Keewahtin Lake, August 16, 2018

Aquatic Plant Meandering Survey and AIS Check for Lake Keewahtin, Washington County, Minnesota, 2018

Survey conducted on August 16, 2018

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Aquatic Plant Meandering Survey and AIS Check for Lake Keewahtin, Washington County, Minnesota in 2018

An aquatic plant meandering survey was conducted on Lake Keewahtin (75 acres) in the summer of 2018. The objectives of the August 16 survey were to look for any aquatic non-native species including primarily Eurasian watermilfoil and starry stonewort.

In August 2018, a total of 17 aquatic plants species were observed. No submerged aquatic non-native species were observed in the August survey (Table 1). However, purple loosestrife was present along some shoreline areas.

Figure 1. View of clear water and productive plant growth in Keewahtin Lake on August 16, 2018.

Methods

An aquatic plant survey of Keewahtin Lake using a meandering sampling method was conducted by Blue Water Science on August 16, 2018. At each rake sample, GPS coordinates were collected using a NAD 83 datum. A plant density rating was assigned to each plant species on a scale from 1 to 3 (Figure 2). A density of a "1" indicated sparse growth with one or two stems present on the rake sampler. A 3 rating indicated dense growth.

Figure 2. Aquatic plant density ratings from 1 to 3.

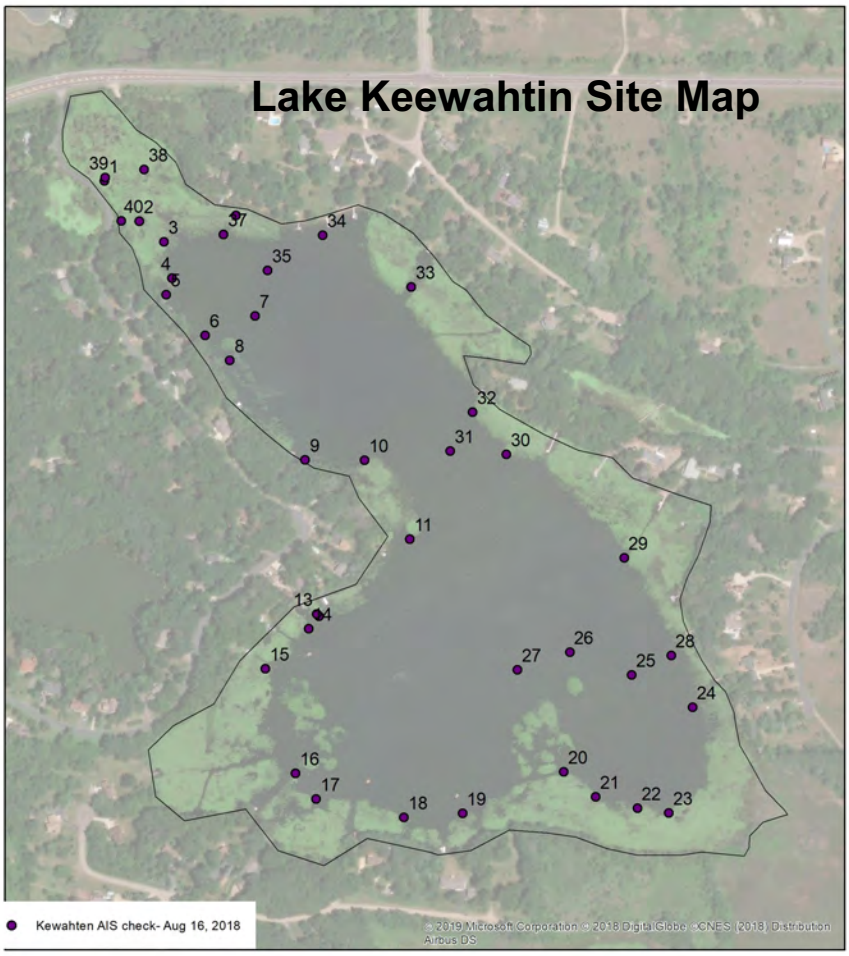


Figure 3. Sample site locations. A total of 40 sites were sampled but visual observations were made around the entire lake.

Plant Results

The aquatic plant community in 2018 had 14 species of submerged plants and 3 species of floating plants. Plant productivity and plant diversity was good at most sites, with an average of 3.9 plant species per site. The most common plants were elodea, flatstem pondweed and coontail. No known non-native plants were observed in the lake. However, purple loosestrife was observed in several locations rooted above the water line along the edge of the lake. Purple loosestrife beds should be mapped and if they start to increase in distribution, herbicide control may be considered.

Table 1. The percent occurrence of aquatic plants for Lake Keewahtin. 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 (40 samples)
Watershield (*Brasenia Schreberi*)	24
White lily (*Nymphaea sp*)	13
Spatterdock (*Nuphar variegatum*)	11
Spike Rush *(Eleocharis spp.)*	5
Elodea (*Elodea canadensis*)	63
Flatstem pondweed (*P. zosteriformis*)	61
Coontail (*Ceratophyllum demersum*)	61
Northern Watermilfoil (*Myriophyllum sibiricum*)	53
Illinois pondweed (*P. illinoensis*)	37
Naiads (*Najas flexilis*)	24
Chara (*Chara sp.*)	11
Water Celery (*Vallisneria americana*)	11
Cabbage (*Potamogeton amplifolius*)	11
Marsh marigold (*Bidens Beckii*)	8
Bladderwort (Utricularia sp)	8
Variable (P. gramineus)	3
Floatingleaf (*P. natans*)	3

Figure 4. Elodea was the most common plant sampled on August 16, 2018 in Lake Keewahtin.

Table 2. Lake Keewahtin aquatic plant occurrence and densities for the August 16, 2018 survey. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Coon-tail	Flat-stem	Chara	Marsh mari-gold	Elodea	illinois	Naiads	Water Celery	White lily	Spatter-dock	Water-shield	Variable	NWM	Cab-bage	Bladder-wort	Float-ingleaf	Spike Rush
1	1	1	1	1					1	1	1						
2	2		1	1	2	1			1	1	1	1	1				
3	1	1	1	1	2	1			1	1	1		1				
4					1		1						1				
5			1		1	1	1	1					1				
6	1				1	1	1	1					1				
7	1	1				1	2						1				
8	1	1			1		1	1		1	1		1				
9	1	1			1		1	2									
10	1	1				1											
11													1				
12	1	1											1				
13		1			1								1				
14	2	1			1		1						1				
15						1					1						
16		1			1								1				
17					1								1	1			
18	1	1			1								1	1			
19	1	1			1						1		1				
20	1	1			1										1		
21		1											1				
22	1				1												
23	1	1			1	1							1	1	1	1	
24	1	1															
25						1											
26					1	1											
27		1			1	1											
28		1			2								1	1	1		
29	2	1			1	1							1				
30	1	1			2	1	1										
31						1											
32	1	1															
33									1		1						
34	1				1												
35							1										
36													1				
37	1	1									1						
38	1	1							1		1						1
39					2												
40	1				1												1

Representative Plant Conditions in Lake Keewahtin

Figure 5. Watershield, white water lily and spatterdock were common in the shallow areas in Lake Keewahtin.

Appendix

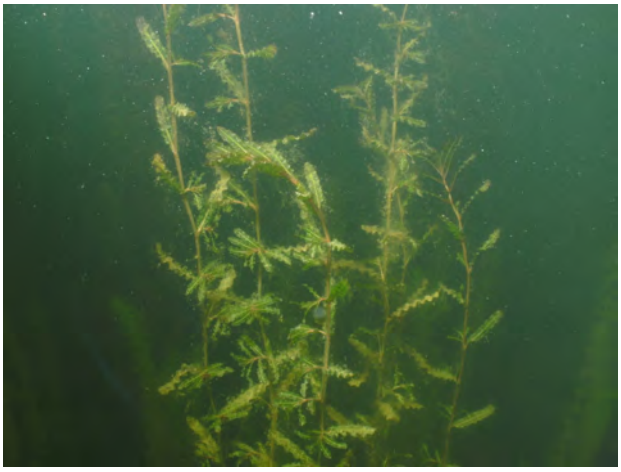
Curlyleaf Pondweed (non-native aquatic plant)

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

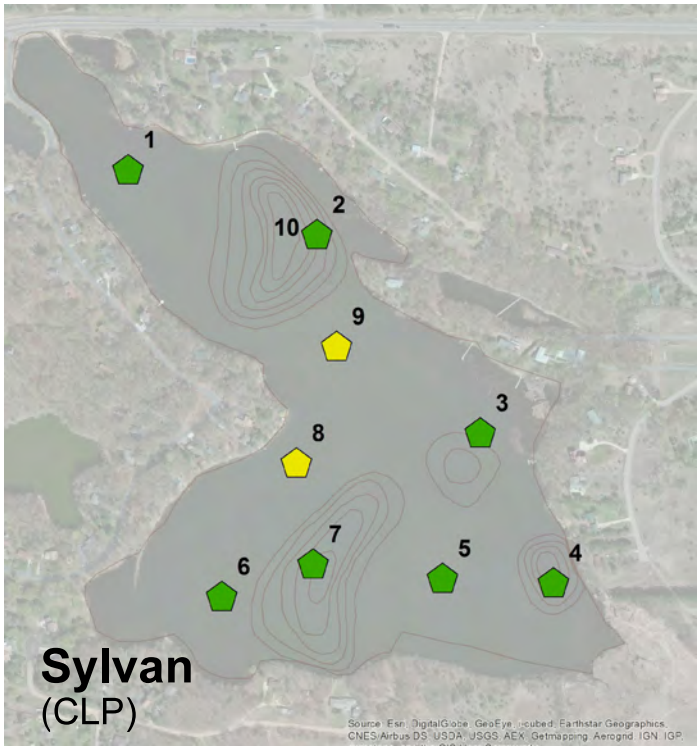
Light growth (left) refers to non-nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Moderate growth (middle) refers to growth that is just below the water surface. Heavy growth (right) refers to nuisance matting curlyleaf pondweed. This is the kind of nuisance 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)

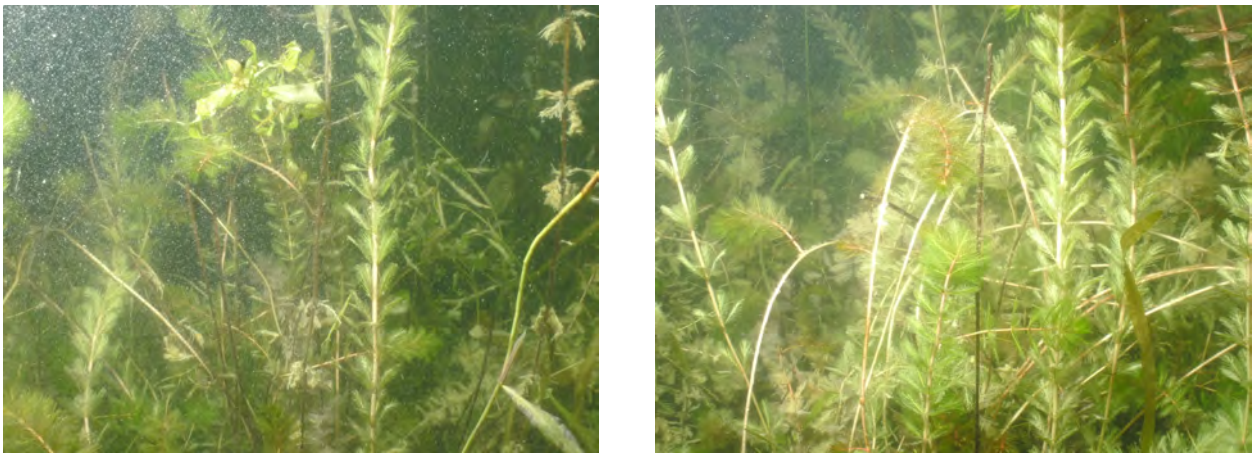
Keewahtin Lake Status: Not found in Keewahtin Lake.

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

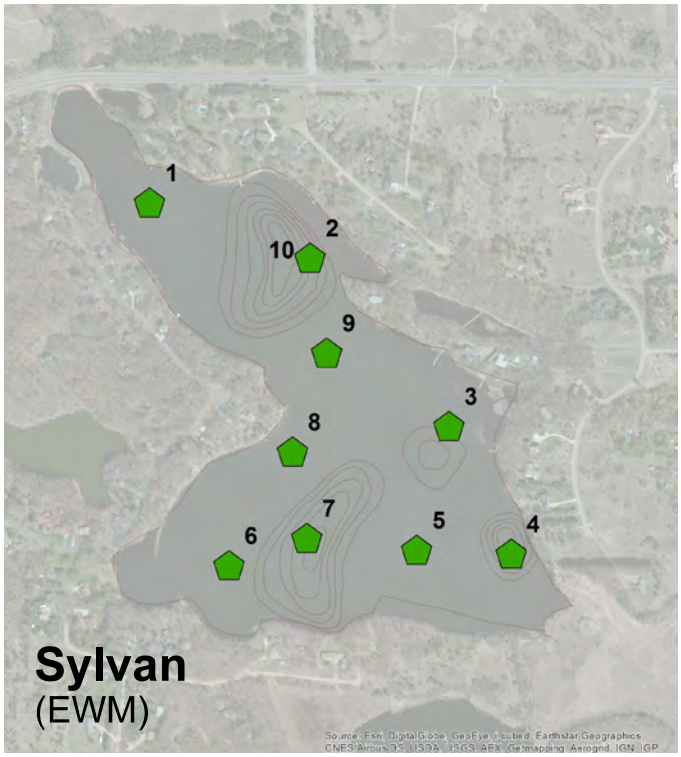
Light growth (left) refers to non-nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Heavy growth (right) refers to nuisance matting Eurasian watermilfoil. This is the kind of nuisance growth predicted by high sediment nitrogen values and a sediment organic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