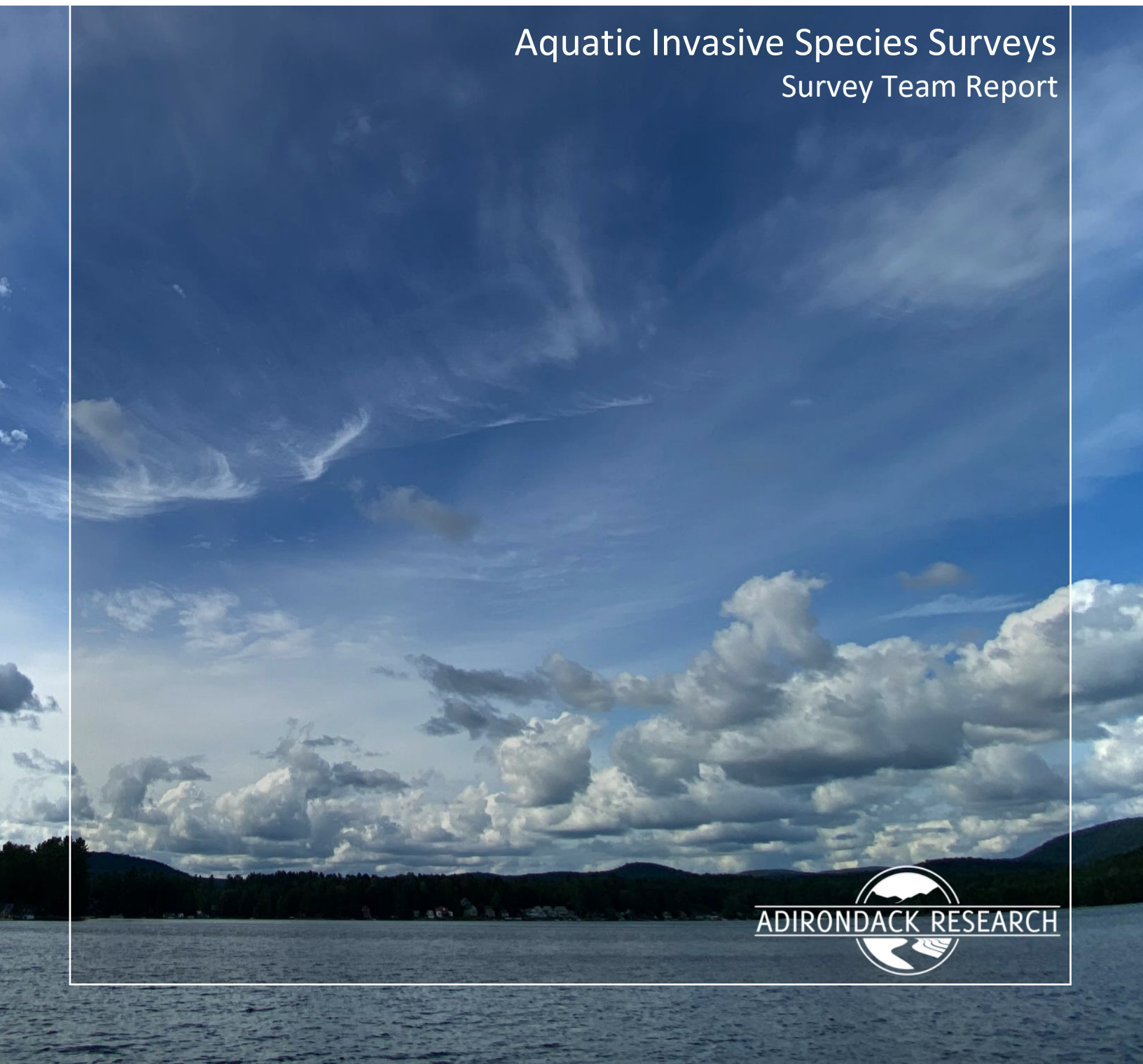
2023
East Caroga Lake AIS Survey

Aquatic Invasive Species Surveys
Survey Team Report



ADIRONDACK RESEARCH

2023 East Caroga Lake Aquatic Invasive Species Survey

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Cover image: East Caroga Lake. Photo by Julia Luna

Executive Summary

The purpose of this effort was to perform a point intercept survey in preparation for submitting a permit to the Adirondack Park Agency (APA) for management of Eurasian watermilfoil using the herbicide ProcellaCOR EC.

We surveyed 132 stations (sample points) with a total of 54 points within each of the three proposed treatment areas. Seventeen points were surveyed in each of the proposed treatment areas. A total of 80 points were surveyed outside of the proposed treatment area. Our survey design and methodologies followed the APA requirements for permit submission.

Our team documented aquatic plant species occurrence, species cover class, overall plant cover class, depth, and species richness at each of the 132 stations.

Eurasian watermilfoil was documented at a total of 54 of the 132 stations (40.9%); within the proposed treatment areas, it was recorded at 33 stations, and at 21 locations outside the proposed treatment area. Twenty-two other native species were documented in this survey.

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Overview

We performed an aquatic invasive species (AIS) and native aquatic plant species survey for East Caroga Lake in Fulton County on the dates of August 15th and 16th 2023. This survey was completed in preparation for The Town of Caroga applying to the Adirondack Park Agency for a permit to use the herbicide ProcellaCOR EC for the control of an aquatic pest (AQV). This survey was completed in accordance with all of the required parameters of the linked application requirements: https://www.dropbox.com/s/kn7c043b53k7wns/SIR-AquaticHerbicides.pdf?dl=0

The Town of Caroga is planning to apply for a permit to use ProcellaCOR EC in 2024 to manage Eurasian watermilfoil. We conducted the surveys and created maps and data tables of the survey results per the requirements of the permit.

For more information on our qualifications and services, our Qualifications Packet can be accessed via this link: https://www.dropbox.com/s/2jc37h56z4jkb6i/Lake%20Surveys.pdf?dl=0 You can also learn more about Adirondack Research at www.adkres.org.

Adirondack Research was able to complete the following tasks as part of this project:

- Survey 132 stations in the entirety of the 198 -acre waterbody over a day with two crew members using a motorboat.
- Survey, identify, and photograph all native plant species at point intercept survey stations within a survey design to meet Adirondack Park Agency requirements for applying for the use of the herbicide ProcellaCOR EC.
- Draft maps showing survey locations, overall plant abundance, depth, species richness, and abundance for each of the 23 species recorded in GIS.
- Create tables displaying station number, GPS coordinates, depth, species richness, and abundance of the target species; abundance of each species at all stations; the total count of station numbers each species is found, including overall percentages; and susceptibility of each species to herbicide ProcellaCOR EC.
- Drafted detailed descriptions of all 23 species including information of the impacts of each species on their environment.
- Produced this report of the described survey effort.

Methods

Below is a description of the survey methods used while surveying your lake. We've included a brief description of the equipment used, our cleaning procedure for all of our equipment before accessing the lake, and a description of our survey techniques.

Equipment

Equipment used while completing the Aquatic Invasive Species (AIS) survey of the lake consisted of double-sided rakes for collecting plant samples from under the water, an iPad 4 mini for data collection. All data and observations were recorded using ESRI's Survey123 for ArcGIS application. Surveys were conducted via motorboat.

Cleaning

As our team is frequently moving from one water body to another, specific precautionary measures were taken to ensure that all equipment used was decontaminated and free of AIS. To ensure that all equipment was free of AIS, we thoroughly washed and decontaminated all of our equipment at one of the Adirondack AIS Prevention Program's free boat wash and decontamination stations. High pressure hot water was used at these sites to ensure that no AIS spread via equipment.

Monitoring Techniques

While out on the waterbody, we surveyed plants at survey stations, or sites, that were predetermined prior to performing the on-the-water survey. These survey stations were selected based on criteria outlined by the Adirondack Park Agency as requirements for applying for a permit application to perform management using the herbicide ProcellaCOR EC. Specifically, we established a sampling design based on the following APA requirements:

1. Perform survey at height of growing season.
2. Establish point intercept survey points (stations/Sites) based on a grid size one acre or less.
3. Survey area must include the entire littoral zone (buffer zone) within 0.3 miles of the edge of the proposed treatment area.
4. Perform point intercept surveys at a minimum of 12 sites within the proposed treatment area and at least 24 sites outside of the proposed treatment area and within the 0.3-mile buffer zone.
5. Perform rake toss surveys at each site or sample point by throwing as many rake tosses as needed to find all plants at or near the sample point or site. This method is biased towards finding every plant species that may exist within the vicinity of a sampling location.
6. Record each species along with the following parameters (water depth, overall rake plant abundance, abundance of each species)
7. Additionally, photograph one example of each species identified during the survey.

The littoral zone typically encompasses the area from shoreline to a depth of about 15 feet. We utilized publicly available bathymetric maps of the proposed treatment areas as well as the surrounding area within 0.3 miles to determine the survey extent. We then evenly distributed roughly 80 survey points outside of the proposed treatment areas, for a total of 132 points across the entirety of the lake. We then shifted points to distribute our sampling locations across different habitat types, locations around shorelines, and to be within the water depths of the littoral zones based on maps and aerial imagery.

The team surveyed the area by navigating to each survey point, tossing the rake and by performing visual surveys where possible. All plants retrieved by rake toss or seen by visual inspection were identified to the best of our abilities (usually to the species level, but sometimes to genus). Both native and invasive plants found were identified using the "Maine Field Guide to Invasive Aquatic Plants and their common native look-alikes" by Lake Stewards of Maine.

Based upon how much plant material was observed on the rake toss, we assigned a percent cover for the entire rake and for each species on the rake. Plants that were observed visually and not collected on a rake toss were estimated based on their appearance from the water surface. Based on plant abundance, we used the following density classes:

Density Class	Class Description		Coverage Class (plant density)
T	Trace	1-2 stems	Less than 5%
S	Sparse	3-10 stems	5 - 25%
M	Moderate	Rakeful; no empty tines	26 - 50%
D	Dense	Rakeful; no visible tines	51 - 75%
HD	High Density	Difficult to bring on boat	76 - 100%

Table 1: Note we collect two density classes between 51-100% (51-75% and 75-100%) while some studies combine the two. Colors in the density class correspond to their relative abundance markers on maps (3 and 5-32).

Results

The team surveyed 132 sites on August 15th and 16th 2023: detecting one invasive species (Eurasian watermilfoil) and 22 native species including one native milfoil *Myriophyllum sibiricum* (Northern-water milfoil). Table 2 provides a summary of all aquatic vegetation detected in East Caroga Lake, in addition to their count and frequency of occurrence relative to the 132 points surveyed, invasive species are dictated in red. Full descriptions for each of these species and impacts on their environment are attached in the appendix.

Table 2. Summary of Aquatic Vegetation Occurrences and Frequency – East Caroga Lake 2023

Lake	Common Name	Latin Name	# of Stations	% Occurrence
East Caroga	Bladderwort	*Utricularia spp.*	22	16.67
East Caroga	Clasping-leaf pondweed	*Potamogeton perfoliatus*	1	0.76
East Caroga	Eel grass	*Vallisneria americana*	8	6.06
East Caroga	Eurasian watermilfoil	*Myriophyllum spicatum*	54	40.91
East Caroga	Floating-leaf pondweed	*Potamogeton natans*	4	3.03
East Caroga	Horsetail	*Equisetum spp.*	1	0.76
East Caroga	Large-leaf pondweed	*Potamogeton amplifolius*	21	15.91
East Caroga	Little floating heart	*Nymphoides cordata*	11	8.33
East Caroga	Muskgrass	*Chara spp.*	2	1.52
East Caroga	Naiad	Naiad sp.	2	1.52
East Caroga	Nitella	Nitella sp.	23	17.42
East Caroga	Northern milfoil	*Myriophyllum sibiricum*	8	6.06
East Caroga	Pickerelweed	*Pontederia cordata*	5	3.79
East Caroga	Pipewort	*Eriocaulon aquaticum*	1	0.76
East Caroga	Quillwort sp.	*Isoetes spp.*	1	0.76
East Caroga	Robbins pondweed	*Potamogeton robbinsii*	35	26.52
East Caroga	Slender naiad	*Najas flexilis*	15	11.36
East Caroga	Slender-leaf pondweed	*Potamogeton pusillus*	27	20.45
East Caroga	Variable-leaf pondweed	*Potamogeton gramineus*	41	31.06
East Caroga	Water bulrush	*Schoenoplectus acutus*	14	10.61
East Caroga	Watershield	*Brasenia schreberi*	23	17.42
East Caroga	White-stemmed pondweed	*Potamogeton praelongus*	22	16.67
East Caroga	White waterlily	*Nymphaea odorata*	10	7.58

Coverage class was recorded for each of the individual plant records recorded at every station in 2023 and are displayed in Table 4.

Species Distributions

Bladderwort *(Utricularia sp.):* This plant was found at a total of 22 out of 132 stations resulting in 16.67% of occurrences. It was most commonly found growing at less than 5% levels, (n=18, 81.82%) followed by 5% - 25% levels, (n=4, 18.18%).

Clasping-leaf pondweed *(Potamogeton perfoliatus):* This plant was found at a total of 1 out of 132 stations resulting in 0.76% of occurrences. It was most commonly found growing at less than 5% levels, (n=1, 100.00%).

Eel grass *(Vallisneria americana):* This plant was found at a total of 8 out of 132 stations resulting in 6.06% of occurrences. It was most commonly found growing at less than 5% levels, (n=7, 87.50%) followed by 5% - 25% levels, (n=1, 12.50%).

Eurasian watermilfoil *(Myriophyllum spicatum):* This plant was found at a total of 54 out of 132 stations resulting in 40.91% of occurrences. It was most commonly found growing at less

than 5% levels, (n=36, 66.67%) followed by 5% - 25% levels, (n=15, 27.78%) followed by 26% - 50% levels, (n=3, 5.56%).

Floating-leaf pondweed *(Potamogeton natans):* This plant was found at a total of 4 out of 132 stations resulting in 3.03% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=3, 75.00%) followed by less than 5% levels, (n=1, 25.00%).

Horsetail *(Equisetum spp.):* This plant was found at a total of 1 out of 132 stations resulting in 0.76% of occurrences. It was most commonly found growing at less than 5% levels, (n=1, 100.00%).

Large-leaf pondweed *(Potamogeton amplifolius):* This plant was found at a total of 21 out of 132 stations resulting in 15.91% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=11, 52.38%) followed by less than 5% levels, (n=7, 33.33%) followed by 26% - 50% levels, (n=3, 14.29%).

Little floating heart *(Nymphoides cordata):* This plant was found at a total of 11 out of 132 stations resulting in 8.33% of occurrences. It was most commonly found growing at less than 5% levels, (n=9, 81.82%) followed by 5% - 25% levels, (n=2, 18.18%).

Muskgrass *(Chara sp.):* This plant was found at a total of 2 out of 132 stations resulting in 1.52% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=1, 50.00%) followed by less than 5% levels, (n=1, 50.00%).

Naiad (*Najas sp.*): This plant was found at a total of 2 out of 132 stations resulting in 1.52% of occurrences. It was most commonly found growing at 51% - 75% levels, (n=1, 50.00%) followed by less than 5% levels, (n=1, 50.00%).

Nitella sp.: This plant was found at a total of 23 out of 132 stations resulting in 17.42% of occurrences. It was most commonly found growing at less than 5% levels, (n=11, 47.83%) followed by 5% - 25% levels, (n=10, 43.48%) followed by 26% - 50% levels, (n=1, 4.35%) followed by 51% - 75% levels, (n=1, 4.35%).

Northern milfoil *(Myriophyllum sibiricum):* This plant was found at a total of 8 out of 132 stations resulting in 6.06% of occurrences. It was most commonly found growing at less than 5% levels, (n=8, 100.00%).

Pickerelweed *(Pontederia cordata):* This plant was found at a total of 5 out of 132 stations resulting in 3.79% of occurrences. It was most commonly found growing at less than 5% levels, (n=4, 80.00%) followed by 5% - 25% levels, (n=1, 20.00%).

Pipewort *(Eriocaulon aquaticum):* This plant was found at a total of 1 out of 132 stations resulting in 0.76% of occurrences. It was most commonly found growing at less than 5% levels, (n=1, 100.00%).

Quillwort *(Isoetes sp.):* This plant was found at a total of 1 out of 132 stations resulting in 0.76% of occurrences. It was most commonly found growing at less than 5% levels, (n=1, 100.00%).

Robbins pondweed *(Potamogeton robbinsii):* This plant was found at a total of 35 out of 132 stations resulting in 26.52% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=13, 37.14%) followed by less than 5% levels, (n=11, 31.43%) followed by 26% - 50% levels, (n=8, 22.86%) followed by 51% - 75% levels, (n=2, 5.71%).

Slender naiad *(Najas flexilis):* This plant was found at a total of 15 out of 132 stations resulting in 11.36% of occurrences. It was most commonly found growing at less than 5% levels, (n=10, 66.67%) followed by 5% - 25% levels, (n=5, 33.33%).

Slender-leaf pondweed *(Potamogeton pusillus):* This plant was found at a total of 27 out of 132 stations resulting in 20.45% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=17, 62.96%) followed by 26% - 50% levels, (n=4, 14.81%) followed by less than 5% levels, (n=3, 11.11%) followed by 51% - 75% levels, (n=2, 7.41%) followed by 76% - 100% levels, (n=1, 3.70%).

Variable-leaf pondweed *(Potamogeton gramineus):* This plant was found at a total of 41 out of 132 stations resulting in 31.06% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=24, 58.54%) followed by less than 5% levels, (n=11, 26.83%) followed by 26% - 50% levels, (n=6, 14.63%) followed by 76% - 100% levels, (n=1, 2.44%).

Water bulrush *(Schoenoplectus acutus):* This plant was found at a total of 14 out of 132 stations resulting in 10.61% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=8, 57.14%) followed by less than 5% levels, (n=6, 42.86%).

Watershield *(Brasenia schreberi):* This plant was found at a total of 23 out of 132 stations resulting in 17.42% of occurrences. It was most commonly found growing at 5% - 25% levels, (n=14, 60.87%) followed by less than 5% levels, (n=9, 39.13%).

White stemmed pondweed *(Potamogeton praelongus):* This plant was found at a total of 22 out of 132 stations resulting in 16.67% of occurrences. It was most commonly found growing at less than 5% levels, (n=19, 86.36%) followed by 5% - 25% levels, (n=2, 9.09%) followed by 26% - 50% levels, (n=1, 4.55%).

White waterlily *(Nymphaea odorata):* This plant was found at a total of 10 out of 132 stations resulting in 7.58% of occurrences. It was most commonly found growing at 26% - 50% levels, (n=8, 80.00%) followed by less than 5% levels, (n=1, 10.00%) followed by 5% - 25% levels, (n=1, 10.00%).

Eurasian watermilfoil distribution

Of the 54 stations Eurasian watermilfoil were detected at, 33 were recorded in the proposed treatment area, and 21 were located outside the proposed treatment area. Of the 33 points recorded in the treatment area the majority of points, (n=23, 70%) were recorded at trace densities. Followed then by sparse coverage, (n=10, 30%). Moderate, dense or highly dense coverage was not found at any of the points in the treatment area. Of the 21 stations outside of the treatment area the majority of points, (n=13, 62%) were recorded at trace densities, followed by sparse, (n=5, 24%), and moderate coverage (n=3, 14%). Eurasian watermilfoil was found at any point outside of the treatment area, with dense, or highly dense coverage. Table 3 displays the station number, respective GPS coordinates and depth that Eurasian watermilfoil was recorded, along with its abundance and the total species richness at that point. Tables are ordered from lowest to highest density, separated by the four coverage classes Eurasian watermilfoil was detected at.

Table 3. Eurasian watermilfoil Presence – East Caroga Lake 2023

Station Number	X	Y	Depth (ft.)	Abundance of Target Species	Total Species Richness
4	-74.49039549	43.12742018	3.2	less than 5%	4
5	-74.49031519	43.13114764	2.5	less than 5%	7
6	-74.49017731	43.1308605	2.5	5% - 25%	8
7	-74.49014476	43.13067788	2.5	less than 5%	6
8	-74.4900561	43.130399	2.5	less than 5%	7
9	-74.49000605	43.1299575	2.5	less than 5%	7
10	-74.49026708	43.12963378	2.5	less than 5%	8
11	-74.49020182	43.12895106	2.5	5% - 25%	10
12	-74.48993644	43.12869382	3.1	5% - 25%	6
13	-74.48953306	43.12842182	5.0	less than 5%	3
14	-74.48957965	43.12790794	3.9	less than 5%	4
15	-74.48998148	43.1277685	4.2	5% - 25%	6
17	-74.48855527	43.12816649	4.2	less than 5%	4
19	-74.48894445	43.12942951	6.2	less than 5%	3
20	-74.48958789	43.12942195	4.8	less than 5%	4
21	-74.48960282	43.12992275	3.1	less than 5%	6
25	-74.48747909	43.12838404	6.2	less than 5%	3
29	-74.48717229	43.12992667	6.2	less than 5%	3
30	-74.48797391	43.12987958	6.8	less than 5%	4
33	-74.48538449	43.12934458	7.0	less than 5%	4
49	-74.47656613	43.13228636	1.5	less than 5%	7
51	-74.47730723	43.13181002	3.5	less than 5%	4
52	-74.47562439	43.12636613	6.1	less than 5%	4
58	-74.4754929	43.12527341	3.7	5% - 25%	2
68	-74.47885263	43.12393883	31.2	26% - 50%	4
69	-74.48136817	43.12325775	13.7	26% - 50%	4
70	-74.48197484	43.12349765	6.2	5% - 25%	3
71	-74.48050002	43.12307118	9.2	5% - 25%	4
72	-74.47931199	43.1230161	10.1	5% - 25%	4
73	-74.47853722	43.12305	8.8	5% - 25%	3
78	-74.47508139	43.12367025	3.2	less than 5%	3
81	-74.47724019	43.12321447	14.0	less than 5%	2
82	-74.47800976	43.12308752	10.1	less than 5%	3
86	-74.47565575	43.12319553	13.0	5% - 25%	1
88	-74.47432789	43.12317629	1.9	5% - 25%	2
89	-74.47407818	43.12318742	1.9	less than 5%	3
90	-74.47447037	43.12292979	3.2	less than 5%	3
91	-74.47463658	43.12276013	2.8	less than 5%	3
92	-74.47500169	43.12300323	4.2	less than 5%	3
97	-74.47752893	43.12914472	10.9	less than 5%	2
98	-74.47726096	43.12952138	4.3	26% - 50%	1
100	-74.47706123	43.13015905	7.3	less than 5%	4
101	-74.47777634	43.13047455	8.1	less than 5%	2
102	-74.47829382	43.13043321	8.9	less than 5%	3
108	-74.48119354	43.13046063	11.6	less than 5%	2
109	-74.47950809	43.13116007	4.5	5% - 25%	2
112	-74.47847962	43.1326362	7.7	less than 5%	3
113	-74.47848448	43.1326933	7.8	5% - 25%	3
114	-74.47795543	43.13289997	4.4	less than 5%	2
116	-74.4776936	43.13336002	2.1	less than 5%	3
118	-74.47725511	43.13331384	1.8	5% - 25%	4
119	-74.47700919	43.13303791	1.4	less than 5%	4
120	-74.47713354	43.13288903	1.8	5% - 25%	5
124	-74.47916081	43.13068508	4.2	less than 5%	2

Table 3. Note: The survey point with the highest density coverage class was located in an area outside of the treatment area

Table 4. Abundance of Species by Site – East Caroga Lake 2023

Survey Station	Depth (ft)	Lake	Bladderwort	Clasping-Leaf Pondweed	Common Elodea	Eel Grass	Eurasian Watermilfoil	Floating-Leaf Pondweed	Horsetail	Large-Leaf Pondweed	Little Floating Heart	Muskgrass	Naiad Spp	Nitella Sp.	None	Northern Milfoil	Pickerelweed	Pipewort	Quillwort Sp.	Robbins Pondweed	Slender Naiad	Slender-Leaf Pondweed	Small Pondweed	Variable-Leaf Pondweed	Water Bulrush	Water Nymph	Watershield	White Stemmed Pondweed	White Waterlily	Richness	Overall Plant Abundance
1	1.8	East Caroga	T																				T	T				S	4	51% - 75%
2	1.8	East Caroga	HD																				D	T		T			4	76% - 100%
3	2.2	East Caroga	T							HD									T					T		T			5	26% - 50%
4	3.2	East Caroga	T			HD			T																			HD	4	26% - 50%
5	2.5	East Caroga			HD	HD					T								T	T			HD			HD			7	26% - 50%
6	2.5	East Caroga	HD		T	T										HD			T				HD	T		HD			8	51% - 75%
7	2.5	East Caroga		HD	HD	HD													T					HD		T			6	26% - 50%
8	2.5	East Caroga	HD		HD	HD				HD									T					T		HD			7	26% - 50%
9	2.5	East Caroga	HD			HD							HD							HD			HD	T		T			7	26% - 50%
10	2.5	East Caroga	HD			HD										HD				HD			HD	T		T		S	8	51%- 75%
11	2.5	East Caroga	HD		HD	T			HD	T						HD				HD						T	HD	S	10	76% - 100%
12	3.1	East Caroga			HD	T				T													S				HD	S	6	76% - 100%
13	5	East Caroga				HD																	S				HD		3	26% - 50%
14	3.9	East Caroga				HD				HD													T				HD		4	5% - 25%
15	4.2	East Caroga			HD	T							HD										T			HD	HD		6	26% - 50%
16	3.9	East Caroga	HD							HD					HD			HD		T				HD		HD		S	8	51% - 75%
17	4.2	East Caroga				HD									HD								T				HD		4	5% - 25%
18	6	East Caroga																		T			S						2	26% - 50%
19	6.2	East Caroga				HD									HD								T						3	5% - 25%
20	4.8	East Caroga				HD									HD								T				HD		4	5% - 25%
21	3.1	East Caroga				HD			T				HD							HD				HD			HD		6	5% - 25%
22	3.1	East Caroga											HD		HD		HD			HD			T				HD		6	5% - 25%
23	7.2	East Caroga	HD										T										T				HD		4	26% - 50%
24	7.2	East Caroga											T										T						2	5% - 25%
25	6.2	East Caroga				HD									HD								S						3	26% - 50%
26	4.2	East Caroga	HD										HD																2	less than 5%
27	10.5	East Caroga											T										S						2	26% - 50%
28	7.2	East Caroga											T										T						2	5% - 25%
29	6.2	East Caroga				HD							S										T						3	26% - 50%
30	6.8	East Caroga				HD																	T				HD		4	5% - 25%
31	2.9	East Caroga																	HD										1	less than 5%
32	2.8	East Caroga								HD																			1	less than 5%
33	7	East Caroga				HD							T		HD								T						4	26% - 50%
34	9.5	East Caroga											HD										HD						2	less than 5%
36	3.8	East Caroga																	HD				T						2	less than 5%
37	7	East Caroga																					S						1	5% - 25%
38	7.1	East Caroga											HD										T						2	26% - 50%
39	8.5	East Caroga											T										T						2	5% - 25%
40	7.8	East Caroga											T										HD						2	5% - 25%
41	8.8	East Caroga							HD				HD										HD						3	5% - 25%
42	6.5	East Caroga							HD														T						2	5% - 25%
43	3.4	East Caroga											HD										T				HD		3	5% - 25%
44	3.4	East Caroga																					T			HD	HD		3	5% - 25%
45	6.4	East Caroga																	HD				T						2	5% - 25%
46	7.8	East Caroga																					HD				HD		2	less than 5%
47	9.3	East Caroga	HD																				T				HD		3	5% - 25%
48	8.9	East Caroga	HD										HD										T						3	5% - 25%
49	1.5	East Caroga	HD			HD										T							HD	T		T		S	7	76% - 100%
50	2.2	East Caroga	HD					HD		HD						HD				HD				HD		T		T	8	26% - 50%
51	3.5	East Caroga	T			HD									HD								T						4	26% - 50%

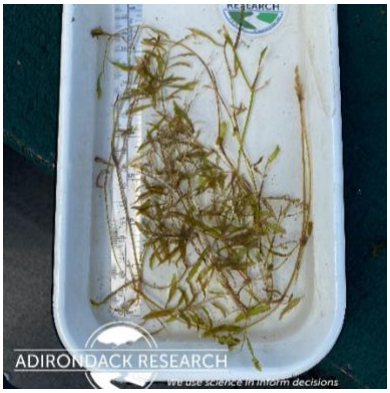
Table 4 continued

Survey Station	Depth (ft)	Lake	Bladderwort	Clasping-Leaf Pondweed	Common Elodea	Eel Grass	Eurasian Watermilfoil	Floating-Leaf Pondweed	Horsetail	Large-Leaf Pondweed	Little Floating Heart	Muskgrass	Naiad Spp	Nitella Sp.	None	Northern Milfoil	Pickerelweed	Pipewort	Quillwort Sp.	Robbins Pondweed	Slender Naiad	Slender-Leaf Pondweed	Small Pondweed	Variable-Leaf Pondweed	Water Bulrush	Water Nymph	Watershield	White Stemmed Pondweed	White Waterlily	Richness	Overall Plant Abundance
52	6.1	East Caroga				HD			HD											T	T									4	26% - 50%
53	12	East Caroga											T																	1	5% - 25%
54	14	East Caroga											T																	1	5% - 25%
55	12.9265	East Caroga	HD																	HD										2	less than 5%
57	4.00262	East Caroga									HD									HD										2	less than 5%
58	3.67454	East Caroga				T						M																		2	51% - 75%
59	5.80709	East Caroga										HD																		1	less than 5%
60	14.5669	East Caroga																		HD										1	less than 5%
61	14.5013	East Caroga																	HD											1	less than 5%
66	11.2861	East Caroga																	HD											1	less than 5%
67	4.00262	East Caroga											M																	1	51% - 75%
68	31.2008	East Caroga				S	T												T							T			4	51% - 75%
69	13.7139	East Caroga				S													T						T	HD				4	51% - 75%
70	6.2336	East Caroga				T																			T			S		3	51% - 75%
71	9.2	East Caroga				T																			T	HD				4	26% - 50%
72	10.1	East Caroga				T													T						T	HD				4	26% - 50%
73	8.8	East Caroga				T	T																			T				3	26% - 50%
75	13.9108	East Caroga											HD						T											2	5% - 25%
76	12.5	East Caroga																	HD											1	less than 5%
77	4.1	East Caroga																		T			HD							2	5% - 25%
78	3.2	East Caroga				HD	T																			S				3	26% - 50%
79	12.3031	East Caroga																	HD											1	less than 5%
80	14	East Caroga																	HD											1	less than 5%
81	14	East Caroga				HD													S											2	26% - 50%
82	10.1	East Caroga				HD	HD												HD											3	5% - 25%
83	10.1	East Caroga	HD																S											2	26% - 50%
84	9.48163	East Caroga																	S											1	26% - 50%
85	14.1732	East Caroga																	S											1	26% - 50%
86	12.9921	East Caroga				T																								1	5% - 25%
87	4.06824	East Caroga																		HD										1	less than 5%
88	1.87008	East Caroga				T													M											2	51% - 75%
89	1.90289	East Caroga				HD			HD										S											3	26% - 50%
90	3.24803	East Caroga				HD			T										S											3	26% - 50%
91	2.78871	East Caroga				HD			S										T											3	26% - 50%
92	4.19947	East Caroga				HD			T										T											3	26% - 50%
93	6.69291	East Caroga																	M											1	51% - 75%
94	9.80971	East Caroga																	S											1	26% - 50%
95	8.66142	East Caroga																	S											1	26% - 50%
97	10.8924	East Caroga				HD															T									2	5% - 25%
98	4.33071	East Caroga				S																								1	26% - 50%
99	7.18504	East Caroga																			HD									1	less than 5%
100	7.28346	East Caroga				HD			T												T		T							4	26% - 50%
101	8.10367	East Caroga				HD															T									2	5% - 25%
102	8.85827	East Caroga				HD															S				T					3	26% - 50%
103	11.4829	East Caroga																			T									1	5% - 25%
104	4.2979	East Caroga																			T									1	5% - 25%
105	11.4173	East Caroga	HD																		T									2	5% - 25%
106	10.9908	East Caroga																			T									1	5% - 25%
107	10.3018	East Caroga																			T									1	5% - 25%
108	11.647	East Caroga				HD															T									2	5% - 25%

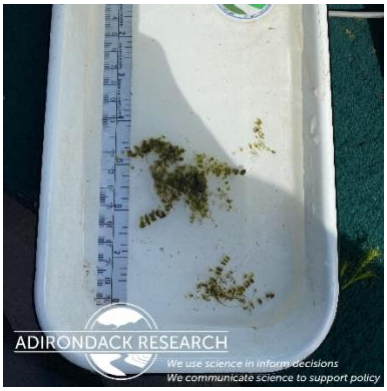
Table 4 continued

Survey Station	Depth (ft)	Lake	Bladderwort	Clasping-Leaf Pondweed	Common Elodea	Eel Grass	Eurasian Watermilfoil	Floating-Leaf Pondweed	Horsetail	Large-Leaf Pondweed	Little Floating Heart	Muskgrass	Naiad Spp	Nitella Sp.	None	Northern Milfoil	Pickerelweed	Pipewort	Quillwort Sp.	Robbins Pondweed	Slender Naiad	Slender-Leaf Pondweed	Small Pondweed	Variable-Leaf Pondweed	Water Bulrush	Water Nymph	Watershield	White Stemmed Pondweed	White Waterlily	Richness	Overall Plant Abundance
109	4.52756	East Caroga					T														D									2	76% - 100%
110	8.53018	East Caroga							HD											HD	T									3	5% - 25%
111	9.31758	East Caroga	HD																	HD	T									3	5% - 25%
112	7.70997	East Caroga					HD		T												T									3	26% - 50%
113	7.77559	East Caroga					T		T												HD									3	26% - 50%
114	4.39633	East Caroga					HD		S																					2	26% - 50%
115	5.0853	East Caroga																			HD									1	less than 5%
116	2.13255	East Caroga					HD		T												M									3	51% - 75%
117	1.8	East Caroga							S											T	S									3	76% - 100%
118	1.8	East Caroga					T		HD												S					T				4	51% - 75%
119	1.41076	East Caroga					HD														S					HD		S		4	51% - 75%
120	1.83727	East Caroga	HD				T		T	HD											M									5	76% - 100%
121	3.77297	East Caroga							T												T						HD			3	26% - 50%
122	5.51181	East Caroga																			T									1	5% - 25%
123	2.49344	East Caroga																			T									1	5% - 25%
124	4.2	East Caroga					HD														T									2	5% - 25%
125	2.5	East Caroga			HD				T	HD										T						HD				5	51% - 75%
126	2.5	East Caroga											T																	1	51% - 75%
127	2	East Caroga								HD																HD				2	76% - 100%
131	3.9	East Caroga																						HD						1	76% - 100%
132	3.8	East Caroga																						HD						1	76% - 100%

Photos



Caption: Variable-leaf pondweed *(Potamogeton gramineus)*



Caption: *Nitella sp*

Caption: Slender naiad *(Najas flexilis)*

Caption: Quillwort *(Isoetes spp.)*

Caption: Eel grass *(Vallisneria americana)*

Caption: Large-leaf pondweed *(Potamogeton amplifolius)*

Caption: Eurasian watermilfoil *(Myriophyllum spicatum)*

Caption: Floating-leaf pondweed *(Potamogeton natans)*

Caption: Little floating heart *(Nymphoides cordata)*

Caption: Muskgrass *(Chara sp.)*

Caption: White stemmed pondweed *(Potamogeton praelongus)*

Caption: Pickerelweed *(Pontederia cordata)*

Caption: Clasping-leaf pondweed *(Potamogeton perfoliatus)*

Caption: Pipewort *(Eriocaulon aquaticum)*

Caption: Horsetail *(Equisetum sp.)*

Caption: Water bulrush *(Schoenoplectus acutus)*

Caption: Watershield (*Brasenia schreberi)*

Caption: White waterlily *(Nymphaea odorata)*

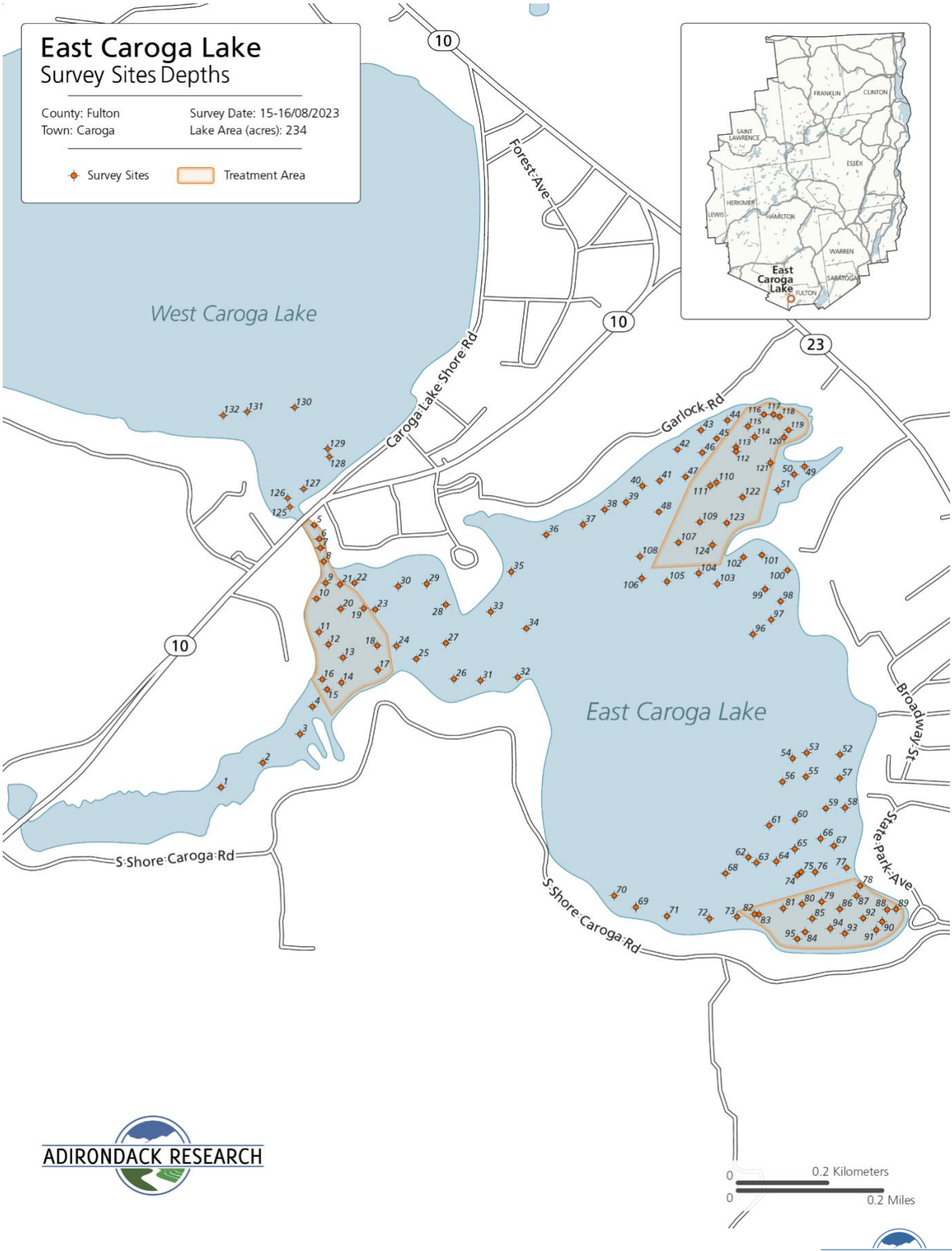
Caption: Northern milfoil *(Myriophyllum sibiricum)*

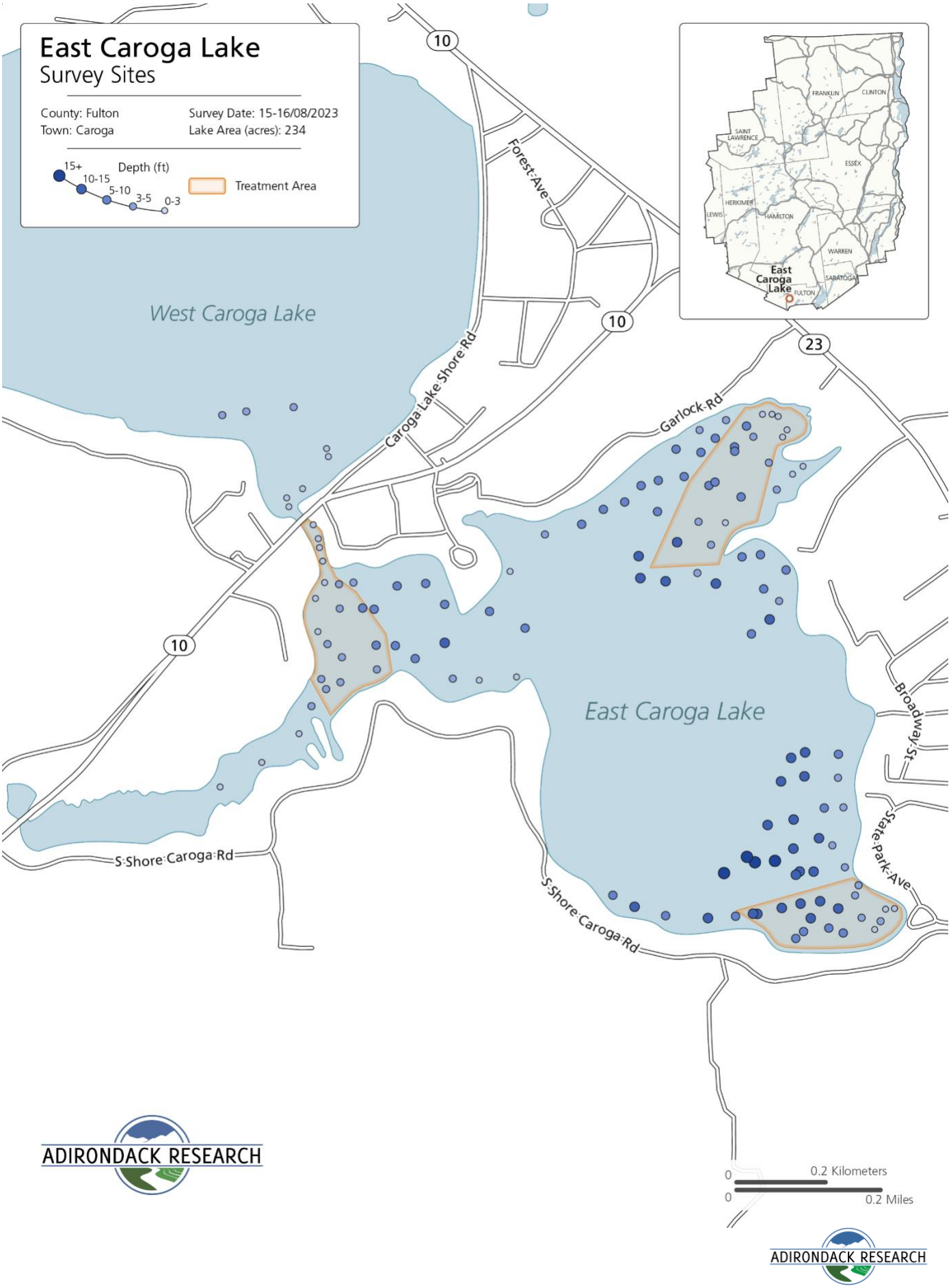
Caption: Bladderwort *(Utricularia sp.)*

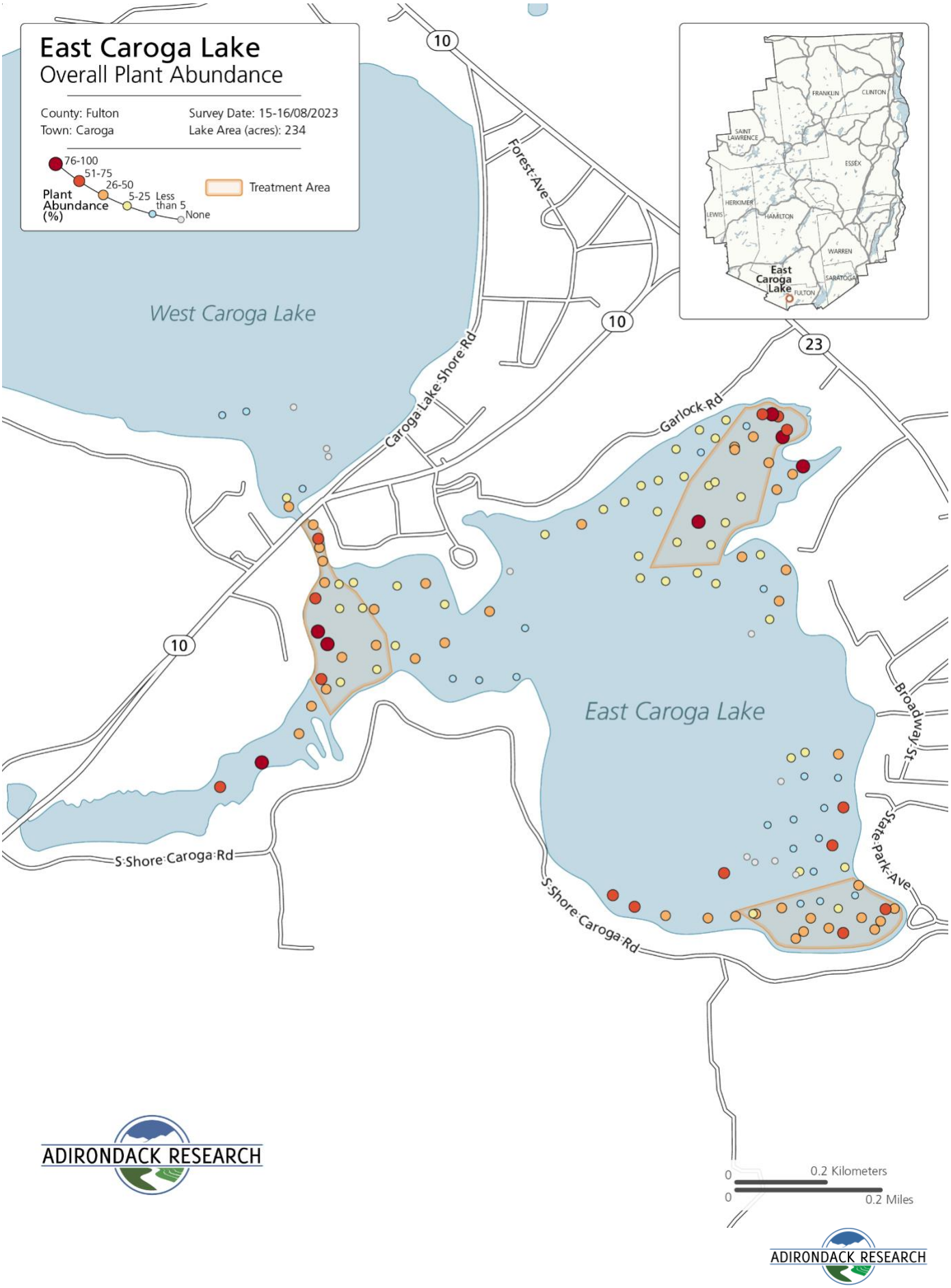
Caption: Robbins pondweed *(Potamogeton robbinsii)*

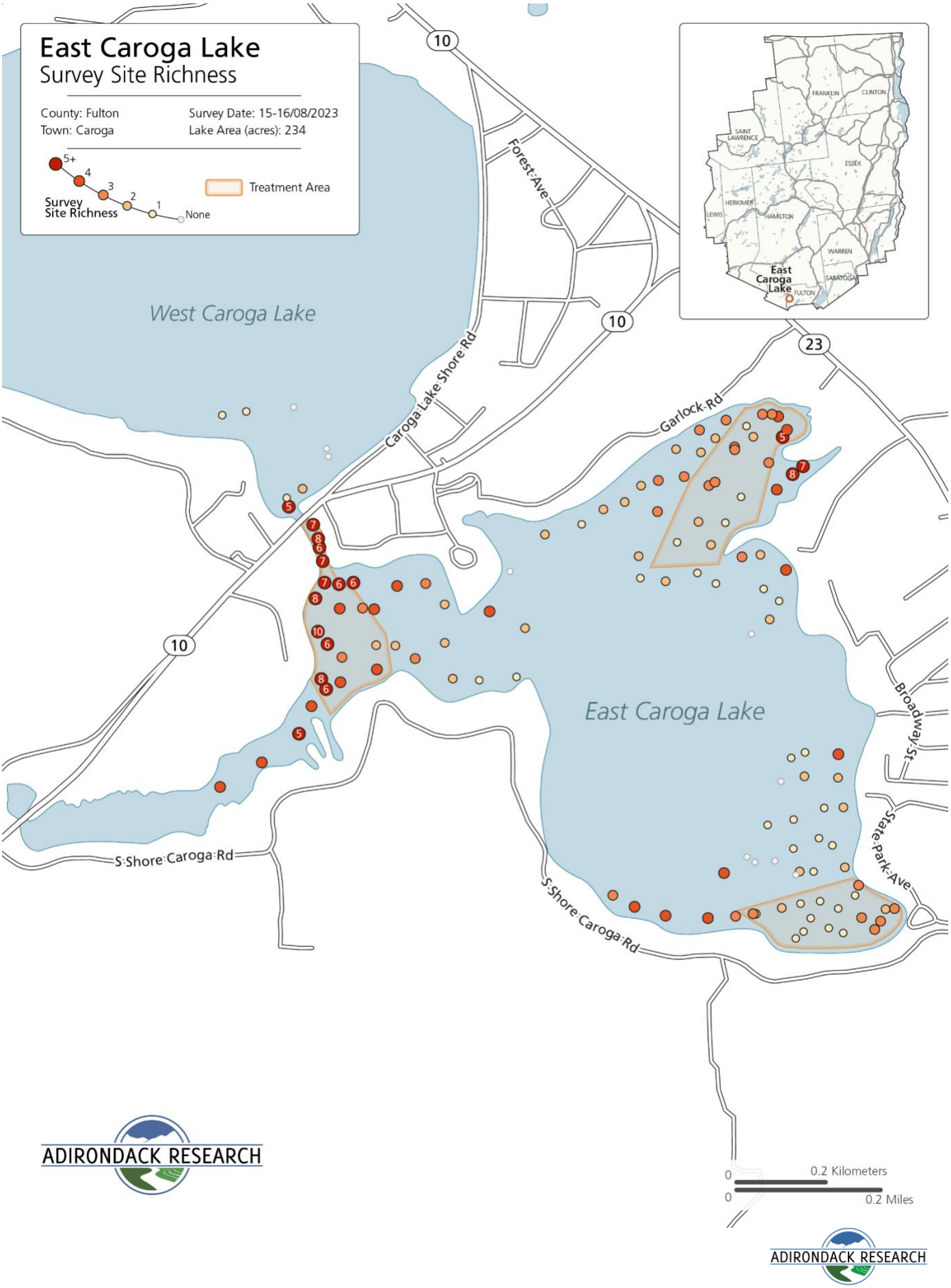
Maps

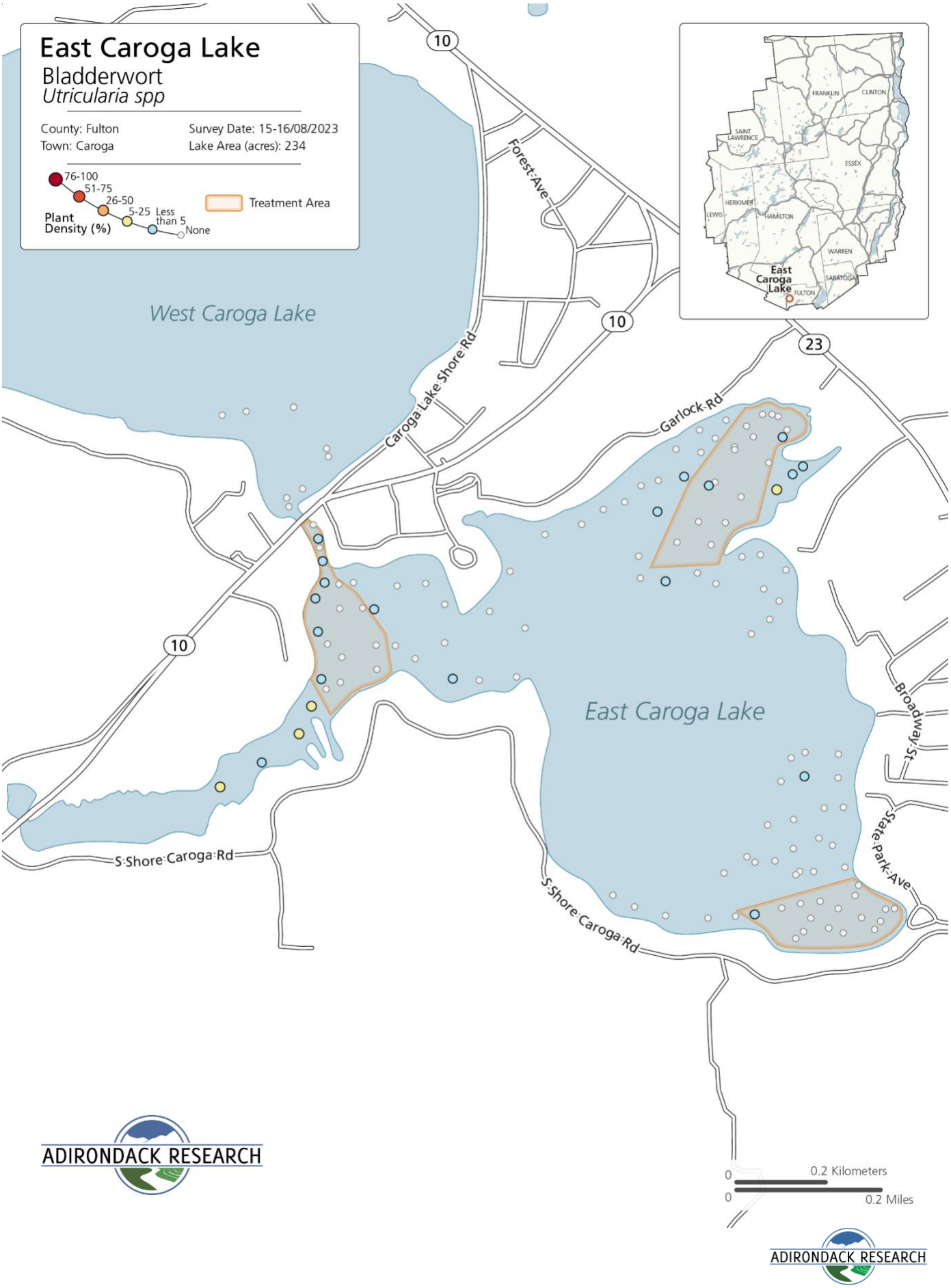
Maps 5-26 display the plant abundance for each species across all survey points. Map 1 marks the numbered station points, Map 2 displays depth at each station point, Map 3 displays overall plant abundance, and Map 4 displays species richness per site.

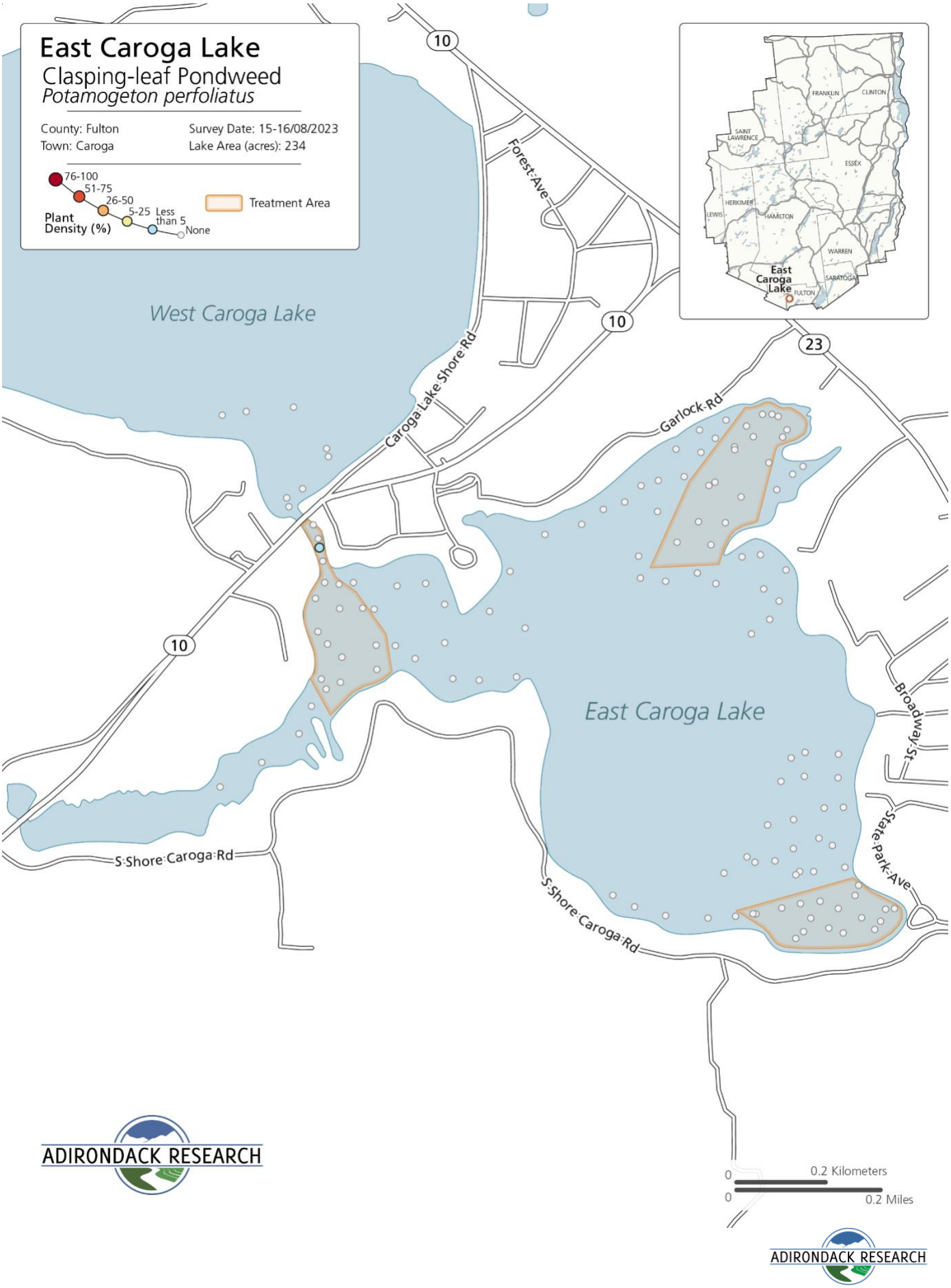

East Caroga Lake
Survey Sites Depths
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
Survey Sites
Treatment Area
West Caroga Lake
East Caroga Lake
Caroga Lake Shore Rd
Forest Ave
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH

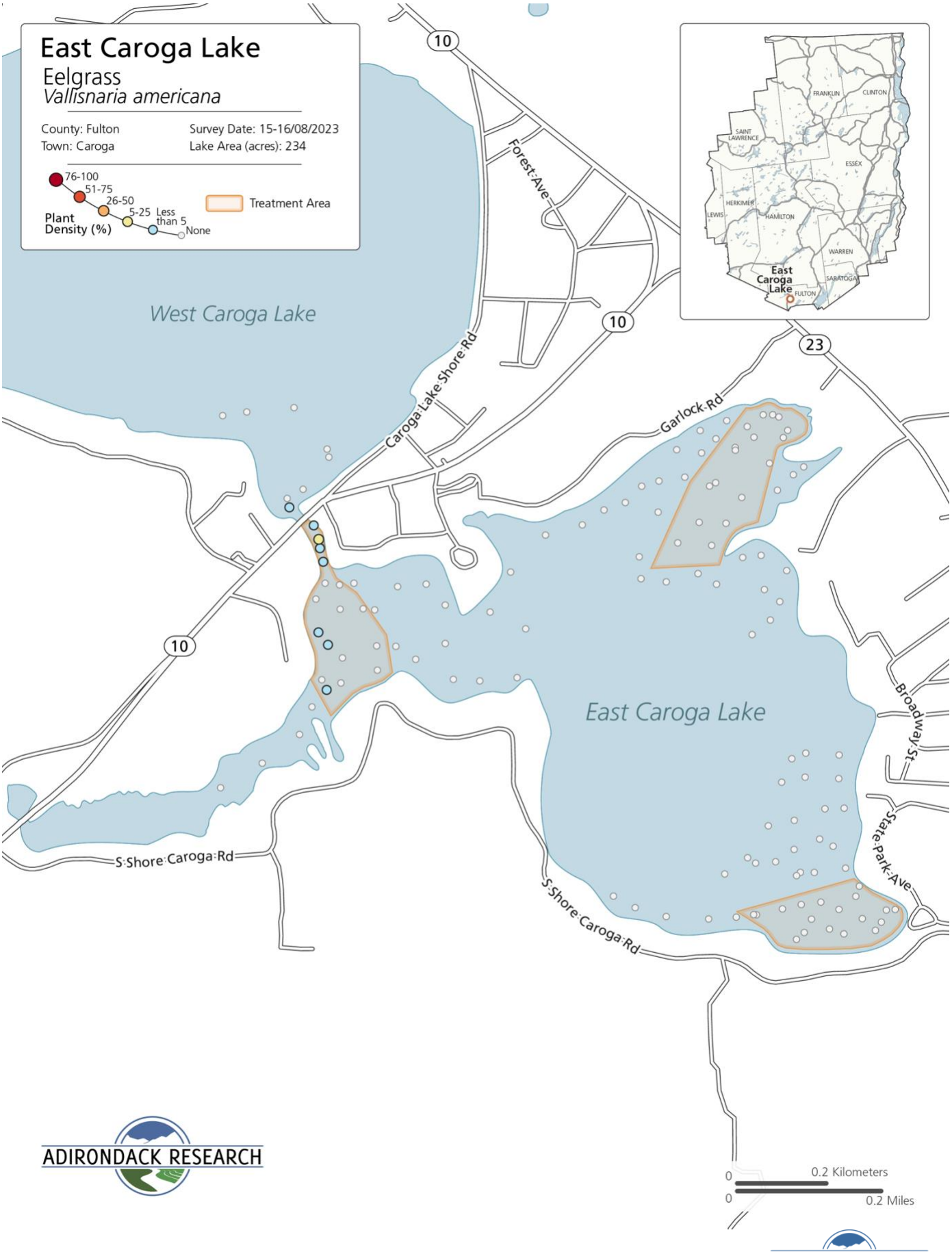

East Caroga Lake
Survey Sites
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
Depth (ft)
15+
10-15
5-10
3-5
0-3
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0.2 Kilometers
0
0.2 Miles
ADIRONDACK RESEARCH

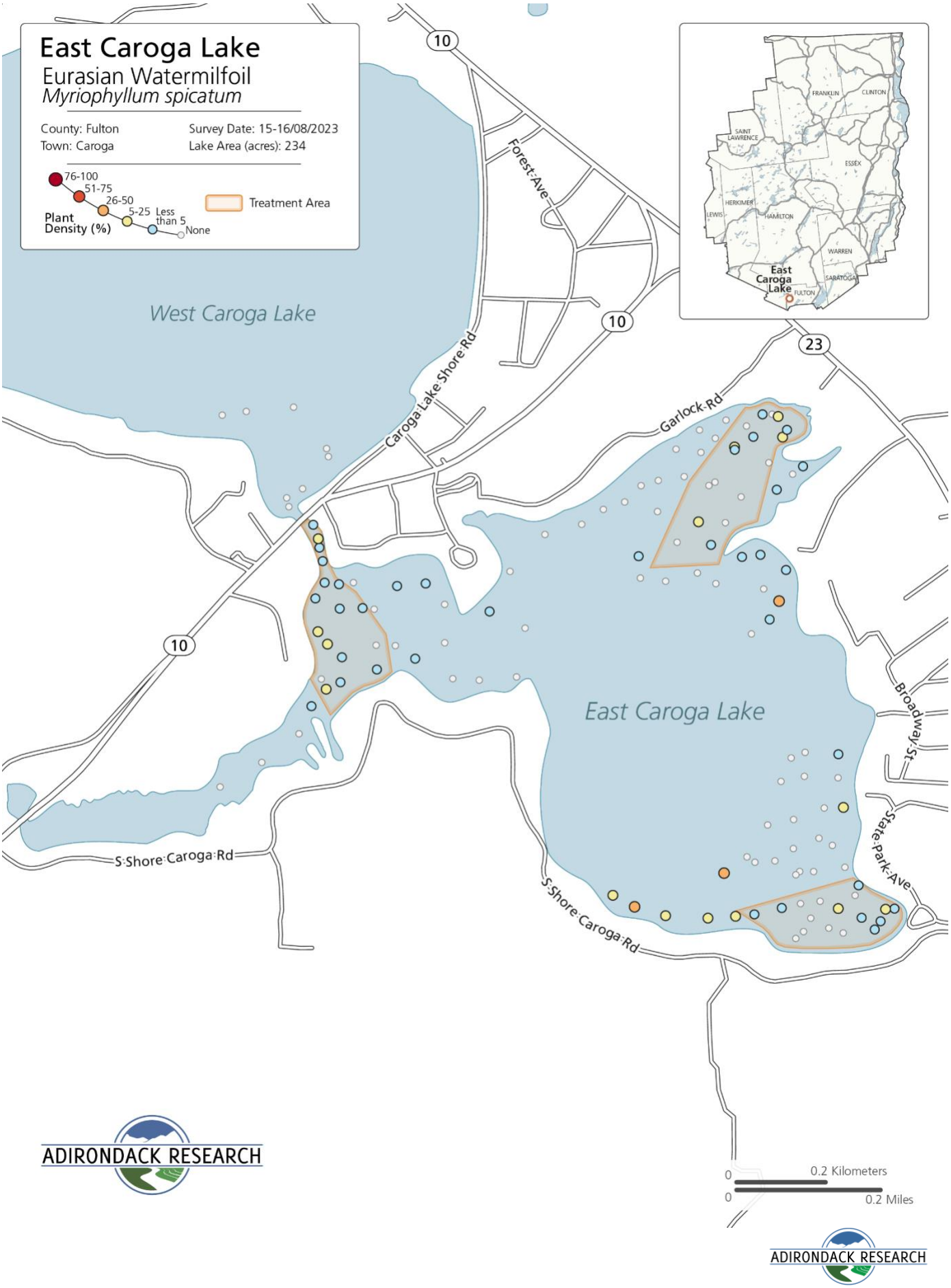

East Caroga Lake
Overall Plant Abundance
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
Plant Abundance (%)
76-100
51-75
26-50
5-25
Less than 5
None
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH

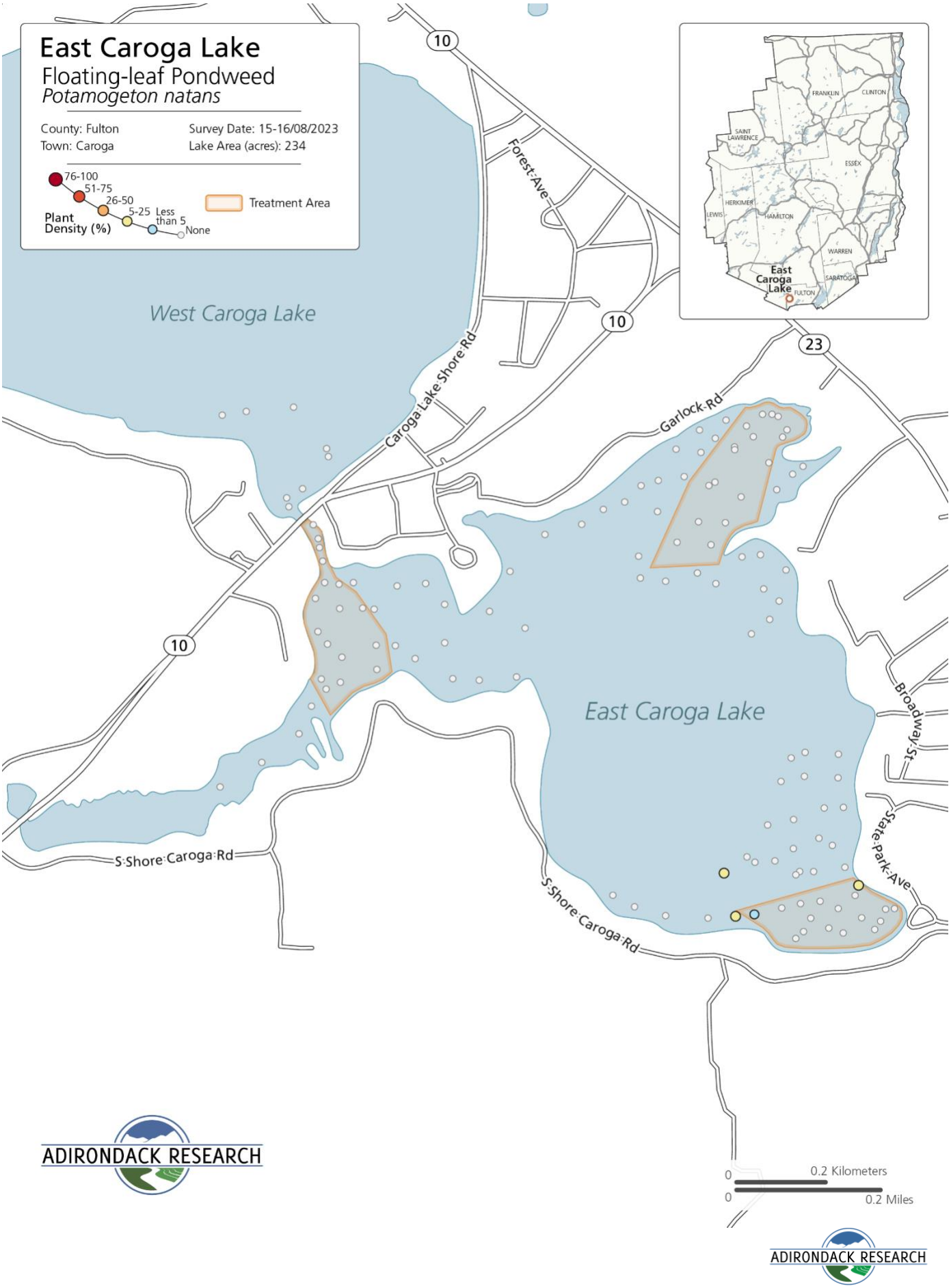

East Caroga Lake
Survey Site Richness
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
5+
4
3
2
1
None
Survey Site Richness
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH

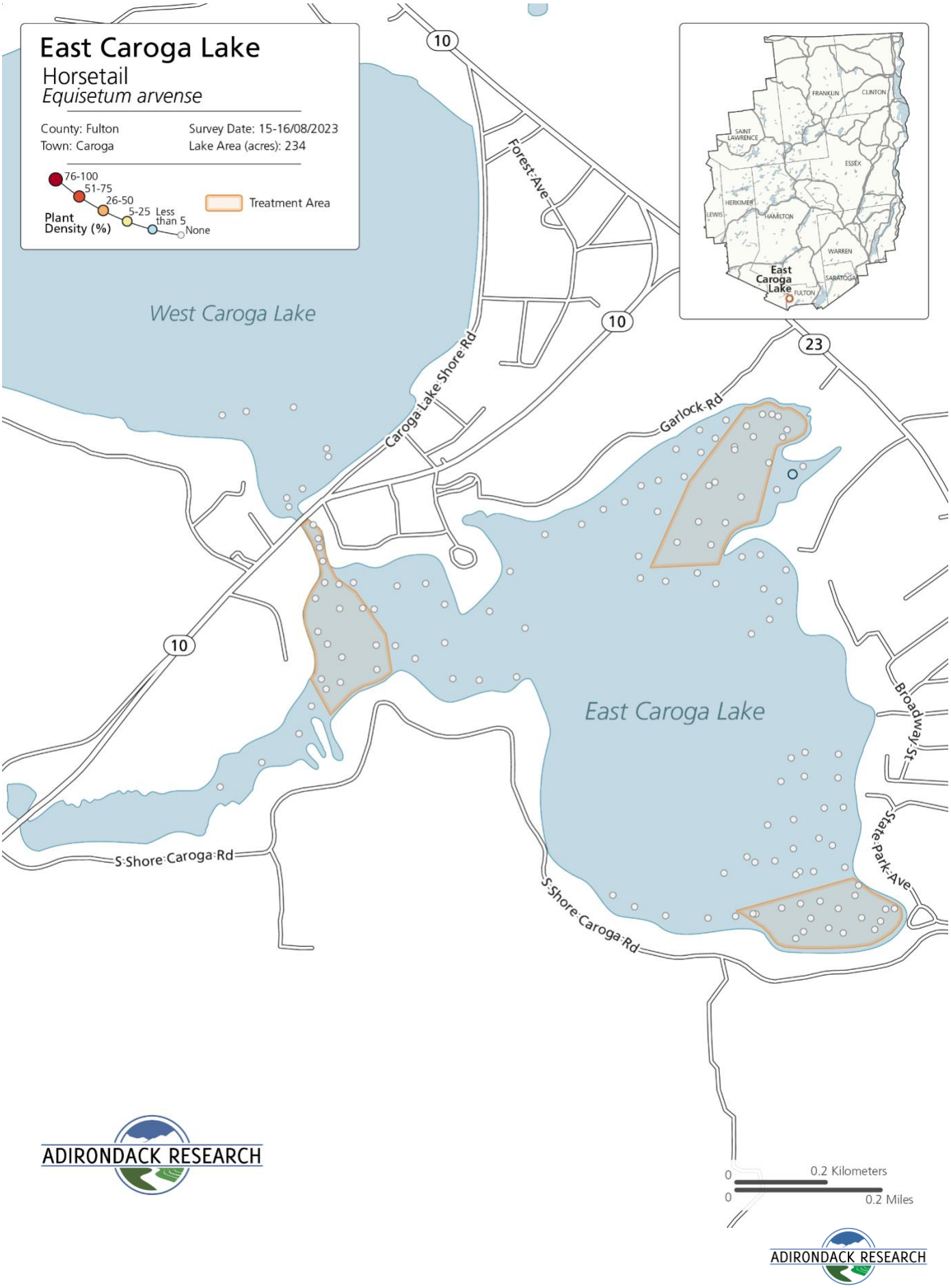

East Caroga Lake
Bladderwort
Utricularia spp
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
State Park Ave
S Shore Caroga Rd
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0.2 Kilometers
0
0.2 Miles
ADIRONDACK RESEARCH

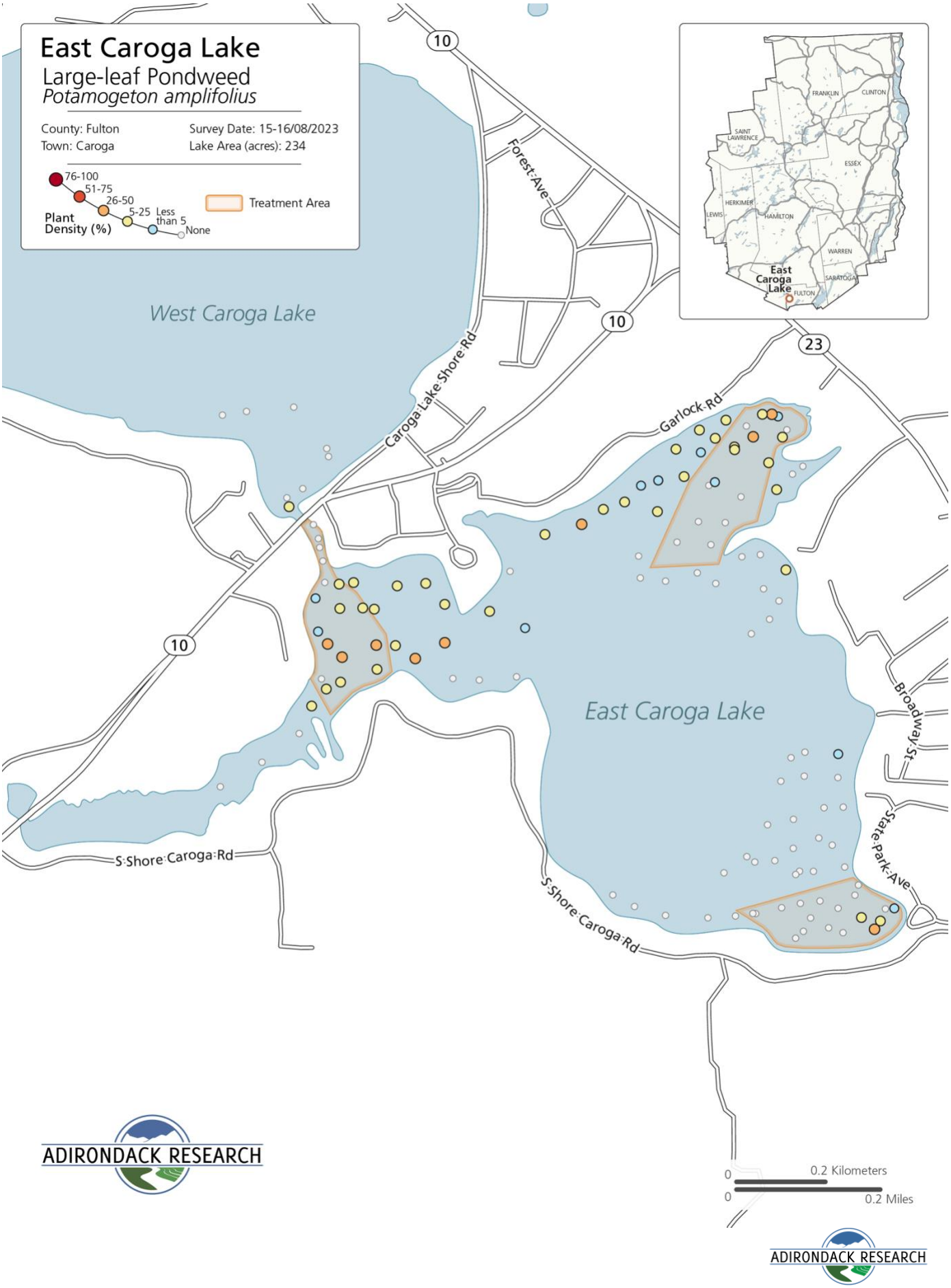

East Caroga Lake
Clasping-leaf Pondweed
Potamogeton perfoliatus
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
State Park Ave
S Shore Caroga Rd
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH

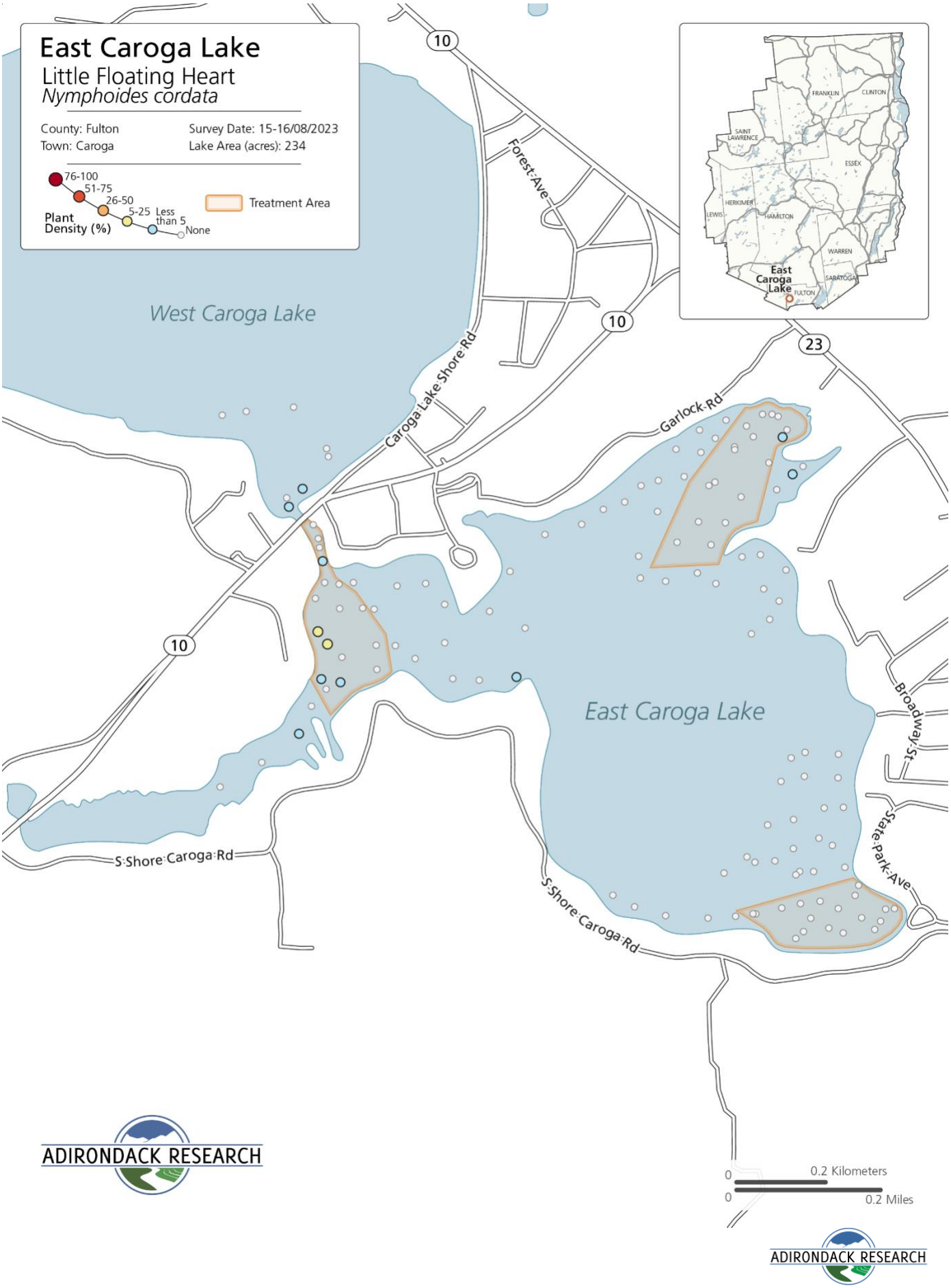

East Caroga Lake
Eelgrass
Vallisnaria americana
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH

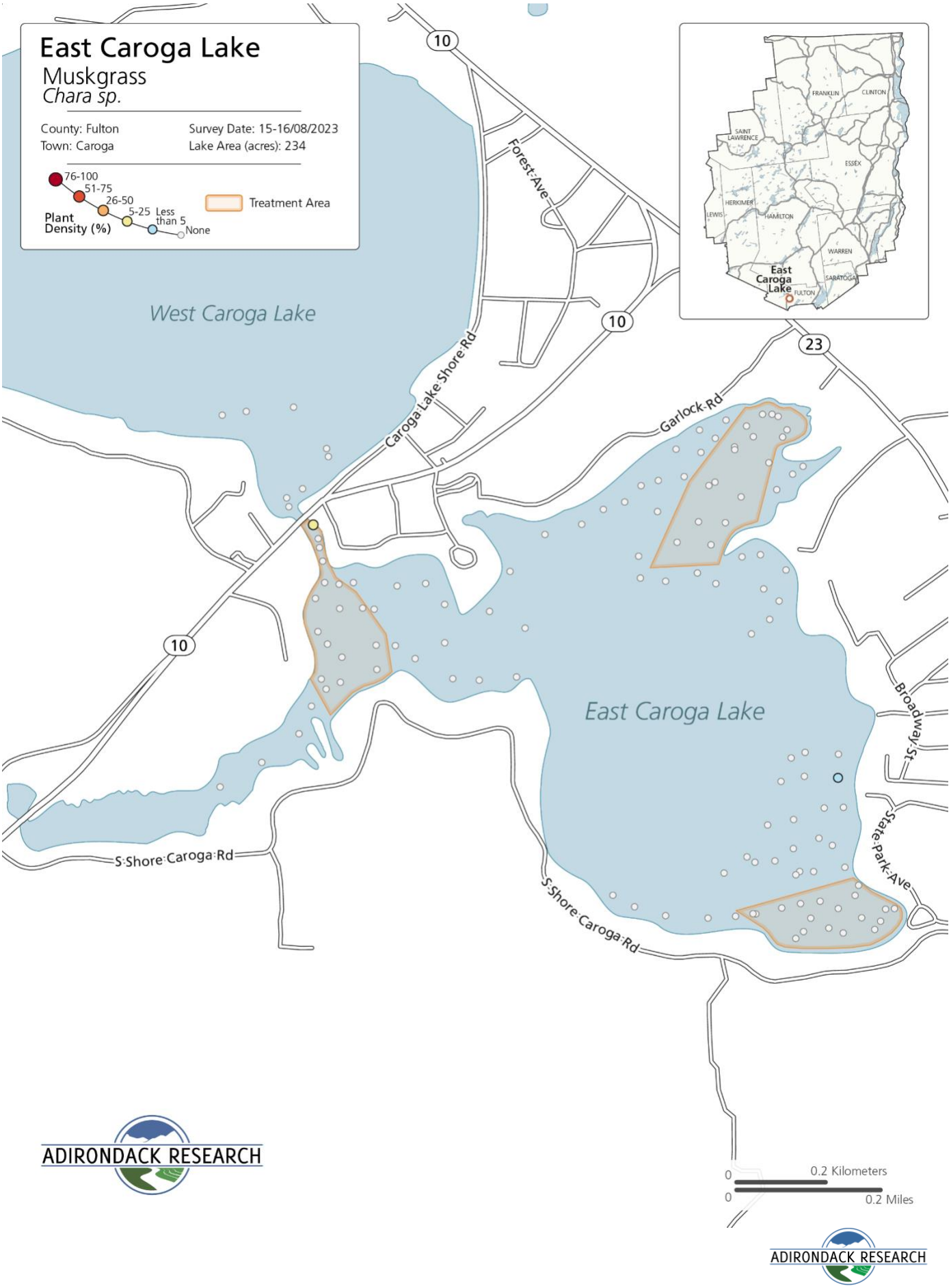

East Caroga Lake
Eurasian Watermilfoil
Myriophyllum spicatum
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH

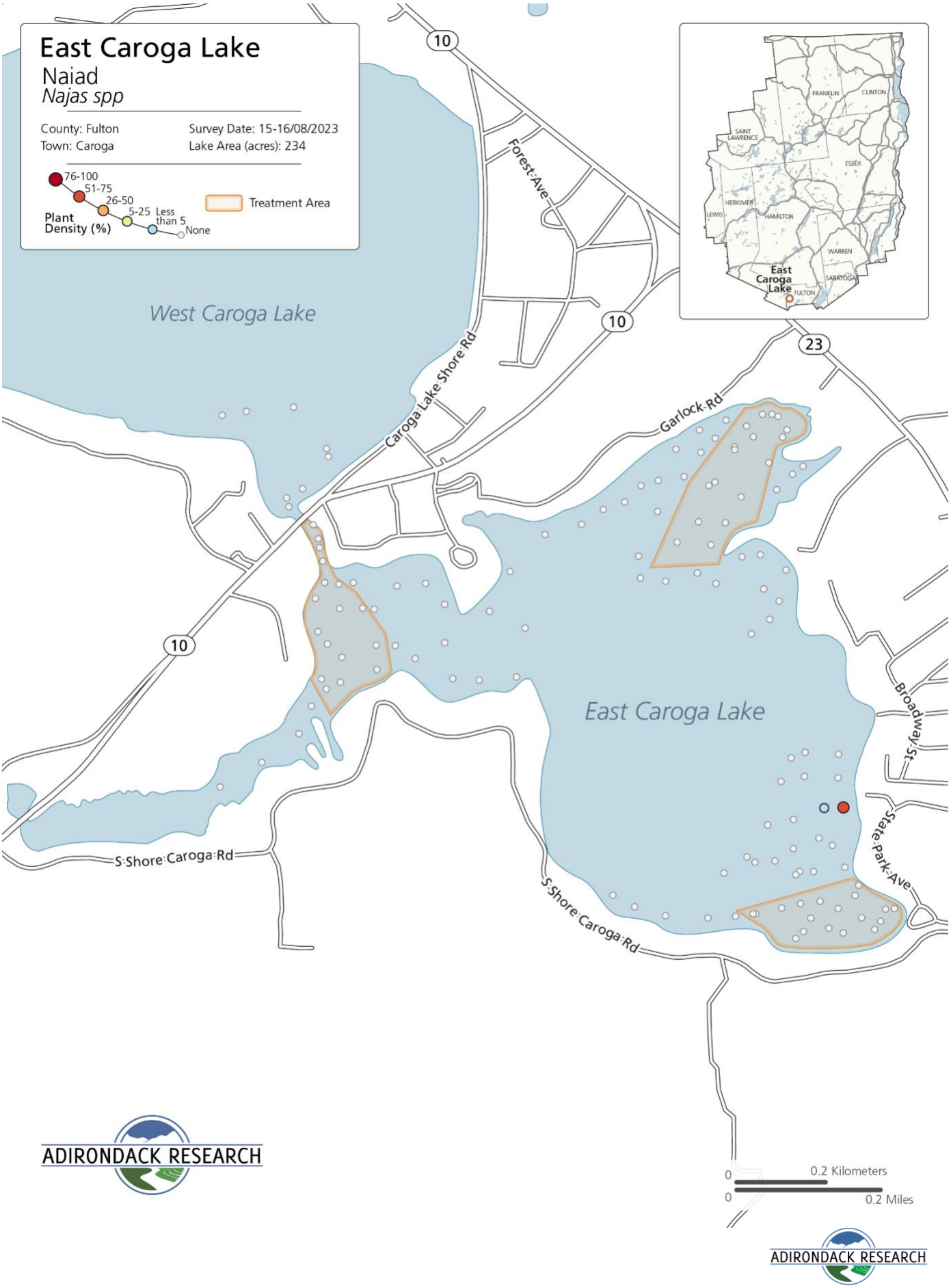

East Caroga Lake
Floating-leaf Pondweed
Potamogeton natans
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Horsetail
Equisetum arvense
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Large-leaf Pondweed
Potamogeton amplifolius
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0.2 Kilometers
0
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Little Floating Heart
Nymphoides cordata
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
State Park Ave
S Shore Caroga Rd
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Muskgrass
Chara sp.
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
State Park Ave
S Shore Caroga Rd
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Naiad
Najas spp
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
State Park Ave
S Shore Caroga Rd
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
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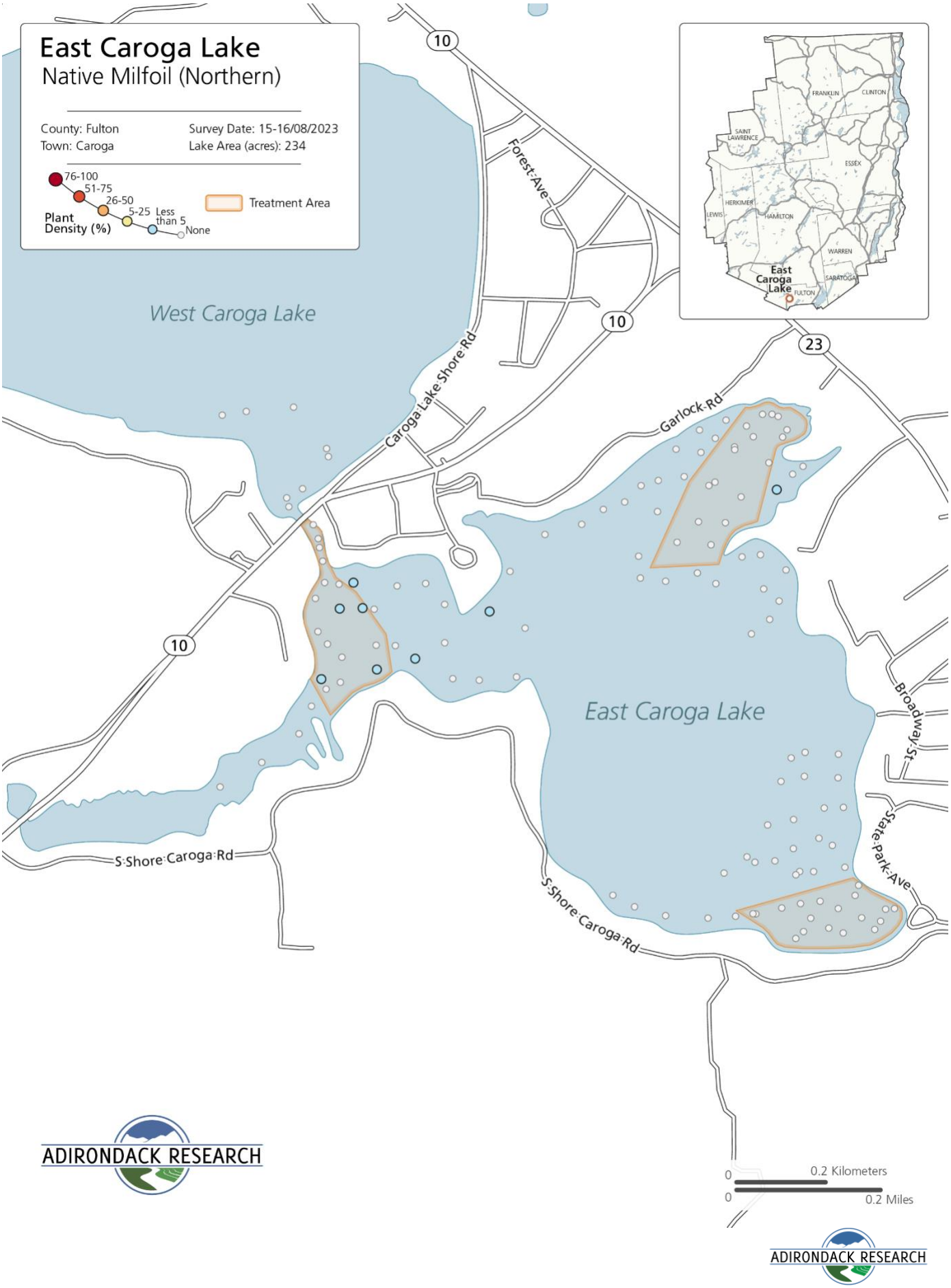
0.2 Kilometers
0
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Native Milfoil (Northern)
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
10
23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0.2 Kilometers
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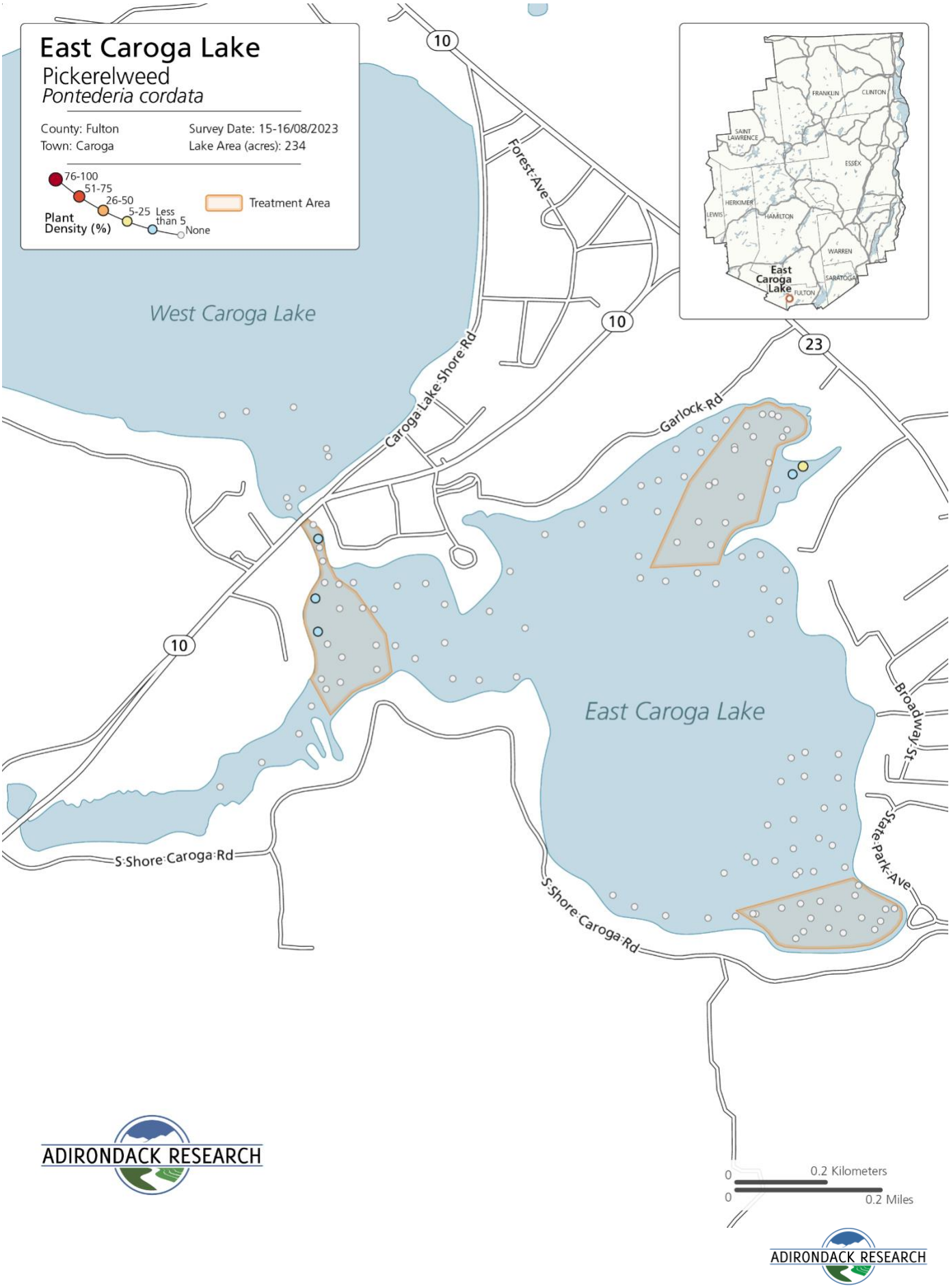
ADIRONDACK RESEARCH


East Caroga Lake
Pickerelweed
Pontederia cordata
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
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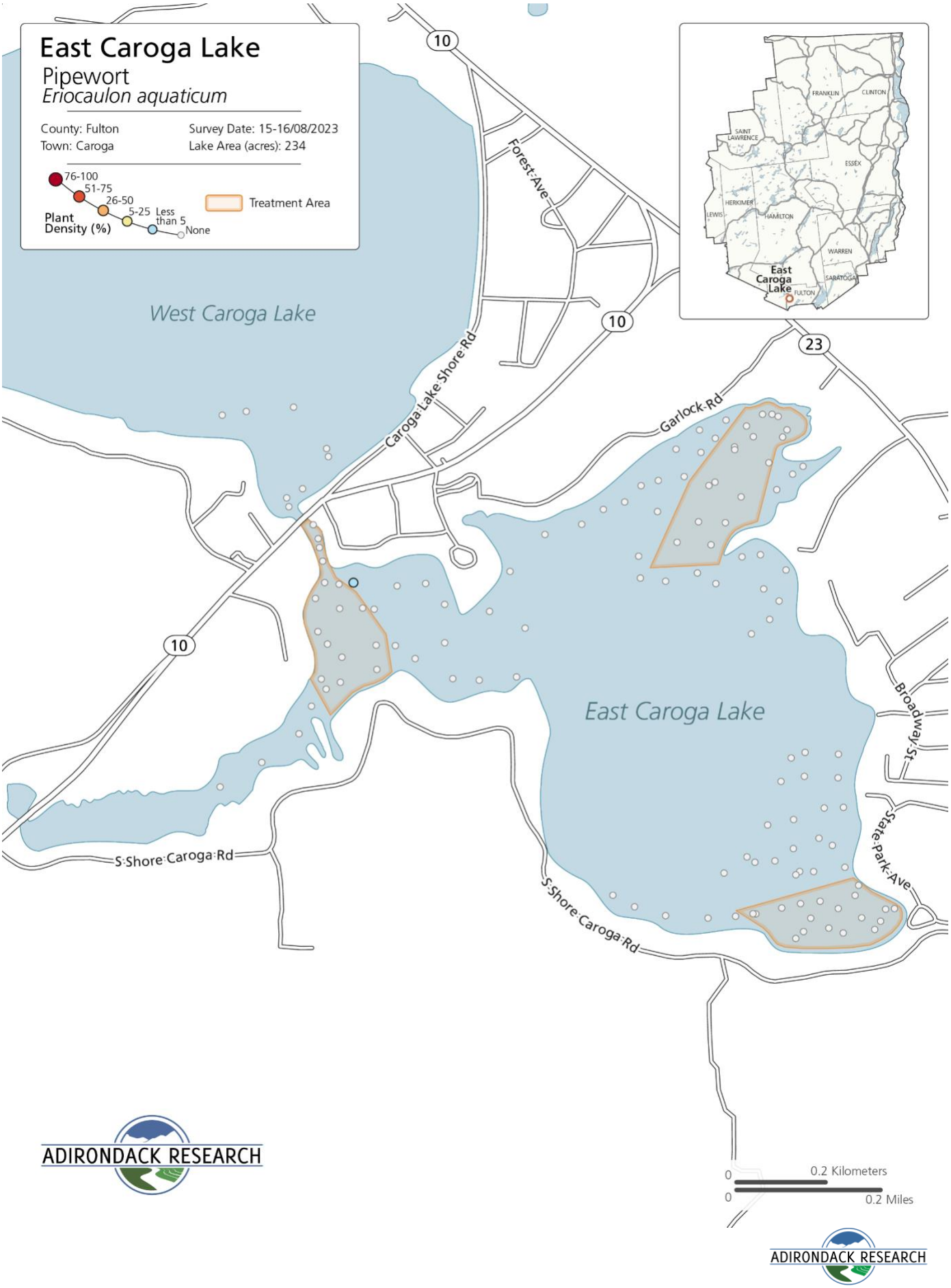
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
ADIRONDACK RESEARCH
0
0.2 Kilometers
0.2 Miles


East Caroga Lake
Pipewort
Eriocaulon aquaticum
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
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23
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
0.2 Kilometers
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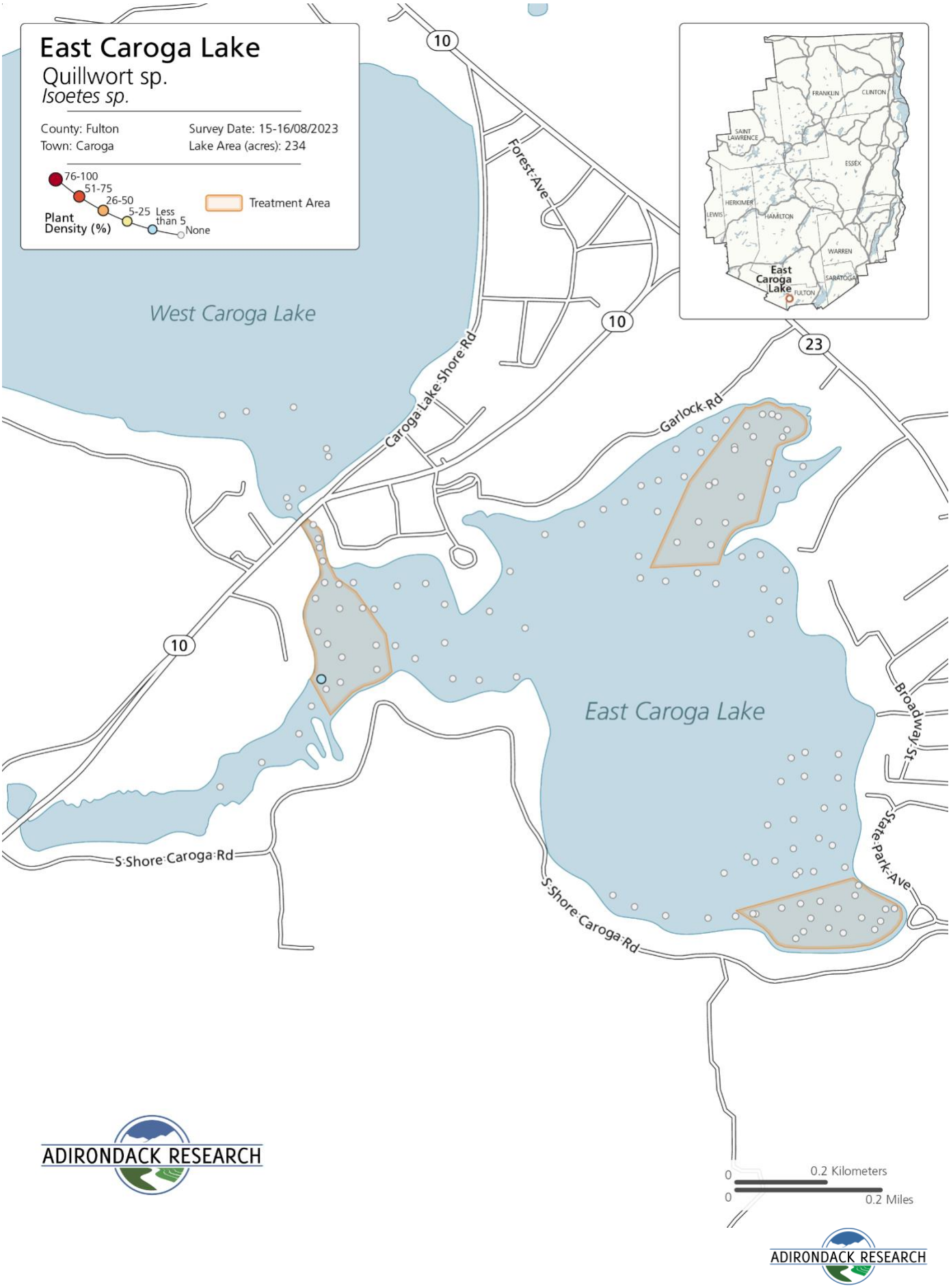
ADIRONDACK RESEARCH


East Caroga Lake
Quillwort sp.
Isoetes sp.
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
State Park Ave
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FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0.2 Kilometers
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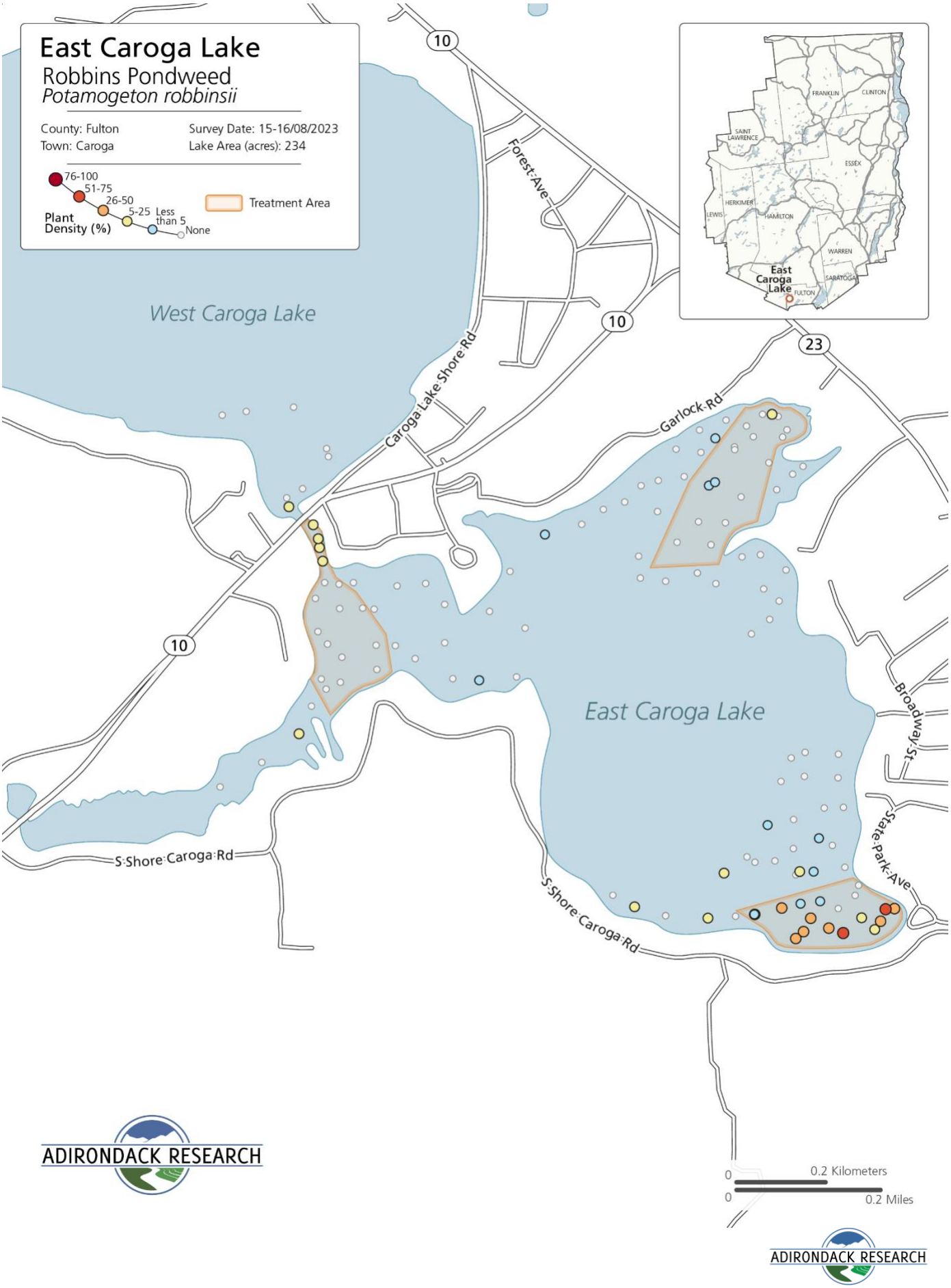
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Robbins Pondweed
Potamogeton robbinsii
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
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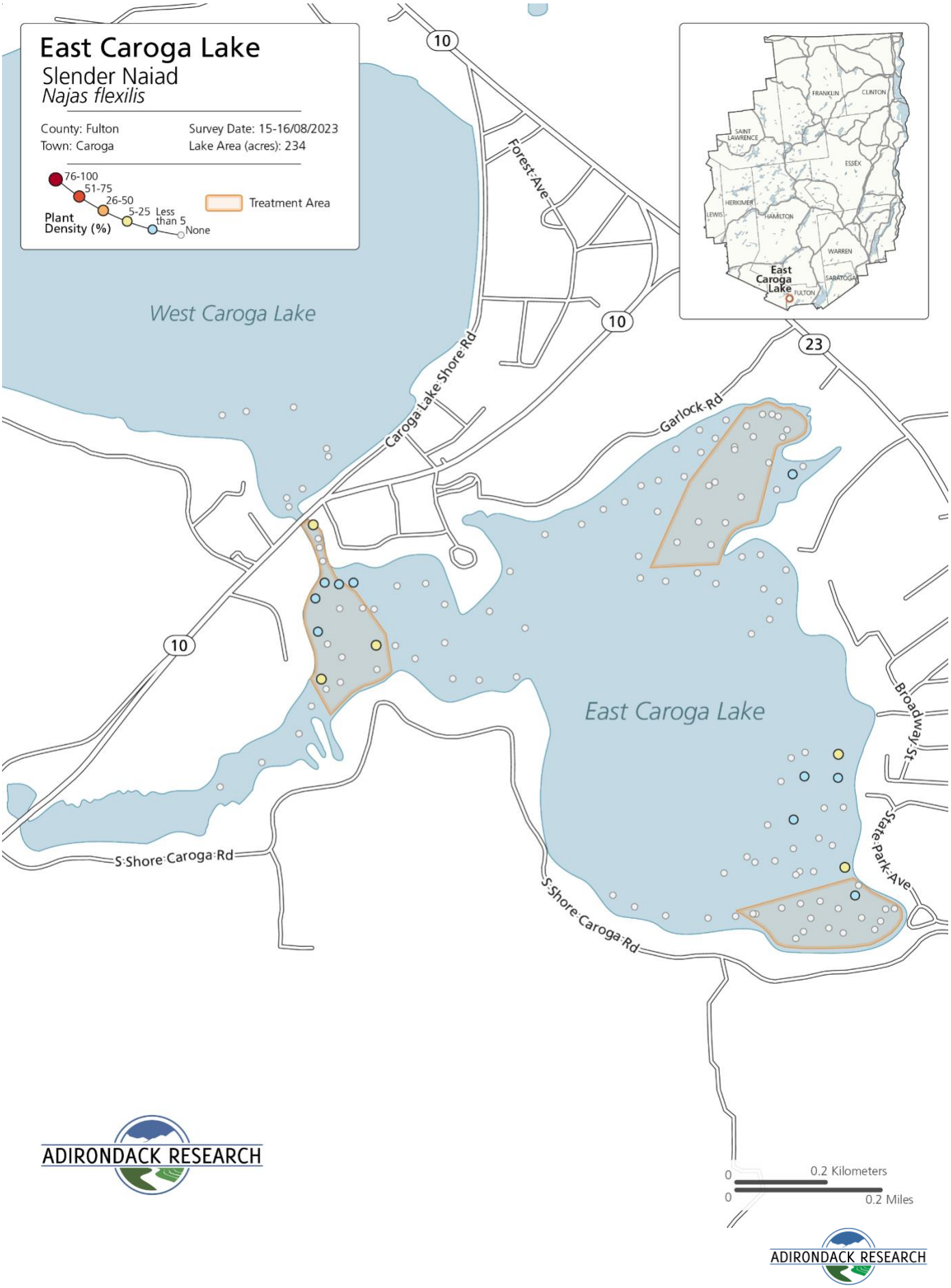
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Slender Naiad
Najas flexilis
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
State Park Ave
S Shore Caroga Rd
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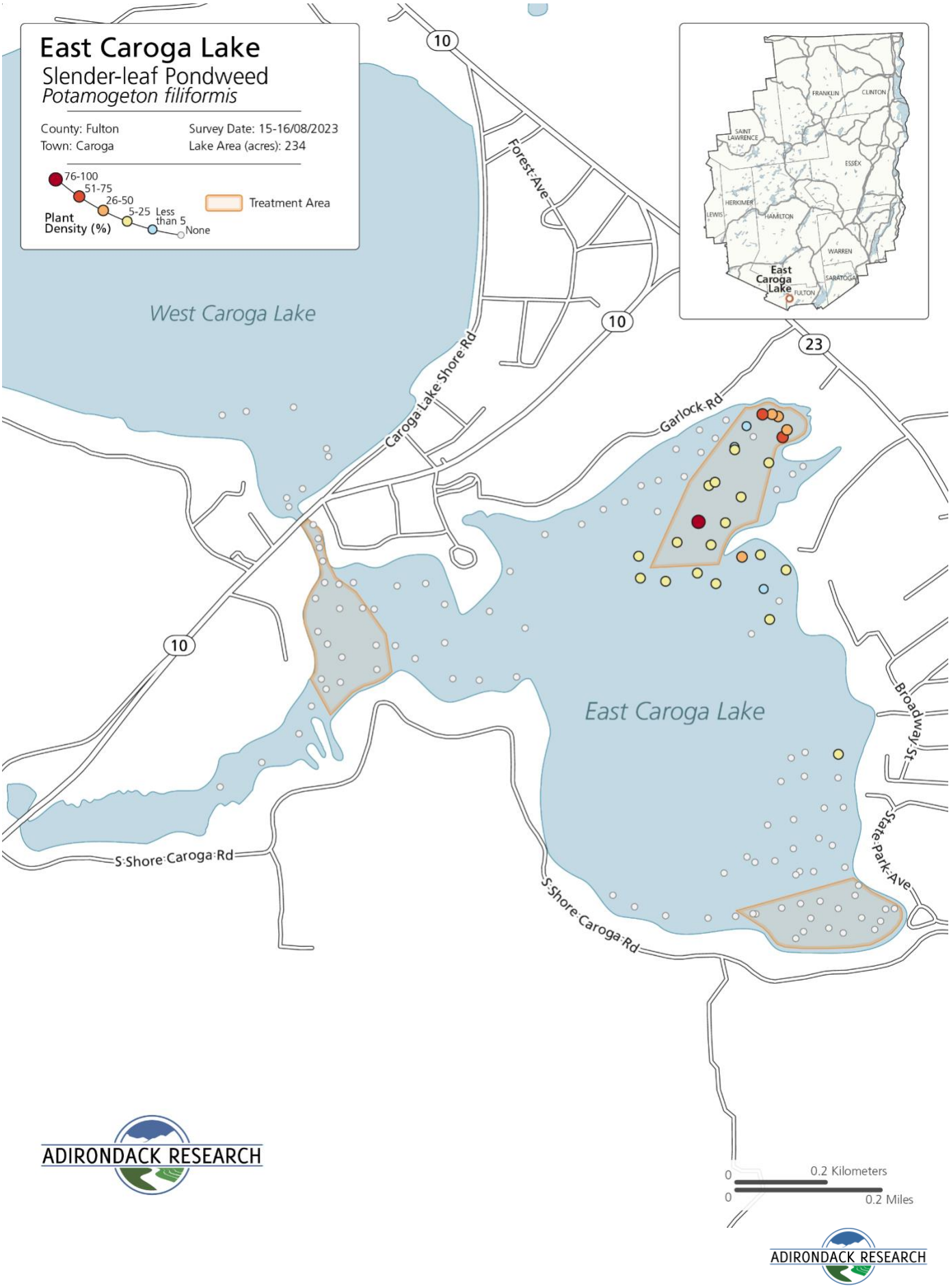
FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
ADIRONDACK RESEARCH
0.2 Kilometers
0.2 Miles


East Caroga Lake
Slender-leaf Pondweed
Potamogeton filiformis
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
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FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
0.2 Kilometers
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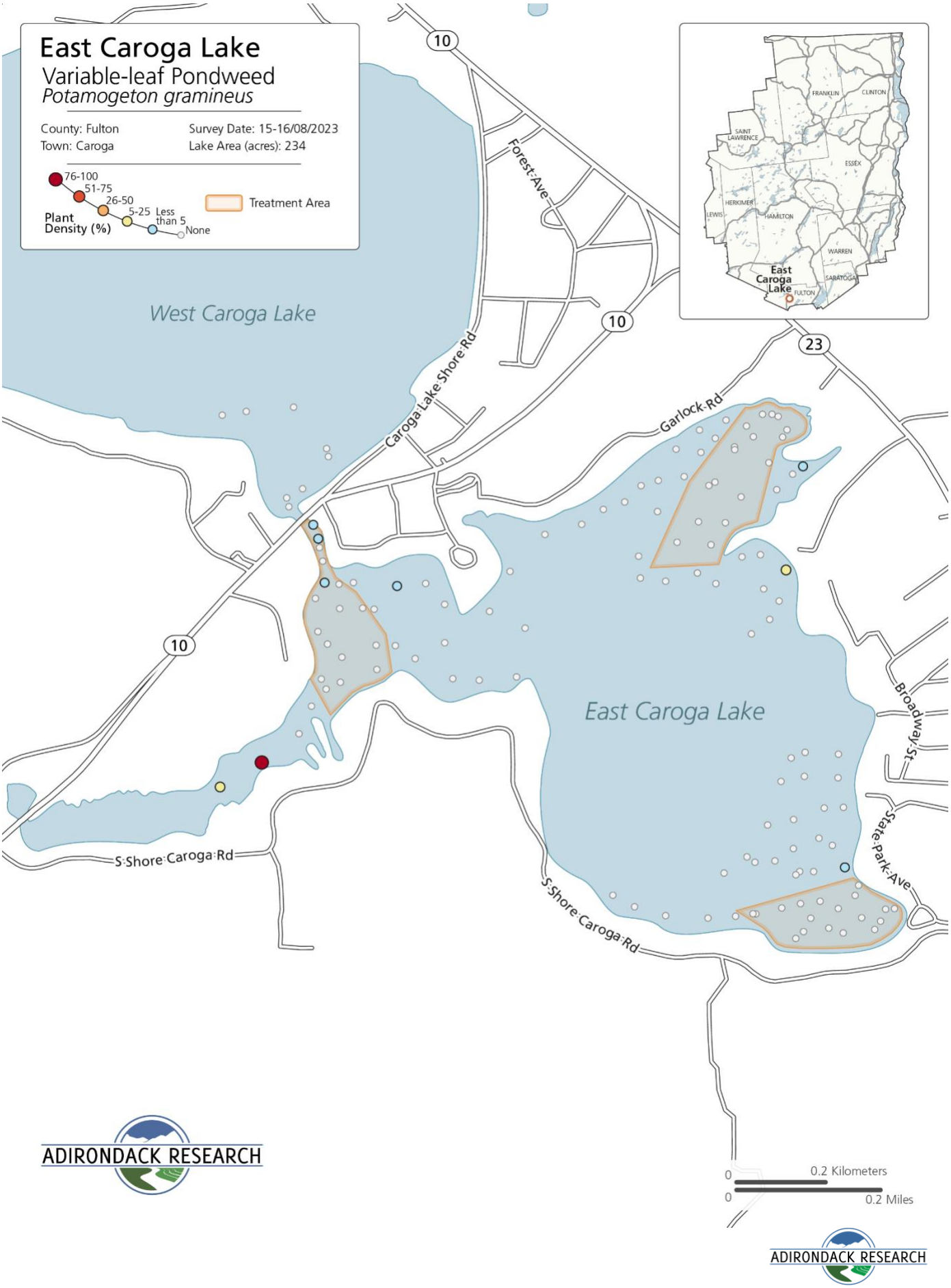
ADIRONDACK RESEARCH


East Caroga Lake
Variable-leaf Pondweed
Potamogeton gramineus
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
Broadway St
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S Shore Caroga Rd
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FRANKLIN
CLINTON
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HERKIMER
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HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
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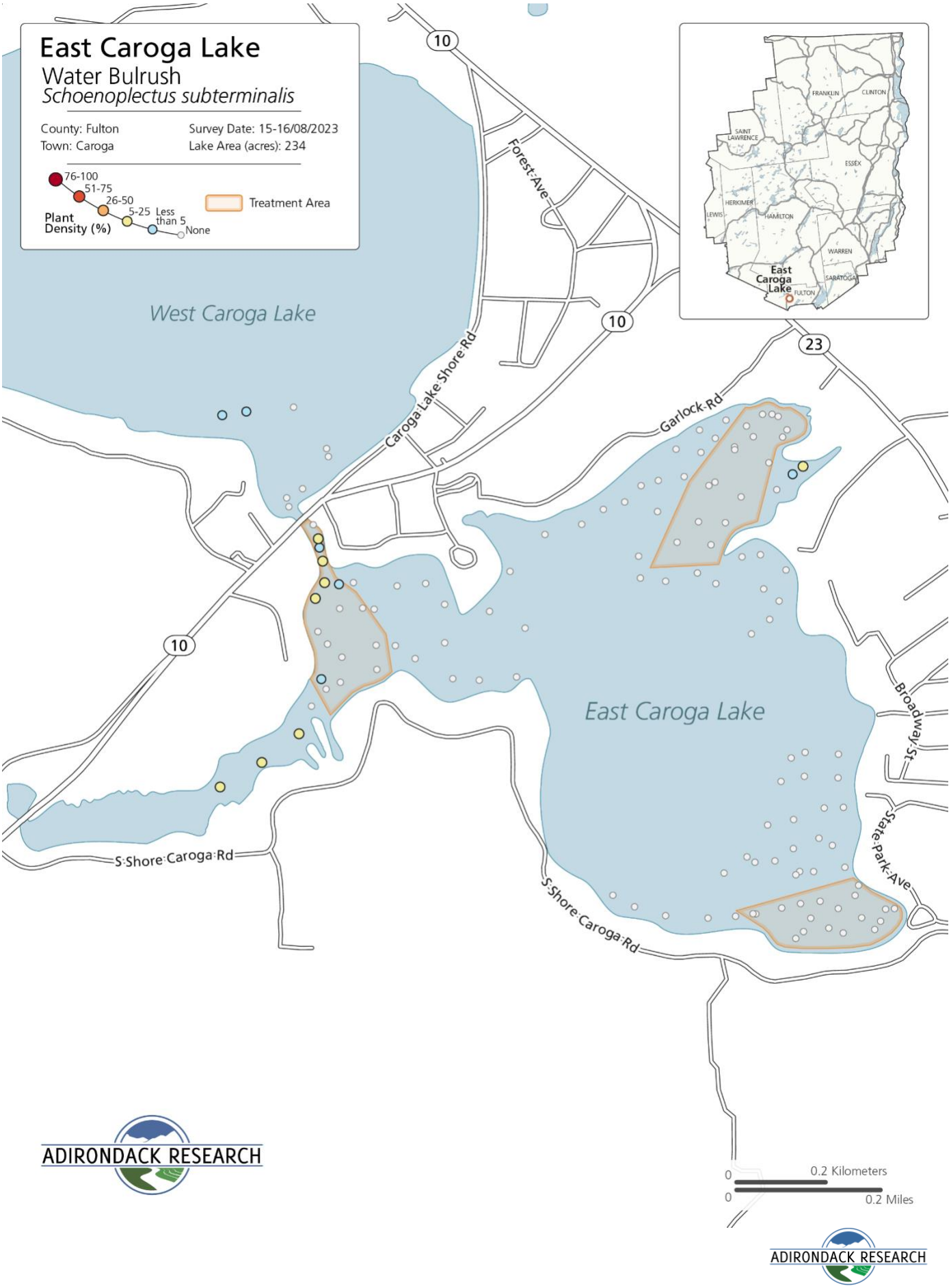
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH


East Caroga Lake
Water Bulrush
Schoenoplectus subterminalis
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
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FRANKLIN
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SARATOGA
FULTON
East Caroga Lake
0
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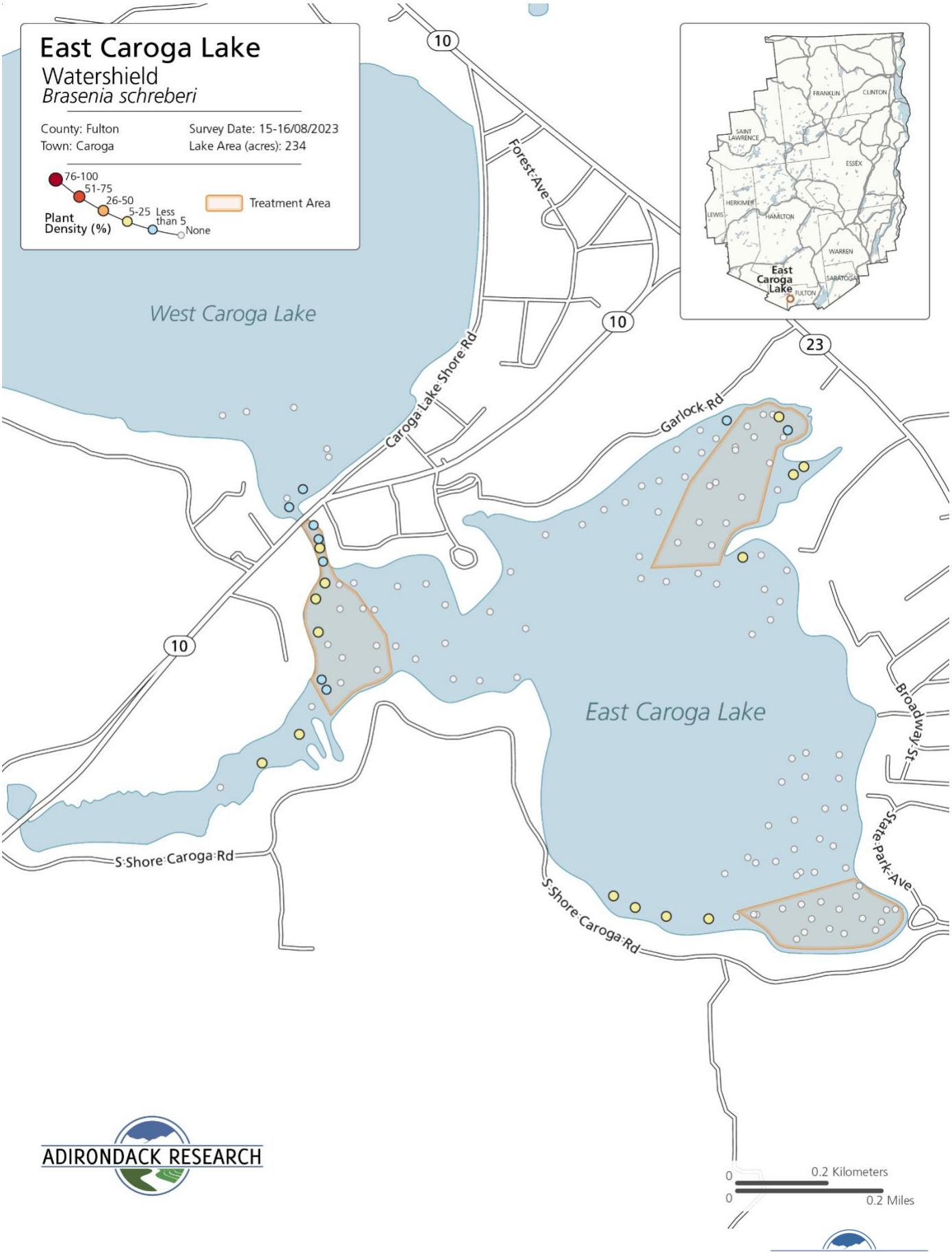
ADIRONDACK RESEARCH


East Caroga Lake
Watershield
Brasenia schreberi
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
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Forest Ave
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FRANKLIN
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ESSEX
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SARATOGA
FULTON
East Caroga Lake
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0.2 Kilometers
0.2 Miles
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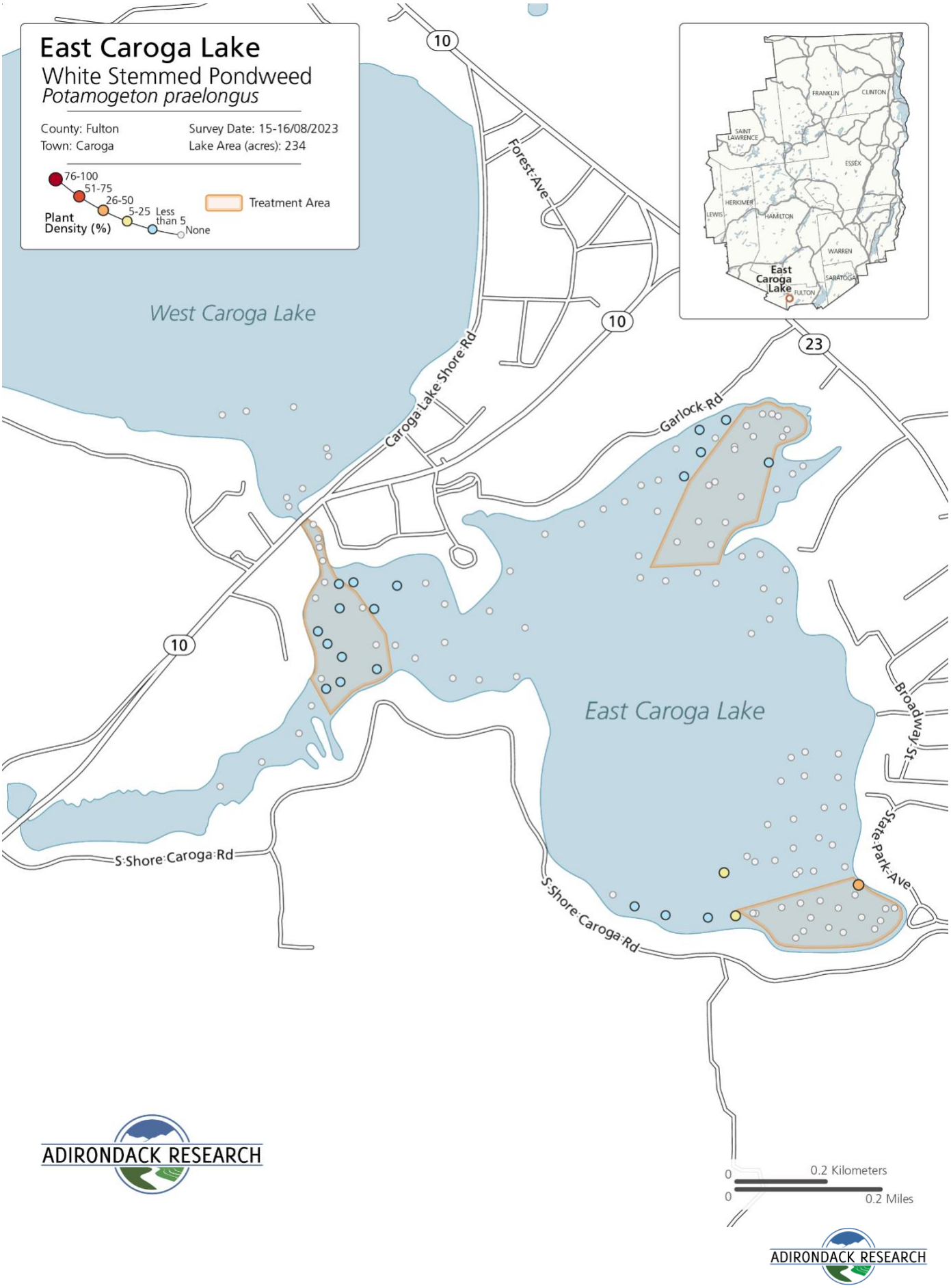
East Caroga Lake
White Stemmed Pondweed
Potamogeton praelongus
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
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FRANKLIN
CLINTON
SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
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East Caroga Lake
ADIRONDACK RESEARCH
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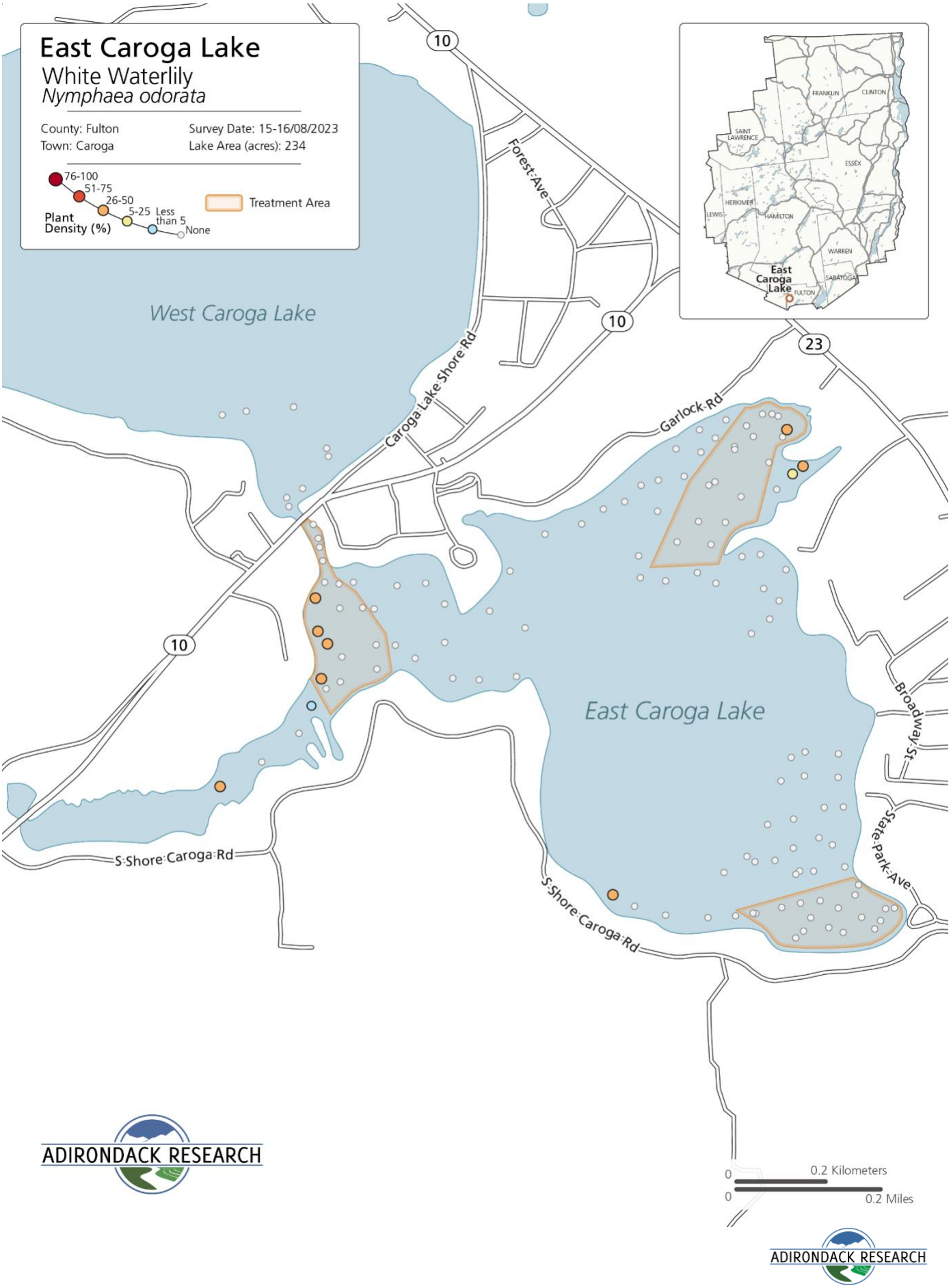
East Caroga Lake
White Waterlily
Nymphaea odorata
County: Fulton
Town: Caroga
Survey Date: 15-16/08/2023
Lake Area (acres): 234
76-100
51-75
26-50
5-25
Less than 5
None
Plant Density (%)
Treatment Area
West Caroga Lake
East Caroga Lake
10
23
Forest Ave
Caroga Lake Shore Rd
Garlock Rd
S Shore Caroga Rd
Broadway St
State Park Ave
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SAINT LAWRENCE
ESSEX
HERKIMER
LEWIS
HAMILTON
WARREN
SARATOGA
FULTON
East Caroga Lake
ADIRONDACK RESEARCH
0
0
0.2 Kilometers
0.2 Miles
ADIRONDACK RESEARCH

Plant Descriptions & ProcellaCOR Sensitivity

[1]Table 5. ProcellaCOR sensitivity

Common Name	Scientific Name	ProcellaCOR sensitivity	Source
Eurasian watermilfoil	Myriophyllum spicatum	High	1
Watershield	Brasenia schreberi	Moderate-high	1
Muskgrass	Chara spp.	Low	1
Canadian water weed	Elodea sp.	low	1
Common pipewort	Eriocaulon aquaticum	N/A	
Horsetail	Equisetum spp.	Low	1
Quillwort	Iseotes sp.	N/A	
Northern milfoil	Myriophyllum sibiricum	High	1
Naiad	Najas	Low	1
Slender Naiad	Najas flexilis	Low	1
Stonewort	Nitella sp.	Low	2
White water lily	Nymphaea odorata	Moderate	1
Little floating heart	Nympoides cordata	Moderate	1
Pickerelweed	Pontederia cordata	Moderate	1
Variable-leaf pondweed	Potamogeton gramineus	Low	1
Large leaf pondweed	Potamogeton amplifolius	Low	1
Floating-leaf pondweed	Potamogeton natans	Low	1
Clasping-leaf pondweed	Potamogeton perfoliatus	Low	1
White stemmed pondweed	Potamogeton praelongus	Low	1
Robbin's pondweed	Potamogeton robbinsii	Low	1
Water bulrush	Schoenoplectus acutus	Low	1
Common Bladderwort	Utricularia intermedia	Low	1
Eelgrass	Vallisneria americana	Low	1

Table 5. ProcellaCOR sensitivity for all species detected in East caroga Lake. Species with unavailable or unknown responses to ProcellaCOR are marked N/A

[1]**Source 1:** Heilman, M. (2019). "Selective Control of Invasive Watermilfoils with ProcellaCOR® Aquatic Herbicide and Response of Native Aquatic Plants." SePRO. https://lgpc.ny.gov/system/files/documents/2022/03/technical-summary-procellacor-selective-control-of-invasive-watermilfoils-plus-appendix-28jan2019.pdf

Source 2: Vermont Department of Environmental Conservation (2022), "ProcellaCOR EC Aquatic Macrophyte Species Frequency of Occurrence Pre-and Post-Treatment Statistical Analysis." https://dec.vermont.gov/sites/dec/files/wsm/lakes/ANC/docs/Procellacor%20Aquatic%20Macrophyte%20Species%20Frequency%20of%20Occurrence%20Pre-and%20Post-Treatment%20Statistical%20Analysis%204-12-22.pdf

Myriophyllum spicatum (Eurasian watermilfoil)

Originating in Europe and Asia, this is a rapidly spreading invasive milfoil species. Its ability to grow in cool water and at low light conditions, in addition to reproducing by fragmentation and fruit production; allows it to quickly overtake waterbodies and choke out native species. *Myriophyllum spicatum* (Eurasian watermilfoil) has feather-like leaves, arranged in whorls of 4 to 5 along the stem, and each leaf has a central axis with 12 to 21 leaflet pairs. It has relatively large spaces between each whorl, sometime greater than ½ inch. These leaves are attached to thin stems that can normally grow 3 to 10 feet but have been reported as long as 33 feet in length. The stem is typically light brown in color and the tips are occasionally red or pink in color. These stems branch off repetitively at the water's surface forming large, floating mats of vegetation that block light to native species and imped water traffic. It is extremely sensitive to ProcellaCOR treatment, completely wiping out exposed plant beds and resulting in severe browning to the extent the plant is no longer recognizable.

Brasenia schreberi (Watershield)

A floating-leaf aquatic plant, resembling miniature water lily leaves; with 2–5-inch oval, bright green leaves and red to purple bottoms. Its stems are attached to a rooted rhizome, anchoring into the ground and providing a source of nutrients. Purple flowers bloom in late summer to early fall for a two-day period on short 1-inch stocks. It is most commonly found in clear, soft water, up to depths of 10 feet. This plant has been found to have a moderate to high sensitivity to ProcellaCOR treatment. Notable reductions in density and coverage of this plant can be observed after treatment, along with severe discoloration. Effects from ProcellaCOR are dependent of the proximity of watershield to treatment areas.

Chara sp. (Muskgrass)

Is in the genus of charophyte green algae in the family Characeae. They are multicellular and superficially resemble land plants because of stem-like and leaf-like structures. They are found in freshwater, where they grow submerged, attached to the muddy bottom. The branching system of Chara species is complex with branches derived from apical cells which cut off segments at the base to form nodal and internodal cells alternately. The main axes bear whorls of branches in a superficial resemblance to Equisetum (a vascular plant). They are typically anchored to the littoral substrate by means of branching underground rhizoids. Chara plants are rough to the touch because of deposited calcium salts on the cell wall. The metabolic processes associated with this deposition often give Chara plants a distinctive and unpleasant smell of hydrogen sulfide. Chara has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Elodea sp. (Canadian water weed)

Grows entirely underwater, except for a small white flower that blooms during the summer. Leafy shoots between 8 inches and 3.5 feet long are elongated, with slender, unbranched roots, and branched stems. Leaves are dark green, oval-shaped and arranged in clusters of 3-4. *Elodea sp.* (Canadian water weed) is an excellent oxygen producer and provides a habitat for many small aquatic animals, which fish and wildlife eat. However, dense growth of this plant can create a nuisance, and its closed, compact structure is not ideal fish habitat. Canadian water weed has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Eriocaulon aquaticum (Common pipewort)

Is an emergent aquatic plant most recognizable by its cottony, gray-white, knob-like flower head atop a 7-sided, leafless stalk. Its grass-like leaves form a basal rosette and are papery thin, often translucent with 3 to 9 parallel veins the length of the blade, and notable cross hatched veinlets near its base. Its submerged portions provide habitats for invertebrates that are used as food by fish and other wildlife species. Sensitivity to ProcellaCOR treatment is unknown.

Equisetum sp. (Horsetail)

Is a vascular plant that commonly grows in dense colonies along freshwater shorelines or in shallow water in ponds, swamps, ditches, and other sluggish or still waters with mud bottoms. It is a perennial herbaceous species, growing 30–100 cm (rarely 140 cm) tall with erect dark green stems 2–8 mm in diameter, smooth, with about 10–30 fine ridges. Horsetail has a low sensitivity to ProcellaCOR.

Iseotes sp. (Quillwort)

Quillwort leaves grow from a fleshly, lobed underground stem adorned with forked roots, in water 1 to 3 meters deep. Its leaves are hollow and narrow, growing on average to be 0.8-8 inches long arranged in a rosette, radiating from the base of the plant. Spores form inside sacks located on the spoon-like bases of the leaves; examining the megaspores the only way to positively identify quillworts to species. Foliage is sometimes consumed by waterfowl. Sensitivity to ProcellaCOR treatment is unknown.

Myriophyllum sibiricum (Northern milfoil)

The leaves of Northern Watermilfoil are completely submersed, dark green, and up to two inches long. They are divided all the way to midvein like a feather, containing five to 12 pairs of leaflets on a short leaf stalk. The stem is typically peach or pinkish-colored and sparsely branched. Milfoil flowers occur atop the same stem as the leaves; the spike emerges from the water; flowers are tinted red and spaced out. Northern milfoil is known to have a high sensitivity to ProcellaCOR

Najas (Naiad sp.)

Water-nymphs or naiads is a genus of aquatic plants. Often characterized by bushy, compact growth. Naiads have small leaves, usually stiff and curled. Naiads fragment easily. Naiad's have been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Najas flexilis (Slender naiad)

Is an annual submersed rooted or floating plant with slender, branching stems and fibrous roots. Growth is usually compact and relatively bushy; the highly branched stems can grow up to 4 feet in length and fragment easily. Leaves are commonly 1 mm wide and 0.5 to 3.5 cm long, and are typically stiff, curled and pointed, and have spines along the margins that are visible to the naked eye. Tiny flowers appear in the axil of the plant with separate male and female flowers on the same plant. *Najas flexilis* (Naiad sp.) can form dense surface mats of vegetation that inhibit growth of native plant species and reduce the water quality of habitat utilized by aquatic fauna. Naiad's have been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Nitella sp. (Stonewort)

Are branched multicellular algae, that may grow several feet long and resemble larger plants. Commonly light green to bright-green in color with forked, bushy branches 1/16 to 1/8 inches in diameter, and does not flower. *Nitella sp.* (Stonewort) grows entirely below the water surface, usually in deeper zones, to depths of 30 feet. The plant provides food for waterfowl and cover for fish and also supports insects and other small aquatic animals, which provide substance for trout, bluegills, small mouth bass, and largemouth bass. Stonewort has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Nymphaea odorata (White water lily)

Roots in relatively shallow, silty bottoms up to 5 feet deep and produces a familiar round floating leaf 6 to 12 inches in diameter. Flowers have twenty to thirty white tapering petals. They also have forty or more bright yellow stamens in the center and a whorl of four green to purplish sepals at the base. The flowers, which are three to five inches wide, are fragrant and emerge in early Summer. *Nymphaea odorata* (White water lily) provide shad and protection for largemouth bass and sunfish. Seeds are eaten by waterfowl and leaves, stems, and flowers provide food for beavers and muskrats. White water lily has been found to have a moderate sensitivity to ProcellaCOR treatment. Initial symptoms, including a reduction in biomass and browning of leaves can be seen almost imminently to 2 weeks. However, this plant will tend to make a strong to full recovery over time.

Nympoides cordata (Little floating heart)

Is in the genus of Nymphoides. Nymphoides, or floatingheart, is a genus of aquatic flowering plants in the family Menyanthaceae. The genus name refers to their resemblance to the water lily Nymphaea. Nymphoides are aquatic plants with submerged roots and floating leaves that hold the small flowers above the water surface the floating leaves are 30–70 mm long and cordate (or heart-shaped), with smooth, purple lower surfaces. Little floatingheart grows in eastern North America, from the eastern provinces of Canada down to Maryland, and then reoccurs from the Carolinas down to Louisiana. Nymphoides are known to be sensitive to ProcellaCOR.

Pontederia cordata (Pickerelweed)

Pickerelweed is a perennial emergent that can reach three to four feet in height. It is easily recognizable by its bright purple to blue flowers spiking up 6 inches from the water. Deep green, heart shaped leaves, 1 to 6 inches in width and 2 to 10 inches in length, emerge at the ends of stems that are fibrously rooted in soil commonly, no more than 3 feet deep. Fish and small mammals use the foliage for cover, while waterfowl consume its seeds, and deer and muskrats consume its vegetation. *Pontederia cordata* (Pickerelweed) has been found to have a low to moderate sensitivity to ProcellaCOR treatment. It is more common to suffer effects such as discoloration and slight loss of biomass density after treatment. However, it will still generally tend to make a full recovery in time.

Potamogeton gramineus (Variable-leaf pondweed)

Also known as grassy pondweed, it is often found in less than 3 feet of water, it grows from a creeping rhizome that anchors in wet substrate, producing thin, cylindrical, heavily branching stems. Leaf appearance is variable depending on depth. Floating leaves are rounded at the base and can be rounded or pointed at the tip about 1½ inches long, and up to 2cm wide, while submersed leaves are narrowly

elliptic and almost always pointed at the tip. This species hybridizes frequently, but can be recognized by its flower, a dense cylindrical spike with 5-10 whorls of flowers that just reaches above the surface of the water. *Potamogeton gramineus* (Variable-leaf pondweed) has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Potamogeton amplifolius (Large-leaf pondweed)

is an aquatic plant of North America. It grows in water bodies such as lakes, ponds, and rivers, often in deep water. This perennial plant grows from rhizomes and produces a very slender, cylindrical, sometimes spotted stem up to a meter or so long. The leaves take two forms. Submersed leaves are up to 20 centimeters long by 7 wide and may be folded along their midribs. The submersed leaves have more veins than do those of other pondweed species, up to 49.[1] Floating leaves are up to 10 centimeters long by 5 wide, leathery in texture, and borne on long petioles. The inflorescence is a spike of many flowers rising above the water surface on a thick peduncle. Potamogeton amplifolius (Large-leaf pondweed) has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Potamogeton natans (Floating-leaf pondweed or Broad-leaf pondweed)

Growing from 2 to 4 feet tall, *Potamogeton natans* (Floating-leaf pondweed) have long, pale, bent leaf stalks that connect to green, heart-elliptical shaped, 1 to 2 inch wide, 1.5 to over 4 inch long, floating leaves. It can tolerate a variety of sediment types and water chemistries, commonly growing in waters no deeper than 8 feet. Its leaves provide shade and hunting opportunities for fish. *Potamogeton natans* (Floating-leaf pondweed) has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Potamogeton perfoliatus (Clasping-leaf pondweed)

Growing from a network of rhizomes, with stems ranging from 1 to 10 feet long, this pondweed is most recognizable by its wide, wavy, oval shaped leaves that partially surround the plants stem. Small greenish flowers emerge from a stem that can either be submerged for emergent from the water's surface. The leaves and stems of Clasping leaf pondweed are colonized by invertebrates and provide cover for fish, while its fruit and leaves provide food for waterfoil, muskrats, beaver, and deer. *Potamogeton perfoliatus* (Clasping-leaf pondweed) has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Potamogeton praelongus (White stemmed pondweed)

Commonly found in quiet, clear waters up to 20 feet deep, it is recognized by its pale, zig-zag stem and large white stripules. Stalkless leaves grow to be 4 to 8 inches long, ¾ to 1½ inches (2 to 4 cm) wide, with wavy edges, and 11 to 35 veins and a boat-shaped tip that splits when pressed. Its leaves are all submersed and more or less spirally arranged along the stem. It produces a dense cylindrical spike held above the surface of the water, 1 to 3 long at the tip of the stem. Spikes have 6 to 12 whorls of flowers, with 4 pedals. Seeds and leaves provide a source of nutrients for waterfowl, muskrats, and deer. *Potamogeton praelongus* (White stemmed pondweed) has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Potamogeton robbinsii (Robbin's pondweed)

Found in waters 2 to 20+ feet deep, *Potamogeton robbinsii* (Robbin's pondweed) thrives in deeper water and can range in height 20 to 40 inches. It tends to form dense colonies with dark green, crowded, linear, fern-like leaves. Leaves are stalkless and the stems are round, with little branching seen on the lower portion and more frequent branching seem further up the plant. Its dense coverage can provide a suitable habitat and cover for lie-in-wait predaceous fish. *Potamogeton robbinsii* (Robbin's pondweed) has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Schoenoplectus acutus (Water bulrush)

is a giant species of sedge in the plant family Cyperaceae, native to freshwater marshes all over North America. Stout, herbaceous perennials from rhizomes, the culms 1-3 m. tall, firm, terete, often over 1 cm. thick toward the base. Leaves few, toward the base of the culm, with well-developed sheath and short blade. Bulrush have been found to have Low Sensitivity to ProcellaCOR.

Utricularia intermedia (Bladderwort)

Is a carnivorous free-floating, non-rooted plant that can reach 2-3 meters in length with submerged stems, bladders, and overwintering buds. Stems are slender, 1/16 inches thin or smaller with small, crowded, linear leaves forked 3-7 times. Dark bladders cover the stems and are responsible for capturing prey, opening like a valve to trap microorganisms then using enzymes to slowly digest prey and absorb needed nutrients. Prey can consist of aquatic insect larvae, water mites, nematodes, gastropods, small tadpoles, crustaceans, diatoms, and other aquatic microorganisms. *Utricularia intermedia* (Bladderwort) produces 1-4 bright yellow 1/3-inch snap-dragon-like blooms with a slender green stalk. Its stems provide food and cover for many fish species. Bladderworts have been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

Vallisneria americana (Eelgrass)

A submerged, flowering seagrass that thrives in soft, sandy sediment in shallow bays and inlets. It is a grass-like plant with dark-green, narrow, ribbon shaped leaves with rounded tips, that grow 20 to 50 cm in length. These leaves shoot from rhizomes binding the plant to the sediment. *Vallisneria americana* (Eelgrass) form dense underwater meadows, that support a diversity of flora and fauna, and act as a nursery to fish and shellfish. Additionally, it adds structure to silty sands that would otherwise shift and erode. Eelgrass has been found to have a relatively low sensitivity to ProcellaCOR treatment, resulting in little to no response observed on the plants health after treatment.

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