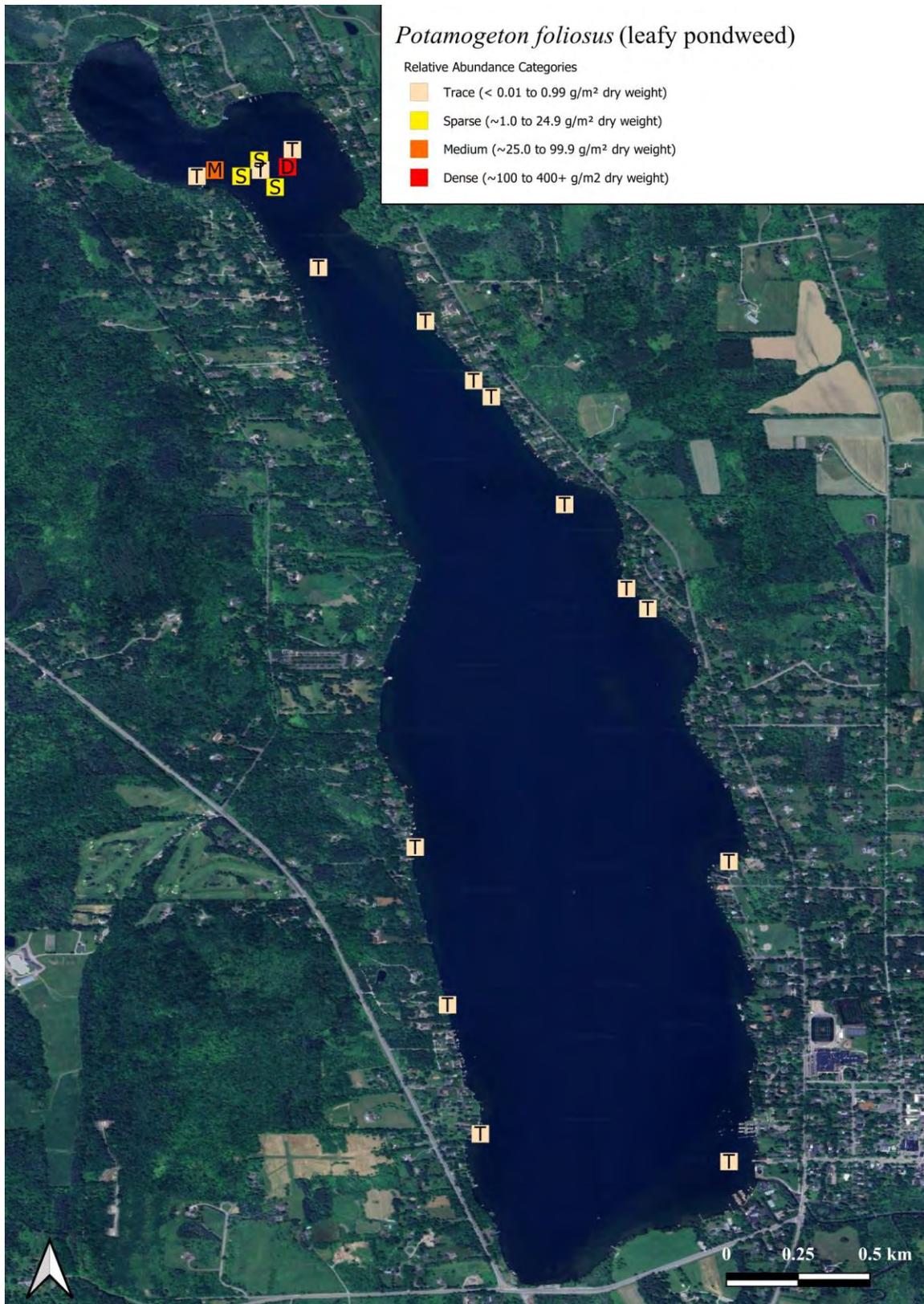


Figure 25. *Potamogeton foliosus* (leafy pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

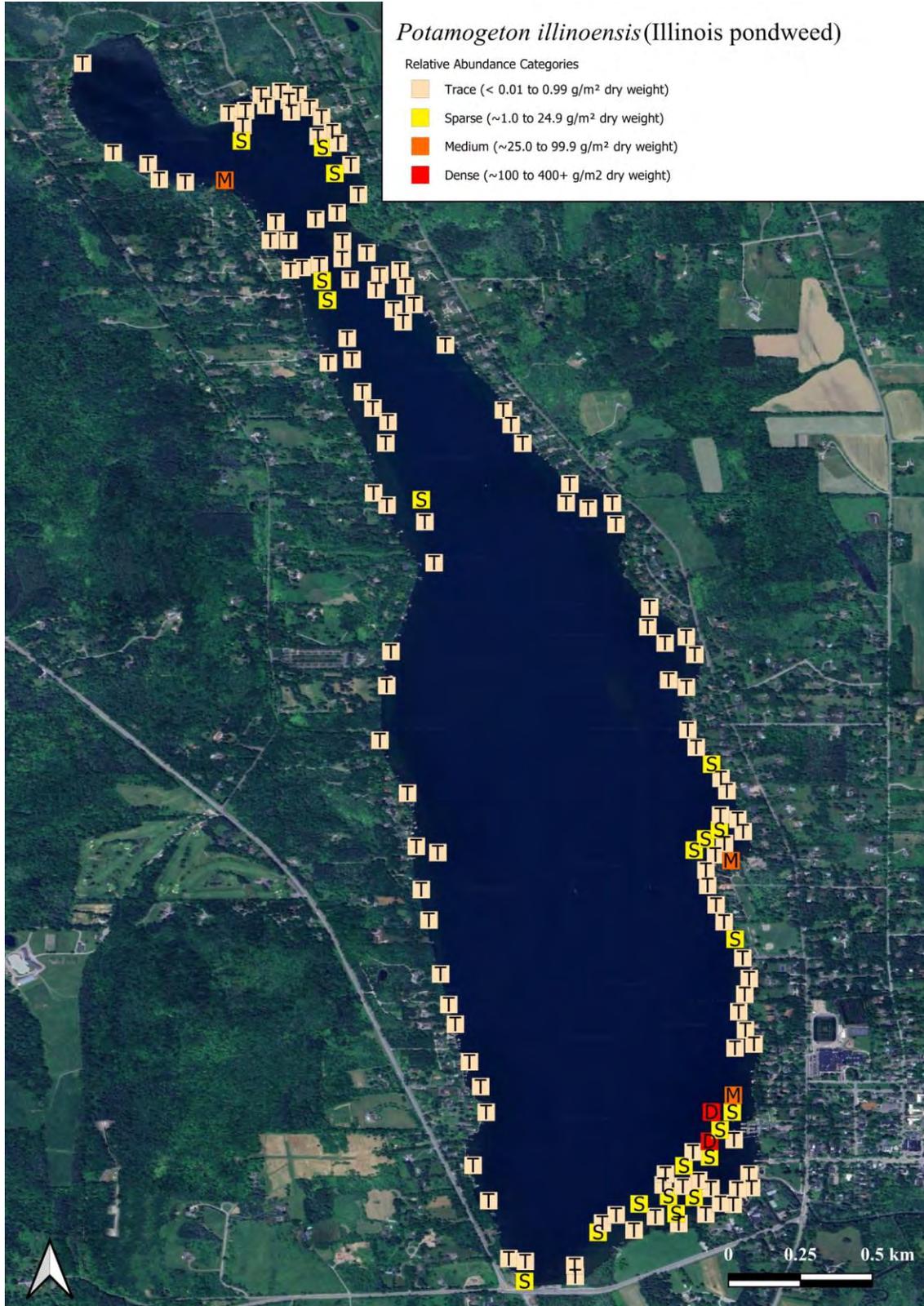


Figure 26. *Potamogeton illinoensis* (Illinois pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

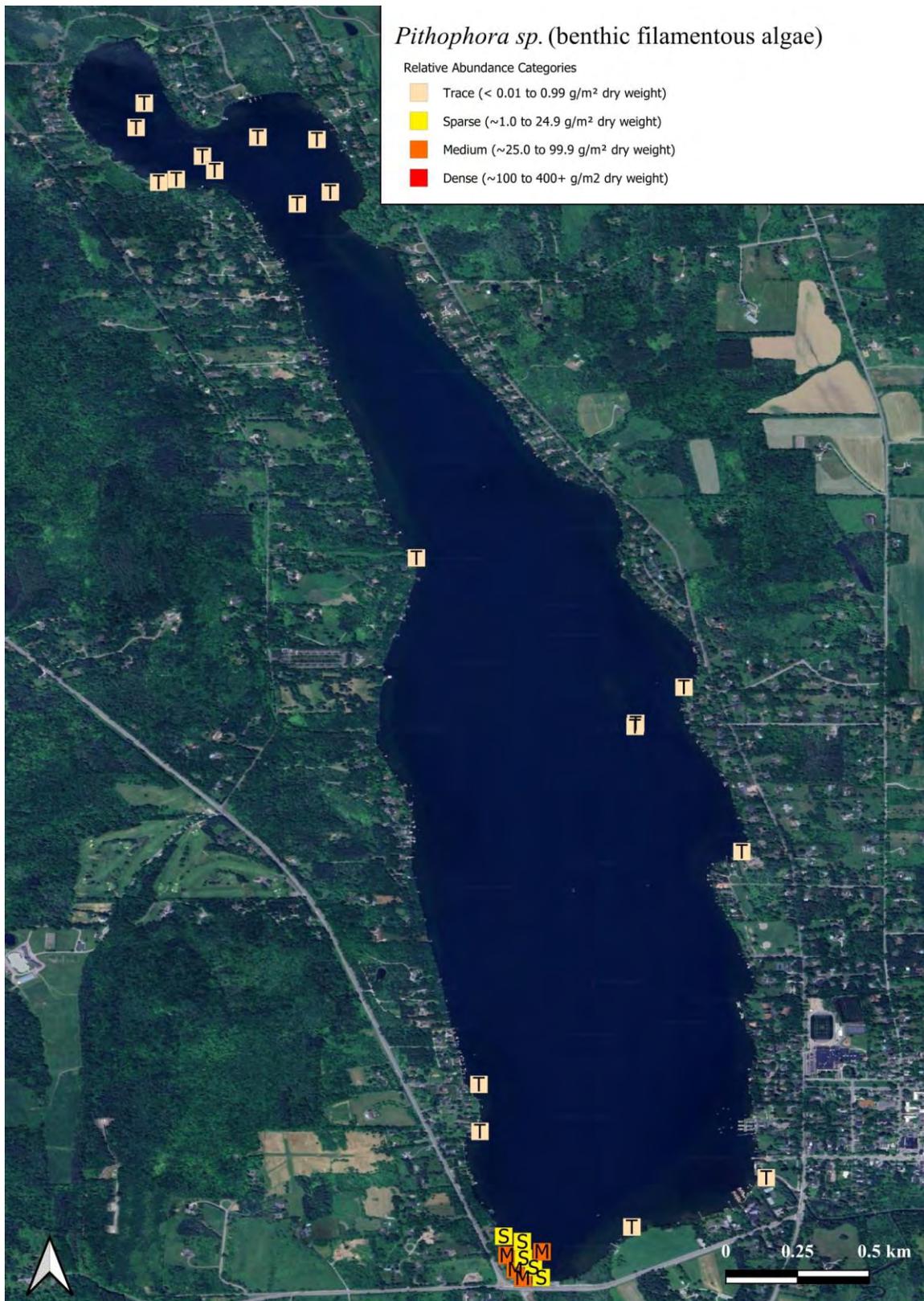


Figure 27. *Pithophora sp.* (benthic filamentous algae) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake

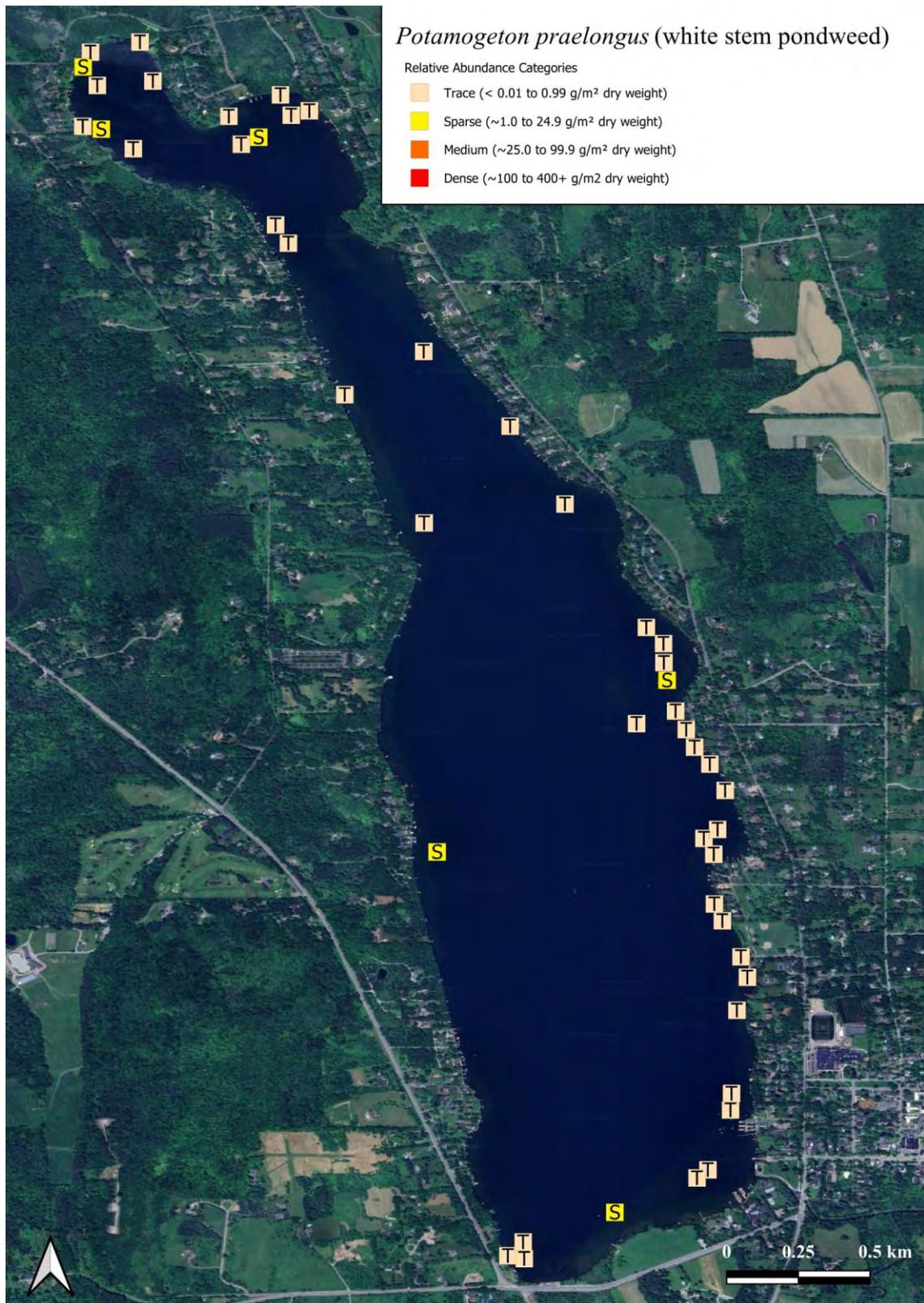


Figure 28. *Potamogeton praelongus* (white-stem pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

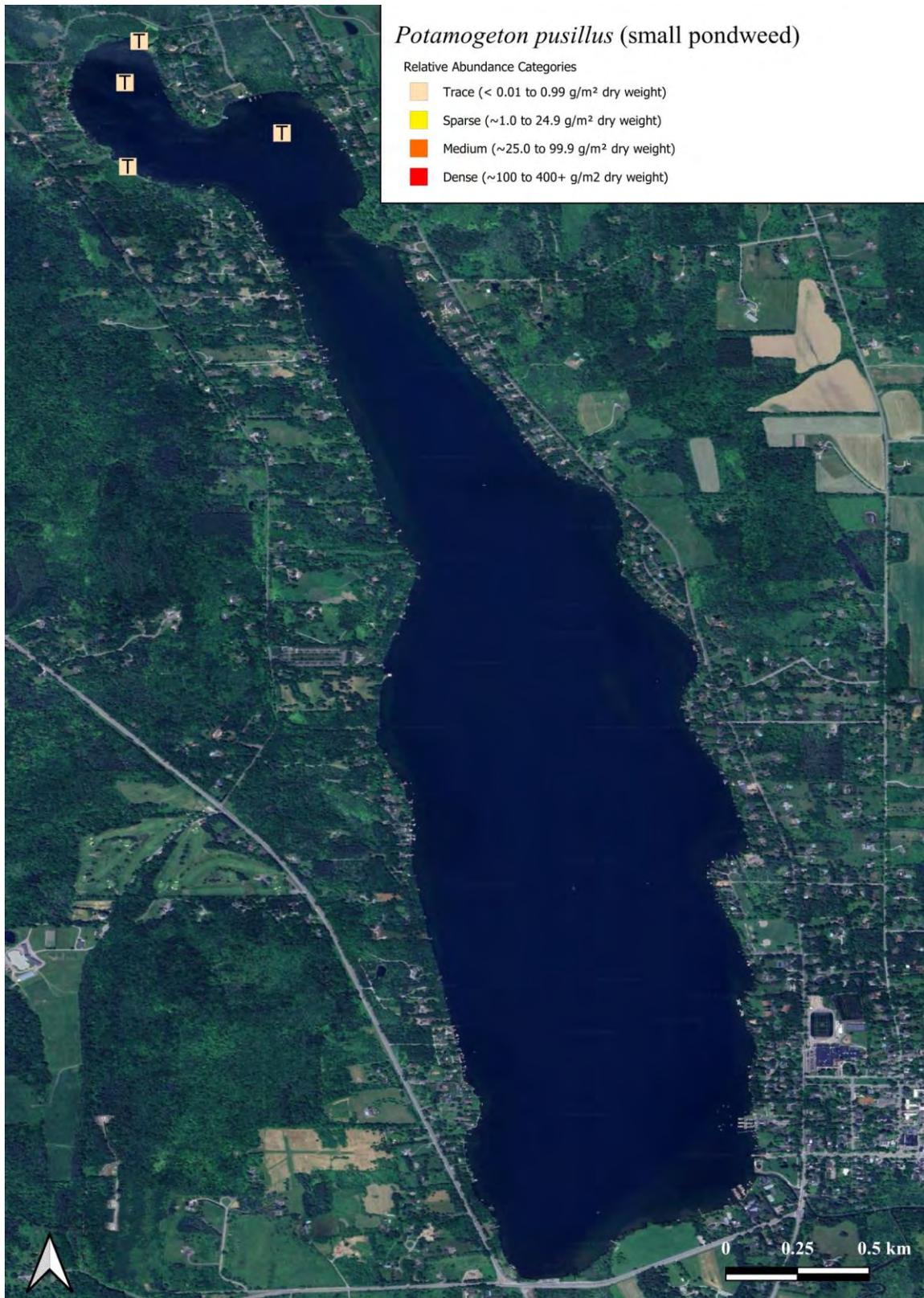


Figure 29. *Potamogeton pusillus* (small pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

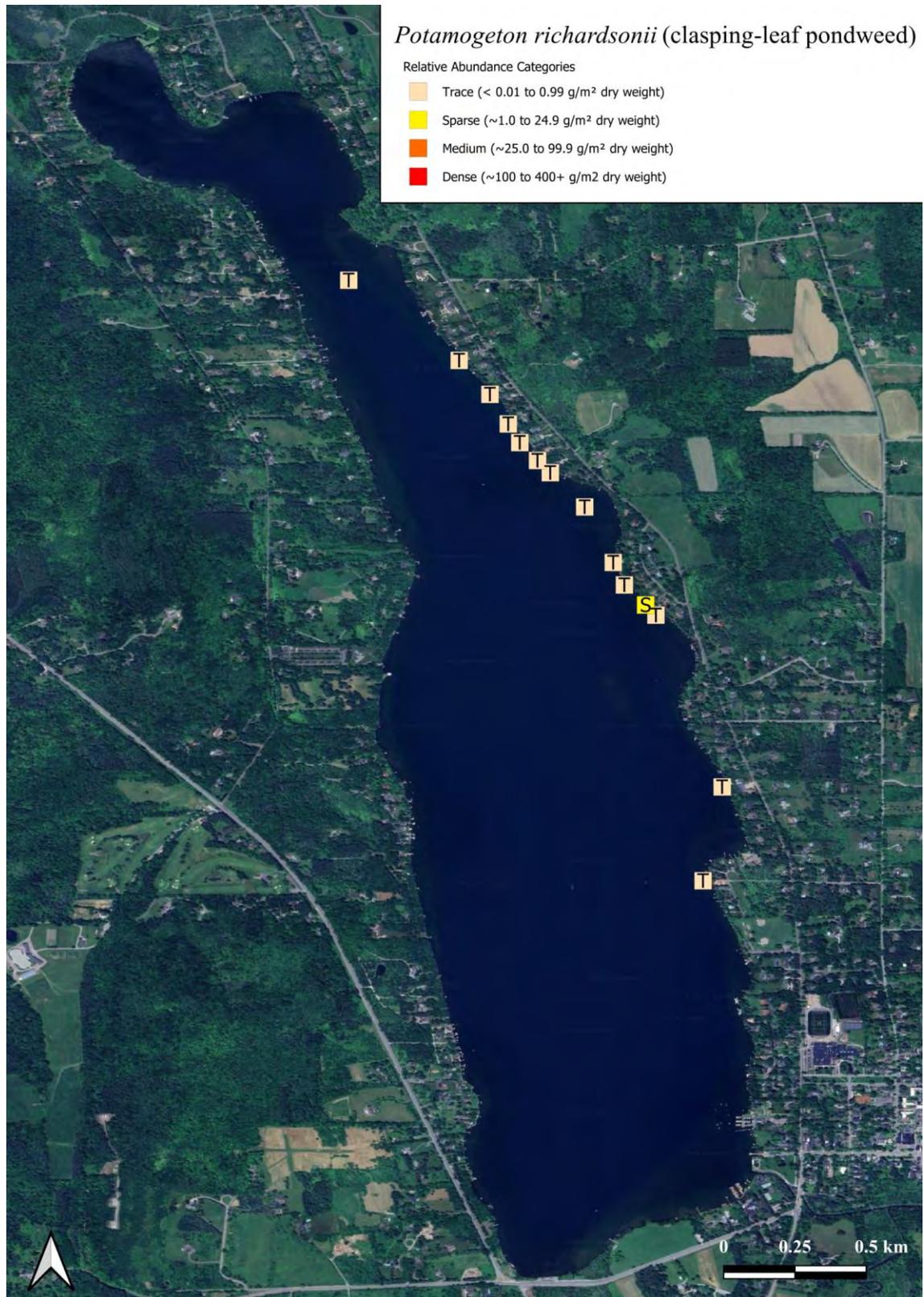


Figure 30. *Potamogeton richardsonii* (clasping-leaf pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

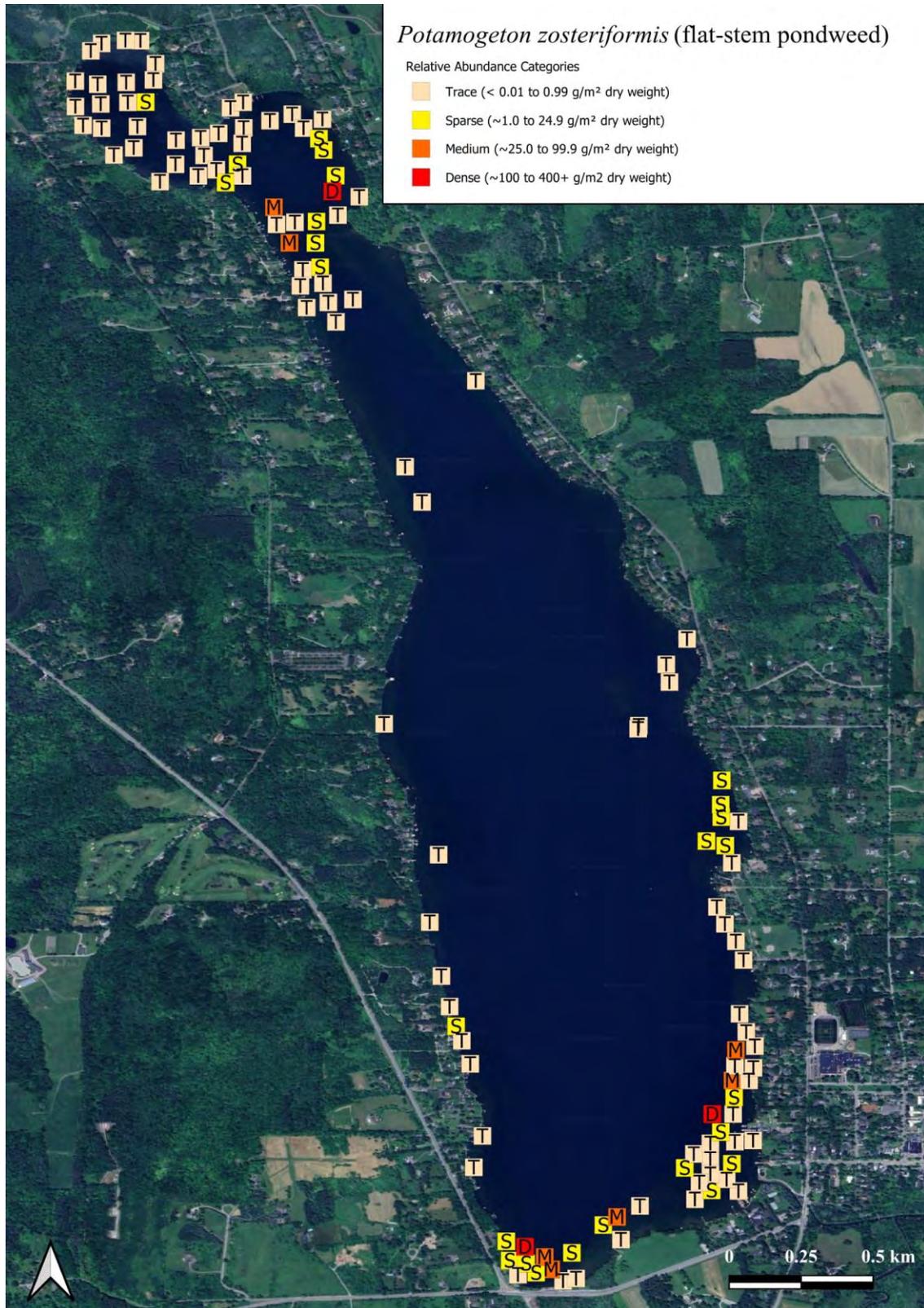


Figure 31. *Potamogeton zosteriformis* (flat-stem pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

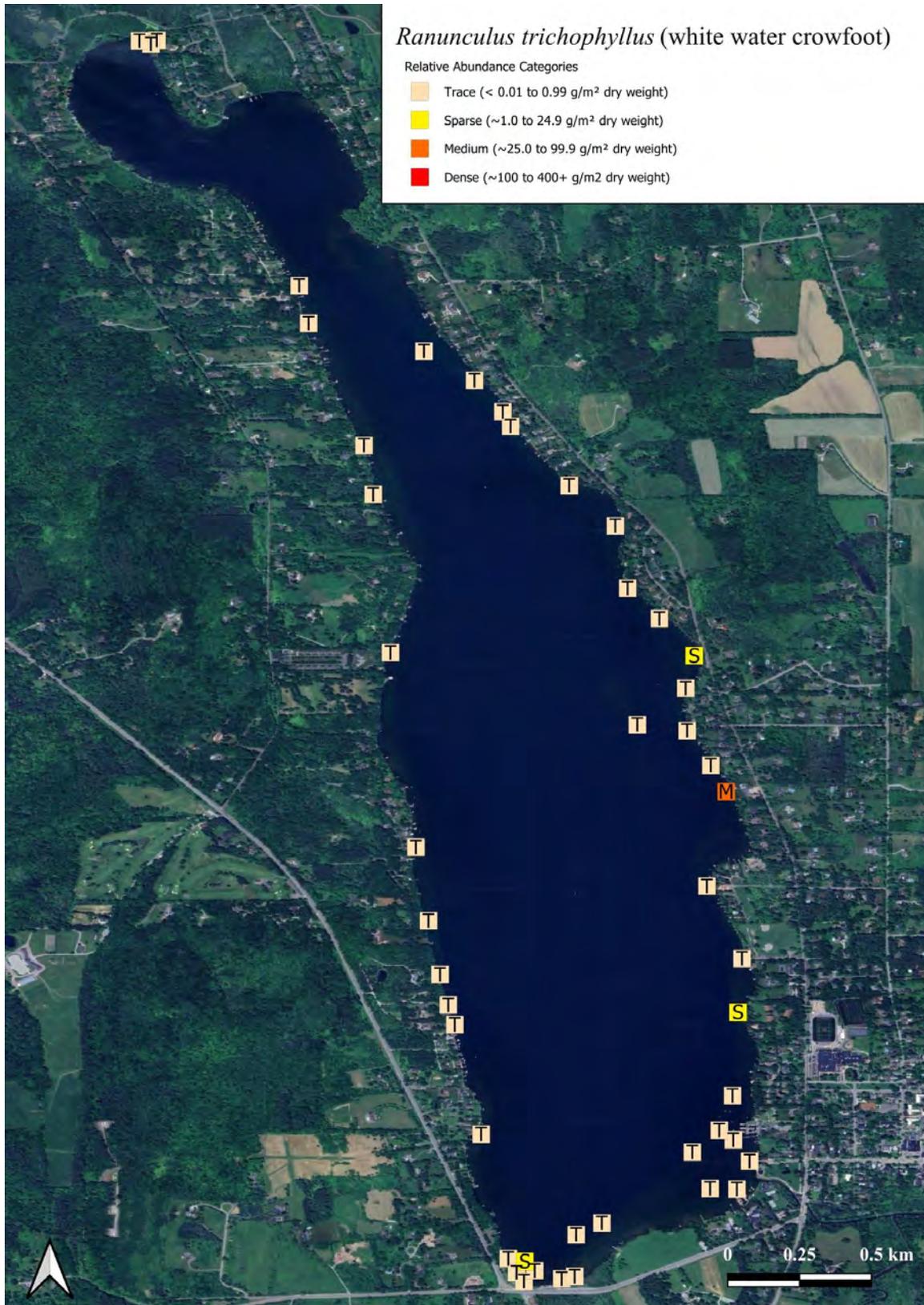


Figure 32. *Ranunculus trichophyllus* (white water crowfoot) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake



Figure 33. *Stuckenia pectinata* (sago pondweed) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

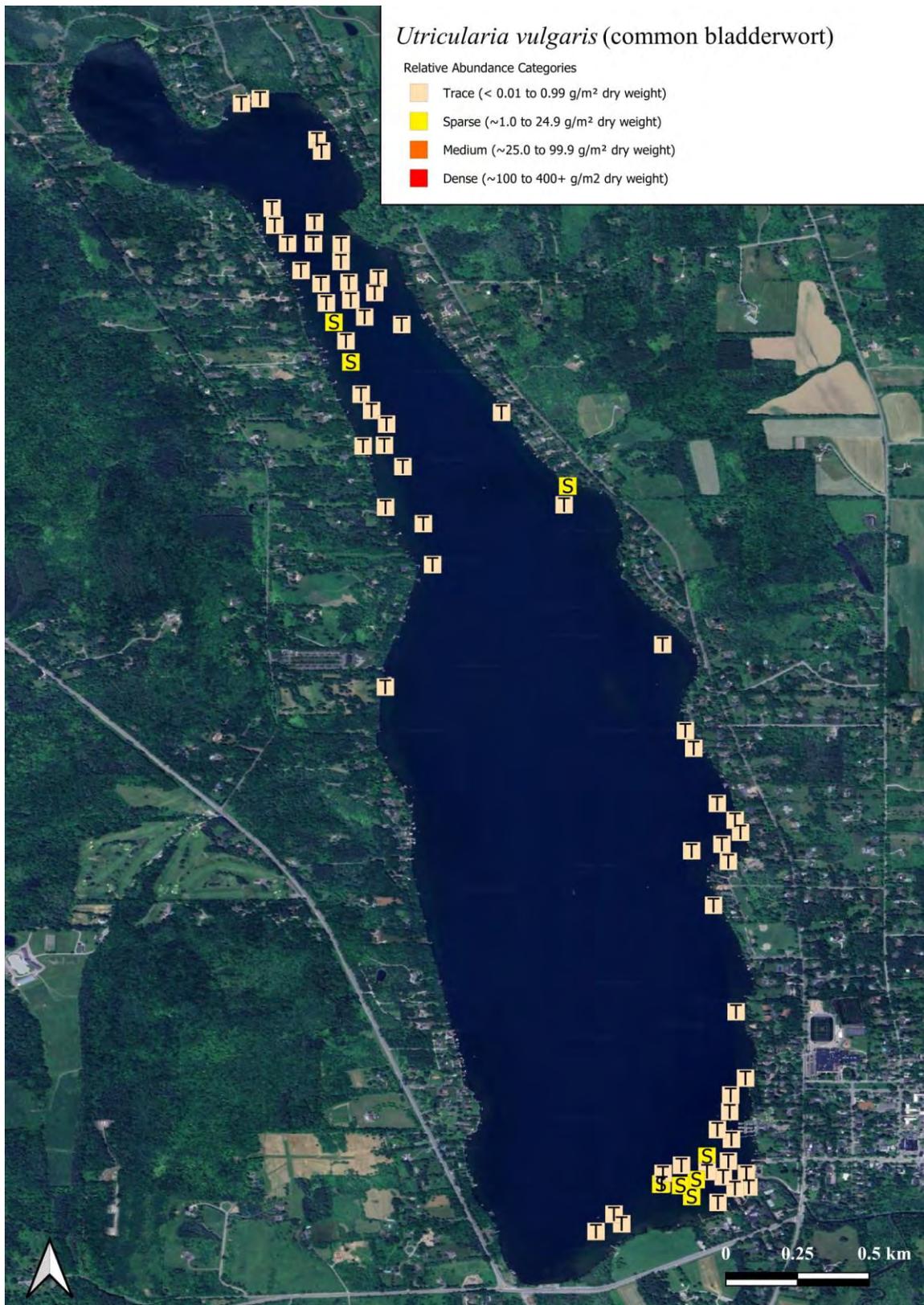


Figure 34. *Utricularia vulgaris* (common bladderwort) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

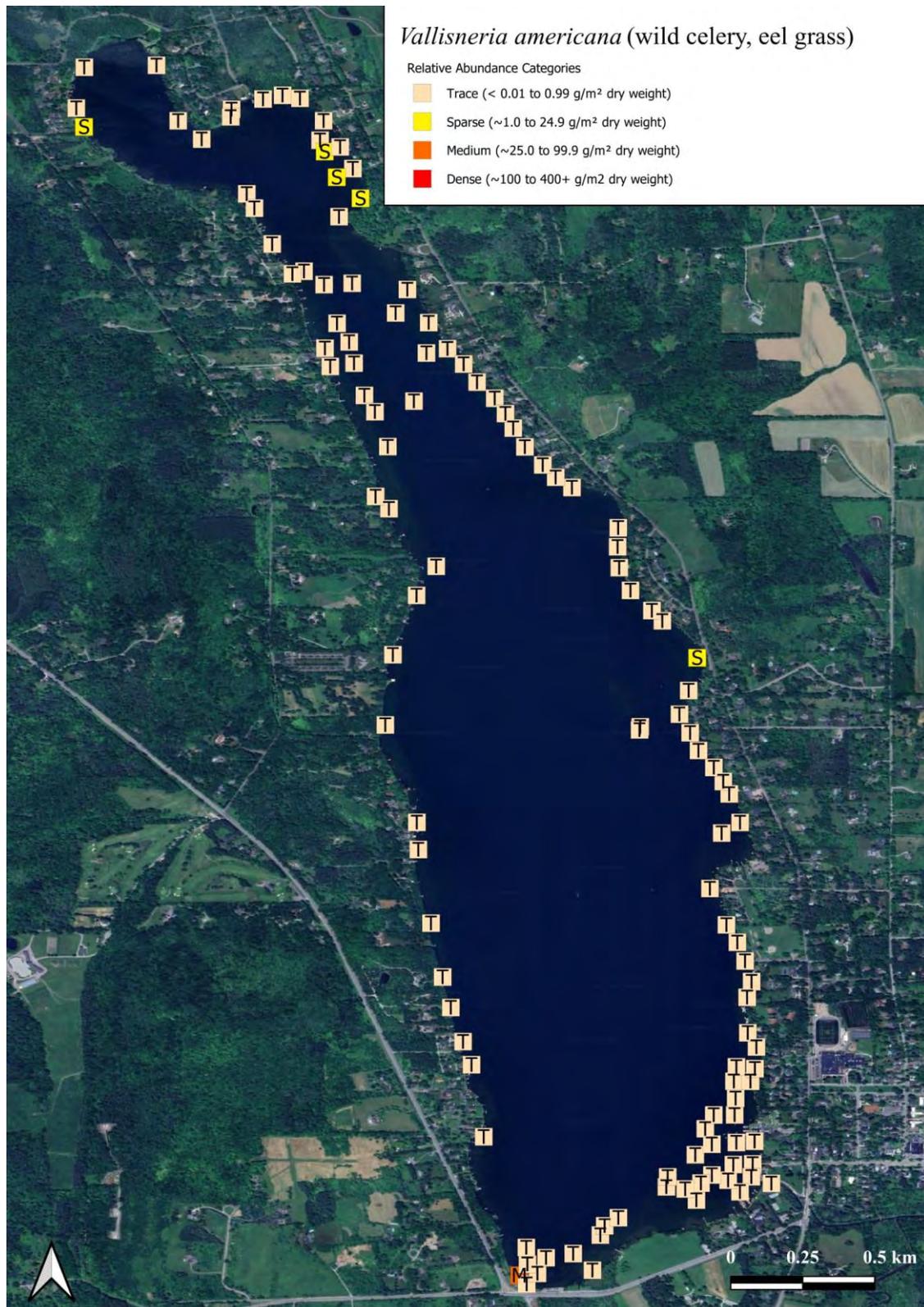


Figure 35. *Vallisneria americana* (wild celery, eel grass) as abundance by two rake-toss drags from August 1 – August 22, 2024 in Cazenovia Lake.

APPENDIX B

Table A. Results of two-rake toss drag sampling of Cazenovia Lake on August 1 – August 22, 2024 at 304 sample locations.

Table B. Conversion of August 1 – August 22, 2024 data from Table A to abundance categories for each species at each sample point.

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss drags on August 1 – August 22, 2024. Entries of “1” show species found at that sample point and sums to species total occurrences for all sample points.

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species		
1	1		1				1	1	1																								6		6	
2	1		1	1		1		1								1		1															9	3	6	
3	1		1														1						1	1			1	1					8	1	7	
4	1		1	1	1			1								1											1						8	2	6	
5	1	1			1							1				1	1	1									1						8	2	6	
6	1	1	1									1				1							1				1						8	2	6	
7	1		1													1																	3	1	2	
8	1		1													1																	3	1	2	
9	1		1	1												1																	5	2	3	
10			1		1											1											1				1		5	1	4	
11	1		1	1																1													4	1	3	
12	1		1													1																	3	1	2	
13	1	1	1	1	1							1		1		1						1	1						1			12	2	10		
14	1	1	1	1	1							1				1											1						7	1	6	
15	1															1							1										5	2	3	
16	1		1													1							1										5	1	4	
17	1		1	1												1							1	1									6	1	5	
18	1		1	1												1																	5	2	3	
19	1		1													1											1					1		4		4
20	1		1													1											1						5	2	3	
21	1															1											1						3	1	2	
22		1	1															1									1				1		5		5	
23	1	1	1													1							1							1			9	2	7	
24	1		1													1							1										5	1	4	
25	1															1											1					1	5	2	3	
26				1												1																	2	1	1	
27	1		1	1												1															1		5	1	4	
28		1	1											1		1											1				1		6	1	5	
29	1	1	1	1					1				1	1		1											1			1		10	1	9		
30		1	1	1										1		1												1	1				8	1	7	

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species	
31		1	1	1									1			1			1		1	1							1		9	1	8		
32		1												1								1								1		4	1	4	
33		1												1								1										3		3	
34		1	1	1										1		1				1		1										7	2	5	
35	1	1	1	1										1								1										6		6	
36		1		1										1		1						1	1							1		7	1	6	
37		1											1			1						1	1					1				6	1	5	
38	1	1	1											1		1						1	1			1		1				9	1	8	
39	1	1	1													1					1					1						6	2	4	
40	1	1	1													1					1					1						7	2	5	
41		1	1																							1						3		3	
42			1	1					1					1		1										1				1		7	1	6	
43			1	1												1										1						4	1	3	
44																1																1	1	1	
45	1		1													1							1									5	1	4	
46	1	1	1	1	1									1			1				1					1						10	1	9	
47	1		1	1												1	1							1								6	1	5	
48		1	1													1						1										4	1	3	
49	1		1	1										1												1						5		5	
50	1		1													1										1		1				6	1	5	
51	1		1													1										1		1				4	2	2	
52	1		1		1											1						1	1			1		1				8	1	7	
53	1		1																				1								1	4		4	
54	1		1																		1			1								4	1	3	
55	1		1											1		1										1						6	2	4	
56	1	1	1											1		1						1				1						9	1	8	
57		1											1	1		1						1										5	1	4	
58	1		1	1												1						1				1		1	1	1		11	1	10	
59																					1												1		1
60	1		1																	1	1												4	1	3

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species
61	1		1																	1						1						4	1	3
62	1		1																	1	1										1	6	1	5
63	1		1																	1	1											5	1	4
64	1		1												1																1	4	1	3
65	1		1	1											1	1				1										1	9	2	7	
66	1	1													1						1										4	1	3	
67	1	1	1												1												1				5	1	4	
68	1		1											1								1									6	1	5	
69	1		1																	1	1										5	1	4	
70			1																	1	1										3	1	2	
71																				1	1										1		1	
72	1		1												1						1						1	1	1		9	1	8	
73	1	1													1						1									1	5	1	4	
74	1	1												1							1									1	6	1	5	
75	1	1	1										1	1					1			1					1				11	1	10	
76																																0		
77			1	1																1	1										4	1	3	
78		1	1												1															1	5	1	4	
79		1	1												1													1			3		3	
80	1		1												1							1									5	1	4	
81			1																											1	2		2	
82	1																			1										1	4	1	3	
83		1	1										1								1								1	7	1	6		
84		1											1								1						1			1	7	1	6	
85	1		1											1								1						1			7	1	6	
86	1		1																			1									3		3	
87	1		1												1						1	1						1			7	1	6	
88		1																	1												2		2	
89		1	1																			1							1		4		4	
90	1		1												1					1		1	1					1	1		9	1	8	

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species	
91	1		1																							1							5		5
92		1	1										1			1						1						1					6	1	5
93		1											1			1																	3	1	2
94		1											1																				2		2
95		1											1			1				1													5	2	3
96		1	1										1			1					1							1					6	1	5
97	1		1													1				1	1					1		1					7	1	6
98		1														1					1					1		1	1				6	1	5
99		1																				1								1			3		3
100		1	1										1	1		1		1								1	1						8	1	7
101		1	1													1						1				1		1	1				8	1	7
102			1	1									1	1		1						1			1			1	1				9	1	8
103		1	1										1			1						1						1					6	1	5
104		1											1			1						1											4	1	3
105		1	1										1	1		1						1								1			7	1	6
106		1	1									1	1			1						1						1					7	2	5
107	1		1													1										1		1					5	1	4
108		1	1																			1					1		1				5		5
109		1	1									1				1		1								1							6	2	4
110		1	1									1		1													1	1					5	1	4
111		1	1									1	1	1		1										1		1	1	1			10	2	8
112	1	1	1													1												1					5	1	4
113		1	1									1	1	1		1						1								1			8	2	6
114		1	1										1									1											4		4
115		1		1							1		1			1				1										1			7	1	6
116		1											1			1						1						1	1				6	1	5
117		1	1													1																	3	1	2
118		1		1								1	1			1						1							1	1			8	2	6
119		1	1										1	1		1				1										1			7	1	6
120		1										1	1			1						1								1			6	2	4

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemma minor</i>	<i>Lemma trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species		
121		1																			1							1				4		4		
122	1															1												1					2	1	1	
123	1	1	1	1									1	1		1							1				1						10	1	9	
124					1																	1							1				3		3	
125			1		1							1	1											1									6	1	5	
126			1	1										1		1																	4	1	3	
127			1	1												1																	3	1	2	
128		1										1	1			1						1						1	1				7	2	5	
129		1										1	1										1				1						5	1	4	
130		1										1	1					1															4	1	3	
131	1	1		1								1	1									1					1	1	1				9	1	8	
132			1											1		1				1													5	2	3	
133			1													1																	2	1	1	
134			1									1	1	1							1					1	1						8	1	7	
135			1		1								1								1			1									6		6	
136			1	1												1																	3	1	2	
137																																		0		
138		1																				1											3		3	
139		1										1	1						1														4	1	3	
140		1	1		1							1	1	1		1	1									1		1					11	2	9	
141		1	1	1								1										1						1	1				7	1	6	
142	1	1	1		1							1				1									1			1					8	2	6	
143		1																															1		1	
144		1										1	1									1						1	1				6	1	5	
145	1		1	1												1						1				1		1					7	1	6	
146		1	1													1						1	1						1				6	1	5	
147		1											1																				2		2	
148		1			1								1							1													5	1	4	
149		1	1	1										1		1						1						1	1				8	1	7	
150			1											1		1																	3	1	2	

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species				
151													1																				2		2			
152	1	1			1							1	1	1								1						1					9	1	8			
153	1	1														1																	3	1	2			
154	1			1										1																			3		3			
155		1			1								1	1																			7		7			
156		1											1																	1			4		4			
157			1	1									1			1																	4	1	3			
158				1										1																				2		2		
159		1	1		1							1	1	1												1					1			8	1	7		
160	1	1	1									1										1												5	1	4		
161				1										1																				2		2		
162																																		0				
163		1										1																						2	1	1		
164		1	1		1								1	1									1											6		6		
165	1		1	1										1																				4		4		
166				1																														1		1		
167		1											1																			1			3		3	
168	1	1	1										1								1	1									1			8		8		
169	1		1	1										1								1	1											7		7		
170	1			1									1																					3		3		
171		1			1							1	1										1						1					6	1	5		
172		1	1		1							1											1				1	1						8	1	7		
173	1			1																															2		2	
174	1	1	1	1																															4		4	
175	1		1																			1										1			6		6	
176	1		1	1																	1	1									1			8		8		
177	1		1																			1					1	1						5		5		
178	1	1	1													1											1					1			6	1	5	
179	1		1													1											1		1						7	1	6	
180		1																				1											1			3		3

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species	
181		1											1																			3		3	
182	1	1	1		1										1	1					1					1	1	1		1	1	12	1	11	
183		1														1						1				1						4	1	3	
184		1																				1										2		2	
185		1	1													1										1						5	1	4	
186	1	1	1													1	1					1	1			1	1	1			10	1	9		
187	1		1								1					1						1	1			1	1				8	2	6		
188	1		1		1						1		1					1				1				1	1				11	2	9		
189	1	1	1		1				1							1															7	1	6		
190	1	1	1		1							1				1									1	1					8	2	6		
191	1	1	1						1	1		1				1						1			1	1					10	1	9		
192		1										1				1				1									1		5	2	3		
193		1	1									1				1						1									5	1	4		
194	1		1		1					1	1					1									1						7	2	5		
195	1		1									1				1									1	1				1	1	8	2	6	
196	1		1													1						1	1			1	1			1	1	10	1	9	
197	1		1										1							1					1				1	1	7	1	6		
198	1	1	1											1											1				1		6		6		
199		1											1			1										1					1		1		
200		1											1			1									1						4	1	3		
201		1			1							1										1						1	1	1	7		7		
202																											1				1		1		
203																																0			
204	1		1	1																1			1			1				1	1	8	1	7	
205		1											1									1									1		4		4
206		1																													1		1		1
207		1											1															1			4		4		4
208		1											1																		3		3		3
209		1	1										1																		4		4		4
210		1													1				1			1							1		5	1	4		4

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species		
211	1		1																													1	4		4	
212	1	1	1											1					1								1			1			7		7	
213	1	1		1												1						1						1	1				7	1	6	
214	1	1	1											1		1			1			1				1	1		1	1			11	1	10	
215		1											1									1							1					4		4
216		1																				1												2		2
217		1											1									1						1						4		4
218		1																											1					2		2
219	1		1	1							1	1								1		1				1	1	1	1		1			11	2	9
220	1		1	1																		1	1			1		1	1	1				9		9
221		1	1	1									1	1								1				1		1						8		8
222	1	1	1											1		1						1												6	1	5
223		1		1												1						1					1		1	1				7	1	6
224	1	1	1											1		1						1				1	1							8	1	7
225	1	1	1	1										1					1			1				1		1	1					10	1	9
226	1	1														1					1					1		1	1	1				8	1	7
227	1		1	1																		1				1		1						6		6
228			1	1										1		1							1			1		1	1	1				9	1	8
229	1	1	1	1							1											1	1			1		1	1	1				11		11
230	1	1	1						1													1					1		1	1				9	1	8
231		1												1		1											1	1	1					5	1	4
232	1	1	1	1									1	1		1													1					9	1	8
233	1		1	1																		1						1	1	1				7		7
234	1		1	1																		1				1		1	1					7		7
235			1	1										1								1				1	1	1		1				8		8
236	1		1	1																		1					1							7		7
237	1		1													1						1				1	1		1	1				9	1	8
238	1	1	1													1										1					1			7	1	6
239	1	1														1																		4	1	3
240	1		1											1												1	1	1	1					8		8
241	1																														1			2		2
242	1																									1					1			4		4

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species				
243	1	1	1	1												1						1				1	1	1	1			11	1	10				
244		1																				1												1		1		
245		1											1																					2		2		
246	1		1	1																		1	1			1	1	1	1	1				10		10		
247														1																					1		1	
248		1	1																							1					1				4		4	
249		1		1										1												1		1	1						6		6	
250		1														1										1				1				4	1	3		
251	1		1											1												1				1				5		5		
252	1		1																			1				1		1						5		5		
253	1	1	1													1						1				1		1		1				8	1	7		
254	1	1	1	1									1	1								1				1		1		1				10		10		
255	1	1	1	1						1												1	1			1	1	1	1					10		10		
256		1											1									1								1				4		4		
257		1												1								1	1					1		1				7	1	6		
258	1	1	1													1			1			1	1			1	1	1		1				11	1	10		
259	1	1	1																1							1		1		1					7		7	
260	1	1	1											1								1	1			1				1				8		8		
261	1	1	1											1								1	1			1		1	1					9		9		
262		1	1										1	1								1			1		1			1				8		8		
263		1																				1												2		2		
264	1		1																			1						1	1						5		5	
265		1	1																			1	1												4		4	
266	1	1	1	1									1					1		1		1				1			1					10		10		
267		1	1										1																					1		4		4
268	1		1																			1				1		1	1						6		6	
269	1		1											1								1	1			1		1						7		7		
270	1		1																			1	1							1					5		5	
271		1	1															1				1							1						5		5	
272		1	1													1						1				1		1	1	1					8	1	7	

Table C. Presence of aquatic plant species in Cazenovia Lake from two rake-toss samples on August 1 - August 22, 2024. Entries of "1" show species found at that sample point and sums to total occurrences for all sample points.

Sample Point (SP)	<i>Ceratophyllum demersum</i>	<i>Chara vulgaris</i>	<i>Elodea</i> sp.	<i>Fontinalis</i> sp.	<i>Heteranthera dubia</i>	<i>Hydrocharis morsus-ranae</i>	<i>Juncus</i> sp.	<i>Lemna minor</i>	<i>Lemna trisulca</i>	<i>Megalodonta beckii</i>	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum spicatum</i>	<i>Najas flexilis</i>	<i>Najas guadalupensis</i>	<i>Nitella flexilis</i>	<i>Nitellopsis obtusa</i>	<i>Nuphar variegata</i>	<i>Polygonum amphibium</i>	<i>Potamogeton amplifolius</i>	<i>Potamogeton crispus</i>	<i>Potamogeton foliosus</i>	<i>Potamogeton illinoensis</i>	<i>Potamogeton praelongus</i>	<i>Potamogeton pusillus</i>	<i>Potamogeton richardsonii</i>	<i>Potamogeton zosteriformis</i>	<i>Ranunculus trichophyllus</i>	<i>Stuckenia pectinata</i>	<i>Utricularia vulgaris</i>	<i>Vallisneria americana</i>	<i>Pithophora</i> sp.	Total Species	Non-Native Species	Native Species				
273	1		1	1																						1							5		5			
274	1		1																			1				1		1						5		5		
275		1	1		1								1									1	1		1					1				9		9		
276	1	1	1										1	1								1				1				1				8		8		
277	1		1	1									1	1								1	1				1			1				9		9		
278	1	1	1	1									1	1		1						1	1					1	1					10	1	9		
279			1		1				1				1	1								1	1			1		1	1					10		10		
280	1	1	1										1	1		1							1						1	1	1				7	1	6	
281		1											1									1					1				1	1			6		6	
282	1		1													1						1	1			1									6	1	5	
283	1		1																				1			1		1								5		5
284		1	1										1			1		1				1					1			1						8	1	7
285		1											1									1				1										4		4
286		1	1		1							1	1			1						1	1					1	1						10	2	8	
287	1		1													1						1	1													5	1	4
288													1												1		1				1					4		4
289			1		1								1								1	1			1					1						7		7
290		1	1		1								1								1				1		1			1						8		8
291	1	1											1											1						1						5		5
292		1											1			1														1						4	1	3
293		1	1		1							1	1									1					1			1						8	1	7
294		1	1		1								1	1								1														6		6
295		1	1	1								1	1	1		1						1			1											9	2	7
296			1		1							1	1	1							1	1	1						1							9	1	8
297		1	1		1							1				1						1					1		1	1						9	2	7
298					1								1	1										1						1						5		5
299		1											1	1		1								1					1	1						6	1	5
300		1	1		1								1			1						1			1			1			1					9	1	8
301		1	1		1							1	1									1	1		1		1			1						10	1	9
302			1		1							1	1									1					1	1	1	1						9	1	8
303	1		1										1			1							1			1	1			1	1					9	1	8
304			1									1		1												1				1	1					6	1	5

