Watershield in Keewahtin Lake, August 12, 2025

Aquatic Plant Point Intercept Survey and AIS Check for Lake Keewahtin, Washington County, Minnesota, 2025

Survey conducted on August 12, 2025

Prepared for:
Comfort Lake/Forest
Lake Watershed District
Forest Lake, Minnesota

December 5, 2025

Prepared by:
Steve McComas
Jo Stuckert
Connor McComas
Blue Water Science
St. Paul, MN 55116

Aquatic Plant Point Intercept Survey and AIS Check for Lake Keewahtin, Washington County, Minnesota in 2025

Summary

ID: 82008000
Area: 91 acres
Littoral Area: 67 acres
Maximum depth: 34 feet

An aquatic plant point intercept survey was conducted on Lake Keewahtin (91 acres) on the August 12, 2025. The objectives of the survey were to characterize the existing plant community and to look for any aquatic non-native species including Eurasian watermilfoil and starry stonewort.

On August 12, 2025, a total of 28 aquatic plants species were observed with some growing to 20 feet of water depth. No submerged aquatic non-native species were observed in the August survey (Table 1).

Table 1. The percent occurrence of aquatic plants for Lake Keewahtin on August 12, 2025. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey.

Species	Percent Occurrence (145 samples)
Sagittaria (*Sagittaria spp*)	1%
Wild rice (*Zizania palustris*)	1%
Watershield (*Brasenia schreberi*)	41%
Spatterdock (*Nuphar variegatum*)	26%
White lily (*Nymphaea sp*)	30%
Marsh marigold (*Bidens Beckii*)	4%
Coontail (*Ceratophyllum demersum*)	56%
Brauns stonewort (*Chara braunii*))	1%
Chara (*Chara spp*)	13%
Moss (*Drepanocladus sp*)	1%
Elodea (*Elodea canadensis*)	66%
Water stargrass (*Heteranthera dubia*)	6%
Northern Watermilfoil (*Myriophyllum sibiricum*)	21%
Naiads (*Najas flexilis*)	52%
Nitella (*Nitella spp*)	1%

Species	Percent Occurrence (145 samples)
Large-leaf pondweed (*Potamogeton amplifolius*)	7%
Fries (*P. friesii*)	5%
Variable pondweed (*P. gramineus*)	1%
Illinois pondweed (*P. illinoensis*)	33%
Floatingleaf pondweed (*P. natans*)	1%
Whitestem pondweed (*P. praelongus*)	5%
Fern pondweed (*P. robbinsii*)	4%
Flatstem pondweed (*P. zosteriformis*)	27%
White water crowfoot (*Ranunculus aquatilis*)	19%
Sago pondweed (*Stuckenia pectinata*)	1%
Bladderwort (*Utricularia spp*)	31%
Bladderwort - minor (*Utricularia spp*)	14%
Water Celery (*Vallisneria americana*)	6%
Number of submerged plants	23

Survey Methods

An aquatic plant survey of Keewahtin Lake using a point intercept survey method was conducted by Blue Water Science on August 12, 2025. The grid spacing was 50 meters. A plant density rating was assigned to each plant species on a scale from 1 to 3 (Figure 1). A density of a “1" indicated sparse growth with one or two stems present on the rake sampler. A 3 rating indicated dense growth.

Chart of Aquatic Plant Density Ratings

Figure 1. Aquatic plant density ratings from 1 to 3.

Lake Keewahtin Site Map

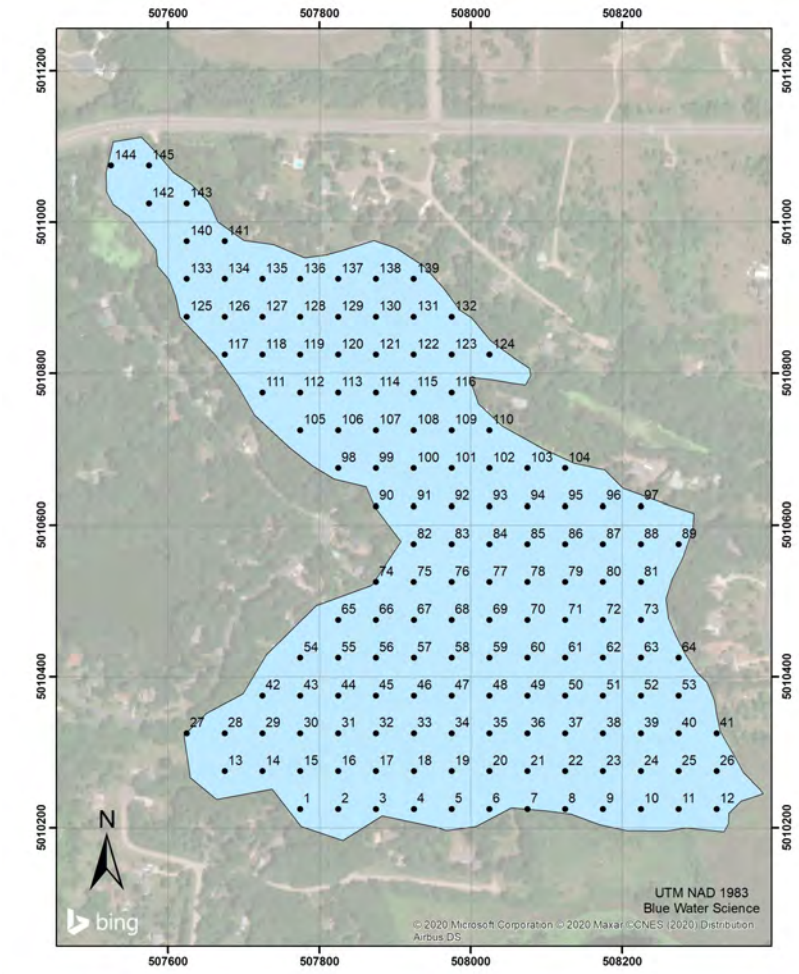


Figure 2. Sample site locations were spaced 50 meters apart. A total of 145 sites were sampled.

Aquatic Plant Survey Results

The aquatic plant community in 2025 had 23 species of submerged plants, 3 species of floating plants, and 2 emergent plants. Plant productivity and plant diversity was excellent at most sites, with an average of 4.3 plant species per site. The most common plants were coontail, elodea, illinois pondweed, and naiads. No known non-native plants were observed in the lake.

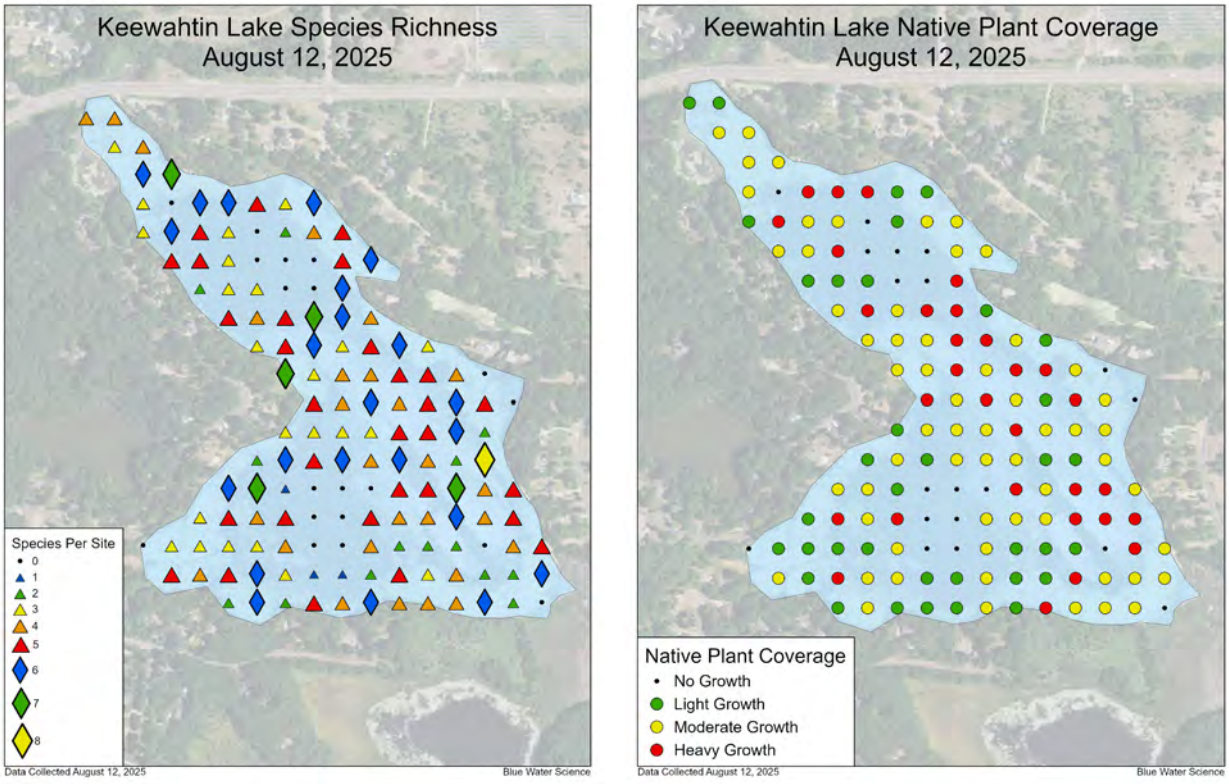


Figure 3. [left] Species richness on August 12, 2025. Number of species ranged from 0 to 8 species/site. [right] Native plant coverage on August 12, 2025. Plant growth ranged from no plants to heavy growth but was dominated by light to moderate growth.

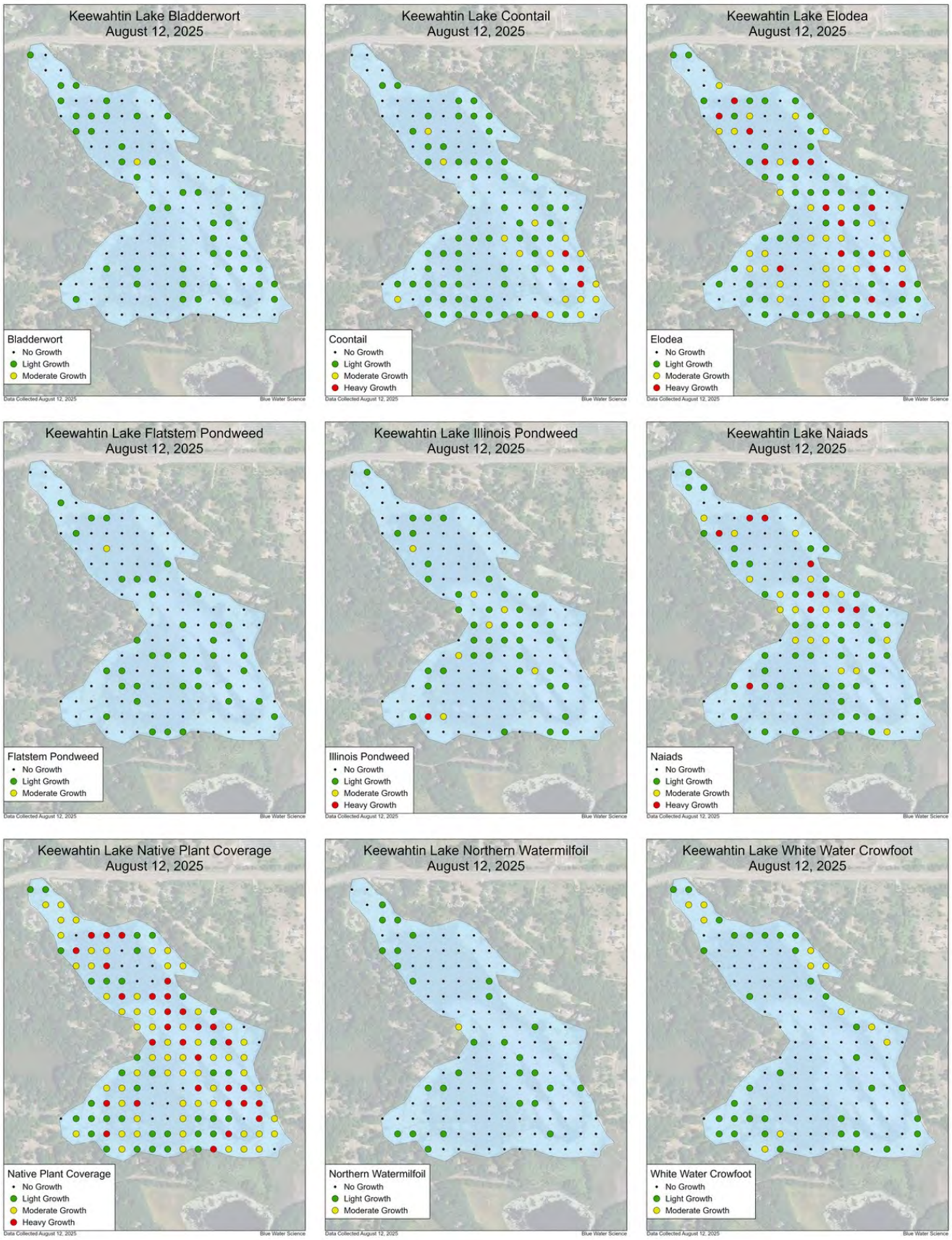


Figure 4. Individual site maps for selected aquatic plants sampled on August 12, 2025 in Lake Keewahtin.

Figure 5. [top] Spatterdock, white lilies, and watershield growth in Lake Keewahtin on August 12, 2025. [bottom] Submerged native plants were common in Lake Keewahtin on August 12, 2025.

Table 2. The percent occurrence of aquatic plants for Lake Keewahtin on August 12, 2025. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey.

Species	Percent Occurrence (145 samples)
Sagittaria (*Sagittaria spp*)	1%
Wild rice (*Zizania palustris*)	1%
Watershield (*Brasenia schreberi*)	41%
Spatterdock (*Nuphar variegatum*)	26%
White lily (*Nymphaea sp*)	30%
Marsh marigold (*Bidens Beckii*)	4%
Coontail (*Ceratophyllum demersum*)	56%
Brauns stonewort (*Chara braunii*))	1%
Chara (*Chara spp*)	13%
Moss (*Drepanocladus sp*)	1%
Elodea (*Elodea canadensis*)	66%
Water stargrass (*Heteranthera dubia*)	6%
Northern Watermilfoil (*Myriophyllum sibiricum*)	21%
Naiads (*Najas flexilis*)	52%
Nitella (*Nitella spp*)	1%
Large-leaf pondweed (*Potamogeton amplifolius*)	7%
Fries (*P. friesii*)	5%
Variable pondweed (*P. gramineus*)	1%
Illinois pondweed (*P. illinoensis*)	33%
Floatingleaf pondweed (*P. natans*)	1%
Whitestem pondweed (*P. praelongus*)	5%
Fern pondweed (*P. robbinsii*)	4%
Flatstem pondweed (*P. zosteriformis*)	27%
White water crowfoot (*Ranunculus aquatilis*)	19%
Sago pondweed (*Stuckenia pectinata*)	1%
Bladderwort (*Utricularia spp*)	31%
Bladderwort - minor (*Utricularia spp*)	14%
Water Celery (*Vallisneria americana*)	6%
Number of submerged plants	23

Figure 6. Submerged aquatic plants were sampled with a double-head rake.

Lake Keewahtin Point Intercept Survey Statistics

A summary of plant statistics from the point intercept survey is shown in Tables 3 and 4 and Figure 7. Plants were observed in depths up to 20 feet (Table 2).

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

Total # Points Sampled to 15 feet	**142**
Depth Range of Rooted Veg	**0-20 feet**
Maximum Depth of Growth (95%) in feet	**15**
# Points in Max Depth Range	**126**
# Points in Littoral Zone (0-15 feet)	**126**
% Points w/ Submersed Native Taxa	**97**
Mean Submersed Native Taxa/Point	**4.3**
# Submersed Native Taxa	**23**
# Submersed Invasive Taxa	0

Table 4. Aquatic plants sampled by depth. Littoral zone goes to 15 feet of water depth.

Depth (feet)	Number of Sites Sampled at that Depth	Percent Occurrence of Plants at that Depth
0	3	0%
1	2	0%
2	9	100%
3	16	100%
4	11	100%
5	10	90%
6	19	100%
7	19	100%
8	13	100%
9	7	100%
10	5	100%
11	4	100%
12	3	100%
13	1	100%
14	1	100%
15	3	100%
16	2	100%
17	0	0%
18	2	100%
19	0	0%
20	1	100%
All sites	131	

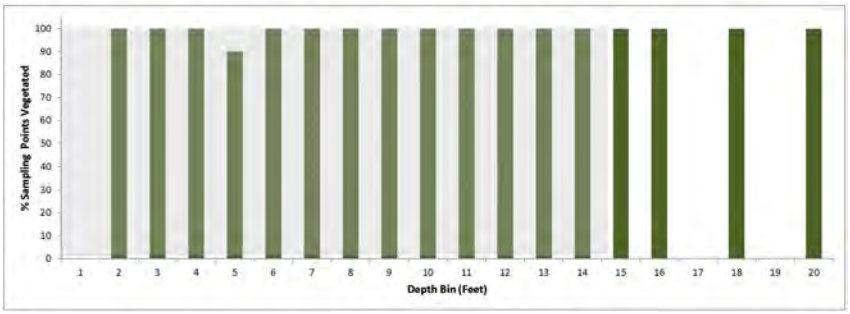


Figure 7. Depth of plant colonization (in feet).

Comparison of 2015, 2020, and 2025 Point Intercept Surveys

Point intercept surveys were conducted in 2015, 2020, and 2025. The number of aquatic plant species have increased from 2015 to 2025 (Table 5). It appears a couple species increased in occurrence from 2015 to 2025 and include coontail, elodea, and white water crowfoot. Also several species were less frequent in occurrence and included chara, northern watermilfoil, and illinois pondweed. Some of these changes may be due to annual variation. The plant community remains in good condition in 2025.

Table 5. The percent occurrence of aquatic plants for Lake Keewahtin for 2015, 2020, and 2025. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey. For example, if coontail was found in 25 out of 50 stations, its percent occurrence would be 50%.

	2015 August 26 % Occur (145 sites)	2020 Sept 4 % Occur (145 sites)	2025 August 12 % Occur (145 sites)
Sagittaria (*Sagittaria spp*)			1
Bulrush (*Scirpus sp*)	1	1	
Cattails (*Typha sp*)	1		
Wild rice (*Zizania aquatica*)	5		1
Watershield (*Brasenia Schreberi*)	22	30	41
Spatterdock (*Nuphar variegatum*)	23	27	26
White waterlily (*Nymphaea sp*)	21	24	30
Water marigold (*Bidens Beckii*)	8	6	4
Coontail (*Ceratophyllum demersum*)	43	88	56
Brauns stonewort (*Chara braunii*)			1
Chara (*Chara spp*)	25	3	13
Moss (*Drepanocladus sp*)	6	1	1
Elodea (*Elodea canadensis*)	36	39	66
Star duckweed (*Lemna trisulca*)		1	
Northern watermilfoil (*Myriophyllum sibiricum*)	31	23	21
Naiads (*Najas flexilis*)	41	35	52
Nitella (*Nitella sp*)	1		1
Large-leaf pondweed (*Potamogeton amplifolius*)	3	5	7
Fries pondweed (*P. friesii*)		2	5
Variable pondweed (*P. gramineus*)			1
Illinois pondweed (*P. illinoensis*)	59	57	33
Floatingleaf pondweed (*P. natans*)	3	3	1
Whitestem pondweed (*P. praelongus*)	8	4	5
Fern pondweed (*P. robbinsii*)			4
Stringy pondweed (*P. sp*)	3		
Flatstem pondweed (*P. zosteriformis*)	11	28	27
White water crowfoot (*Ranunculus aquatilis*)			19
Sago pondweed (*Stuckenia pectinata*)			1
Bladderwort (*Utricularia sp*)	15	6	31
Bladderwort (*Utricularia sp*)		10	14
Water celery (*Vallisneria americana*)	8	8	6
Water stargrass (*Zosterella dubia*)	12	3	6
Total Number of Submerged Species	17	18	23

APPENDIX

August 12, 2025: Lake Keewahtin aquatic plant occurrence and densities. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	Wild rice	Sagit-taria	Spatter dock	Water-shield	White lilies	Bladder wort	Bladder wort - Minor	Chara	Brauns stone-wort	Coon-tail	Elodea	Fern	Flat-stem	Float-ingleaf	Fries	Illinois	Large-leaf	Marsh mari-gold	Moss	Naiads	Nitella	NWM	Sago	Vari-able	Water celery	Water star-grass	White water crow-foot	White-stem	No plants
1	2			1	3	1					1												1							
2	3			2	1	2			1		1	1									1			1				2		
3	4			2	1	3					1																	1		
4	5			1	2	2					1	1		1							1					1				
5	5				1	1					1	1		1				1												
6	3			1		2					1	1		1			1									1	2			
7	1	1		2	1	2					1	1									1					1				
8	3				2	2					3	1															1	1		
9	3				2	2					2	1					1				1									
10	4			1	1	2			1		1	1					1				2							1		
11	3			2	1	1					2	1																		
12	0																													1
13	3			1	1	3	1				2					1							1					1		
14	3					3											1				1		1					1		
15	6					1					1	1		1			3		2											
16	7				1			1			1	1					2						1					1		
17	10										1	2																2		
18	15										1																			
19	16										1																			
20	11						1					2																		
21	5			2	3		1		1			1									1							1		
22	5			1	2							1									1							1		
23	6				1		1					3									1		1							
24	20										2						1													
25	5			2	2	1					2	1																		
26	4			2	2	2	1	1			2	1		1		1														
27	0																													1
28	2				1	3					1	1																1		
29	4			2	3	1					1													1				1		
30	6			1	2	2					1	1																1		
31	6			3				1			1					1														
32	15						1				1	2		1																
33	28																													1
34	29																													1
35	9				1		1				1	2																	1	
36	6			3	2																1							1		
37	6			2	3		1		1																					
38	10											1		1																
39	29																													1
40	7						1				3	3		1																
41	2						1	1			2	1									1									
42	5				2	3						1									1							1		
43	6				1		1				1	2					1				3									
44	7											2		1							1								1	
45	12						1				1	3		1							1									
46	28																													1
47	30																													1
48	10						1				1	2		1							1									
49	7				2							2		1							1		1							
50	7				1						1	2									1		1							
51	8						1				2	3		1			1	1												
52	9						1				1	3					1													

August 12, 2025: Lake Keewahtin aquatic plant occurrence and densities. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	Wild rice	Sagit-taria	Spatter dock	Water-shield	White lilies	Bladder wort	Bladder wort - Minor	Chara	Brauns stone-wort	Coon-tail	Elodea	Fern	Flat-stem	Float-ingleaf	Fries	Illinois	Large-leaf	Marsh mari-gold	Moss	Naiads	Nitella	NWM	Sago	Vari-able	Water celery	Water star-grass	White water crow-foot	White-stem	No plants
53	6				1		1				3	2				1		1												
54	7				2			1			1	2		1			1						1							
55	9										1	2		1			1				1		1						1	
56	18										1																			
57	25																													1
58	26																													1
59	25																													1
60	11										2	3		1			1				2									
61	8						1				1	1					2				2									
62	8						1	1			2	3					1				1		1							
63	8						1				3	2		1																
64	4				2	3		1			2	1				1							1							
65	6				3							1									1									
66	7				1			1			1	1	2				2						1							
67	10										1	1		1			1				1									
68	8										1	2		1			1	1			1									
69	9										2	2		1															1	
70	10										1	2					1				1		1						2	
71	11						1				1			1									1							
72	16										1										1									
73	6						1		1		2	2		1	1				1		1									
74	3				2	2			1					1													1			
75	7																1	1			2									
76	6												2				1				2									
77	8											1					1				2									
78	8										1	3					1				1		1							
79	12						1				2	1		1														1		
80	7						1				1	2					1	1			1									
81	4				3	2			1												2									
82	4						1						3				1				1		1							
83	7						1					2					2				1									
84	7										1	3		1			1				1		1							
85	8								1			2					1				1									
86	7										1	1		1			1				1									
87	6						1				1	3		1			1	1												
88	4			1	2	2			1		1										1	1						2		
90	2			1	1	1						2					1				2		2		1	1	1			
91	3			2	1	3						1	2								2									
92	7											1					1				3						1			
93	8						1					1					2				2									
94	7						1					1					1				3								1	
95	6															1		1			3		1					1		
96	5			2	2	1						1									1	1						2		
97	0																													1
98	6				3	1						1	2								1									
99	6						1					1					1	1			2									
100	6										1	1		1			2			1	1									
101	9								1												3						2			
102	7										1	1					1			1	3									
103	3			2	3	1						1		1		1		1			2							2		
104	2		1	1	2	3					1						1				1									
105	8				2						1	1					1				2							1		

August 12, 2025: Lake Keewahtin aquatic plant occurrence and densities. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	Wild rice	Sagit-taria	Spatter dock	Water-shield	White lilies	Bladder wort	Bladder wort - Minor	Chara	Brauns stone-wort	Coon-tail	Elodea	Fern	Flat-stem	Float-ingleaf	Fries	Illinois	Large-leaf	Marsh mari-gold	Moss	Naiads	Nitella	NWM	Sago	Vari-able	Water celery	Water star-grass	White water crow-foot	White-stem	No plants
106	12						1				2	3		1																
107	13						2				1	2		1															1	
108	9						1		1		1	3		1							1						1			
109	7								2		1	3					1				2		1							
110	4				3	2		1			1										1					1				
111	7				3																1		1							
112	11										1						1				1									
113	15						1				1	1																		
114	39																													1
115	34																													1
116	7											1		1							3		1			1		1		
117	4				3		1		1			2											1			1				
118	8						1				1	2					2				1									
119	9										2	3		2																
120	36																													1
121	30																													1
122	25																													1
123	3			1	1	3		2	1		1	1									1									
124	2			2	2	3		1	1			2							1		1							2		
125	3				3																1		1					1		
126	8						1					3		1			1				3		1							
127	8						1		1			1					1				2									
128	14						1				1	2																		
129	31																													1
130	18						1				1																			
131	4			1	2	2		1			1	2									2									
132	2			2	2	1	1	2			1	1							1											
133	5			3	1	2	1					1									2									
134	5																													1
134	6			1							2	2		1							1		1							
135	6				1			1				3		1			1		1				1							
136	7						1	1				1		1			1				3									
137	6							1				1					1				3					1				
138	5			2	2	3		1	1		1																			
139	3			2	1	3		1	1	1	1	1			1															
140	3			3	2	2	1	2			1			1					1				1							
141	2			3	1	2	1	1			1	2	1										1				1			
142	3			1	2	2			1												1							2		
143	3			3	2	2		1													1		1					2		
144	1			2	1		1					1															1	1		
145	2			2	1	1						1					1				1							1		
Average		1.0	1.0	1.8	1.8	2.0	1.0	1.1	1.1	1.0	1.3	1.6	2.0	1.0	1.0	1.0	1.2	1.0	1.2	1.0	1.5	1.0	1.0	1.0	1.0	1.0	1.2	1.3	1.1	
Occurrence (145 sites)		1	1	38	60	43	45	21	19	1	81	95	6	39	2	7	48	10	6	2	75	2	30	2	1	8	9	28	7	18
% occur		1	1	26	41	30	31	14	13	1	56	66	4	27	1	5	33	7	4	1	52	1	21	1	1	6	6	19	5	

Predicted CLP and EWM Growth Potential in Lake Keewahtin

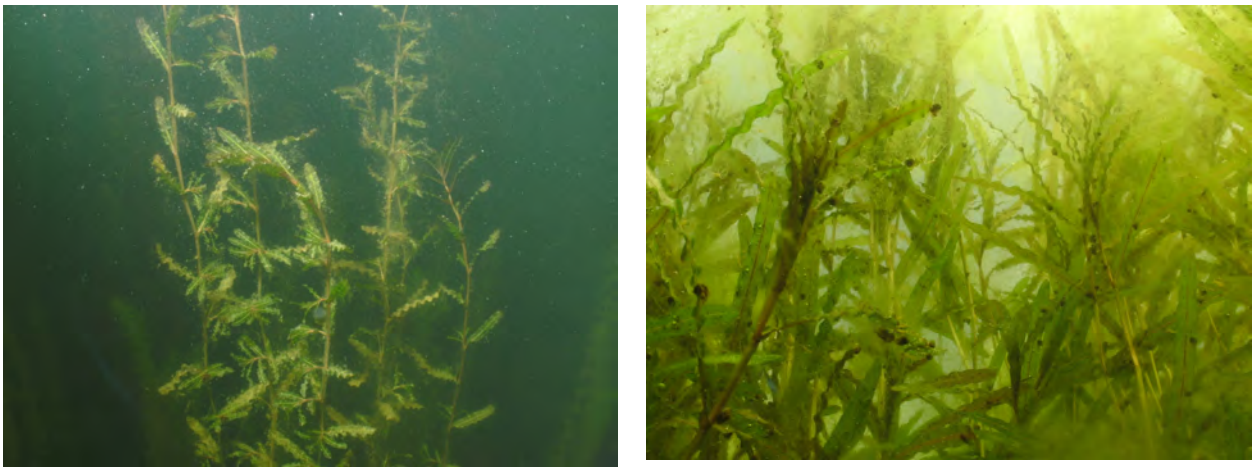
Curlyleaf Pondweed (non-native aquatic plant)

Keewahtin Lake Status: Present in Keewahtin Lake.

Potential for Curlyleaf Pondweed Growth in Keewahtin Lake: Mostly light growth potential with scattered areas of moderate growth potential.

Lake sediment sampling results from 2014 have been used to predict lake bottom areas that have the potential to support heavy curlyleaf pondweed plant growth. Various types of curlyleaf growth patterns are shown below. Based on the key sediment parameters of pH, sediment bulk density, organic matter, and the Fe:Mn ratio (McComas, unpublished), the predicted growth characteristics of curlyleaf pondweed in Keewahtin Lake are shown on the next page.

Curlyleaf pondweed growth is predicted to produce light to moderate growth in Keewahtin Lake.



Underwater views of curlyleaf pondweed. Light growth (left) and moderate growth (right).

Examples of Curlyleaf Pondweed Growth Characteristics

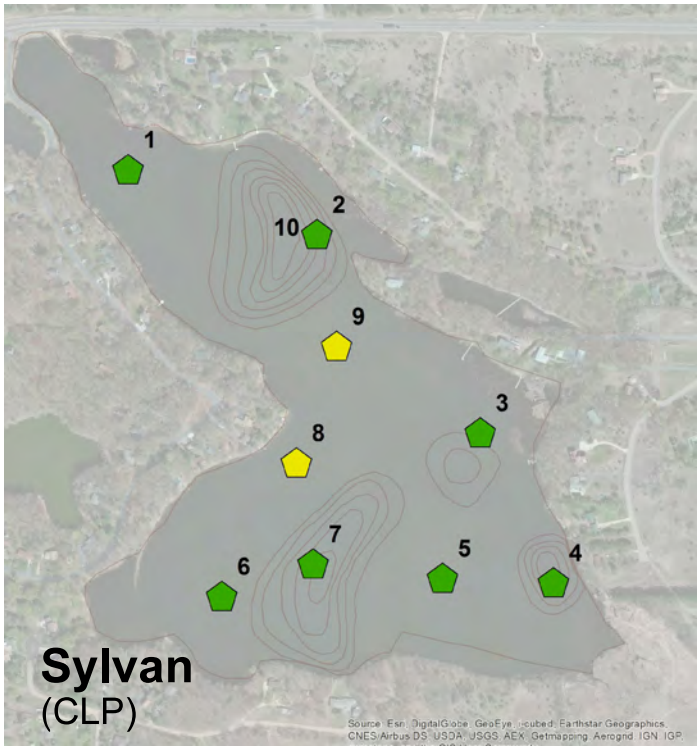
Light growth (left) refers to non-nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Moderate growth (middle) refers to growth that is just below the water surface. Heavy growth (right) refers to nuisance matting curlyleaf pondweed. This is the kind of nuisance growth predicted by high sediment pH and a sediment bulk density less than 0.51.

Curlyleaf Pondweed Growth Potential Based on Lake Sediments: Curlyleaf pondweed is present in Keewahtin Lake. Research has found curlyleaf is limited or enhanced based on lake sediment characteristics. Based on lake sediment characteristics, curlyleaf has the potential to produce light, moderate, or heavy growth on an annual basis.

In Keewahtin Lake it is predicted that curlyleaf will grow at mostly light to moderate densities. Low sediment pH and high Fe:Mn ratios are predicted to limit curlyleaf growth.

Keewahtin Lake sediment data and ratings for potential growth of curlyleaf pondweed growth.

Site	Depth (ft)	pH (su)	Bulk Density (g/cm^3 dry)	Organic Matter (%)	Fe:Mn Ratio	Potential for Curlyleaf Pondweed Growth
Light Growth		**<7.4**	**>1.04**	**0.1-5**	**>4.5**	**Light (green)**
Moderate Growth		**7.4 - 7.7**	**0.52 - 1.03**	**6-20**	**1.6 - 4.5**	**Moderate (yellow)**
Heavy Growth		**>7.7**	**<0.51**	**>20**	**<1.6**	**Heavy (red)**
Keewahtin 1	6	6.7	0.20	64.6	49.0	Light
Syl 2	6	6.8	0.10	76.5	30.2	Light
Syl 3	7	7.4	0.16	67.5	30.3	Light
Syl 4	7	7.2	0.21	66.9	24.1	Light
Syl 5	5	7.0	0.13	77.9	28.8	Light
Syl 6	6	6.9	0.20	76.4	20.2	Light
Syl 7	32	5.6	0.62	38.5	16.0	Light
Syl 8	6	7.5	0.16	61.0	18.1	Moderate
Syl 9	6	7.5	0.28	64.9	22.3	Moderate
Syl 10	33	6.3	0.57	52.7	ND	



The color indicates the potential growth of curlyleaf pondweed.
Key: green = light growth and yellow = moderate growth.

Eurasian Watermilfoil (non-native aquatic plant)

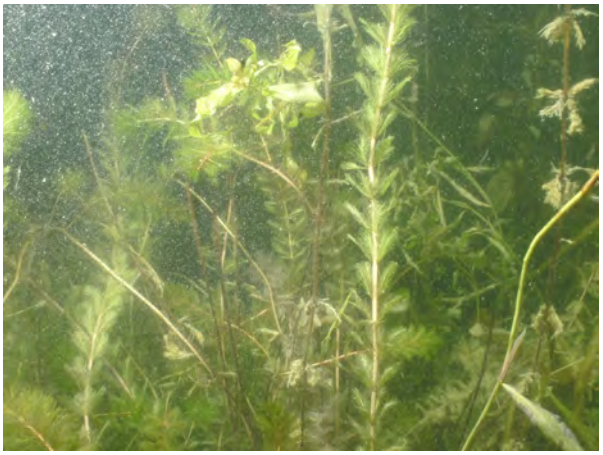
Keewahtin Lake Status: Not found in Keewahtin Lake.

Nearest Occurrence: Bone Lake, Washington County

Potential for Eurasian Watermilfoil Growth in Keewahtin Lake: Potential for mostly light growth.

Lake sediment sampling results from 2014 have been used to predict lake areas that have the potential to support heavy Eurasian watermilfoil growth. Examples of milfoil growth characteristics are shown in below. Based on the key sediment parameters of NH_4 and organic matter (McComas, unpublished), a table and map were prepared that predict the type of growth that could be expected in the future if milfoil becomes established in Keewahtin Lake .

In Keewahtin Lake a majority of sites had low nitrogen and high organic matter and these areas are predicted to have the potential to produce light growth of milfoil on an annual basis unless water clarity is limiting.



Underwater views of Eurasian watermilfoil.

Examples of Eurasian Watermilfoil Growth Characteristics

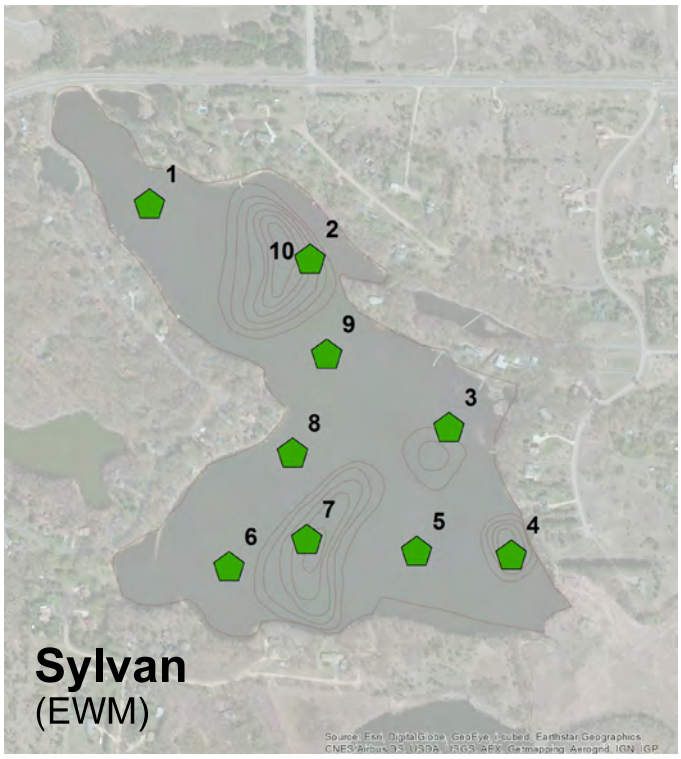
Light growth (left) refers to non-nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Heavy growth (right) refers to nuisance matting Eurasian watermilfoil. This is the kind of nuisance growth predicted by high sediment nitrogen values and a sediment organic matter content less than 20%.

Eurasian Watermilfoil (EWM) Growth Potential Based on Lake Sediments: Lake sediment sampling results from 2014 have been used to predict lake bottom areas that have the potential to support EWM growth. Eurasian watermilfoil has not been observed in Keewahtin Lake as of June 2014. The potential for milfoil growth, based on lake sediment sampling, would be for light growth. Light milfoil growth has been correlated with low sediment nitrogen and high organic matter conditions and Keewahtin Lake has both of these conditions.

For Keewahtin Lake, it is estimated the plants have the potential to grow down to about 20 feet of water depth based on existing water clarity conditions.

Keewahtin Lake sediment data and ratings for potential growth of Eurasian watermilfoil.

Site	Depth (ft)	NH_4 Conc (ppm)	Organic Matter (%)	Potential for Eurasian Watermilfoil Growth
Light Growth		**<4**	**<0.5 and >20**	**Light (green)**
Moderate Growth		**4 - 10**	**0.6 - 2 and 18 - 20**	**Moderate (yellow)**
Heavy Growth		**>10**	**3 - 17**	**Heavy (red)**
Keewahtin 1	6	3.2	64.6	Light
Syl 2	6	0.4	76.5	Light
Syl 3	7	0.6	67.5	Light
Syl 4	7	2.5	66.9	Light
Syl 5	5	0.7	77.9	Light
Syl 6	6	1.9	76.4	Light
Syl 7	32	75.8	38.5	Light
Syl 8	6	0.5	61.0	Light
Syl 9	6	2.1	64.9	Light
Syl 10	33	41.1	52.7	



The color indicates the potential growth of Eurasian watermilfoil. Key: green = light growth.