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Park Agency**

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2024 Eagle Lake AIS Survey

Aquatic Invasive Species Surveys
Survey Team Report


ADIRONDACK RESEARCH

2024 Eagle Lake Aquatic Invasive Species Survey

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Cover image: Eagle Lake by Justin wolford, 2024

Executive Summary

The purpose of this effort was to full inventory and document aquatic invasive species in Eagle Lake, as well as document native plant species.

We surveyed 123 stations (sample points). Our survey design and methodologies followed the current best practices for documenting plant species in a waterbody.

Our team documented aquatic plant species occurrence, species cover class, overall plant cover class, depth, and species richness at each of the 123 stations.

Eurasian watermilfoil was documented at a total of 39 of the 123 stations (55.8%). Twenty-three other native species were documented.



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Overview

We performed an aquatic invasive species (AIS) and native aquatic plant species survey for Eagle Lake in Essex County on the dates of July 31st and August 1st. This survey was completed as part of a grant the Eagle Lake Property Owners Inc. received to create an invasive species management plan.

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 123 stations in the entirety of the 410 -acre waterbody over a 2-day period with two crew members using a motorboat.
- Survey and identify all native plant species at point intercept survey stations
- Draft maps showing survey locations, overall plant abundance, depth, species richness, and abundance for each of the 24 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.
- Produced this report of the described survey effort.

Methods

Below is a description of the survey methods used while surveying the lake. We've included a brief description of the equipment used, our pre- and post-cleaning procedure for all of our equipment, 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, and a Lowrance HDS 7 GPS and sonar unit. All data and observations were recorded using ESRI's Field Maps 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.

Sampling Techniques

The littoral zone typically encompasses the area from shoreline to a depth of about 15 feet. We utilized publicly available bathymetric to determine the survey extent. We then evenly distributed 123 points around the lake for sampling.

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: Density class descriptions. 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.

Results

The team surveyed 123 sites on July 31st, and August 1st 2024: detecting one invasive species (Eurasian watermilfoil). The team also detected 24 native species. Table 2 provides a summary of all aquatic vegetation detected in Eagle Lake, in addition to their count and frequency of occurrence relative to the 123 points surveyed, invasive species are dictated in red.

Table 2. Summary of Aquatic Vegetation Occurrences and Frequency for Eagle Lake 2024. Coverage class was recorded for each of these and are displayed in Table 4.

Common Name	Scientific Name	Frequency	% Occurrence
American eelgrass	<i>Vallisneria americana</i>	4	3.3
Beck's water-marigold	<i>Bidens beckii</i>	1	0.8
Clasping leaf pondweed	<i>Potamogeton perfoliatus</i>	9	7.3
Common naiad	<i>Najas flexilis</i>	19	15.4
Coontail	<i>Ceratophyllum demersum</i>	1	0.8
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	39	31.7
Floating-leaf pondweed	<i>Potamogeton natans</i>	1	0.8
Fragrant water lily	<i>Nymphaea odorata</i>	5	4.1
Horsetail	<i>Equisetum fluviatile</i>	1	0.8
Large-leaved pondweed	<i>Potamogeton amplifolius</i>	1	0.8
Low watermilfoil	<i>Myriophyllum humile</i>	1	0.8
Muskgrass	<i>Chara sp.</i>	11	8.9
Northern watermilfoil	<i>Myriophyllum sibiricum</i>	1	0.8
Nuttalls waterweed	<i>Elodea nuttallii</i>	1	0.8
Pickerelweed	<i>Pontederia cordata</i>	1	0.8
Quillwort	<i>Isoetes spp.</i>	10	8.1
Ribbon-leaf pondweed	<i>Potamogeton epihydrus</i>	10	8.1
Robbins pondweed	<i>Potamogeton robbinsii</i>	14	11.4
Small pondweed	<i>Potamogeton pusillus</i>	7	5.7
Stonewort	<i>Nitella sp.</i>	6	4.9
Water weed	<i>Elodea sp.</i>	9	7.3
Watershield	<i>Brasenia schreberi</i>	5	4.1
White stem pondweed	<i>Potamogeton praelongus</i>	11	8.9
Whorled watermilfoil	<i>Myriophyllum verticillatum</i>	1	0.8

Below are the results for each species' density class distributions for Eagle Lake.

American eelgrass (*Vallisneria americana*)

This plant was found at a total of 4 sample points resulting in 3.3% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=4, 100.0%)

Becks water marigold (*Bidens beckii*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Casping leaf pondweed (*Potamogeton perfoliatus*)

This plant was found at a total of 9 sample points resulting in 7.3% of occurrences. It was found growing in three stages of cover class, appearing at sparse levels, (n=5, 55.6%), trace levels (n=3, 33.3%), and moderate levels (n=1, 11.1%).

Common naiad (*Najas flexilis*)

This plant was found at a total of 19 sample points resulting in 15.4% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=14, 73.7%), and sparse levels (n=5, 26.3%).

Coontail (*Ceratophyllum demersum*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Eurasian watermilfoil (*Myriophyllum spicatum*)

This plant was found at a total of 39 sample points resulting in 31.7% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=27, 69.2%), and sparse levels (n=12, 30.8%).

Floating-leaf pondweed (*Potamogeton natans*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Fragrant waterlily (*Nymphaea odorata*)

This plant was found at a total of 5 sample points resulting in 4.1% of occurrences. It was found growing in two stages of cover class, appearing at sparse levels, (n=4, 80.0%), and trace levels (n=1, 20.0%).

Horsetail (*Equisetum fluviatile*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Large-leaved pondweed (*Potamogeton amplifolius*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Low watermilfoil (*Myriophyllum humile*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Muskgrass (*Chara sp.*)

This plant was found at a total of 11 sample points resulting in 8.9% of occurrences. It was found growing in three stages of cover class, appearing at trace levels, (n=8, 72.7%), sparse levels (n=2, 18.1%), and moderate levels (n=1, 9.2%).

Northern watermilfoil (*Myriophyllum sibiricum*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at sparse level, (n=1, 100.0%).

Nuttalls waterweed (*Elodea nuttallii*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Pickerekweed (*Pontederia cordata*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Quillwort (*Isoetes spp.*)

This plant was found at a total of 10 sample points resulting in 8.1% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=9, 90.0%), and sparse levels (n=1, 10.0%).

Ribbon-leaf pondweed (*Potamogeton epihydrus*)

This plant was found at a total of 10 sample points resulting in 8.1% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=7, 70.0%), and sparse levels (n=3, 30.0%).

Robbins Pondweed (*Potamogeton robbinsii*)

This plant was found at a total of 14 sample points resulting in 11.4% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=10, 71.4%), and sparse levels (n=4, 28.6%).

Small pondweed (*Potamogeton pusillus*)

This plant was found at a total of 7 sample points resulting in 5.7% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=6, 85.7%), and sparse levels (n=1, 14.3%).

Stonewort (*Nitella sp.*)

This plant was found at a total of 6 sample points resulting in 4.9% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=4, 66.6%), and sparse levels (n=2, 33.3%).

Water weed (*Elodea sp.*)

This plant was found at a total of 9 sample points resulting in 7.3% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=8, 88.8%), and sparse levels (n=1, 11.2%).

Watershield (*Brasenia schreberi*)

This plant was found at a total of 5 sample points resulting in 4.1% of occurrences. It was found growing in three stages of cover class, appearing at sparse levels, (n=3, 60.0%), trace levels (n=1, 20.0%), and moderate levels (n=1, 20.0%).

White stem pondweed (*Potamogeton praelongus*)

This plant was found at a total of 11 sample points resulting in 8.9% of occurrences. It was found growing in two stages of cover class, appearing at sparse levels, (n=6, 54.5%), and trace levels (n=5, 45.5%).

Whorled watermilfoil (*Myriophyllum verticillatum*)

This plant was found at a total of 1 sample point resulting in 0.8% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Table 3: Station number, and depth that Eurasian watermilfoil was recorded, along with its abundance and the total species richness at that point.

Station	Depth	Latitude	Longitude	Density
1	9.5	43.87694	-73.593841	Less than 5%
2	1.8	43.8738	-73.604873	Less than 5%
3	1.8	43.87339	-73.604722	Less than 5%
4	2	43.87319	-73.60423	Less than 5%
6	3.8	43.874	-73.603366	Less than 5%
8	6.2	43.87405	-73.603003	Less than 5%
9	4.3	43.87343	-73.602768	5-25%
11	8.8	43.87368	-73.601835	Less than 5%
19	8.3	43.87276	-73.598984	Less than 5%
20	8.3	43.8734	-73.597033	Less than 5%
23	12	43.87336	-73.594226	Less than 5%
24	4.6	43.87304	-73.593367	Less than 5%
25	4.6	43.8733	-73.593079	Less than 5%
26	10.2	43.87387	-73.5934	Less than 5%
30	9.4	43.87676	-73.592246	Less than 5%
31	10.3	43.87734	-73.592824	5-25%
33	8.8	43.87769	-73.593205	5-25%
34	7.5	43.878	-73.592386	5-25%
45	7.7	43.87952	-73.588039	Less than 5%
55	18.6	43.88242	-73.577714	5-25%
57	36.5	43.88276	-73.576283	5-25%
68	10.4	43.88173	-73.566768	5-25%
72	4.4	43.88162	-73.563451	5-25%
76	9.9	43.88206	-73.565876	Less than 5%
77	8.2	43.88282	-73.566251	Less than 5%
84	7.5	43.88697	-73.56746	Less than 5%
89	5.7	43.88544	-73.57403	Less than 5%
91	15	43.88604	-73.577589	5-25%
94	10.6	43.8847	-73.581065	5-25%
95	14	43.88462	-73.581725	Less than 5%
96	14.3	43.88464	-73.582838	Less than 5%
99	11.2	43.88383	-73.58596	Less than 5%
100	8.4	43.88382	-73.587415	Less than 5%
104	16.5	43.8835	-73.591032	5-25%
105	10.8	43.88327	-73.591786	5-25%
108	20.1	43.88113	-73.593469	Less than 5%
109	12	43.87992	-73.594891	Less than 5%
110	6	43.87885	-73.595017	Less than 5%
115	4.1	43.87691	-73.594271	Less than 5%

Table 4. Abundance of Species by Site – Eagle Lake 2024

Station	Depth	American eelgrass	Beck's water-margold	Clasping leaf pondweed	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Horsetail	Large-leaved pondweed	Low watermilfoil	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Pickereitweed	Quillwort	Ribbon-leaf pondweed	Robbins pondweed	Small pondweed	Stonewort	Water weed	Watershield	White stem pondweed	Whorled watermilfoil	Species Richness	Total Rake Density
1	9.5						T											T				T			4	5-25%	
2	12.5	T						S											T						5	5-25%	
3	8.4						T																T		2	Less than 5%	
4	12.3						T										T					T			3	Less than 5%	
5	13																								0	None	
6	18						T	S																	2	Less than 5%	
7	16.5																T		T						2	Less than 5%	
8	10.8						T										T		T		T			T	5	5-25%	
9	4.8						S												T	T					3	26-50%	
10	41.9																				T				1	Less than 5%	
11	20.1						T															T		S	3	5-25%	
12	12												T											S	2	5-25%	
13	8.8																		T					S	2	5-25%	
14	6																				T			S	2	5-25%	
15	6.5											S									S				2	5-25%	
16	2																		T			T			3	Less than 5%	
17	2.2																		T						1	Less than 5%	
18	5.2																		T	T				S	3	5-25%	
19	4.1						T																S	T	3	5-25%	
20	25.6						T																		1	Less than 5%	
21	11.5																								0	None	
22	21.3																								0	None	
23	19.6						T													T					2	Less than 5%	
24	9.3	T			T		T										T						T		5	5-25%	
25	19.5				T		T	T																	3	5-25%	
26	15			M			T											T							3	5-25%	
27	20.8																								0	None	
28	19.7																								0	None	
29	8.3				T																S				2	5-25%	
30	9.3						T															T			2	Less than 5%	
31	6.7						S																		1	Less than 5%	
32	9.4																								0	None	
33	8.7	T					S																		2	5-25%	
34	6.8						S												T						2	5-25%	
35	8.3																								0	None	
36	1.8																								0	None	
37	8.3																								0	None	
38	19.9				S																				1	5-25%	
39	16.5																			S					1	5-25%	
40	12				T																				1	Less than 5%	
41	4.6																		T						1	Less than 5%	
42	4.6				T	T					T														3	Less than 5%	
43	10.2				S																				1	5-25%	
44	21.5							S									S								2	5-25%	
45	19.3						T																S		2	Less than 5%	

Table 4 continued

Station	Depth	American eelgrass	Beck's water-margold	Clasping leaf pondweed	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Horsetail	Large-leaved pondweed	Low watermilfoil	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Pickereelweed	Quillwort	Ribbon-leaf pondweed	Robbins pondweed	Small pondweed	Stonewort	Water weed	Watershield	White stem pondweed	Whorled watermilfoil	Species Richness	Total Rake Density
46	13.5			S																						1	5-25%
47	1.8																									0	None
48	9.4																						T			1	Less than 5%
49	10.3																T									1	Less than 5%
50	21.1										T															1	Less than 5%
51	8.8																									0	None
52	7.5																									0	None
53	15.2				T																					1	Less than 5%
54	16.2																									0	None
55	10.2						S																			1	5-25%
56	7.3																									0	None
57	8.3						S																			1	5-25%
58	2																									0	None
59	9.6																									0	None
60	8.7																									0	None
61	9.2																									0	None
62	6.6																									0	None
63	2																									0	None
64	7.7																	T								1	Less than 5%
65	8.1									T														S		2	Less than 5%
66	16.3																									0	None
67	7.7			S								T					T									3	5-25%
68	1.8			S			S																T			3	26-50%
69	3.7			T								S														2	5-25%
70	6.5												S		S		S	S								3	5-25%
71	9.9			T								T														2	Less than 5%
72	8	T	S	T			S												S	T						6	5-25%
73	14																T						T			2	Less than 5%
74	33.6				T																					1	Less than 5%
75	18.6			S								T														2	5-25%
76	37.3			S			T																			2	5-25%
77	36.5						T					T						S	S							4	5-25%
78	28.8																			S	T					1	Less than 5%
79	5.5																									0	Less than 5%
80	3.8																						T			1	Less than 5%
81	15.5																T									1	Less than 5%
82	6.2											T														1	Less than 5%
83	10.2											T														1	Less than 5%
84	25.6			T	T		T																			3	Less than 5%
85	14.6																									0	None
86	18.6																									0	None
87	16.6																						T			1	Less than 5%
88	10.2				T																					1	Less than 5%
89	10.4						T																S			2	Less than 5%
90	8.7																									0	None

Table 4 continued

Station	Depth	American eelgrass	Beck's water-marigold	Clasping leaf pondweed	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Horsetail	Large-leaved pondweed	Low watermilfoil	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Pickertweed	Quillwort	Ribbon-leaf pondweed	Robbins pondweed	Small pondweed	Stonewort	Water weed	Watershield	White stem pondweed	Whorled watermilfoil	Species Richness	Total Rake Density
91	3						S											S								2	5-25%
92	8.5																									0	None
93	7.7				T																					1	Less than 5%
94	4.4						S																			1	5-25%
95	4.5						T																			1	Less than 5%
96	5.5						T																			1	Less than 5%
97	9.6																									0	None
98	9.9		T		S																					2	5-25%
99	8.2						T																			1	Less than 5%
100	12.5						T																T			2	Less than 5%
101	9																				S					1	5-25%
102	6.2													S												1	Less than 5%
103	14.5																									0	None
104	3						S						T													2	Less than 5%
105	7.8						S									T										2	Less than 5%
106	4.5				S																					1	Less than 5%
107	7.5																									0	None
108	11						T																			1	Less than 5%
109	11.3						T																S			2	5-25%
110	16				T		T										T									3	Less than 5%
111	10.3																			T						1	Less than 5%
112	5.7				T																		M			2	5-25%
113	4.3				T												T									2	Less than 5%
114	9.4												M								T					2	26-50%
115	15						T		S																	2	5-25%
116	8.9																									0	None
117	11.4								T																	1	Less than 5%
118	10.6																									0	None
119	14																									0	None
120	14.3																									0	None
121	16.5																									0	None
122	14																									0	None
123	11.2																									0	None

Photos:



Caption: Clasping leaf pondweed (*Potamogeton perfoliatus*)



Caption: Robbin's pondweed (*Potamogeton robbinsii*)



Caption: Eurasian watermilfoil (*Myriophyllum spicatum*)



Caption: Common naiad (*Najas flexilis.*)



Caption: American eelgrass (*Vallisneria americana*)



Caption: Small pondweed (*Potamogeton pusillus*)



Caption: Quillwort (*Isoetes spp.*)



Caption: Muskgrass (*Chara sp.*)



Caption: Ribbon leaf pondweed (*Potamogeton epihydrus*)



Caption: Water weed (*Elodea sp.*)



Caption: Watershield (*Brasenia schreberi*)



Caption: Horsetail (*Equisetum fluviatile*)



Caption: Beck's water-marigold (*Bidens beckii*)



Caption: Stonewort (*Nitella sp.*)



Caption: Northern watermilfoil (*Myriophyllum sibiricum*)



Caption: Pickerelweed (*Pontederia cordata*)



Caption: Coontail (*Ceratophyllum demersum*)



Caption: Fragrant waterlily (*Nymphaea odorata*)



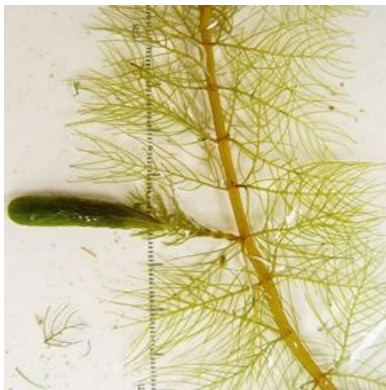
Caption: Large leaf pondweed (*Potamogeton amplifolius*)



Caption: Floating leaf pondweed (*Potamogeton natans*)



Caption: White stem pondweed (*Potamogeton praelongus*)



Caption: Whorled watermilfoil (*Myriophyllum verticillatum*)



Caption: Nuttall's water weed (*Elodea nuttallii*)



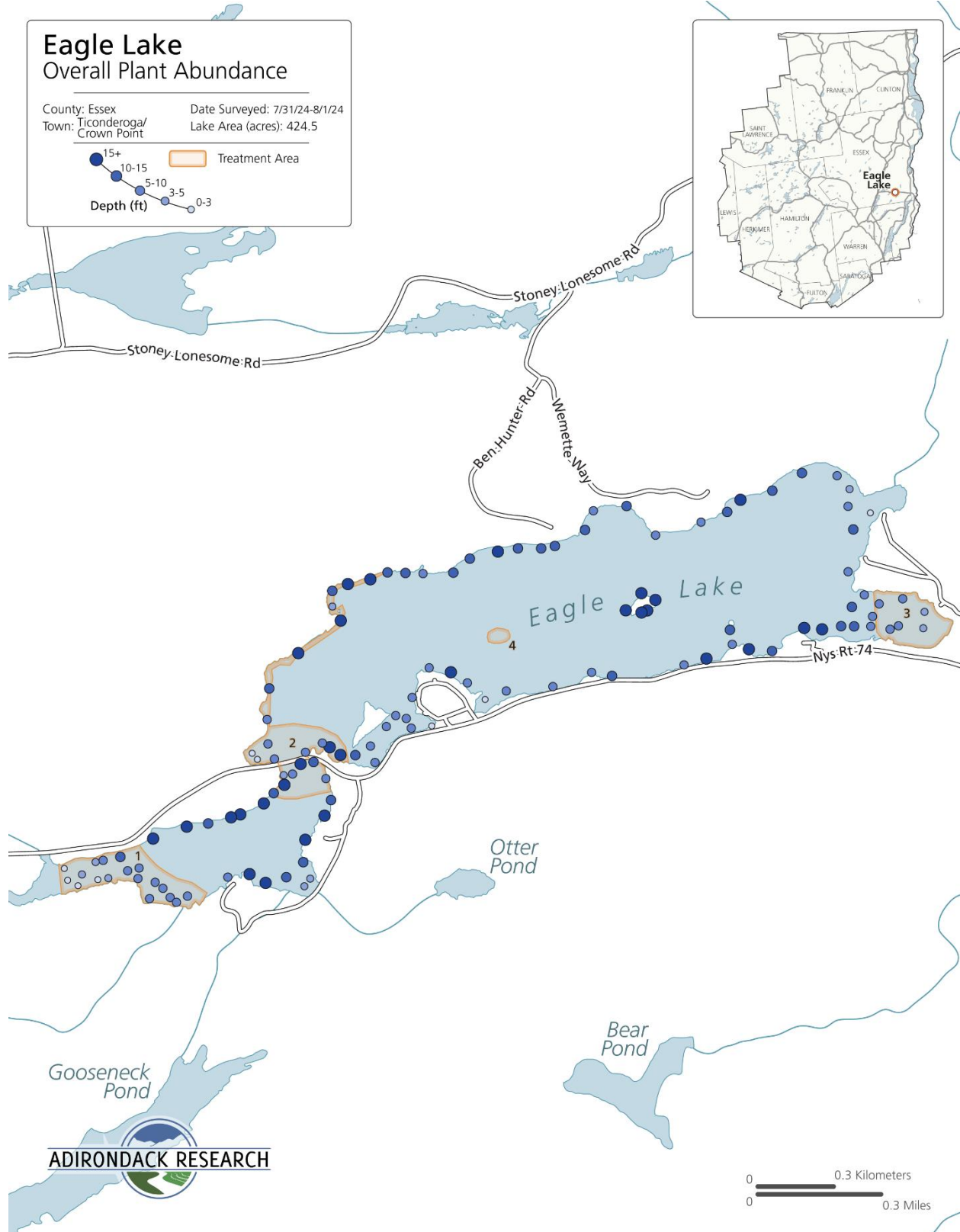
Caption: Low watermilfoil (*Myriophyllum humile*)

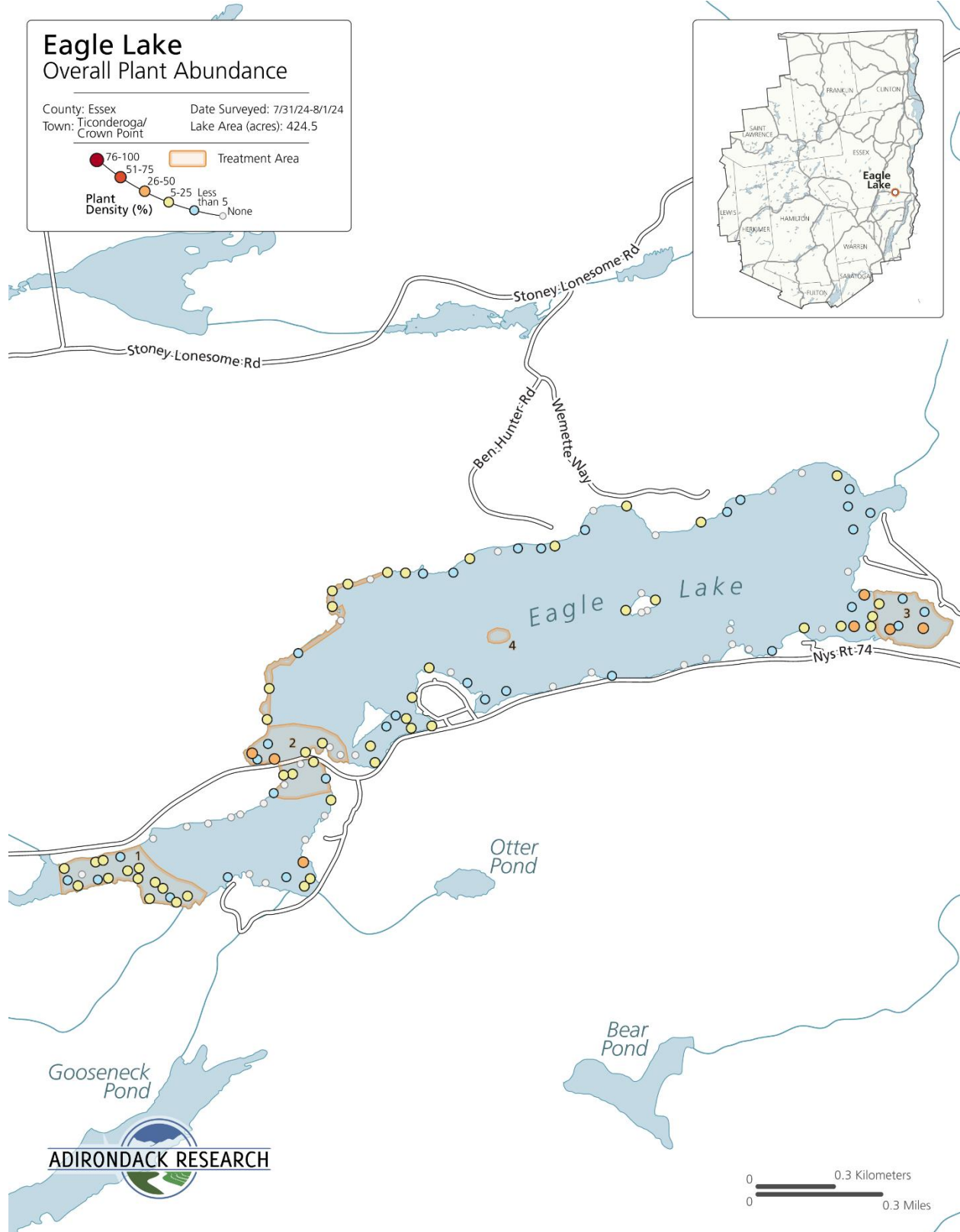
Note: We lost an iPad due to water damage during our 2024 field season. This iPad had the photos for the native milfoils, and other native species documented by Adirondack Research during our Eagle Lake Survey. While most of the pictures are from our survey on Eagle Lake, some photos are from other Adirondack Research surveys this year and 3 others are from identification resources on the internet.

Maps

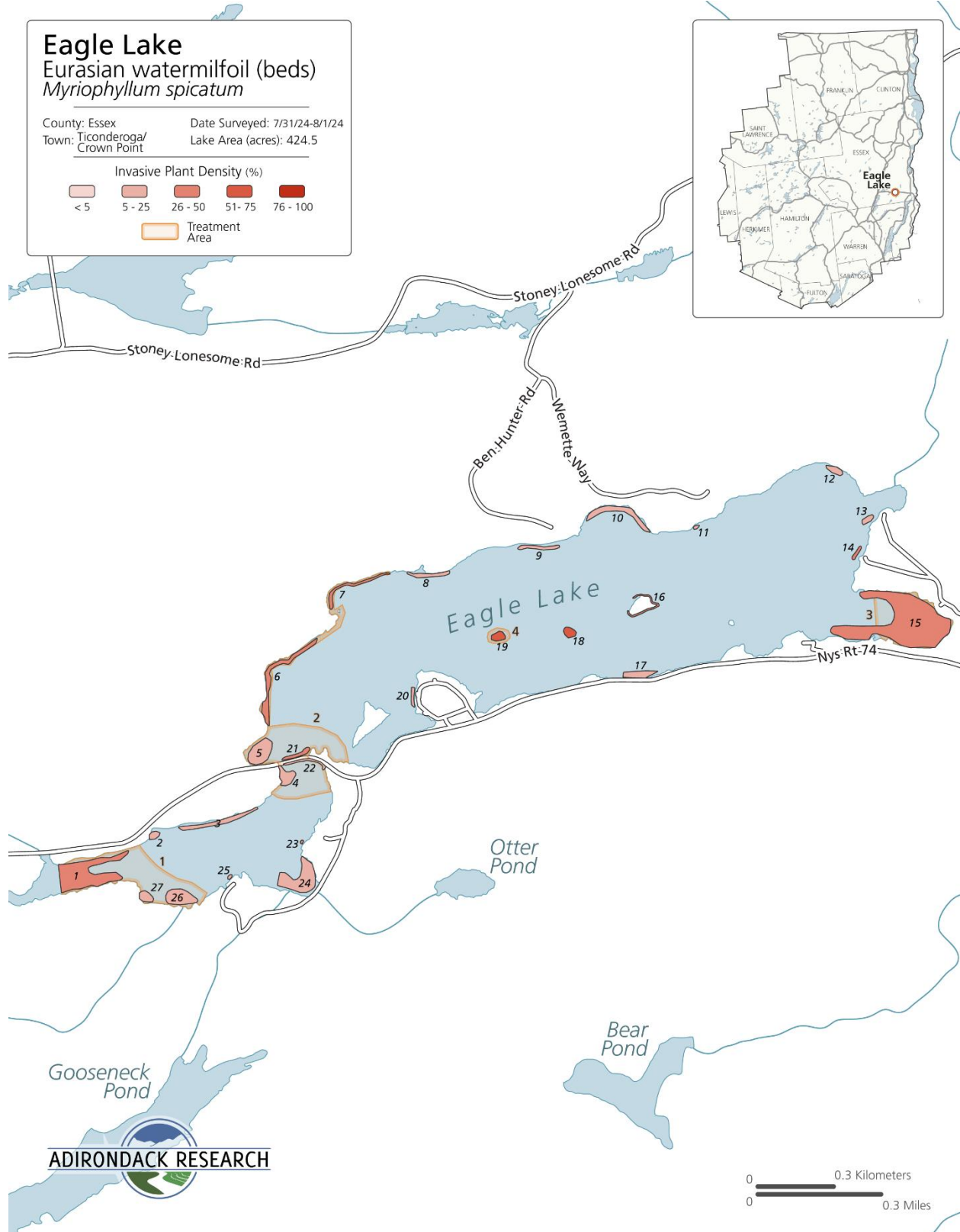
The following maps show the survey stations, overall plant abundance, Eurasian watermilfoil beds, as well as the plant density classes for each species across all survey points.



























































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