



Buck Lake, Scott County, Minnesota, in 2019

Curlyleaf Pondweed Assessment and Aquatic Plant Point Intercept Survey for Buck Lake, Scott County, Minnesota

[Curlyleaf Pondweed Assessment June 10, 2019]
[Point Intercept Plant Survey Conducted August 6, 2019]

Prepared for:
Prior Lake-Spring Lake
Watershed District



Prepared by:
Steve McComas
Jo Stuckert
Blue Water Science

February 15, 2020

Curlyleaf Pondweed Assessment and Aquatic Plant Point Intercept Survey for Buck Lake, Scott County, Minnesota

Summary

Buck Lake (MnDNR ID #70-006500) is a 23 acre lake located in Scott County, Minnesota. Two surveys were conducted in 2019, first a curlyleaf pondweed (CLP) assessment was conducted on June 10, 2019 to evaluate the extent of CLP and check for EWM growth. Second, a point intercept aquatic plant survey was conducted on August 6, 2019 by Blue Water Science to characterize conditions of native aquatic plants and to look for the non-native Eurasian watermilfoil.

The CLP assessment on June 10, 2019 found abundant CLP in much of Buck Lake except for the southern end (Figures S1 and S2). Coontail was also widespread but at light to moderate growth.

Buck Lake has a moderate diversity of submerged aquatic plants, with 8 species of rooted submerged plants observed. Curlyleaf Pondweed was abundant in June but had died back by August. In August, coontail was the most common plant followed by flatstem pondweed.

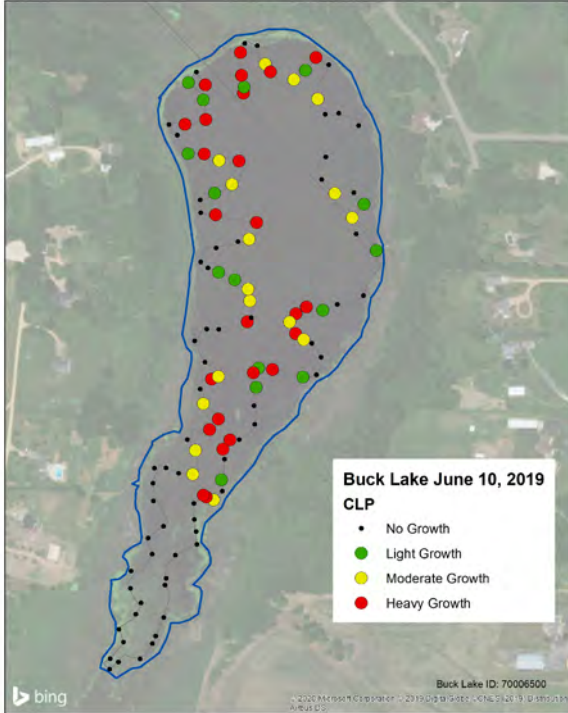
No Eurasian watermilfoil was observed in this survey.



Figure S1. Curlyleaf growth was heavy in June 2019, growing throughout most of the basin.

Curlyleaf Pondweed Assessment June 10, 2019

Buck Lake Curlyleaf Pondweed
June 10, 2019



Native Plants Point Intercept Survey August 6, 2019

Buck Lake Native Plant Coverage
August 6, 2019

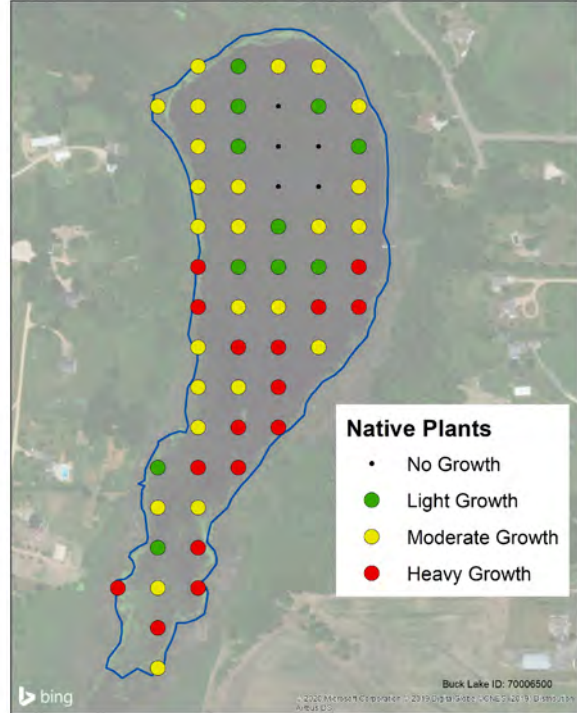


Figure S2. [left] In the June CLP assessment using a meander survey, CLP was widespread with fairly abundant growth. [right] In the August point intercept survey, plant were widespread with a range of light to heavy growth. Coontail was the dominant plant.

Curlyleaf Pondweed Assessment and Aquatic Plant Point Intercept Survey for Buck Lake, Scott County, Minnesota

Buck Lake, Scott County (MnDNR ID: 70-006500)

Size: 23 acres (source: PLSLWD website)

Maximum depth: 9 feet (source: PLSLWD website)

Introduction

A curlyleaf pondweed assessment and an aquatic plant point intercept survey were conducted on 23 acre Buck Lake, located in Scott County, in 2019. The objectives of the surveys were to assess curlyleaf growth at its maximum extent in June, characterize the aquatic plant community, and to look for non-native Eurasian watermilfoil.

Methods

Two surveys were conducted on Buck lake in 2019. The first survey was a meandering survey for assessing curlyleaf pondweed growth. The assessment survey conducted on June 10, 2019 collected 121 GPS points around the lake with the main objectives to characterize the growth of curlyleaf pondweed during its maximum growth phase in June and check for the presence of Eurasian watermilfoil.

An aquatic plant point intercept survey of Buck Lake was conducted by Blue Water Science on August 6, 2019 and 57 points were sampled. Sample points were placed 50 meters apart on a grid that covered the lake (Figure 1). At each sample point, a sampling rake was lowered into the water and a plant sample was taken. The point intercept grid allows year to year comparisons to be made in order to assess changes in the plant community. The plant species were recorded and the density of each species was assigned.

Densities were based on the coverage on the teeth of the rake. Density ratings were from 1 to 3 with 1 being sparse and 3 being a heavy growth. Based on these sample sites, plant distribution maps were constructed.



Figure 1. Sample locations for the aquatic plant surveys conducted on Buck Lake. [left] Curlyleaf assessment meander survey site map [right] point intercept survey site map.

Results

Curlyleaf Pondweed Assessment: June 10, 2019: A meander survey was conducted on June 10, 2019 to assess the status of CLP. A total of 121 sites were sampled and CLP was found at 57 sites (47%)(Figure 2) Coontail was also common, but less abundant and was found at 65 sites (54%)(Figure 2).

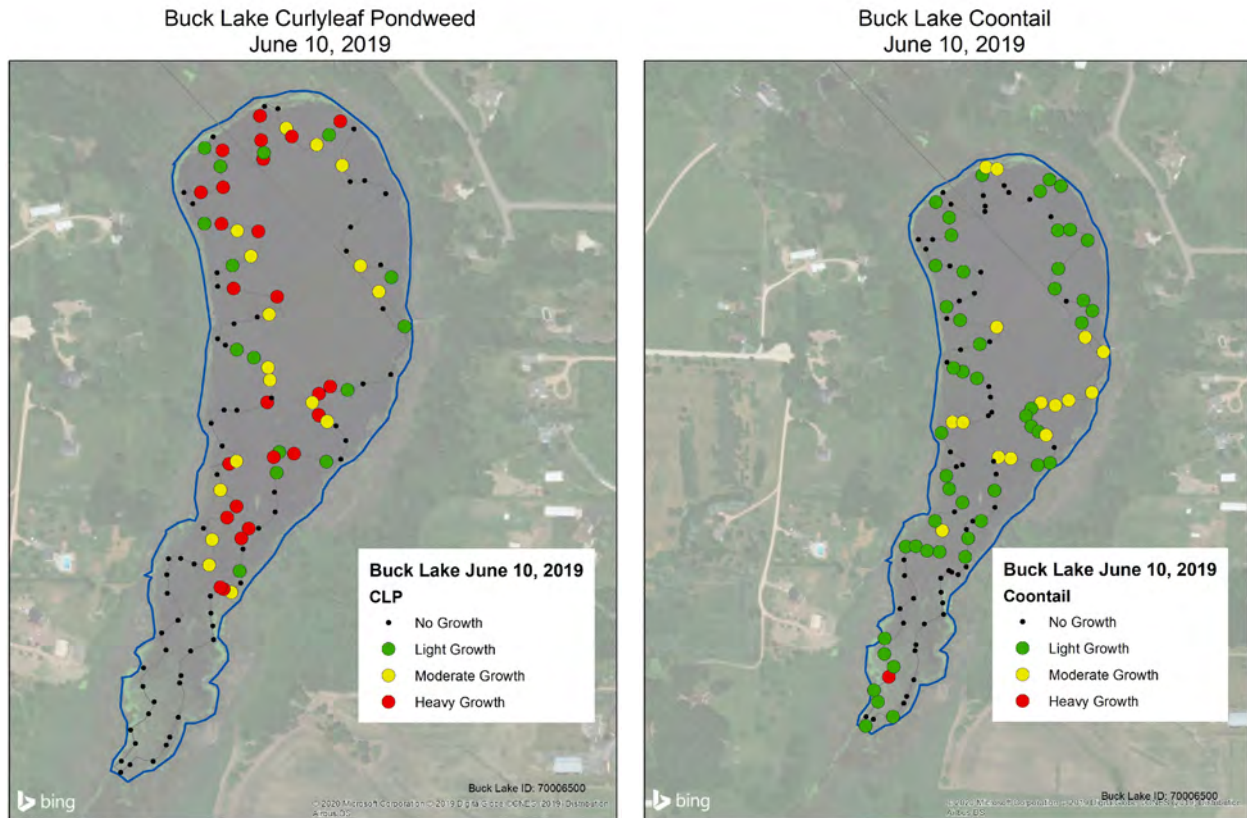


Figure 2. [left] Curlyleaf pondweed growth on June 10, 2019. CLP was growing abundantly and throughout most of the lake. [right] Coontail growth on June 10, 2019.



Figure 3. Pictures from the June 10, 2019 CLP assessment meander survey.

Point Intercept Survey, August 6, 2019: Results of the summer aquatic plant point intercept survey conducted on August 6, 2019 found 8 submerged plants species (Table 1). Coontail was the most common plant followed by flatstem pondweed (Table 1). Duckweed was also very common. Maps of aquatic plants are shown in Figures 4, 5, and 6.

Eurasian watermilfoil was not observed in the June or August survey and curlyleaf pondweed was not observed August survey. Individual site data are shown in Table 2.

Table 1. The percent occurrence of summer aquatic plants for Buck Lake on August 6, 2019. 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.

	Buck Lake August 6, 2019 (57 sites)		
	% Occurrence	Occurrence	Density
Duckweed (<i>Lemna</i> sp)	81	46	1.0
Coontail (<i>Ceratophyllum demersum</i>)	91	52	1.9
Elodea (<i>Elodea canadensis</i>)	23	13	1.2
Curlyleaf Pondweed (<i>Potamogeton crispus</i>)	7	4	1.0
Flatstem pondweed (<i>Potamogeton zosteriformis</i>)	72	41	1.3
Sago pondweed (<i>Stuckenia pectinata</i>)	33	19	1.1
Star duckweed (<i>Lemna trisulca</i>)	40	23	1.0
Stringy Pondweed Potamogeton sp)	7	4	1.0
Water Stargrass (<i>Heteranthera dubia</i>)	7	4	1.0
Bladderwort (<i>Utricularia</i> sp)	11	6	1.0
Aquatic Plant Coverage (ac)	21 acres (91%)		
Total submerged species	8		

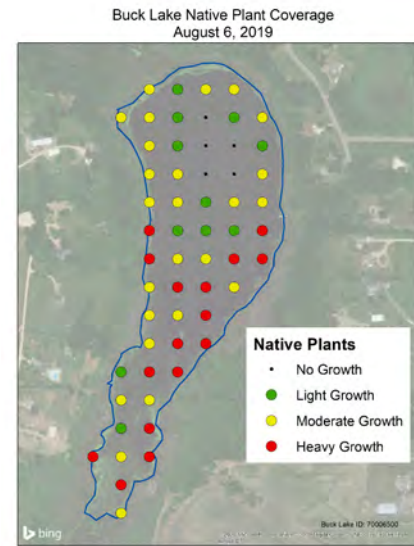


Figure 4. Native plant distribution and abundance maps for August 6, 2019. Key: green = light growth, yellow = moderate growth, and red = heavy growth.



Figure 5. Aquatic plant growth was abundant on August 6, 2017. Coontail was the dominant plant.

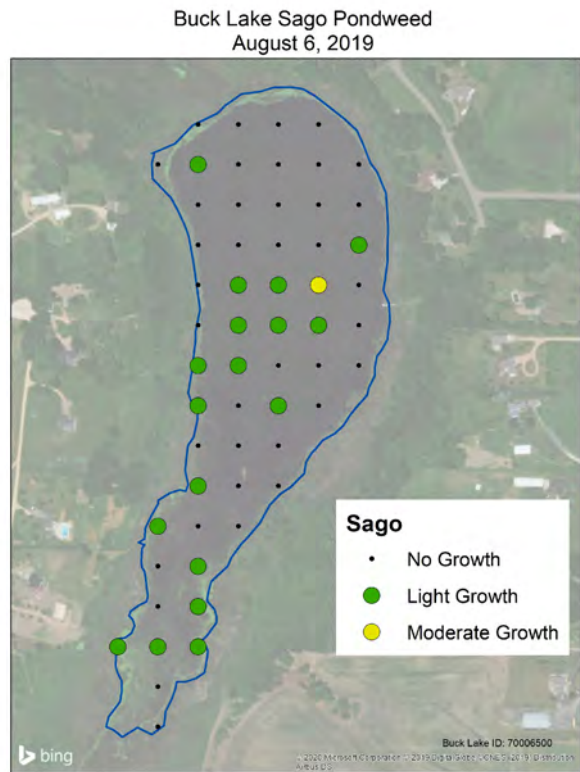
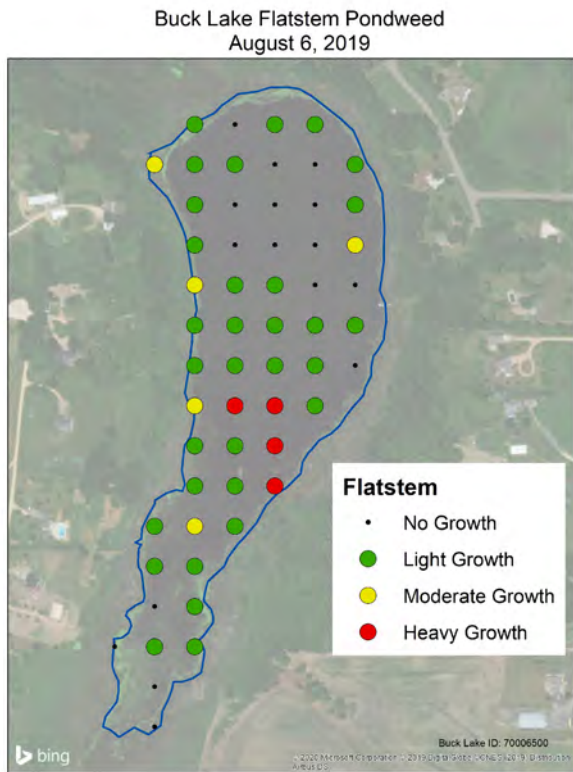
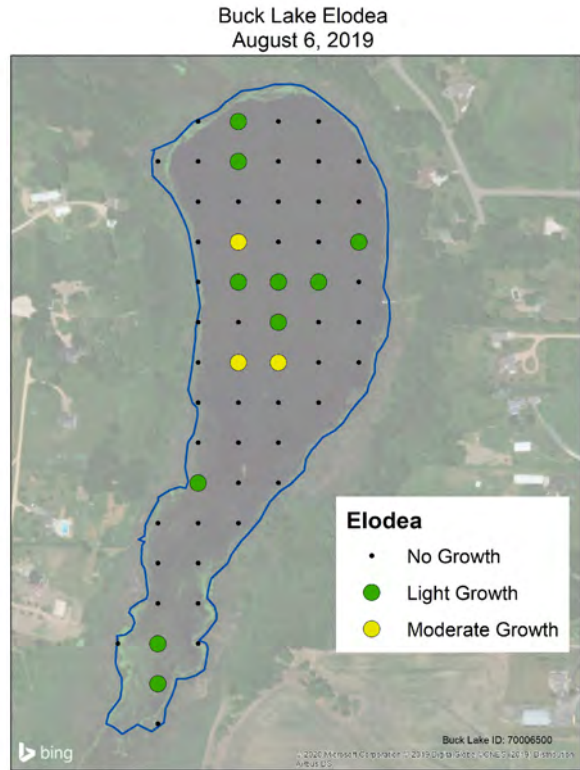
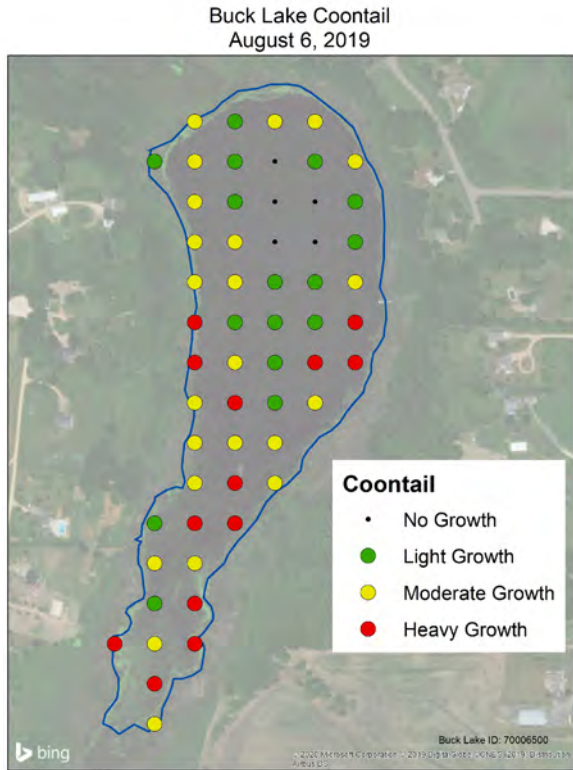


Figure 6. Buck Lake distribution and abundance maps for coontail (top-left), elodea (top-right), flatstem pondweed (bottom-left), and sago pondweed (bottom-right). Key: green = light growth, yellow = moderate growth, and red = heavy growth.

Table 2. Buck Lake, individual site data for the point intercept survey collected on August 6, 2019.

Site	Depth (ft)	Duckweed/watermeal	Bladderwort	Coontail	CLP	Elodea	Flatstem	Star duckweed	Sago	Stringy	Water stargrass	No Plants
1	2	1		2								
2	2	1		3		1						
3	2	1		3					1			
4	2	1		2		1	1		1	1		
5	2	1		3			1		1			
6	2	1		1								
7	2	1		3			1		1	1		
8	2	1		2			1	1				
9	2	1		2			1		1	1		
10	2	1		1			1		1			
11	2	1		3			2	1				
12	3	1		3			1	1				
13	3	1		2		1	1		1			
14	3	1		3			1	1				
15	2	1		2			3	2				
16	2	1		2			1					
17	3	1		2			1			1		
18	3	1		2			3	1				
19	3	1		2			2		1			
20	4	1		3			3					
21	5	1		1			3	1	1		1	
22	3	1	1	2			1	1				
23	3	1		3			1		1			
24	4			2		2	1		1			
25	5	1		1		2	1	1				
26	4	1	1	3	1		1	1				
27	3	1		3				1				
28	3	1		3			1	1				
29	5			1	1		1		1			
30	5	1		1	1	1	1		1			
31	4	1		1	1		1		1			
32	4	1		3			1	1			1	
33	3	1		2			2	1				
34	5			2		1	1		1			
35	5	1	1	1		1	1	1	1			
36	6	1	1	1		1			2			
37	3	1		2							1	
38	4	1	1	2			1	1				
39	5	1		2		2		1				
40	7											1
41	8											1
42	5	1		1		1	2	1	1		1	
43	4	1		2			1					
44	6			1								
45	8											1
46	8.5											1
47	6	1		1			1					
48	2	1	1	1			2	1				
49	4	1		2			1	1	1			
50	6			1		1	1					
51	8											1
52	6			1								
53	5	1		2			1					
54	2	1		2			1	1				
55	3	1		1		1		1				
56	3	1		2			1	1				
57	4	1		2			1					
Average		1.0	1.0	1.9	1.0	1.2	1.3	1.0	1.1	1.0	1.0	
Occur (57 sites)		46	6	52	4	13	41	23	19	4	4	5
% occurrence		81	11	91	7	23	72	40	33	7	7	

General Findings of This Study

- The shoreline around Buck lake is mostly native, has abundant emergent plant growth along the shoreline with and offers good wildlife habitat.
- Coontail was the dominant plant in 2010, 2016, and 2019. Coontail occurred at all sites where plant growth was present in 2019 (91% of sites)(Table 3).
- Curlyleaf pondweed grows abundantly in spring and early summer but dies back in July and native plants dominate in Buck Lake.
- Overall aquatic plant coverage may have increased since 2010 (Table 3).
- The native plant community is in good shape and should continue to support good water quality.

Table 3. Aquatic plant point intercept surveys for 2010, 2016, and 2019 for Buck Lake.

	September 19, 2010 (60 sites)	August 31, 2016 (57 sites)	August 6, 2019 (57 sites)
	% Occurrence	% Occurrence	% Occurrence
Cattails (<i>Typha sp</i>)	12	--	
Duckweed (<i>Lemna sp</i>)	55	14	81
Watermeal (<i>Wolffia columbiana</i>)	53	--	
Coontail (<i>Ceratophyllum demersum</i>)	73	95	91
Curlyleaf Pondweed (<i>Potamogeton crispus</i>)	--	--	7
Elodea (<i>Elodea canadensis</i>)	--	46	23
Star duckweed (<i>Lemna trisulca</i>)	13	--	40
Stringy pondweed (<i>Potamogeton sp</i>)	5	–	7
Flatstem pondweed (<i>Potamogeton zosteriformis</i>)	5	49	72
Sago pondweed (<i>Stuckenia pectinata</i>)	5	19	41
Bladderwort (<i>Utricularia sp</i>)	--	12	11
Aquatic Plant Coverage (ac)	19.7	21.9	21.0
Total submerged species	5	5	8

APPENDIX

Results of the Lake Sediment Survey-2010

Buck Lake sediment results are fairly typical for lake sediments except for a couple of parameters. Sediment pH is a little lower than normal (where normal is 7.7). Both Olsen-phosphorus and ammonia nitrogen were elevated in the sediments (Table 1) and iron was also slightly elevated. With high Olsen-P concentrations, it appears Buck Lake sediments have a potential to release moderate amounts of phosphorus to the water column. Sulfate levels were normal except for Site B6 where there was a high concentration. Organic matter was normal for a shallow lake and results indicated sediments were generally a silty muck.

Table 1. Lake sediment results for six locations.

Sample Number	Bulk Density (wt/8.51)	Water pH	Organic Matter (%)	Bray-P (ppm)	Olsen-P (ppm)	Potassium (ppm)	Zinc (ppm)	Copper (ppm)	Iron (ppm)	Manganese (ppm)	Fe/Mn	Calcium (ppm)	Magnesium (ppm)	Boron (ppm)	Ammonia Nitrogen (ppm)	Sulfate (ppm)
B1	0.58	7.4	26.1	1	14	65	1.7	1.6	227.8	27.6	8.3	2,790	278	0.8	55.5	45
B2	0.76	7.3	14.9	7	19	147	3.4	3.8	263.3	47.8	5.5	3,285	462	0.9	171.9	39
B3	0.77	7.4	12.4	10	18	122	3.3	3.4	275.1	25.8	10.7	3,122	396	1.2	110.7	23
B4	0.59	7.5	19.5	2	12	69	1.9	1.9	177.1	26.2	6.8	2,712	298	0.9	62.7	61
B5	0.66	7.4	19.2	1	19	90	2.1	2.4	264.3	48.4	5.5	3,151	327	0.7	85.7	70
B6	0.72	7.2	19.0	2	49	100	2.2	2.4	399.6	71.8	5.6	3,647	472	1.1	61.7	215



Figure 1. [left] Coontail was found growing to the surface in some areas of Buck Lake on September 16, 2010. [right] Buck Lake plant conditions on September 16, 2010. Some plants were growing to the surface.

Lake Sediment Conditions and Future Non-Native Plant Growth

The objective of this lake soil fertility survey was to characterize Buck Lake soils in the littoral zone in order to better predict where potential nuisance areas of milfoil and Curlyleaf growth could occur in the future.

Table 2. Sediment survey summary. Based on lake sediment characteristics, curlyleaf pondweed has a low potential for heavy growth and Eurasian watermilfoil has a high potential for heavy growth.

	Depth (ft)	Plants Observed at Sample Site	Curlyleaf Suitability for Heavy Growth	Eurasian watermilfoil Suitability for Heavy Growth
Site 1	5	Coontail "5" Stringy "1"	Moderate	Moderate
Site 2	5	Coontail "4"	Low	High
Site 3	3	--	Low	High
Site 4	4	Coontail "4"	Moderate	High
Site 5	5	Coontail "5" Sago "1"	Low	High
Site 6	8	Coontail "1"	Low	High

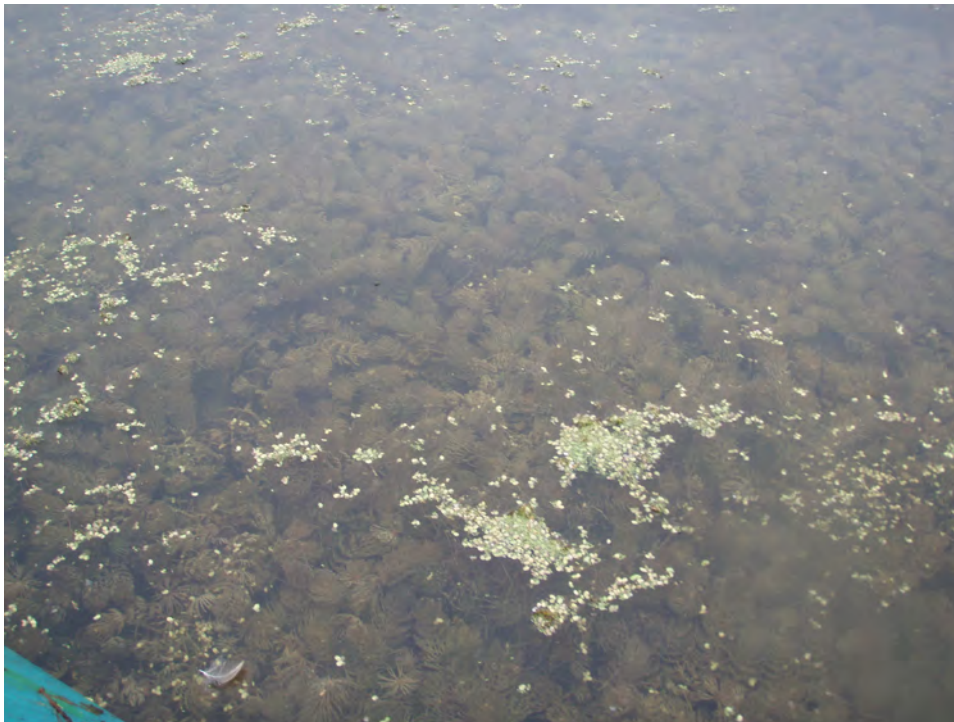


Figure 2. Buck Lake has fairly good water clarity, especially in areas with thick coontail growth. Duckweed (shown floating on the water) was common as well.

Potential for Curlyleaf Pondweed Growth

Lake sediment sampling results from 1997 have been used to predict lake bottom areas that have the potential to support nuisance curlyleaf pondweed plant growth. 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 are shown in Table 3 and Figure 3.

Curlyleaf pondweed growth is predicted to produce mostly low to moderate nuisance growth (where plants top out) at only several locations (Figure 3).

Table 3. Buck Lake sediment data and ratings for potential nuisance curlyleaf pondweed growth.

Site	pH (su)	Bulk Density (g/cm ³ dry)	Organic Matter (%)	Fe:Mn Ratio	Potential for Curlyleaf Pondweed Growth
Light Growth	6.8	1.04	5	4.5	Light (green)
Moderate Growth	6.2	0.94	11	5.9	Moderate (yellow)
Heavy Growth	>7.7	<0.51	>20	<1.6	High (red)
1	7.4	0.579	26.1	5.3	Moderate
2	7.3	0.756	14.9	5.5	Light
3	7.4	0.766	12.4	10.7	Light
4	7.5	0.591	19.5	6.8	Moderate
5	7.4	0.662	19.2	5.5	Light
6	7.2	0.718	19.0	5.6	Light



Figure 3. Curlyleaf pondweed growth is predicted to be light to moderate based on lake sediment characteristics. Green circles = light growth and yellow circles = moderate growth.

Potential for Eurasian Watermilfoil Growth

Based on results from other lakes we predict that the combination of high organic matter and high nitrogen values (greater than 10 ppm as exchangeable ammonium) will sustain nuisance milfoil growth on an annual basis unless some other factor limits growth. Limiting factors include things such as milfoil weevils, light penetration, and other unknown variables. When lake bottom areas have moderate fertility (less than 6 ppm of exchangeable nitrogen), we predict there is the potential to support nuisance growth in some years, but not on a continuous basis.

Table 4. Buck Lake sediment data and ratings for potential nuisance Eurasian watermilfoil growth.

Site	NH ₄ Conc (ppm)	Organic Matter (%)	Potential for Nuisance EWM Growth
Light Growth	<10	>20	Low (green) to Medium (yellow)
Heavy Growth	>10	<20	High (red)
1	56	26	Medium
2	172	15	High
3	111	12	High
4	63	20	High
5	86	19	High
6	62	19	High

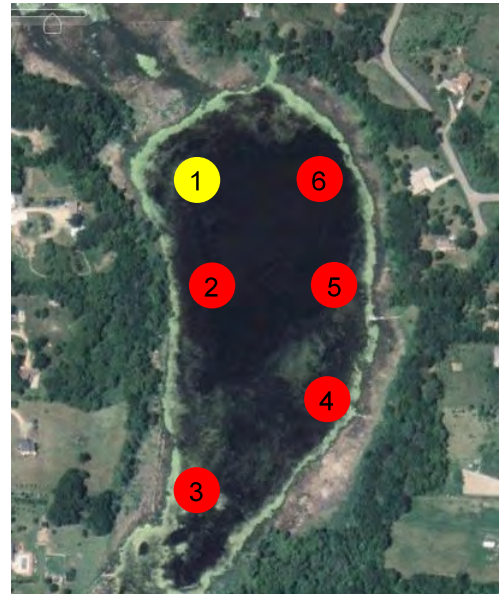


Figure 4. Eurasian watermilfoil growth is predicted to be moderate to heavy. Yellow circle = moderate growth and red circles = heavy growth.