



Shields Lake, September 1, 2015

Aquatic Plant Point-Intercept Survey for Shields Lake, Washington Co, Minnesota, 2015

Survey conducted on September 1, 2015

Prepared for:
Comfort Lake/Forest Lake
Watershed District



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

January 2016

Aquatic Plant Point-Intercept Survey for Shields Lake, Washington Co, Minnesota in 2015

Summary

On September 1, 2015 an aquatic plant point-intercept survey was conducted on Shields Lake (28.7 acres) in Washington County. The survey looked for non-native species such as curlyleaf pondweed and Eurasian watermilfoil and characterized all aquatic plants.

In September, curlyleaf pondweed was found at 1 out of 49 sites (2%) and no Eurasian watermilfoil was observed. Coontail was the only native submerged plant found and was observed at 4 sites (8% of the sites)(Table S1). Plants grew out to about 3 feet of water depth (Figure S1)(Table S1).

Table S1. The percent occurrence of aquatic plants for Shields Lake. 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%.

	September 1, 2015 % Occur (49 sites)
Cattails (<i>Typha sp</i>)	2
Duckweed (<i>Lemna sp</i>)	10
Coontail (<i>Ceratophyllum demersum</i>)	8
Curlyleaf pondweed (<i>Potamogeton crispus</i>)	2
Aquatic Plant Coverage (acres)	2.9

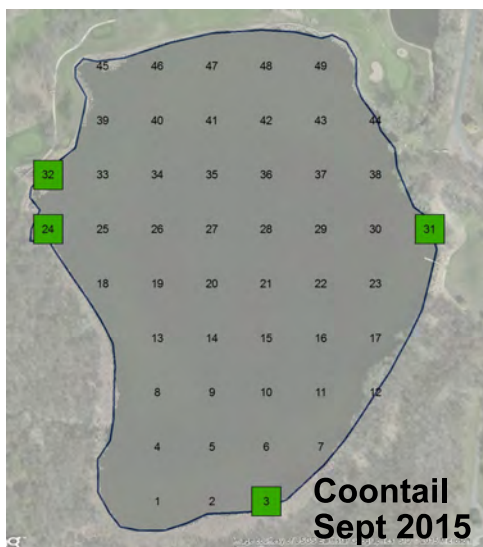


Figure S1. Coontail coverage on September 1, 2015. Key: Green shading = light growth.

Conclusions: The aquatic plant community in 2015 had 2 species of submerged plants in late summer. This is a low plant diversity condition. Curlyleaf pondweed was the only non-native plant present.

Curlyleaf pondweed covered about 2% (0.6 acres) in September. Aquatic plants covered about 10% of the lake and grew out to about 3-feet of water depth.

Eurasian watermilfoil was not found in this survey.



Figure S2. Duckweed was abundant in this cove in the northwest side of Shields Lake on September 1, 2015.

Aquatic Plant Point-Intercept Survey for Shields Lake, Washington Co, Minnesota, 2015

Lake ID: 82-0162

Size: 28.7 acres

Littoral area: 24.8 acres

Maximum depth: 26 ft (at normal lake level)

Introduction

Shields Lake is located within the Comfort Lake/Forest Lake Watershed District boundaries. The aquatic plant community is of interest because the non-native curlyleaf pondweed is present. Also, it is important to document the distribution and abundance of the aquatic plant community because aquatic plants help sustain good water quality.

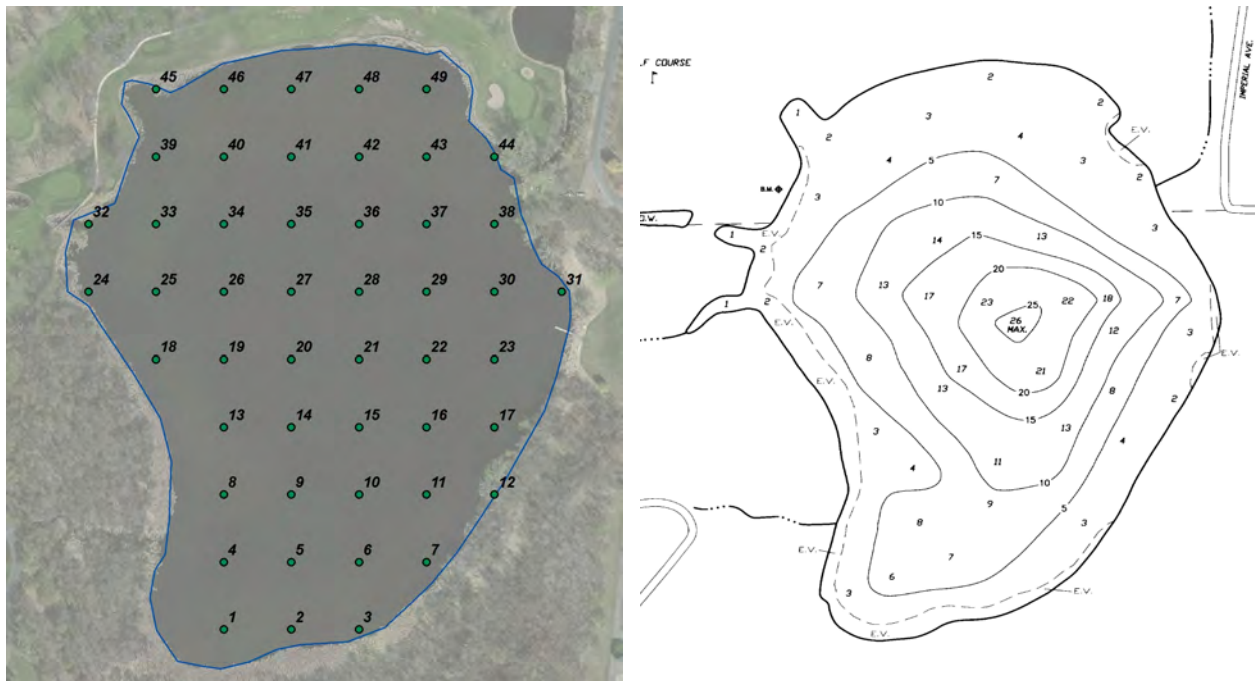


Figure 1. [left] Point locations for the aquatic plant surveys. Lake map with UTM coordinates using the NAD1983 datum. [right] MnDNR contour map.

Methods - Aquatic Plant Survey

An aquatic plant survey of Shields Lake using a point intercept sampling method was conducted by Blue Water Science on September 1, 2015. A map and sampling grid were prepared by Blue Water Science and consisted of a total of 49 points that were distributed throughout the lake (Figure 1). Points were spaced 50 meters apart. Each point represented about 0.6 acres. GPS coordinates used a UTM WGS84 datum. At each sample point, plants were sampled with a rake sampler. A plant density rating was assigned to each plant species on a scale from 1 to 5 (Figure 2). A density of a "1" indicated sparse growth with one or two stems present on the rake sampler. A 4.5 or 5 rating indicated matting surface plant growth.

Chart of Aquatic Plant Density Ratings

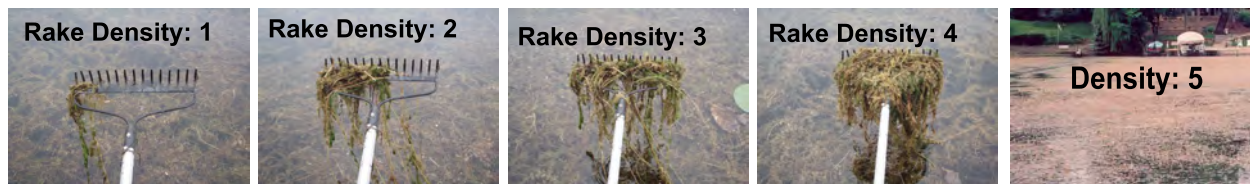


Figure 2. Aquatic plant density ratings from 1 to 5. A density rating of 4.5 or 5 is used for plants topping out at the surface.

Results of the Summer Survey -- September 1, 2015

The most abundant plant on the September 1, 2015 point-intercept plant survey for Shields Lake was coontail, found at 4 out of 49 sites (8%) but at light growth (Figure 3 and Table 1). The only other submerged plant observed was curlyleaf pondweed found at 1 site at light growth (Figure 3).

A summary of plant density and occurrence for coontail and curlyleaf pondweed is shown in Tables 1 and 2.

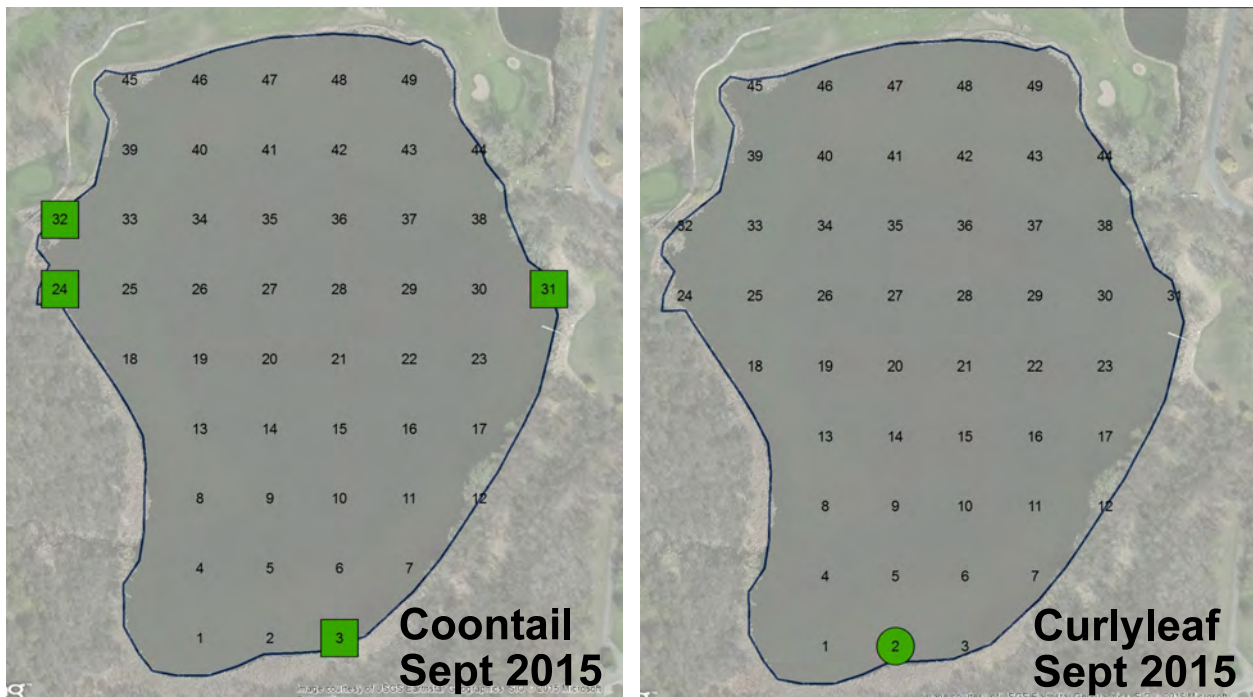


Figure 3. Aquatic plant coverage maps for September 1, 2015. [left] Coontail coverage. [right] Curlyleaf coverage. (Key: green = light growth)

Table 1. Shields Lake aquatic plant occurrences and densities for the September 1, 2015 survey based on 49 sites. Density ratings are 1-5 with 1 being low and 5 being most dense.

	All Stations (n=49)		
	Occur	% Occur	Density
Cattails (<i>Typha sp</i>)	1	2	4.0
Duckweed (<i>Lemna sp</i>)	5	10	2.4
Coontail (<i>Ceratophyllum demersum</i>)	4	8	1.0
Curlyleaf pondweed (<i>Potamogeton crispus</i>)	1	2	1.0

Table 2. Individual site data for September 1, 2015. Numbers indicate plant density.

Site	Depth (ft)	Cattails	Duckweed	Coontail	Curlyleaf
1	4				
2	3				1
3	2			1	
4					
5					
6					
7	3				
8	4				
9					
10					
11	4				
12	0	4			
13	4				
14					
15					
16					
17	3				
18	4		1		
19					
20					
21					
22					
23					
24	3		1	1	
25					
26					
27					
28					
29					
30	6				
31	2		2	1	
32	2		5	1	
33					
34					
35					
36					
37					
38	4				
39	3				
40					
41					
42					
43					
44					
45	2		3		
46	3				
47					
48	4				
49	4				
Average		4.0	2.4	1.0	1.0
occurrence (49 sites)		1	5	4	1
% occurrence		2	10	8	2

Conclusions: The aquatic plant community in 2015 had 2 species of submerged plants in late summer. This is a low plant diversity condition. Curlyleaf pondweed was the only non-native plant present.

Curlyleaf pondweed covered about 2% (0.6 acres) in September. Aquatic plants covered about 10% of the lake and grew out to about 3-feet of water depth.

Eurasian watermilfoil was not found in this survey.



Figure 4. Coontail was the only native submerged aquatic plant found on September 1, 2015.

Appendix

Potential Curlyleaf Pondweed Growth in the Future

Curlyleaf Pondweed (non-native aquatic plant)

Shields Lake Status: Present in Shields Lake.

Potential for Curlyleaf Pondweed Growth in Shields Lake: Mostly moderate growth potential with scattered areas of light and heavy 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 in Figures 5 and 6. 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 Shields Lake are shown below.

Curlyleaf pondweed growth is predicted to produce moderate growth in Shields Lake.



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

Examples of Curlyleaf Pondweed Growth Characteristics



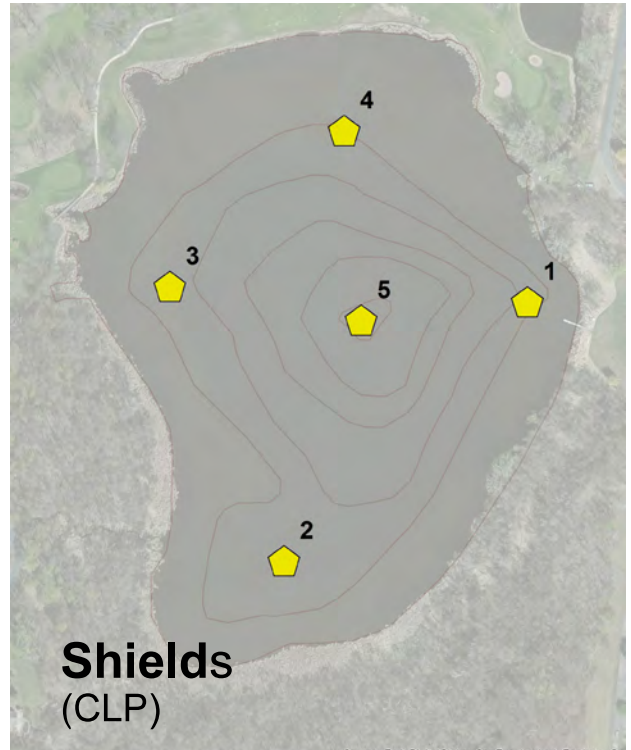
Light growth (left) refers to non- nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Moderate growth (middle) refers to growth that is just below the water surface. Heavy growth (right) refers to nuisance matting curlyleaf pondweed. This is the kind of 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 Shields 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 Shields Lake it is predicted that curlyleaf will grow at mostly moderate densities. Seasonal variability may increase the viability of curlyleaf on occasion, but results indicate a mostly non-nuisance or moderate growth.

Shields 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)
Shields 1	6	7.0	0.36	47.3	6.0	Moderate
SH 2	8	6.7	0.61	43.2	2.2	Moderate
SH 3	7	6.6	0.67	46.6	2.5	Moderate
SH 4	4	6.7	0.53	71.8	1.6	Moderate
SH 5	26	7.1	0.51	42.2	4.2	



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

Potential Eurasian Watermilfoil Growth in the Future

Shields Lake Status: Not found in Shields Lake.

Nearest Occurrence: Bone Lake, Washington County

Potential for Eurasian Watermilfoil Growth in Shields Lake: Mostly light potential.

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 Figures 9 and 10. 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 Shields Lake.

In Shields Lake a majority of the sediment sites had high nitrogen but had very high organic matter content. EWM generally does not produce heavy growth. Therefore, these areas are predicted to have the potential to produce light growth of milfoil on an annual basis.



Underwater views of Eurasian watermilfoil.

Examples of Eurasian Watermilfoil Growth Characteristics



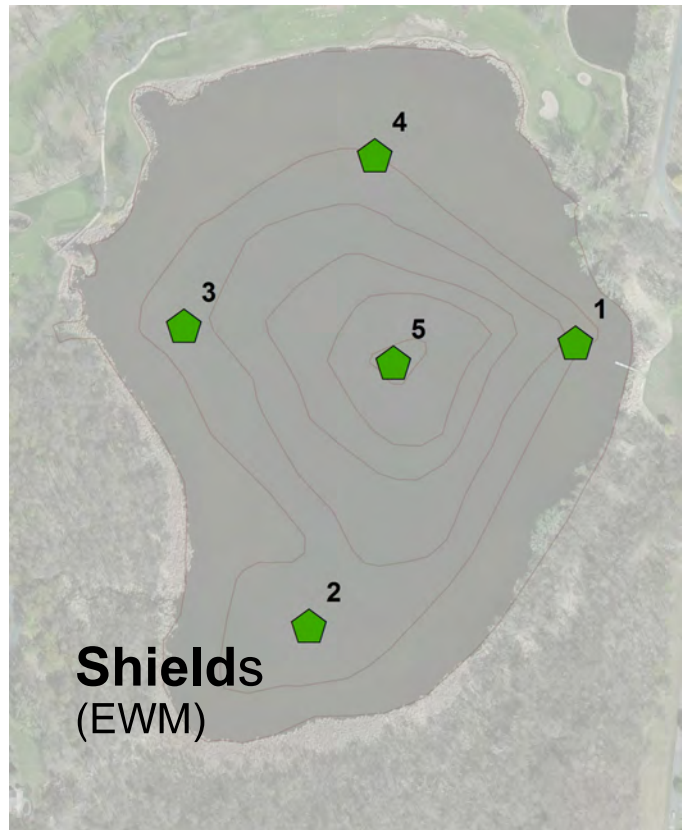
Light growth (left) refers to non-nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Heavy growth (right) refers to nuisance matting Eurasian watermilfoil. This is the kind of nuisance growth predicted by high sediment nitrogen values and a sediment organic 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 heavy EWM growth. Eurasian watermilfoil has not been observed in Shields Lake as of June 2014. The potential for milfoil growth, based on lake sediment sampling, would be mostly light growth. Heavy milfoil growth has been correlated with high sediment nitrogen condition and Shields Lake has high nitrogen conditions, but the high organic matter content could be limiting.

For Shields Lake, it is estimated the plants have the potential to grow down to about 5 to 6 feet of water depth based on existing water clarity conditions and that could limit EWM distribution.

Shields 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)
Shields 1	6	13.5	47.3	Light
SH 2	8	108.6	43.2	Light
SH 3	7	144.5	46.6	Light
SH 4	4	26.7	71.8	Light
SH 5	26	49.5	42.2	



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