



Clearwater Lake, Wright County, MN, August 2023

Clearwater Lake, Wright County: 2023 Aquatic Point Intercept Survey

Point Intercept Survey: August 21 and 22, 2023

Prepared for:
Clearwater Lake Property
Owners Association



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February 15, 2024

Clearwater Lake, Wright County: 2023 Aquatic Point Intercept Survey

Summary

On August 21 and 22, 2023, a summer point intercept survey was conducted on the 3,187 acre Clearwater Lake, Wright County. Plant growth was found to a depth of 20 feet and aquatic plants were estimated to cover 1,445 acres or 45% of Clearwater Lake. The most common submerged aquatic plant was chara. Chara was observed at 382 sites (970 ac of chara). The aquatic plant community in 2023 had 21 species of submerged aquatic plants. This is a good plant diversity condition for a lake in the North Central Hardwood Forest ecoregion setting. The number of individual plant species observed at sample points ranged from 1 to 6 with an average of 2.0 species/point (Figure 1).

Zebra mussels which were first confirmed in 2015, were found attached to aquatic plants at 323 survey sites. Zebra mussel distribution in Clearwater Lake was estimated at 1,392 acres (44% of the lake area)(Figure 1).

Eurasian watermilfoil was found at 2 sites (Table 1). Starry stonewort was found in a protected bay during the point intercept survey but not on any point intercept sites.

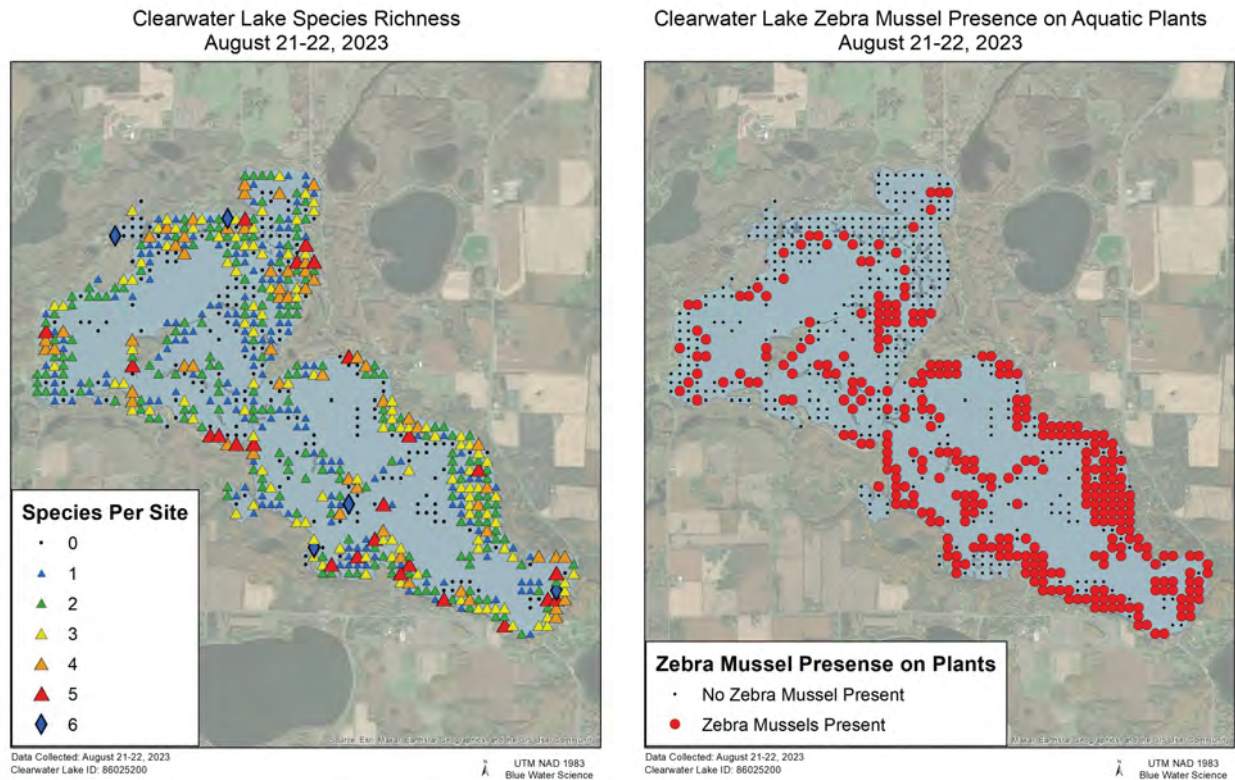


Figure 1. [left] Aquatic plant species richness for each sample site for Clearwater Lake in August 2023. [right] Zebra mussel distribution for August 2023 was based on observations of zebra mussels attached to aquatic plants collected during the point intercept survey.

Table 1. Clearwater Lake aquatic plant occurrences and densities for the August 21 & 22, 2023 survey. Density ratings are 1-3 with 1 being low and 3 being most dense. Statistics are based on the sites that were within the 20 feet of depth based on MnDNR lake contour map.

	All Sites (n=711)			East Lake Sites (n=358)			West Lake Sites (n=353)		
	Occur	% Occur	Density	Occur	% Occur	Density	Occur	% Occur	Density
Bulrush (<i>Scirpus sp</i>)	65	9	2.0	10	3	1.3	55	15	2.1
Cattails (<i>Typha sp</i>)	21	3	1.2	4	1	2.3	17	5	1.0
Wild rice (<i>Zizania palustris</i>)	15	2	1.4				15	4	1.4
Spatterdock (<i>Nuphar variegatum</i>)	26	4	1.3	2	1	1.0	24	7	1.4
White waterlily (<i>Nymphaea sp</i>)	88	12	2.0	11	3	2.4	77	22	1.9
Coontail (<i>Ceratophyllum demersum</i>)	179	25	1.4	93	26	1.5	86	24	1.2
Chara (<i>Chara sp</i>)	382	54	1.8	186	53	1.9	196	55	1.7
Elodea (<i>Elodea canadensis</i>)	7	1	1.1	6	2	1.2	1	0	1.0
Water stargrass (<i>Heteranthera dubia</i>)	12	2	1.2	8	2	1.1	4	1	1.3
Northern watermilfoil (<i>Myriophyllum sibiricum</i>)	85	12	1.1	23	7	1.0	62	17	1.1
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	2	0	1.0	2	1	1.0			
Naiads (<i>Najas flexilis</i>)	65	9	1.1	59	17	1.1	6	2	1.2
Nitella (<i>Nitella sp</i>)	1	0	1.0				1	0	1.0
Cabbage (<i>Potamogeton amplifolius</i>)	1	0	1.0	1	0	1.0			
Curlyleaf pondweed (<i>P. crispus</i>)	3	0	1.0	3	1	1.0			
Fries pondweed (<i>P. friesii</i>)	40	6	1.0	31	9	1.0	9	3	1.0
Variable pondweed (<i>P. gramineus</i>)	1	0	1.0	1	0	1.0			
Illinois pondweed (<i>P. illinoensis</i>)	101	14	1.1	76	22	1.1	25	7	1.5
Whitestem pondweed (<i>P. praelongus</i>)	24	3	1.0	15	4	1.0	9	3	1.1
Claspingleaf pondweed (<i>P. Richardsonii</i>)	25	4	1.1	3	1	1.0	22	6	1.1
Stringy pondweed (<i>P. sp</i>)	10	1	1.0	10	3	1.0			
Flatstem pondweed (<i>P. zosteriformis</i>)	17	2	1.0	11	3	1.0	6	2	1.0
Buttercup (<i>Ranunculus sp</i>)	3	0	1.0	3	1	1.0			
Sago pondweed (<i>Stuckenia pectinata</i>)	83	12	1.2	41	12	1.1	42	12	1.2
Bladderwort (<i>Utricularia sp</i>)	36	5	1.0	18	5	1.1	18	5	1.0
Water celery (<i>Vallisneria americana</i>)	86	12	1.5	55	16	1.5	31	9	1.4

Clearwater Lake, Wright County: 2023 Aquatic Point Intercept Survey

Lake ID: 86-025200

Size: 3,187 acres

Littoral area: 1,596 acres

Maximum depth: 73 feet

Mean depth: 19.2 feet

Introduction

Clearwater Lake is located within Wright County. Aquatic plant surveys also aid in characterizing distribution of native plants which help to sustain good water quality. As a general rule, if plant coverage is 40% or greater of the lake area, good water clarity is likely present. That was one parameter of many to be determined with the plant survey effort.

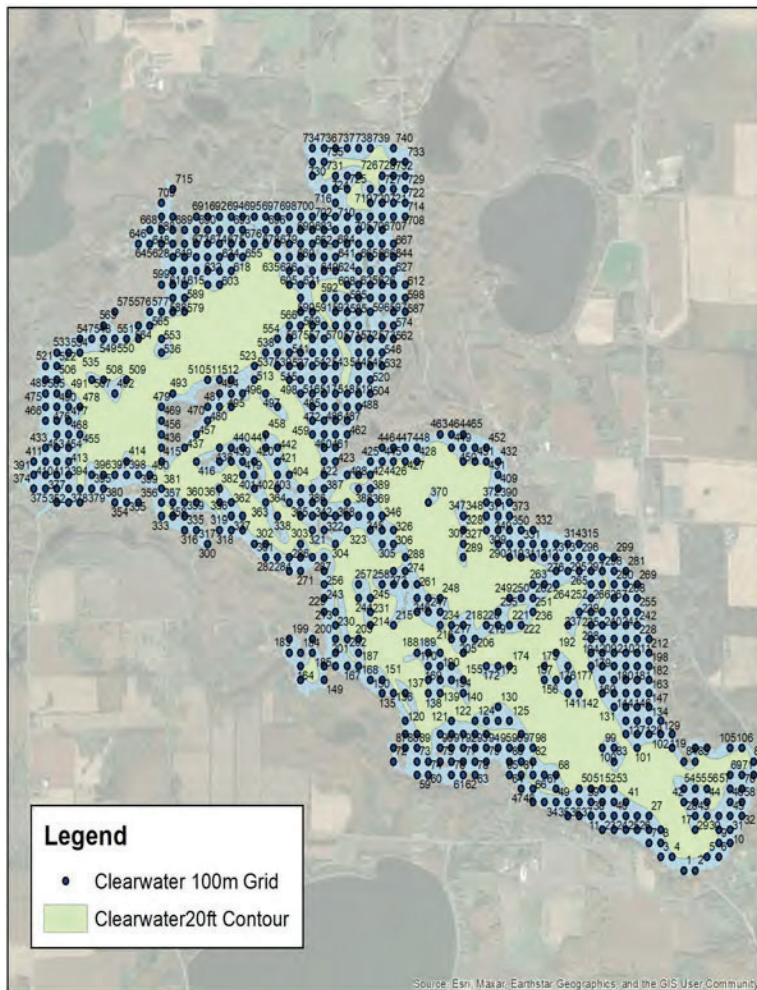
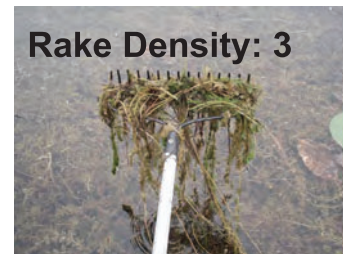


Figure 2. Sample locations for the point intercept aquatic plant survey based on 100 meter spacing. The 20 foot contour is shown in blue and the open water is shown in green.

Methods - Aquatic Plant Surveys

Point Intercept Survey: An aquatic plant survey of Clearwater Lake using a point intercept sampling method was conducted by Blue Water Science using 2 boats per day on August 22 and 23, 2023. A map and sampling grid were prepared by Blue Water Science and consisted of a total of 740 points that were distributed throughout the lake. Points were spaced 100 meters apart. Each point represented about 2.47 acres. At each sample point, plants were sampled with a rake sampler. In water less than 15 feet, a fixed-head rake sampler on a telescoping pole was used (Figure 3). In water deeper than 15 feet, a double-ended rake sampler on a rope was tossed into the lake to sample plants. Plants were sampled to depth of 20 feet. A plant density rating was assigned to each plant species on a scale from 1 to 3. A density of a “1” indicated sparse growth and a “3” rating indicated heavy plant growth.



Aquatic plant density ratings from 1 to 3.



Figure 3. Two different rake samplers used during the Clearwater Lake surveys. [left] Fixed head sampler. [right] Double headed throw rake.

Point Intercept Survey - August 21 and 22, 2023

The submerged aquatic plants were common in Clearwater Lake for the August 2023 point intercept plant survey. Chara was the dominant plant in Clearwater Lake. Coontail was also common. A total of 21 submerged aquatic plants, 2 floatingleaf aquatic plants, and 3 emergent plant were found (Table 2). Non-native Eurasian watermilfoil was observed in Clearwater Lake at 2 sites.

The non-native starry stonewort was observed in a secluded bay in Clearwater Lake. Starry stonewort was found in an area of approximately 1.85 acres. This area was chemically treated on September 5, 2023.

A summary of plant density and occurrence for individual species is shown in Table 2.



Figure 4. Starry stonewort was discovered in Clearwater Lake during the point intercept survey on August 21, 2023. It was found between point intercept points in the southeast area of Clearwater Lake.

Table 2. Clearwater Lake aquatic plant occurrences and densities for the August 21 & 22, 2023 survey. Density ratings are 1-3 with 1 being low and 3 being most dense. Statistics are based on the sites that were within the 20 feet of depth based on MnDNR lake contour map.

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Aquatic Plant Maps for Clearwater Lake

The number of aquatic plant species found at a sample point is referred to as species richness. The species richness in Clearwater Lake for each sample site is shown in Figure 5. The number of plant species at a sample point ranged from 0 to 6 with an average of 2.0 species per sample point. This is a good species richness. Additional native aquatic plant maps for individual plant species with an occurrence of over 15% are shown on the next page. Overall, aquatic plant growth in Clearwater Lake is mostly light to moderate.

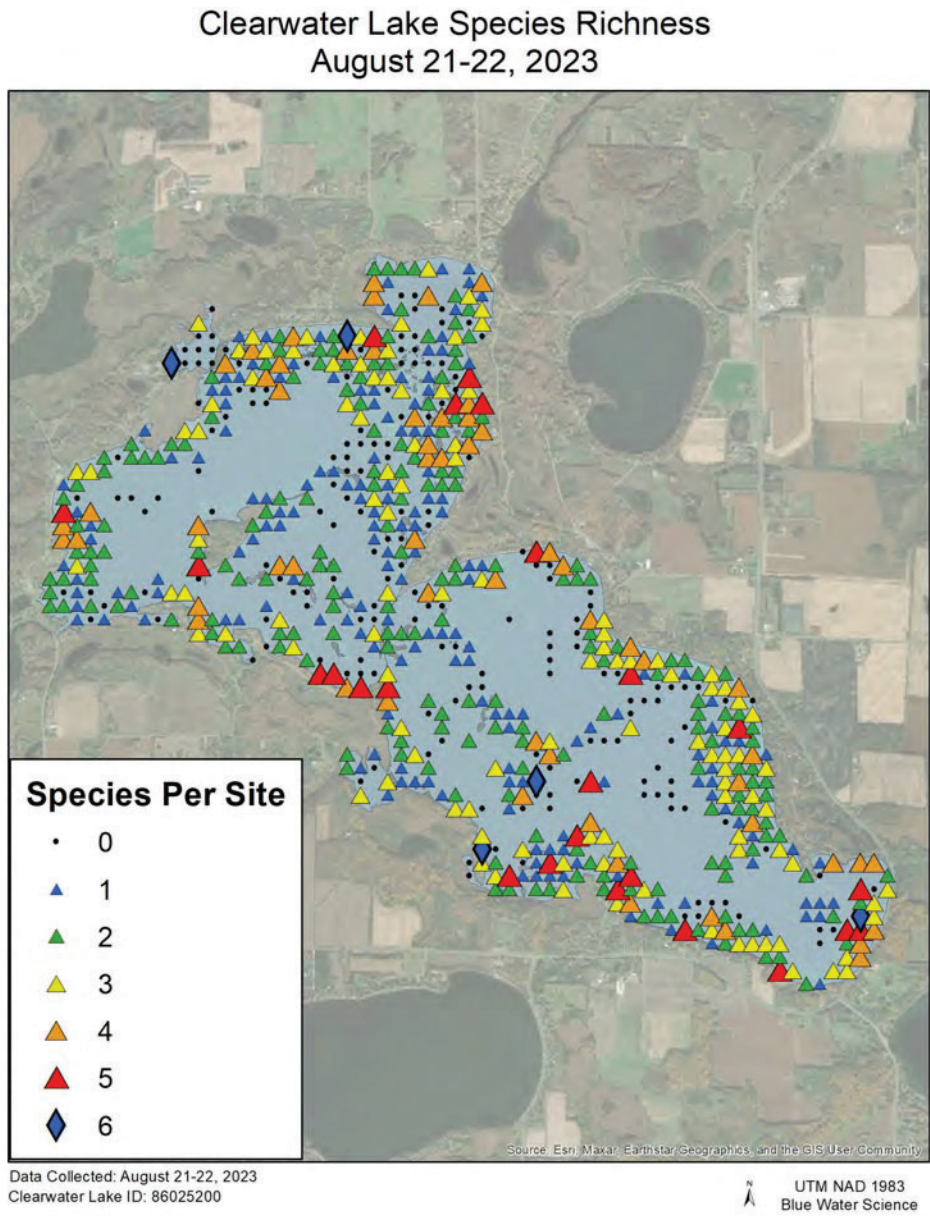
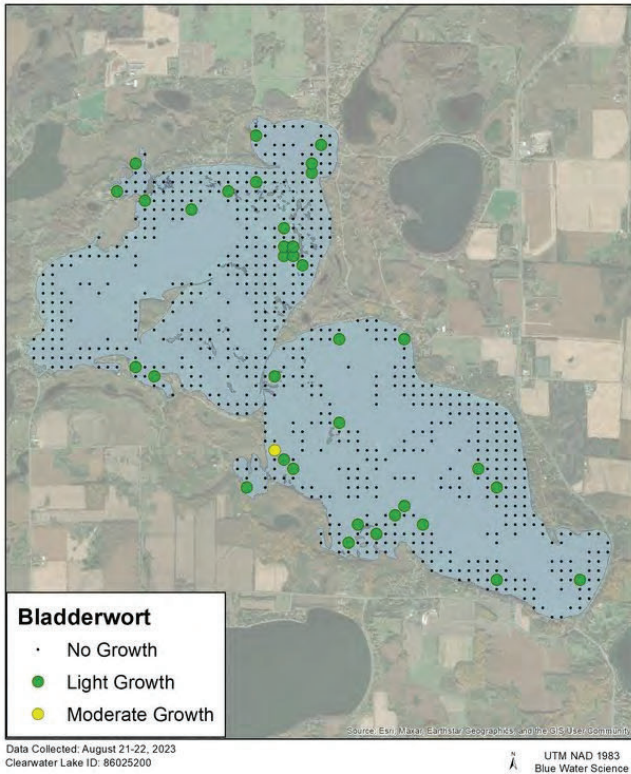


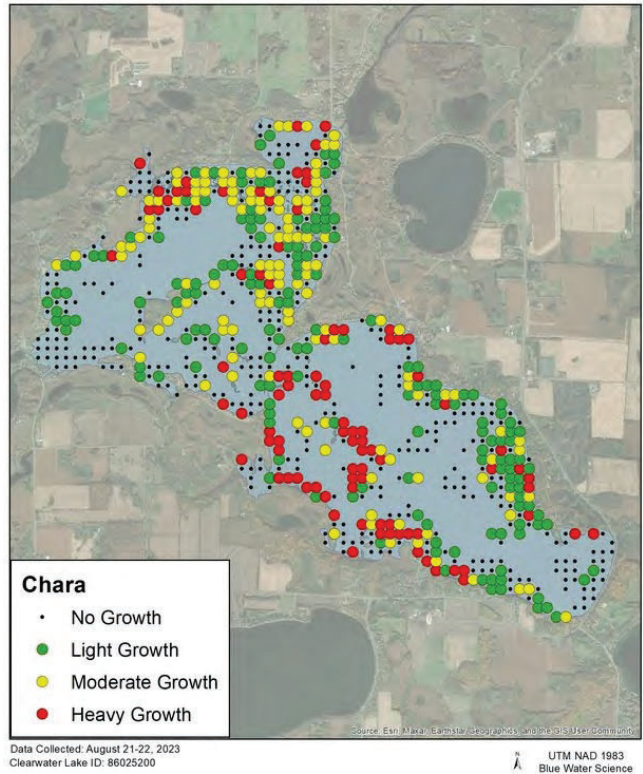
Figure 5. The number of aquatic plant species found at a sample point.

Aquatic Plant Abundance and Distribution

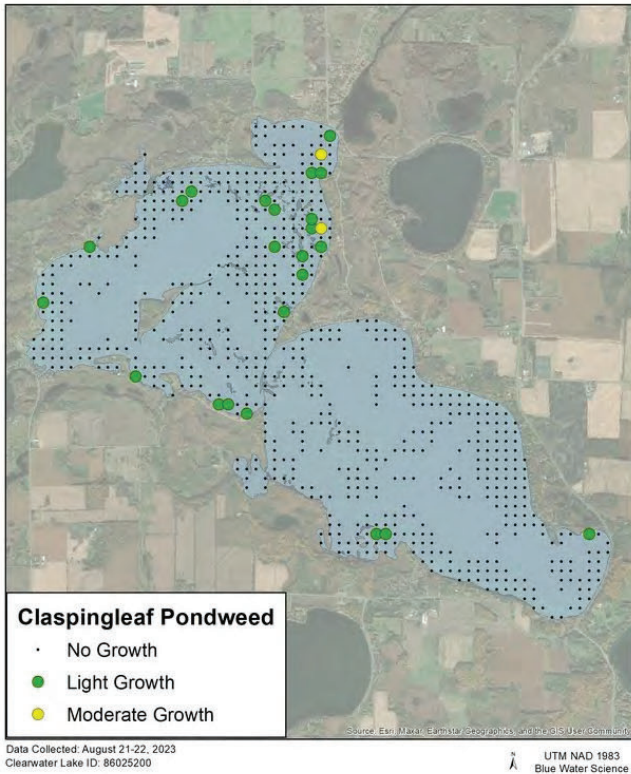
Clearwater Lake Bladderwort
August 21-22, 2023



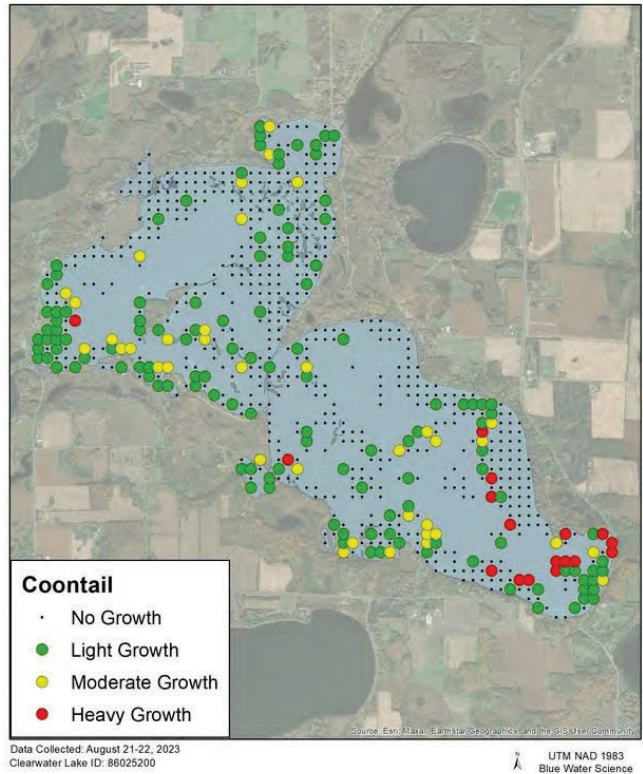
Clearwater Lake Chara
August 21-22, 2023



Clearwater Lake Claspingleaf Pondweed
August 21-22, 2023



Clearwater Lake Coontail
August 21-22, 2023



Clearwater Lake Point Intercept Survey MnDNR Statistics

A summary of plant statistics from the point intercept survey is shown in Tables 3 and 4 and Figure 5. Plants were observed in depths up to 20 feet and a total of 621 points were sampled from 0 to 20 feet of depth. However, 95% of plant occurrences were recorded from 1 to 12 feet representing 569 points (Table 3).

The aquatic plant coverage of Clearwater Lake was estimated at 1,445 acres or 45% of the lake area. Since plant coverage exceeds the 40% coverage criterium for good water clarity, Clearwater is predicted to good water clarity in most years.

Table 3. Clearwater Lake aquatic plant statistics (using MnDNR format).

Total # Points Sampled	690
Depth Range of Rooted Veg	0-20 feet
Maximum Depth of Growth (95%) in feet	12
# Points in Max Depth Range	569
# Points in Littoral Zone (0-15 feet)	581
% Points w/ Submersed Native Taxa	93
Mean Submersed Native Taxa/Point	2.0
# Submersed Native Taxa	19
# Submersed Invasive Taxa	2
Max Depth of EWM in feet	12
% Frequency of EWM	0
Mode Rake Abundance of EWM	1
Max Depth of CLP in feet	14
% Frequency of CLP	1
Mode Rake Abundance of CLP	1

Table 4. Aquatic plants sampled by depth.

Depth (feet)	Number of Sites Sampled at that Depth	Percent Occurrence of Plants at that Depth
0	18	0%
1	9	0%
2	80	85%
3	149	97%
4	103	94%
5	62	97%
6	44	98%
7	30	100%
8	18	100%
9	19	100%
10	24	100%
11	4	100%
12	9	100%
13	1	100%
14	6	100%
15	5	60%
16	8	88%
17	6	33%
18	5	0%
19	9	44%
20	9	11%
All sites	618	

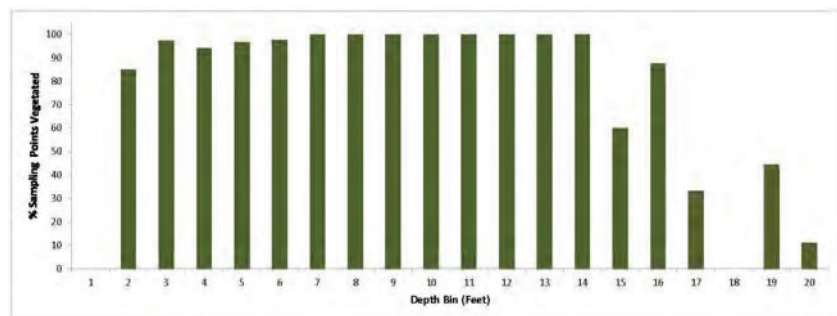


Figure 6. Growth depth of plant colonization out to 20 feet.

Representative Aquatic Plants in Clearwater Lake

A total of 21 submerged aquatic plant species were observed in the Clearwater Lake aquatic plant surveys. Representative aquatic plant conditions and species are in Figure 6.

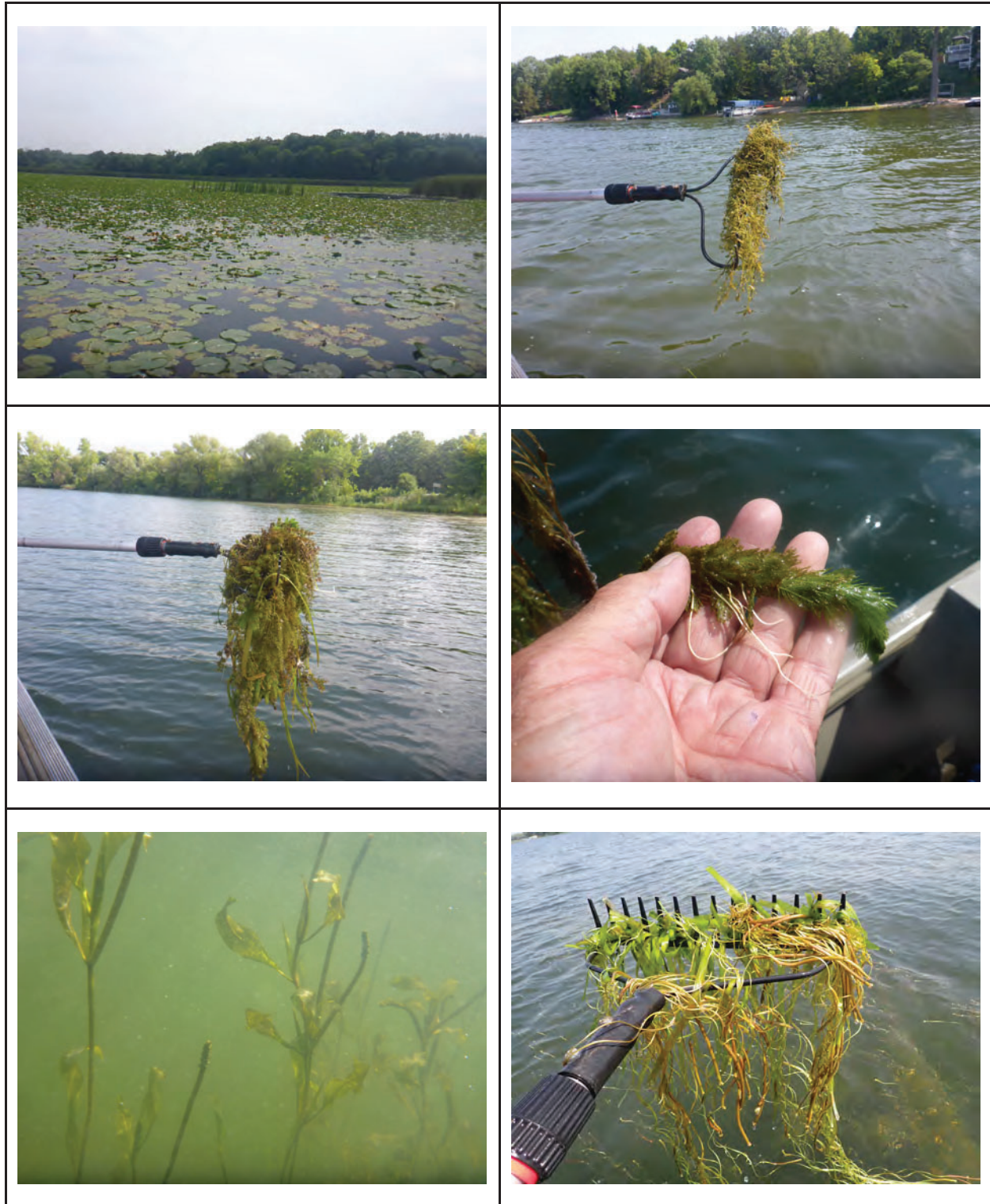


Figure 7. Representative aquatic plants and conditions in Clearwater Lake in 2023.

Aquatic Invasive Species Found in the Point Intercept Survey

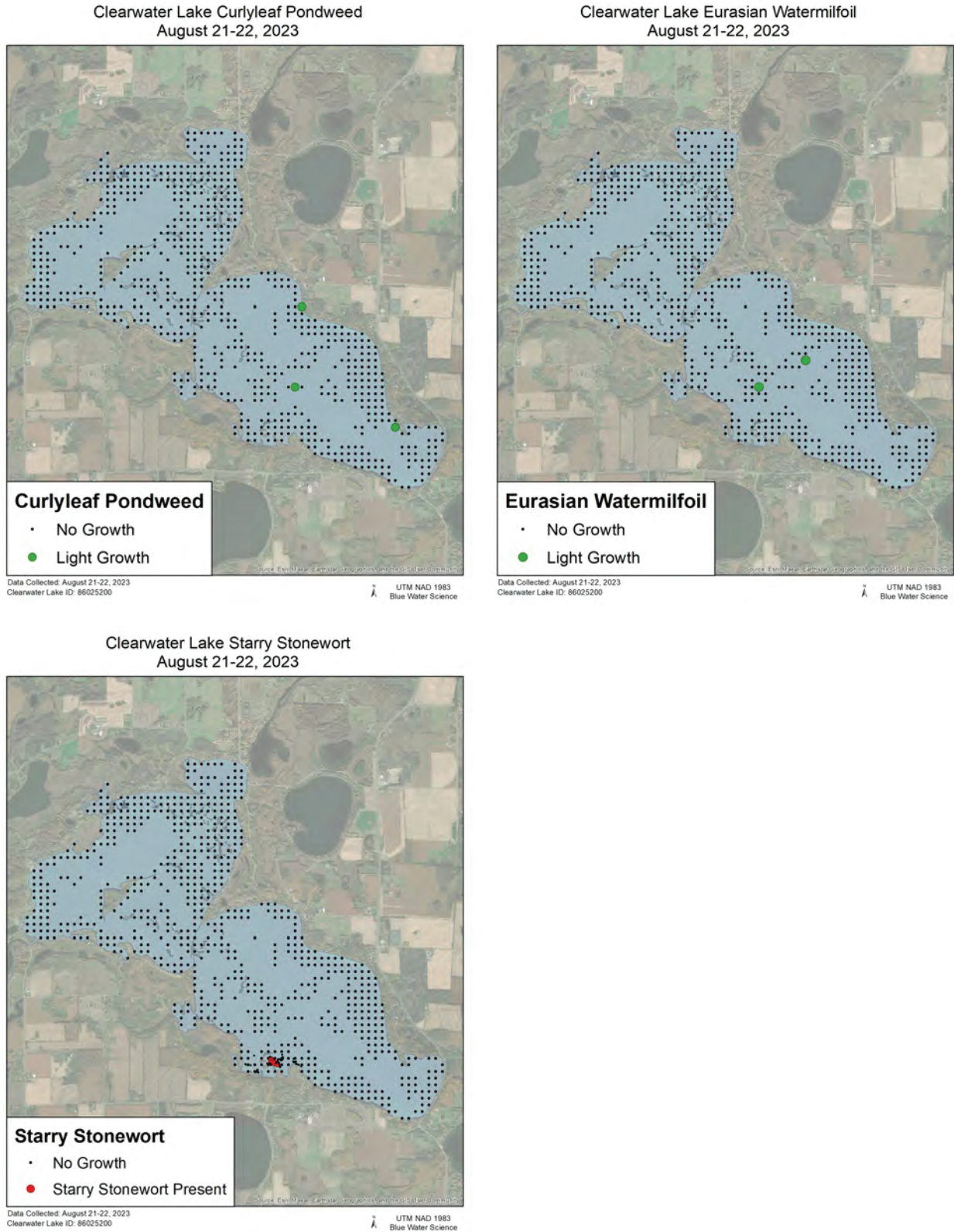


Figure 8. Three AIS plants were found in Clearwater Lake in the point intercept survey.

Zebra Mussel Distribution in Clearwater Lake

During the aquatic plant point intercept survey, the presence of zebra mussels (an AIS) attached to plants was noted. A map of zebra mussel distribution was prepared and is shown in Figure 9. Zebra mussels were found at 323 survey sites and are estimated to cover 798 acres or 25% of the lake area in Clearwater Lake. Zebra mussels were found to a depth of 20 feet.

Clearwater Lake Zebra Mussel Presence on Aquatic Plants August 21-22, 2023

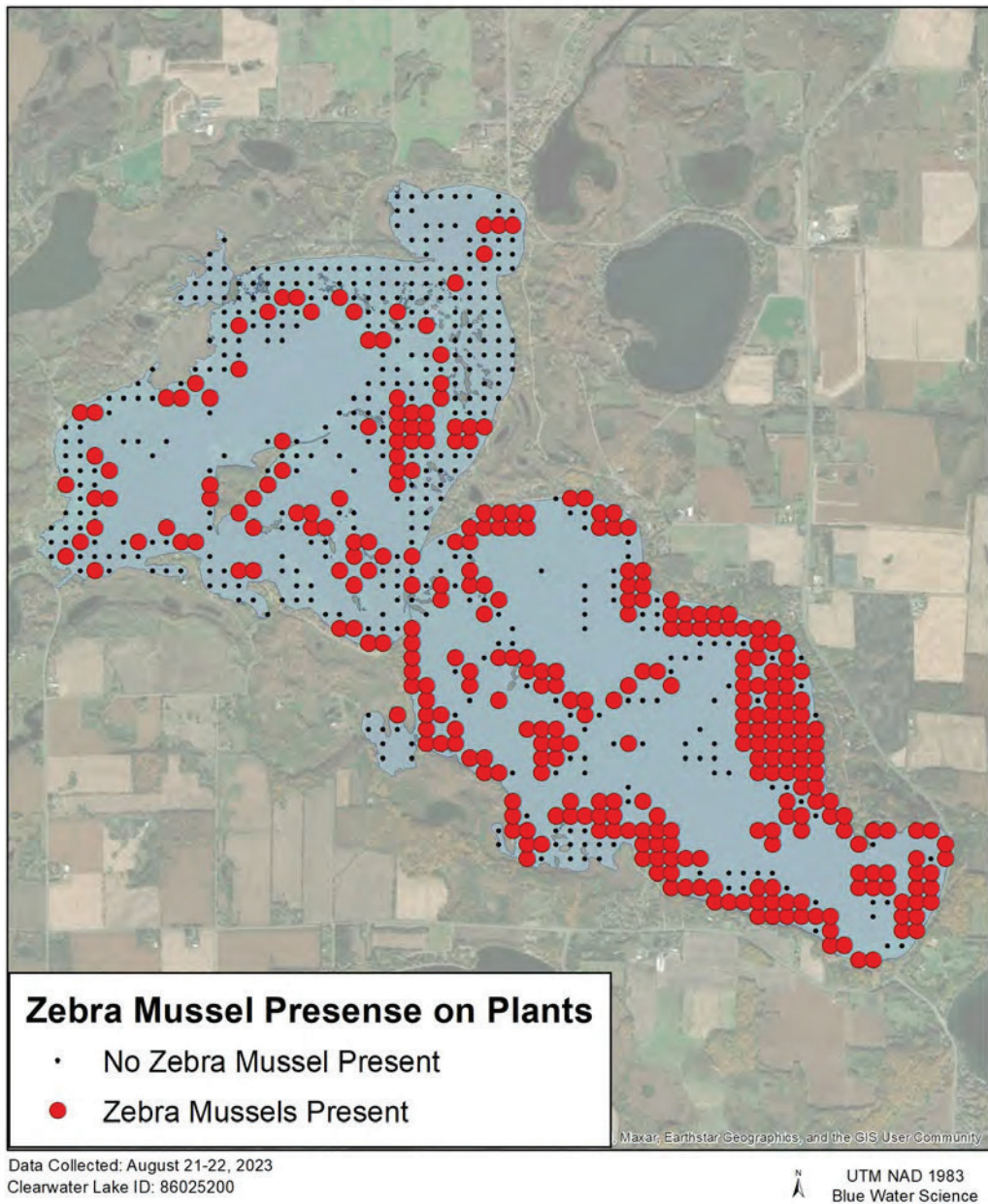


Figure 9. Zebra mussel distribution for August 2023 was based on observations of zebra mussels attached to aquatic plants collected during the point intercept survey.

Water Quality Summary and Transparency for Clearwater Lake

SUMMARY

WATER QUALITY

BIOLOGY

HYDROLOGY

STEWARDSHIP

Lake Health Score (▲): 50

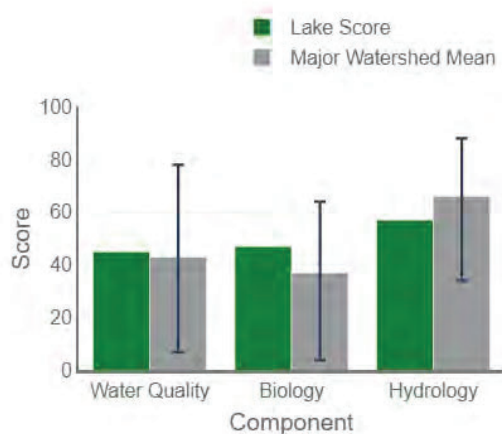
Lake Health Grade: C

Lake Health Score Major Watershed Mean (●): 50

Lake Health Score Major Watershed Min/Max: 20/75



Lake Health Component Scores



Water Quality Score: 45

Water Quality Score Major Watershed Mean: 43; Min/Max: 7/78

Biology Score: 47

Biology Score Major Watershed Mean: 37; Min/Max: 4/64

Hydrology Score: 57

Hydrology Score Major Watershed Mean: 66; Min/Max: 34/88

Clearwater (86025200) Basics

Excel

CSV

Area (acres)	3,187
Lakeshed Area (acres)	101,708
Maximum Depth (feet)	73
Maximum Depth (meters)	22.3
Mean Depth (feet)	19
Mean Depth (meters)	5.9
Littoral Area (acres)	Not Evaluated
Shoreline (miles)	22.3
Water Body Class	Lake or Pond
Managed Fisheries Lake	Yes
Lake Finder	Open Lake Finder to Lake
Basin	Mississippi Headwaters (0701)
Major	Mississippi River - St. Cloud (17)
Catchment ID	1700600
County (Majority)	Wright
County (Percent)	Wright: 80%
County (Percent)	Stearns: 20%

Component Input Status

Each component score is created by combining data inputs. Some of these data inputs have a target value labeled a 'goal' or 'threshold'. If an input value is:

- **"Below (Goal or Threshold)"**, the condition for the lake has degraded to the point that it may not support one or more desired outcomes (e.g., water clarity quality, natural diversity of plants and animals).
- **"At or Above (Goal or Threshold)"**, the condition for the lake currently meets or exceeds the minimum criteria to support these desired outcomes.

Water Quality

Phosphorus: Below Goal

Water Clarity: At or Above Goal

Biology

Fish Community Quality: At or Above Threshold

Lake Plant Community Quality: At or Above Threshold

Lake Basics

[About Lake Basics](#)

[Learn More](#)

Conclusions

Clearwater Lake has average water quality. Although zebra mussel filtering activity has increased water clarity in the last few years, the abundance of a diverse native aquatic plant population will help sustain good water quality in the long term.

APPENDIX

Individual Site Data for the Point Intercept Survey for Clearwater Lake for August 21 and 22, 2023.

Site	Depth (ft)	Bul-rush	Cattails	Wild rice	Spatter dock	White lilies	Bladder wort	Butterc up	Cab-bage	Chara	Clasp-leaf	Coon-tail	CLP	Elodea	EWM	Flat-stem	Fries	Illinois	Naiad	Nitella	NWM	Sago	Stringy	Variable	Water celery	Water star-grass	White-stem	FA benthic	No plants	ZM on plants	
1	3									1									1											1	
2	3									2																					1
3	3									1																3	1				1
4	4									1	1							1	1												1
5	6									1		1										1				2					
6	5																					1				3					
7	3																						1				1				
8	5									1								1						1							
9	8											1		1		1															1
10	6										1			1												1					1
11	3									1																					1
12	4									1							1														1
13	4											1						1	1												1
14	6									2								1	1												1
15	7									2								1	1												1
16	9											1						1								3					1
18	10											1																			1
19	6										1			2		1						1									1
20	4									3																					1
21	4									2						1			1	1						1					1
22	4									1									1												1
23	4									1								1	1												1
24	7						1			1								1								3					1
25	9																									3					1
26	9											3														3	1	1			1
27	11											3																			1
29	23																														1
30	7						1			1		1											1			2					1
31	6															1		1				1				1					1
32	5											2						1								2	1				1
33	3									3																					1
34	3									1									1												1
35	3									3														1							1
36	4									3								1													1
37	23																														1
38	27																														1
39	12											3												1	1						1
40	8																								1						1
41	32									1																					1
42	12											3																			1
43	10											1																			1
44	8											1																			1
45	6									1		1				1		1				1				1					1
46	6											1														3		1			1
47	3									3							1									3	1				1
48	3									2							1		1						1						1
49	4																1														1
50	17											1																			1
51	28																														1
52	36																														1
53	25																														1
54	10											3																			1
55	9											3																			1
56	8											3																			1
57	5																	1													1
58	5											1														3					1
59	3	1										2														1					1
60	4									3																					1
61	2																														1
62	3											1																			1
63	3											1																			1
64	3									3																1					1
65	5											1							1							1					1
66	4									1								1								1					1
67	5																	1	1												1
68	5									1									1												1
69	6											2						1	1												1
70	21																														1
71	4											3																			1
72	1																									1					1
73	7											1																			1
74	7						1					2						1								1					1
75	2																														1
76	3											3																			1
77	4																														1
78	4											2																			1
79	3											1																			1
80	3											2																			1
81	12											2																			1
82	6											1						1													1
83	16											1						1	1												1
84	4											2																			1
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465	4									2						1	1		1											1
466	2				1	3						1										1						2		1
467	2									1		1										1	1							
468	12	2										1																		
469	4											1										1						1		1
470	3									2								1									1			1
471	9											1																		1
472	0		1																											
473	2	2																												
474	2									2	1												2			1				
475	2									1	1												2			1				
476	2	1																1					1				1			
477	3					1																								
478	6											2																		
479	4									1		1							1			1								1
480	1	2				2				1																				
481	3	3								2																				
482	8											1																		
484	4									2																				
485	3									2												1								
486	3	2								1																				
487	0		1							1																				
489	3				1	2								1									1			2				
490	2	2								1																				
491	7									1		2						1				1								1
493	2	3																												
494	0	3	1			1				1																		1		
495	3	3								1																				
496	2	3				2																								
499	4									2																				
500	6																1					2	1					1		1
501	3	3																												
502	3	2								1																				
503	2	2																												
504	2									2																				
505	4				2																									
506	18											1																1		
510	2	3																												
511	3									1																				
512	1									2																				
513	4	2								1																				
514	31																													
515	10									1																				
516	4	1								1									1			1								
517	6									3																				
518	3									2													1							
519	4									2																				
520	9											1																		
521	3																													
522	7											1														1				
523	3	3								1																				
524	19																													
525	1									3																				
526	2	3								1																				
527	6									3												1								
528	5									2																				
529	4									2																				
530	4									1																1				
531	6									2	1																			
532	3									1																				
533	3									2		1																		
534	4									1																				
535	2	2								1								2				1	1							
536	35																													
537	3	2								1																				
538	3	2								1																				
539	0		1																											
540	26																													
541	6									2												1								
542	4									2								1				1								
543	4									2								1												
544	5									1																				
545	7						1			2																				
546	3									2																				
547	2					2				2		1																		
548	0																													
549	2	2				2				1																				
550	4									1												1								
551	3									3												1								
552	6									2																				
553	9											2																		
554	30																													
555	20																													
556	10																													
557	15											1																		
558	12																													
559	3						1			1																				

Individual Site Data for the Point Intercept Survey for Clearwater Lake for August 21 and 22, 2023.

Site	Depth (ft)	Bul-rush	Cattails	Wild rice	Spatter dock	White lilies	Bladder wort	Buttercup	Cabbage	Chara	Clasp-ingleaf	Coon-tail	CLP	Elodea	EWM	Flat-stem	Fries	Illinois	Naiad	Nitella	NWM	Sago	Stringy	Variable	Water celery	Water star-grass	White-stem	FA benthic	No plants	ZM on plants	
719	19																														
720	14											1																		1	
721	4	1								1	2																				
722	4			1	1	1				1																					
723	6					1				1		1										1									
724	20																													1	
725	20																													1	
726	9											1					1		1						1						
727	7									3		1																		1	
728	9						1			2												1								1	
729	4									2																				1	
730	3				2	2	1					1																			
731	3	3								1																					
732	16											1																			
733	4									2	1	1						2													
734	7					1						1																			
735	6					2						2																			
736	2	2				2				2																					
737	3	2				1				2																					
738	2									3																					
739	5									2												1	1								
740	3									3																					
Average	2.0	1.2	1.4	1.3	2.0	1.0	1.0	1.0	1.0	1.8	1.1	1.4	1.0	1.1	1.0	1.0	1.0	1.1	1.1	1.0	1.1	1.2	1.0	1.0	1.5	1.2	1.0	1.3			
Occur - all	711	65	21	15	26	88	36	3	1	382	25	179	3	7	2	17	40	101	65	1	85	83	10	1	86	12	24	24	126	323	
% occur	9	3	2	4	12	5	0	0	54	4	25	0	1	0	2	6	14	9	0	12	12	1	0	12	2	3	3				
Average	3.0	2.4	2.2	2.3	3.1	2.0	1.2	0.8	2.9	2.0	2.5	1.2	1.7	1.1	1.9	2.0	2.2	2.1	0.8	2.1	2.2	1.7	0.8	2.5	1.9	2.0	2.2				
Occur - West	358	61	21	14	22	76	15	2	0	260	18	52	1	3	0	8	18	55	38	1	46	53	1	1	40	5	11	20	9	152	
% occur	17	6	4	6	21	4	1	0	73	5	15	0	1	0	2	5	15	11	0	13	15	0	0	11	1	3	6				
Average	1.5	#DIV/0!	1.0	1.5	1.8	1.0	1.0	1.0	1.7	1.1	1.5	1.0	1.3	1.0	1.0	1.0	1.1	1.1	#DIV/0!	1.1	1.1	1.0	#DIV/0!	1.6	1.1	1.1	1.0				
Occur - East	353	4	0	1	4	12	21	1	1	122	7	127	2	4	2	9	22	46	27	0	39	30	9	0	46	7	13	4	117	171	
% occur	1	0	0	1	3	6	0	0	35	2	36	1	1	1	3	6	13	8	0	11	8	3	0	13	2	4	1				