2024 Chateaugay Lake AIS Survey



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Aquatic Invasive Species Surveys Survey Team Report



2024 Chateaugay Lake Aquatic Invasive Species Survey

Written by: Ezra Schwartzberg, Ph.D., Justin Wolford Adirondack Research October 2024

Surveyed by: Morgan Hilliard, Abby Paro, and Gage Root



Client:

Mary Johnson, President Chateaugay Lake Foundation PO Box 222, Lyon Mountain, NY 12952 Email: <u>info@chateaugaylakefoundation.org</u> Email CC: <u>mlmassocaicp@aol.com</u> Website: <u>https://chateaugaylakefoundation.org/</u>

Consultant:

Dr. Ezra Schwartzberg, Director Adirondack Research, LLC 73 Church Street, Suite 2 Saranac Lake, NY 12983 Office: (518) 278-6070 Email: ezra@adkres.org.org Website: www.adkres.org

Cover image: Chateaugay Lake photo by 2024 AIS survey team



Executive Summary

The purpose of this effort was to perform a post treatment point intercept survey after the herbicide ProcellaCOR EC was permitted by the Adirondack Park Agency (APA) and then applied to the waterbody for management of Eurasian watermilfoil.

We surveyed 205 (sample points). 141 points were surveyed within the proposed treatment area and 64 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 205 stations.

Eurasian watermilfoil was documented at a total of 5 stations (2.4%) outside the treatment area. It was not documented inside the treatment areas.





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Overview

We performed an aquatic invasive species (AIS) and native aquatic plant species survey for Chateaugay Lake Narrows and parts of the upper and lower lakes, Located in Clinton and Franklin Counties on the dates of September 3rd, 4th and, 5th 2024. This survey was completed after the application of the herbicide ProcellaCOR EC for the control of an aquatic pest (AQV). The results of the survey will be compared to previous surveys done before ProcellaCOR was applied to determine the effectiveness of the herbicide. This is a part of an ongoing process over a multi-year period to compare the success rates of applying ProcellaCOR to control aquatic invasive growth in the lakes. 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

Chateaugay Lake obtained a permit to use ProcellaCOR EC in 2024 to manage Eurasian watermilfoil. We performed 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: <u>https://www.dropbox.com/s/2jc37h56z4jkb6i/Lake%20Surveys.pdf?dl=0</u> You can also learn more about Adirondack Research at <u>www.adkres.org</u>.

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

- Survey 205 stations in the narrows of Chateaugay Lake over 3 days 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 22 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 where each species is found, including overall percentages; and susceptibility of each species to herbicide ProcellaCOR EC.
- 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, and 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.
- 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 selected from points used in the 2021 pretreatment survey, for a total of 205 points across the entirety of the sample area.

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	Clas	ss Description	Coverage Class (plant density)
Т	Trace	1-2 stems	Less than 5%
S	Sparse	3-10 stems	5 - 25%
М	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 somestudies combine the two. Colors in the density class correspond to their relative abundance markers onmaps (3 and 5-32).

Results

The team surveyed 205 sites on September 3rd, 4th and, 5th 2024: detecting Eurasian watermilfoil species and 19 native species including one native milfoil *Myriophyllum sibiricum* (Northern-water milfoil). Table 2 provides a summary of all aquatic vegetation detected in the sample area, in addition to their count and frequency of occurrence relative to the 205 points surveyed, invasive species are indicated in red.

Recommendations

We recommend a follow-up survey next year, and at regular intervals in following years. Upon viewing the results and finding that there was no Eurasian watermilfoil found at any sites in the treatment area following treatment with ProcellaCOR, we recommend that further surveys be conducted.



Table 2. Comparison table showing species detected in 2021 and 2024– Chateaugay Lakesurvey area.

Common Name	Scientific Name	Present 2021	Present 2024
American eelgrass	Vallisneria americana	X	X
Amphibious bistort	Persicaria amphibia	Х	
Blunt-leaved pondweed	Potamogeton obtusifolius	х	
Bog pondweed	Potamogeton bicupulatus	Х	
Cattail	Typha sp	х	
Clasping-leaved pondweed	Potamogeton perfoliatus	Х	X
Coiled pondweed	Potamogeton spirillus	Х	
Common bladderwort	Utricularia macrorhiza	х	X
Common naiad	Najas flexilis	Х	X
Coontail	Ceratophyllum demersum	Х	X
Eurasian watermilfoil	Myriophyllum spicatum	Х	X
Filamentous algae	Filamentous algae	Х	
Floating bur-reed	Sparganium fluctuans	Х	
Floating-leaf pondweed	Potamogeton natans	X	X
Fontinalis moss	Fontinalis sp	X	
Fragrant water lily	Nymphaea odorata	Х	X
Grass-leaved arrowhead	Sagittaria graminea	Х	
Grass-leaved pondweed	Potamogeton gramineus	Х	
Greater duckweed	Spirodela polyrhiza	Х	
Hairgrass	Eleocharis acicularis	Х	
Large-leaved pondweed	Potamogeton amplifolius	Х	X
Michigan bladderwort	Utricularia geminiscapa	Х	
Muskgrass	Chara sp	Х	X
Narrow-leaved bur-reed	Sparganium angustifolium	Х	
Northern watermilfoil	Myriophyllum sibiricum		X
Nuttalls waterweed	Elodea nuttallii	Х	X
Ribbon-leaf pondweed	Potamogeton epihydrus	Х	X
Robbins pondweed	Potamogeton robbinsii	Х	X
Slender Bulrush	Schoenoplectus skinny	Х	
Small pondweed	Potamogeton pusillus	Х	X
Soft watermilfoil	Myriophyllum tenellum	Х	
Softstem bulrush	Schoenoplectus_tabernaemontani	Х	
Southern naiad	Najas guadalupensis	Х	
Stonewort	Nitella sp	х	X
Thread-leaved crowfoot	Ranunculus trichophyllus	Х	
Variegated yellow pond-lily	Nuphar variegata	х	
Water bulrush	Schoenoplectus subterminalis		X
Water lobelia	Lobelia dortmanna	Х	
Water Stargrass	Zosterella dubia	Х	
Water weed	Elodea sp.		X
Watershield	Brasenia schreberi	Х	X
White-stem pondweed	Potamogeton praelongus		X

Note: The 2021 Pre-treatment survey was conducted by a different Contractor (NEAR), This may account for some of the differences in identification

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Table 3. Summary of Aquatic Vegetation Occurrences and Frequency – Chateaugay Lake 2021and 2024

Common Name	Scientific Name	2021 Frequency	2021 % Occurrence (n=206)	2024 Frequency	2024 % Occurrence (n=206)
American eelgrass	Vallisneria americana	67	32.5	92	44.7
Amphibious bistort	Persicaria amphibia	2	1.0		
Blunt-leaved pondweed	Potamogeton obtusifolius	4	1.9		
Bog pondweed	Potamogeton bicupulatus	1	0.5		
Cattail	Typha sp	4	1.9		
Clasping leaf pondweed	Potamogeton perfoliatus	17	8.3	26	12.6
Coiled pondweed	Potamogeton spirillus	6	2.9		
Common bladderwort	Utricularia macrorhiza	3	1.5	4	1.9
Common naiad	Najas flexilis	11	5.3	51	24.8
Coontail	Ceratophyllum demersum	30	14.6	35	17.0
Eurasian watermilfoil	Myriophyllum spicatum	126	61.2	5	2.4
Filamentous algae	Filamentous algae	15	7.3		
Floating bur-reed	Sparganium fluctuans	10	4.9		
Floating-leaf pondweed	Potamogeton natans	2	1.0	3	1.5
Fontinalis moss	Fontinalis sp	2	1.0		
Fragrant water lily	Nymphaea odorata	45	21.8	29	14.1
Grass-leaved arrowhead	Sagittaria graminea	3	1.5		
Grass-leaved pondweed	Potamogeton gramineus	12	5.8		
Greater duckweed	Spirodela polyrhiza	1	0.5		
Hairgrass	Eleocharis acicularis	4	1.9		
Large-leaved pondweed	Potamogeton amplifolius	41	19.9	15	7.3
Michigan bladderwort	Utricularia geminiscapa	3	1.5		
Muskgrass	Chara sp.	3	1.5	10	4.9
Narrow-leaved bur-reed	Sparganium angustifolium	1	0.5		
Northern watermilfoil	Myriophyllum sibiricum			1	0.5
Nuttall's waterweed	Elodea nuttallii	110	53.4	1	0.5
Ribbon-leaf pondweed	Potamogeton epihydrus	1	0.5	5	2.4
Robbin's pondweed	Potamogeton robbinsii	16	7.8	27	13.1
Slender Bulrush	Schoenoplectus skinny	1	0.5		
Small pondweed	Potamogeton pusillus	8	3.9	14	6.8
Soft watermilfoil	Myriophyllum tenellum	3	1.5		
Softstem bulrush	choenoplectus_tabernaemontai	2	1.0		
Southern naiad	Najas guadalupensis	6	2.9		
Stonewort	Nitella sp.	40	19.4	91	44.2
Thread-leaved crowfoot	Ranunculus trichophyllus	6	2.9		
Variegated yellow pond-li	Nuphar variegata	2	1.0		
Water bulrush	Schoenoplectus subterminalis			3	1.5
Water lobelia	Lobelia dortmanna	2	1.0		
Water Stargrass	Zosterella dubia	36	17.5		
Water weed	Elodea sp.			98	47.6
Watershield	Brasenia schreberi	29	14.1	3	1.5
White stem pondweed	Potamogeton praelongus			1	0.5

Coverage class was recorded for each of the individual plant records recorded at every station in 2024 and are displayed in Table 5.



Species Distributions

American eelgrass (Vallisneria americana)

This plant was found at a total of 92 sample points resulting in 44.7% of occurrences. It was found growing in three stages of cover class, appearing at trace levels, (n=3, 37.5%), moderate levels, (n=3, 37.5%), and sparse levels (n=2, 25.0%).

Clasping leaf pondweed (*Potamogeton perfoliatus*)

This plant was found at a total of 26 sample points resulting in 12.6% of occurrences. It was found growing in three stages of cover class, appearing at trace levels, (n=14, 53.8%), sparse levels, (n=11, 42.3%), and moderate levels (n=1, 3.9%).

Common Bladderwort (Utricularia macrorhiza)

This plant was found at a total of 4 sample points resulting in 1.9% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Common Naiad (Najas flexilis)

This plant was found at a total of 51 sample points resulting in 24.8% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=41, 80.4%), and sparse levels, (n=10, 19.6%).

Coontail (Ceratophyllum demersum)

This plant was found at a total of 35 sample points resulting in 17.0% of occurrences. It was found growing in three stages of cover class, appearing at trace levels, (n=26, 74.3%), sparse levels, (n=8, 22.9%), and dense levels (n=1, 2.8%).

Eurasian watermilfoil (Myriophyllum spicatum)

This plant was found at a total of 5 sample points resulting in 2.4% 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%).

Floating-leaf pondweed (Potamogeton natans)

This plant was found at a total of 3 sample points resulting in 1.5% of occurrences. It was found growing in two stages of cover class, appearing at sparse levels, (n=2, 66.6%), and trace levels, (n=1, 33.3%).

Fragrant waterlily (Nymphaea odorata)

This plant was found at a total of 29 sample points resulting in 14.1% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=26, 89.7%), and trace levels, (n=3, 10.3%).

Large-leaved pondweed (Potamogeton amplifolius)

This plant was found at a total of 15 sample points resulting in 7.3% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=26, 89.7%), and sparse levels, (n=3, 10.3%).



Muskgrass (chara sp.)

This plant was found at a total of 10 sample points resulting in 4.9% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=8, 80.0%), and sparse levels, (n=2, 20.0%).

Northern watermilfoil (Myriophyllum sibiricum)

This plant was found at a total of 1 sample point resulting in 0.5% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Nuttal's waterweed (Elodea nuttallii)

This plant was found at a total of 1 sample point resulting in 0.5% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=1, 100.0%).

Ribbon-leaf pondweed (*Potamogeton epihydrus*)

This plant was found at a total of 5 sample points resulting in 2.4% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=4, 80.0%), and sparse levels, (n=1, 20.0%).

Robbin's pondweed (Potamogeton robbinsii)

This plant was found at a total of 27 sample points resulting in 13.1% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=17, 63.0%), and sparse levels, (n=10, 37.0%).

Small Pondweed (Potamogeton pusillus)

This plant was found at a total of 14 sample points resulting in 6.8% of occurrences. It was found growing in three stages of cover class, appearing at trace levels, (n=9, 64.3%), sparse levels (n=4, 28.6%), and moderate levels, (n=1, 7.1%).

Stonewort (Nitella sp.)

This plant was found at a total of 91 sample points resulting in 44.2% of occurrences. It was found growing in four stages of cover class, appearing at trace levels, (n=59, 64.8%), sparse levels, (n=26, 28.6%), moderate levels (n=3, 3.3%), and dense levels (n=3, 3.3%).

Water bulrush (Schoenoplectus subterminalis)

This plant was found at a total of 3 sample points resulting in 1.5% of occurrences. It was found growing in one stage of cover class, appearing at trace level, (n=3, 100.0%).

Water weed (Elodea sp.)

This plant was found at a total of 98 sample points resulting in 47.6% of occurrences. It was found growing in five stages of cover class, appearing at trace levels, (n=70, 71.4%), sparse levels, (n=21, 21.4%), moderate levels (n=3, 2.4%), dense levels (n=3, 2.4%), and highly dense levels (n=1, 1.0%).



Watershield (Brasenia schreberi)

This plant was found at a total of 3 sample points resulting in 1.5% of occurrences. It was found growing in two stages of cover class, appearing at trace levels, (n=2, 66.6%), and sparse levels, (n=1, 33.3%).

White stem pondweed (*Potamogeton praelongus*)

This plant was found at a total of 1 sample point resulting in 0.5% of occurrences. It was found growing in one stage of cover class, appearing at sparse level, (n=1, 100.0%).

Table 4. Eurasian watermilfoil Presence – Chateaugay Lake 2024

Station	Depth	Latitude	Longitude	Density	Species Richness
820	9	44.762344	-73.971678	Less than 5%	3
804	8.4	44.764682	-73.96407	5-25%	4
154	6.2	44.764915	-73.964092	5-25%	4
S69	6.3	44.765028	-73.964779	5-25%	6
S70	5.7	44.765058	-73.965668	5-25%	4



Table 4. Abundance of Species by Site – Chateaugay Lake Survey area 2024 andRichness/cover class by station 2021

Station	Depth	American eelgrass	Clasping leaf pondweed	Common bladderwort	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Large-leaved pondweed	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Ribbon-leaf pondweed	Robbin's pondweed	Small pondweed	Stonewort	Water bulrush	Water weed	Watershield	White stem pondweed	2021 Richness	2021 Total Rake Density	2024 Richness	2024 Total Rake Density
1	1.4	S							S													6	51-75%	2	5-25%
2	2.9	Т			Т					Т							S		М	S		5	51-75%	6	26-50%
4	1.9	Т			Т			S												Т		6	51-75%	4	5-25%
6	5.4	Т															S					3	51-75%	2	5-25%
7	7.5																Т					0	None	1	Less than 5%
9	7	т															Т					0	None	2	Less than 5%
10	5.9	T													Т		S		т			5	51-75%	4	5-25%
11	8.4	· · · · ·				т											D		T			3	51-75%	3	51-75%
14	2				т	· · ·			т							т						1	5-25%	3	Less than 5%
15	82																S					2	51-75%	1	5-25%
16	8.5														c		s		т			2	51-75%	3	5-25%
17	8.2														3		S					1	51-75%	1	5-25%
10	2.6	т			c	т											3					2	Less than 5%	2	5-25%
10	1.0			т	3												т		т	т		2	26 5004	5	Loss than 5%
20	6.5	Т															т		T			1	51 75%	2	Less than 5%
20	0.5																1 C					4	31-75%	1	E 25%
21	0.7					т											0		т			5	20-30%	1	5-25%
22	77																3		1			/	51-75%	3	5-25%
23	7.7	-			-												5		5			4	51-75%	2	5-25%
25	5.0															-			1			/	51-75%	4	Less than 5%
26	3.7														-	1			5			4	26-50%	4	5-25%
2/	3.1				-											S	-					4	51-75%	4	5-25%
30	4.9				_	-				S							-		D			5	51-75%	4	26-50%
32	6.4	<u> </u>			Т	S													Μ			4	51-75%	4	26-50%
34	7.3																М					6	51-75%	1	26-50%
36	7.1					T									T				T			1	5-25%	3	5-25%
38	3.9	T														Т	Т		S			4	51-75%	4	5-25%
39	5.6	T				ļ			Т									Т	Т			4	51-75%	4	5-25%
40	9.1																					4	51-75%	0	None
42	4.4	T			Т														Т			3	51-75%	3	Less than 5%
44	4.3								Т		Т								Т			6	5-25%	3	Less than 5%
46	4.8			Т	Т	ļ									S				М			6	51-75%	4	26-50%
47	4.9	Т													Т				D			4	51-75%	3	26-50%
49	2.7	T													Т		T		S			8	51-75%	4	5-25%
51	6.1	Т													S				T			1	26-50%	3	5-25%
52	5.1	T													Т							5	51-75%	2	Less than 5%
54	8.3					D																5	51-75%	1	51-75%
55	7										Т											3	51-75%	1	Less than 5%
56	8.1	S																				1	Less than 5%	1	5-25%
57	3.7	Τ			Т					Т					Т							4	26-50%	4	5-25%
58	7.1	Т	Т														М		Т			3	26-50%	4	26-50%
59	3.9	Т			Т				Т										Т			12	26-50%	4	Less than 5%
61	5.6	Т	S						Т								S		Т			5	5-25%	5	5-25%
62	3.7	Т			S				Т						S				S			5	51-75%	5	5-25%
63	7.5	Т							Т								Т					3	51-75%	3	Less than 5%
64	1.7	Т							Т										Т			6	26-50%	3	5-25%
65	79																т					5	51-75%	1	Less than 5%



Station	Depth	American eelgrass	Clasping leaf pondweed	Common bladderwort	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Large-leaved pondweed	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Ribbon-leaf pondweed	Robbin's pondweed	Small pondweed	Stonewort	Water bulrush	Water weed	Watershield	White stem pondweed	2021 Richness	2021 Total Rake Density	2024 Richness	2024 Total Rake Density
67	7.9		S														Т					10	26-50%	2	5-25%
68	8.3																Т					2	51-75%	1	Less than 5%
69	7.2					S																4	5-25%	1	5-25%
70	6.1	Т			Т										S				S			3	51-75%	4	5-25%
71	6.3	Т	S							Т	Т					Т						7	26-50%	5	5-25%
73	6.7					Т											Т		Т			8	51-75%	3	Less than 5%
74	6.3	Т			Т					Т					Т		Т		Т			7	5-25%	6	5-25%
76	6.8		Т												S				Т			7	51-75%	3	5-25%
77	7.6				Т												S					2	51-75%	2	5-25%
78	6.1	Т			Т						Т						Т		D			1	26-50%	5	51-75%
79	1.9	Т	Т							Т									Т			5	26-50%	4	Less than 5%
80	8.8				Т						S						Т		Т			3	51-75%	4	5-25%
82	7.4																S					0	None	1	5-25%
83	6.3				S						S								Т			6	51-75%	3	5-25%
84	2	S						Т	Т	Т												3	Less than 5%	4	5-25%
86	9.2	-																	Т			0	None	1	Less than 5%
87	6.8				Т	Т											Т					4	51-75%	3	Less than 5%
88	6.3				S						т								т			4	26-50%	3	5-25%
90	1.5	т							S		· · ·								т			6	26-50%	3	5-25%
91	8.2					т											т		T			0	None	3	Less than 5%
93	7.3					S																5	51-75%	1	5-25%
94	4.8	т			т	Т			т													4	51-75%	4	Less than 5%
97	53	T															т		т			3	51-75%	3	Less than 5%
99	8.9					т										т			т			3	51-75%	3	Less than 5%
101	44	т			S					т									T			1	51-75%	1	5-25%
101	6.2				3	т									т		Р		۱ ۲			7	51-75%	-	51-75%
104	8.1																U		3			0	None	4	None
107	3.9	т			c				т	т			т					т				4	5 25%	6	5 25%
107	8.5				3												т		т			4	J-23%	2	J-2570
110	3.5	т			т												T					0	5 25%	2	Less than 5%
110	5.5				1	т																2	5-25%	3	E4 75%
112	0		т		0												D					5	51-75%	2	51-75%
113	0.5				о т												э т					4	51-75%	3	5-25%
114	9.2				I	6									т	<u> </u>	T		т			3	51-75%	2	Less than 5%
116	0.2					5										5						/	51-75%	5	26-50%
118	0.0	-												5			-		-			4	51-75%	2	5-25%
119			-			I											-					5	26-50%	4	Less than 5%
120	7.4	-															-					6	51-75%	3	Less than 5%
122	5.5	Т															Т					4	51-75%	2	Less than 5%
123	8.5				Т																	3	51-75%	1	Less than 5%
124	7.2													Т					Т			6	51-75%	2	Less than 5%
125	4.7		Т														S		Т			3	51-75%	3	5-25%
126	8.2					Т											Т					2	Less than 5%	2	Less than 5%
128	9.2				Т	Т																0	None	2	Less than 5%
130	8.4																					2	51-75%	0	None
131	7.2	Т				Т													Т			2	26-50%	3	5-25%
133	7.3										Т						S					8	51-75%	2	5-25%



Station	Depth	American eelgrass	Clasping leaf pondweed	Common bladderwort	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Large-leaved pondweed	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Ribbon-leaf pondweed	Robbin's pondweed	Small pondweed	Stonewort	Water bulrush	Water weed	Watershield	White stem pondweed	2021 Richness	2021 Total Rake Density	2024 Richness	2024 Total Rake Density
135	11				Т																	0	None	1	Less than 5%
136	8	Т	S																			9	26-50%	2	5-25%
137	6.7		S																			3	51-75%	1	5-25%
139	10.1																					3	51-75%	0	None
140	5.2		S																			7	26-50%	1	5-25%
141	8.2	Т																				3	51-75%	1	Less than 5%
143	9.5													Т			Т					3	51-75%	2	Less than 5%
145	8.1	Т	S						Т													6	51-75%	3	5-25%
147	4.1	Т															Т		Т			3	5-25%	3	Less than 5%
148	6.6	Т			Т					S							S		Т			4	51-75%	5	5-25%
149	3.6	Т															Т		Т			6	26-50%	3	5-25%
150	5.7																Т					2	5-25%	1	Less than 5%
152	1		Т						Т										S			5	51-75%	3	Less than 5%
154	6.2	Т		Т			S												Т			1	N/A	4	Less than 5%
161	1.6																					0	None	0	None
166	2.9																Т					2	Less than 5%	1	Less than 5%
168	2.1	Т			Т				Т													3	26-50%	3	Less than 5%
170	3.6	Т				S													S			4	51-75%	3	5-25%
172	5.1														S		Т		Т			4	26-50%	3	5-25%
175	2.7	Т																	Т			6	51-75%	2	Less than 5%
179	6.9				S												S		Т			1	N/A	3	5-25%
189	3.7								Т								Т		S			4	26-50%	3	5-25%
193	8																S		S			1	N/A	2	5-25%
195	1.9			Т	Т				Т													9	26-50%	3	5-25%
197	7.1				Т												Т					3	51-75%	2	Less than 5%
198	7.3					Т								Т			Т					5	51-75%	3	5-25%
200	9.4																					4	51-75%	0	None
203	9.2																S					3	N/A	1	5-25%
204	7.2																Т		Т			3	5-25%	2	Less than 5%
206	7.7	S	М														Т					6	26-50%	3	26-50%
209	7.1	Т	Т														М					8	51-75%	3	26-50%
211	10.1																Т					0	None	1	Less than 5%
213	5.8								Т					Т			S		Т			4	51-75%	4	5-25%
215	1.9	Т	Т					S														7	26-50%	3	5-25%
217	4.2	Т	S						Т										Т			6	51-75%	4	5-25%
219	1.2	М							Т										Т		S	8	5-25%	4	26-50%
221	9.4	Т																				1	26-50%	1	Less than 5%
223	2.4	Т	Т														Т					3	Less than 5%	3	Less than 5%
250	5.7																Т					2	Less than 5%	1	Less than 5%
252	4.3	Т	S														Т					5	51-75%	3	5-25%
254	8.7																					3	26-50%	0	None
255	1.4								Т								Т		Т			3	5-25%	3	Less than 5%
257	3.8	Т			Т										Т		Т		Т			4	51-75%	5	5-25%
259	1								Т	Т					Т		Т		S			7	N/A	5	5-25%
261	3		S		Т					Т												7	51-75%	3	5-25%
264	7.3	Т	S		Т				S								S					5	51-75%	5	5-25%

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Station	Depth	American eelgrass	Clasping leaf pondweed	Common bladderwort	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Large-leaved pondweed	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Ribbon-leaf pondweed	Robbin's pondweed	Small pondweed	Stonewort	Water bulrush	Water weed	Watershield	White stem pondweed	2021 Richness	2021 Total Rake Density	2024 Richness	2024 Total Rake Density
268	4.3	Т			Т												S		Т			3	51-75%	4	5-25%
270	2.7	Т															Т		Т			3	5-25%	3	Less than 5%
272	5.1		Т														S					2	51-75%	2	5-25%
275	5.6	Т																	S			3	51-75%	2	5-25%
278	5.1				S												Т		Т			2	51-75%	3	5-25%
281	5.8					S									Т				Т			6	51-75%	3	5-25%
283	4.4	S															Т		S			4	51-75%	3	5-25%
285	1.6				Т											S	Т					6	51-75%	3	5-25%
287	5	Т			Т										S		S		S			8	51-75%	5	5-25%
289	7.5																S					3	51-75%	1	5-25%
764	8																					0	None	0	None
786	4.2																	Т	Т			4	26-50%	2	Less than 5%
787	14.4																					0	None	0	None
788	15.5																					0	None	0	None
789	16.2																					0	None	0	None
790	15.7	Т																				0	None	1	Less than 5%
794	3.5	Т			Т					Т									Т			4	51-75%	4	Less than 5%
795	14.3																Т					0	None	1	Less than 5%
796	15.1																					0	None	0	None
797	15.2																		Т			0	None	1	Less than 5%
798	15																					0	None	0	None
799	15.4																					0	None	0	None
800	14.9																					0	None	0	None
801	13.2																					0	None	0	None
802	13.5																					1	5-25%	0	None
803	11	Т															Т		Т			1	Less than 5%	3	Less than 5%
804	8.4	Т			Т		S				Т											3	26-50%	4	Less than 5%
808	2.3																					0	None	0	None
809	4.2																					0	None	0	None
810	4.3	Т										Т				Т	Т		Т			3	5-25%	5	Less than 5%
811	5.3																					0	None	0	None
812	4.4																					0	None	0	None
813	4.2																		Т			0	None	1	Less than 5%
814	4.5																					0	None	0	None
815	3.6																					2	Less than 5%	0	None
816	3.7																					0	None	0	None
817	3.2	Т														Т			Т			1	N/A	3	Less than 5%
818	2.9	Т																				2	5-25%	1	Less than 5%
819	6																					0	None	0	None
820	9	Т					Т				Т						Т					1	Less than 5%	4	Less than 5%
821	10.4																S					1	N/A	1	5-25%



Station	Depth	American eelgrass	Clasping leaf pondweed	Common bladderwort	Common naiad	Coontail	Eurasian watermilfoil	Floating-leaf pondweed	Fragrant water lily	Large-leaved pondweed	Muskgrass	Northern watermilfoil	Nuttalls waterweed	Ribbon-leaf pondweed	Robbin's pondweed	Small pondweed	Stonewort	Water bulrush	Water weed	Watershield	White stem pondweed	2021 Richness	2021 Total Rake Density	2024 Richness	2024 Total Rake Density
S100	6.5	Т			Т	S																1	51-75%	3	5-25%
S23	4.8	S	Т			Т			Т										S			1	Less than 5%	5	5-25%
S24	6	Т				T																1	Less than 5%	2	5-25%
S26	6.1	Т							Т										Т			1	51-75%	3	Less than 5%
S27	8.2																					1	26-50%	0	None
S50	6.8	Т														Т	Т		Т			1	Less than 5%	4	Less than 5%
S68	9																					1	Less than 5%	0	None
S69	6.3		Т		Т	Т	S									М			Т			1	Less than 5%	6	26-50%
S70	5.7		Т				S									S	Т					1	Less than 5%	4	5-25%
S72	5.9	Т			Т				Т						Т							1	26-50%	4	5-25%
S73	4.3	S													S							1	51-75%	2	26-50%
S74	5.1	Т				Т			Т						Т				Т			1	26-50%	5	5-25%
S76	6.4																		S			1	26-50%	1	5-25%
S77	6				S	Т													Т			1	26-50%	3	5-25%
S78	4.2																		HD			1	5-25%	1	76-100%
S79	2.6	Т																	Т			1	Less than 5%	2	Less than 5%
S80	4.8	Т			Т										S				Т			1	Less than 5%	4	5-25%
S81	5				Т				Т						Т				S			1	26-50%	4	5-25%
S82	9.2																Т					1	Less than 5%	1	Less than 5%
S83	6.4	Т													Т				Т			1	5-25%	3	5-25%
S93	6.8	Т				S										Т						1	26-50%	3	5-25%
S94	7.4					Т											Т					1	26-50%	2	Less than 5%
S95	5	Т			Т												Т		Т			1	51-75%	4	Less than 5%
S96	5.7	Т				Т				S									S			1	26-50%	4	5-25%
S97	7.6					Т													Т			1	51-75%	2	Less than 5%
S98	7.2									Т									S			1	5-25%	2	5-25%
S99	5.3	Т			Т	Т													S			1	51-75%	4	5-25%



Photos:



Caption: Waterweed (Elodea sp.)



Caption: American eelgrass (*Vallisneria americana*)



Caption: Stonewort (Nitella sp.)



Caption: Common naiad (*Najas flexilis*)



Caption: Coontail (*Ceratophyllum demersum*)



Caption: Fragrant water lily (Nymphaea odorata)





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



Caption: Clasping leaf pondweed (Potamogeton perfoliatus)



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



Caption: Small pondweed (Potamogeton pusillus)



Caption: Muskgrass (Chara sp.)



Caption: Ribbon-leaf pondweed (*Potamogeton epihydrus*)



Caption: Eurasian watermilfoil (*Myriophyllum spicatum*)



Caption: Common bladderwort (Utricularia macrorhiza)



Caption: Floating-leaf pondweed (Potamogeton natans)





Caption: Water bulrush (Schoenoplectus subterminalis)



Caption: Nuttall's waterweed (*Elodea nuttallii*)



Caption: Watershield (*Brasenia schreberi*)



Caption: Northern watermilfoil (*Myriophyllum sibiricum*)



Caption: White stem pondweed (*Potamogeton praelongus*)



Maps

Maps 5-24 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.

























































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