



Buck Lake, Scott County, Minnesota, in 2010

Aquatic Plant Point-Intercept Survey for Buck Lake, Scott County, Minnesota

[Plant Survey Conducted August 31, 2016]

Prepared for:
Prior Lake-Spring Lake
Watershed District



Prepared by:
Steve McComas
Jo Stuckert
Blue Water Science

March 15, 2017

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. An aquatic plant survey was conducted on August 31, 2016 by Blue Water Science to characterize conditions of native aquatic plants and to look for the non-native Eurasian watermilfoil.

Buck Lake has a moderate diversity of submerged aquatic plants, with 5 species of rooted submerged plants observed. The most common plant in the lake was coontail. The entire shoreline is ringed with wetland plant species.

No Eurasian watermilfoil was observed in this survey.

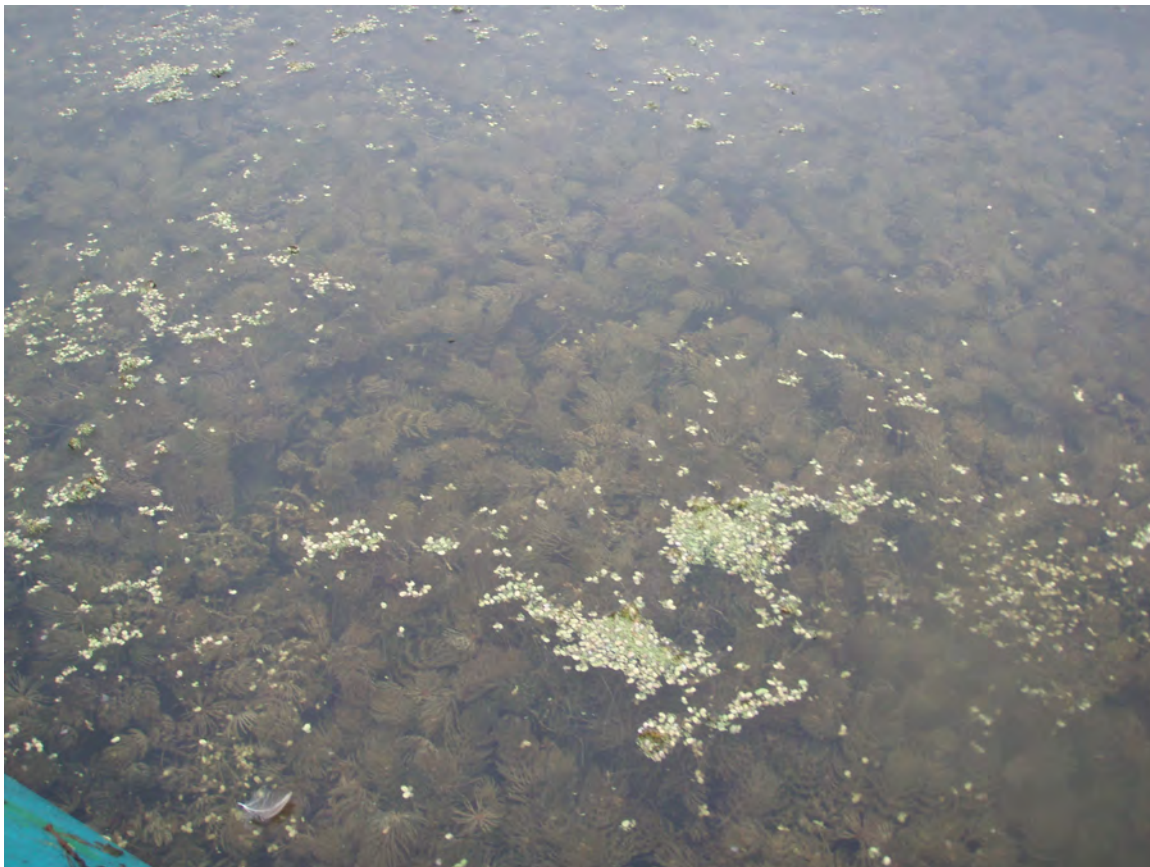


Figure S1. Coontail was dominant in Buck Lake in 2010 and 2016. This picture shows coontail conditions in 2010.

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

An aquatic plant survey was conducted on 23 acre Buck Lake, located in Scott County, on August 31, 2016. The objective of the survey was to characterize the aquatic plant community and to look for Eurasian watermilfoil.

Methods

An aquatic plant point-intercept survey of Buck Lake was conducted by Blue Water Science on August 31, 2016 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 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 5 with 1 being sparse and 5 being a nuisance. Based on these sample sites, a plant distribution map was constructed.

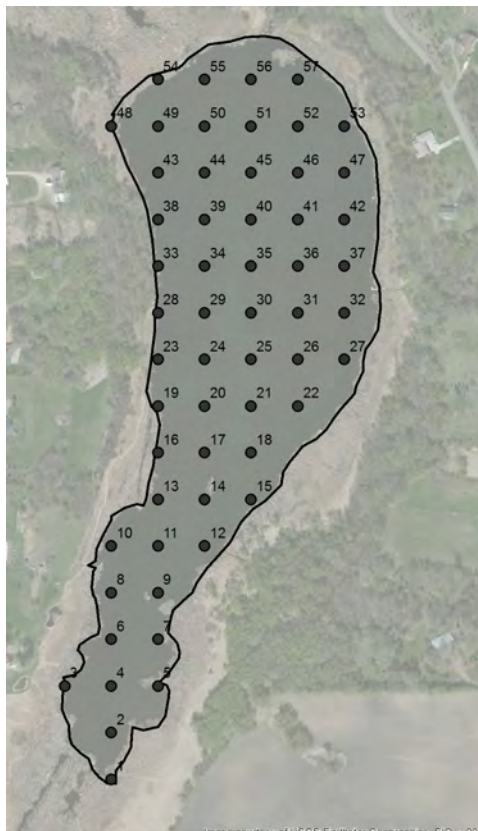


Figure 1. Sample location map for the aquatic plant survey conducted on Buck Lake.

Results

Results of the summer aquatic plant survey conducted on August 31, 2016 found there were 5 submerged plants (Table 1)(Figure 2). Coontail was the most common plant (Table 1). Maps of 4 species of aquatic plants are shown in Figure 3.

Eurasian watermilfoil was not observed in this survey.

Table 1. The percent occurrence of summer aquatic plants for Buck Lake on August 31, 2016. 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 31, 2016 (57 sites)		
	% Occurrence	Occurrence	Density
Duckweed (<i>Lemna sp</i>)	14	8	1.8
Coontail (<i>Ceratophyllum demersum</i>)	95	54	2.7
Elodea (<i>Elodea canadensis</i>)	46	26	1.4
Flatstem pondweed (<i>Potamogeton zosteriformis</i>)	49	28	1.1
Sago pondweed (<i>Stuckenia pectinata</i>)	19	11	1.5
Bladderwort (<i>Utricularia sp</i>)	12	7	1.1
Aquatic Plant Coverage (ac)	21.9 (95%)		
Total submerged species	5		

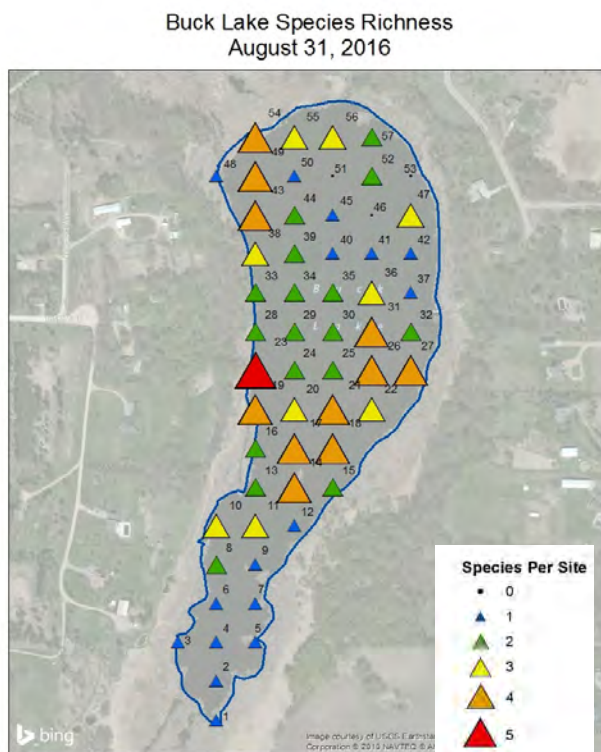
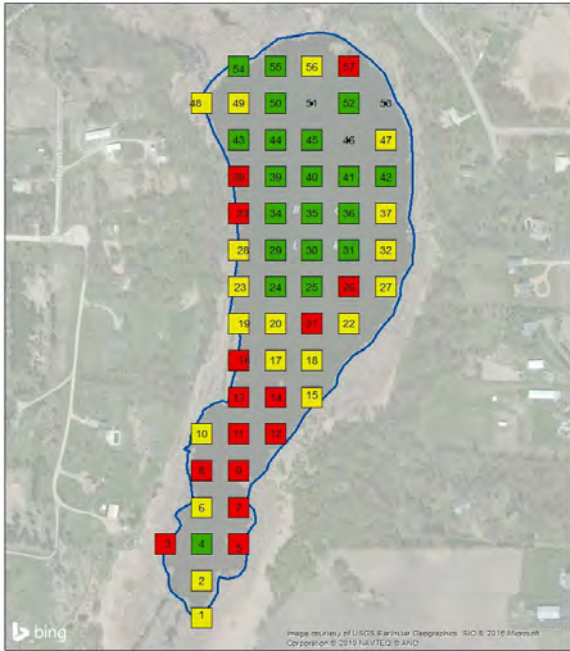


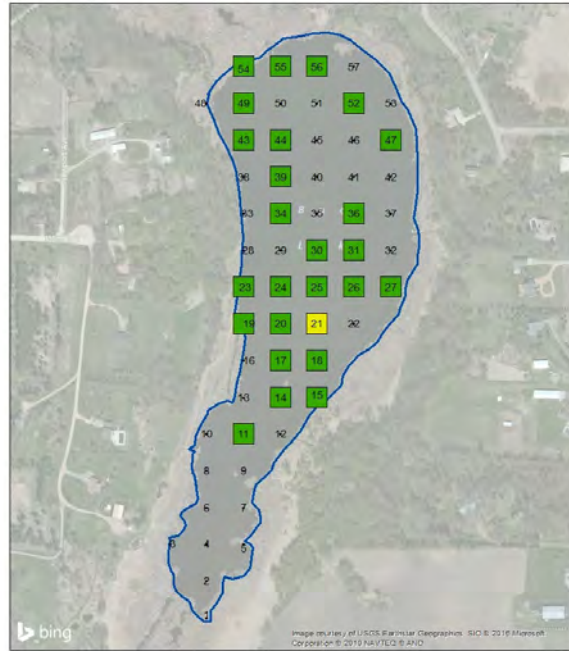
Figure 2. Species richness map for Buck Lake, 2016.

Buck Lake Coontail
August 31, 2016



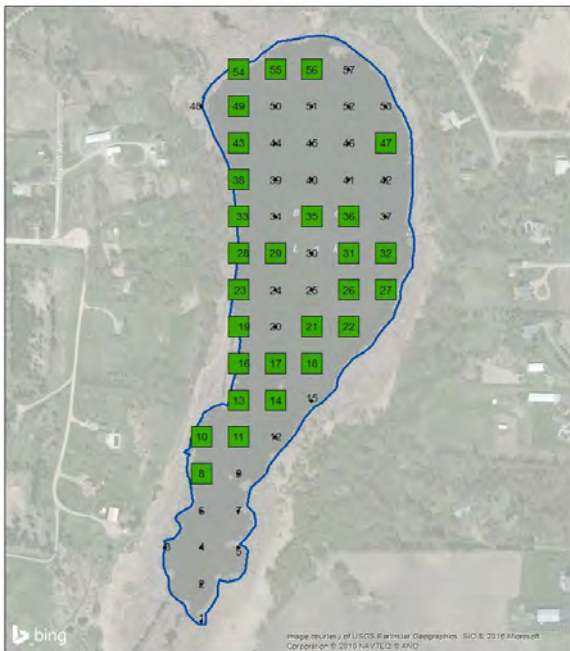
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Buck Lake Elodea
August 31, 2016



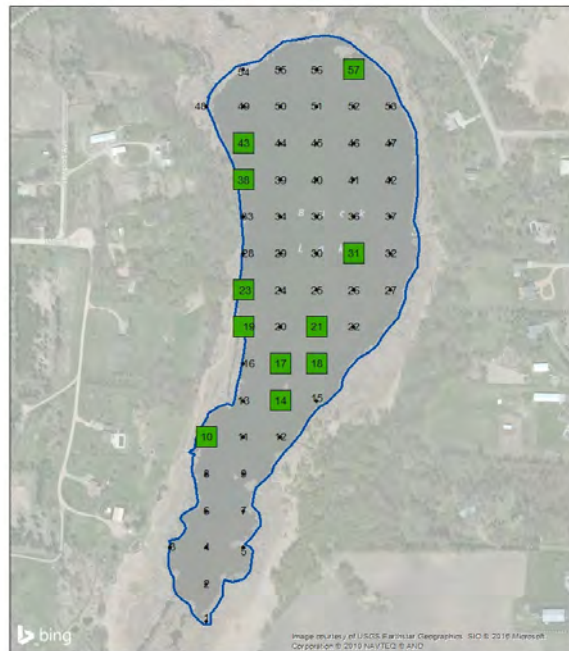
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Buck Lake Flatstem Pondweed
August 31, 2016



Blue Water Science
UTM NAD 1987

Buck Lake Sago Pondweed
August 31, 2016



Blue Water Science
UTM NAD 1987

Figure 3. 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 collected on August 31, 2016.

Site	Depth (ft)	Duckweed	Bladderwort	Coontail	Elodea	Flatstem	Sago	No Plants
1	2			3				
2	2			3				
3	1	2		4				
4	2	2		2				
5	2	1		4				
6	3	1		3				
7	2			4				
8	2	1		4		1		
9	4	1		4				
10	1			3		1	1	
11	3			4	1	1		
12	4			4				
13	3			4		1		
14	3			4	1	1	2	
15	2			3	2			
16	2			4		1		
17	3			3	1	1	2	
18	3			3	2	1	2	
19	3			3	2	1	1	
20	4		1	3	1			
21	4			4	3	1	2	
22	2		1	3		1		
23	3		1	3	1	1	1	
24	4			2	2			
25	4			2	2			
26	3		1	4	2	1		
27	4		1	3	2	1		
28	3			3		1		
29	4			1		2		
30	4			1	1			
31	4			2	2	1	2	
32	4			3		1		
33	3			4		2		
34	5			2	1			
35	5			2		1		
36	5			2	1	1		
37	4			3				
38	3			4		2	1	
39	5			1	1			
40	6			1				
41	7			1				
42	6			1				
43	4			2	1	1	1	
44	5			1	1			
45	6			1				
46	6							1
47	4			3	1	1		
48	2	3		3				
49	3		1	3	1	1		
50	6			1				
51	6							1
52	5			1	2			
53	4							1
54	2	3	2	2	1	1		
55	3			2	1	1		
56	3			3	1	1		
57	4			4			1	
Average Density		1.8	1.1	2.7	1.4	1.1	1.5	
Occurrence (57 sites)		8	7	54	26	28	11	3
% occur		14	12	95	46	49	19	

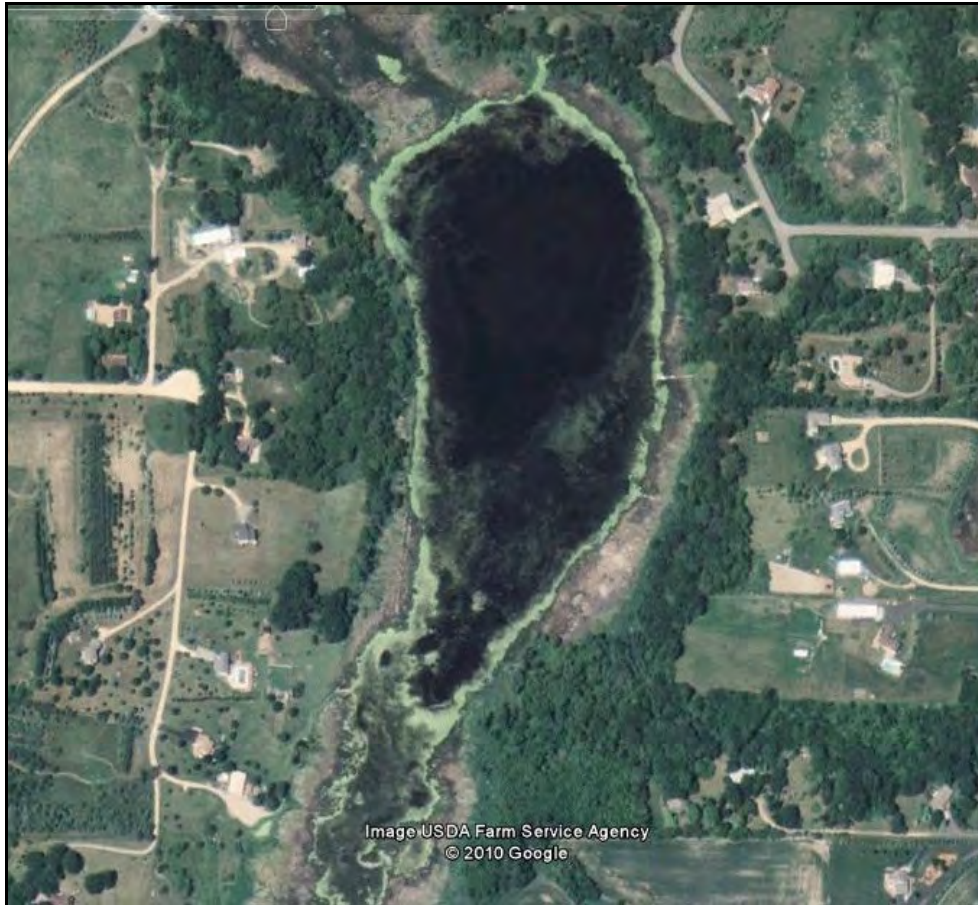
General Findings of This Study

- Emergent plants along the shoreline were abundant and offer good wildlife habitat.
- Coontail was the dominant plant in 2010 and 2016.
- Elodea, flatstem pondweed, and bladderwort show increases since 2010.
- Aquatic plant coverage was similar from 2010 to 2016 (Table 3).

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

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

APPENDIX - BUCK LAKE 2010 REPORT



Buck Lake, Scott County (source: Google Earth)

Sediment Survey and Aquatic Plant Survey for Buck Lake, Scott County, Minnesota for 2010

[Sediment Survey Conducted: September 16, 2010]
[Aquatic Plant Survey Conducted: September 16, 2010]

Prepared for:
City of Prior Lake,
Minnesota

Prepared by:
Steve McComas & Jo Stuckert
Blue Water Science
St. Paul, Minnesota

Prepared January 2011

Results of the Summer Aquatic Plant Survey

Coontail was the dominant plant in Buck Lake in 2010 (Table 1). Other plants present included flatstem pondweed, sago pondweed, and stringy pondweed. Plants grew out to a depth of 5 feet. The lake has a maximum depth of 9 feet although that is a small area in the northern end of the lake (Table 2). Overall plant species diversity is low, but plant abundance, primarily coontail, is high. Submerged plant distribution, which is dominated by coontail, covers about 73% of the lake bottom.

Table 1. Buck Lake aquatic plant occurrence and densities for the September 19, 2010 plant survey based on 60 sampled locations.

Sept. 19, 2010	Buck Lake (60 stations)		
	Occur	% Occur	Density
Cattails	7	12	5.0
Watermeal	32	53	1.8
Duckweed	33	55	2.8
Coontail	44	73	3.5
Flatstem Pondweed	3	5	1.6
Sago Pondweed	3	5	0.8
Star duckweed	8	13	1.0
Stringy Pondweed	3	5	1.0

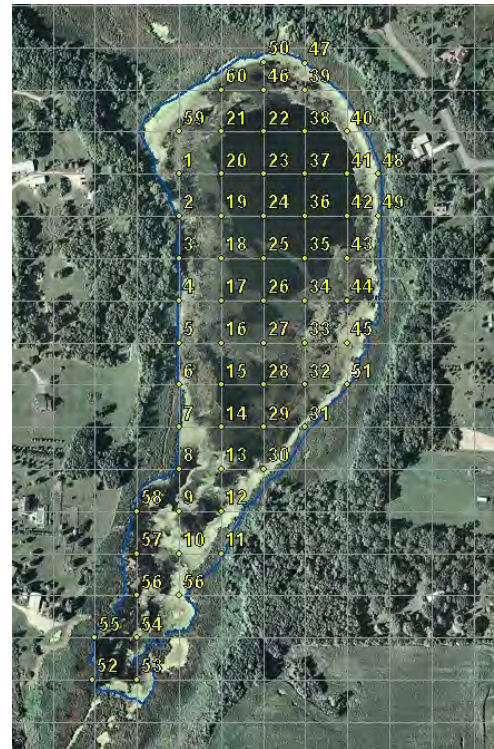


Figure 1. [top] Sample site map used on September 16, 2010.

[right] Coontail was the dominant plant in Buck Lake.

Table 2. Data for point-intercept sample sites from the aquatic plant survey of September 16, 2010 in Buck Lake.

Site	Depth (ft)	Plant Densities							
		Cattails	Watermeal	Duckweed	Coontail	Flatstem	Sago	Star Duckweed	Stringy
1	3.5				4				
2	2		2	5					
3	1.5				1				
4	2		3	5	3				
5	2		4	5	5				
6	2.5		2	2	2				
7	2	5							
8	3				1			1	1
9	3				1				
10	3		1	4	4				
11	1								
12	2								
13	3			1	1				
14	14		1	3	3				
15	4		3	2	5				
16	4.5		2	3	4				
17	4.5				4				
18	5		1	1	4.5				
19	5		1	2	5				
20	5				3				1
21	4.5				2				1
22	8.5								
23	9.5								
24	7								
25	5		1	1	4.5				
26	5		0.5	1	4.5				
27	4.5		0.5	1	4.5			1	
28	4.5		2	2	4				
29	4		3	3	4.5			1	
30	3		4	5	4				
31	3		2	3	5				
32	3.5				4				
33	4				4				
34	4.5		1	1	5		0.5	1	
35	5		1	1	4	1			
36	9								
37	9.5								
38	5			1	3				
39	3								
40	4		1	5	4.5				
41	5				4	2			
42	5			2	5				
43	4.5		2	2	5				
44	4		1	2	5				
45	3		1	5	4			1	
46	4		1	2	4				
47	1	5							
48	1	5							
49	1	5							
50	1								
51	1.5		2	5	3				
52	1.5		4	4	3				
53	2	5							
54	3								
55	2		3	5	3		1		
56	1.5		1	2	3				
57	3		1	3	2	2		1	
58	3			4	3			1	
59	3				1				
60	4				3				

Results of the Lake Sediment Survey

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 3) 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 3. 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 2. [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 4. 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

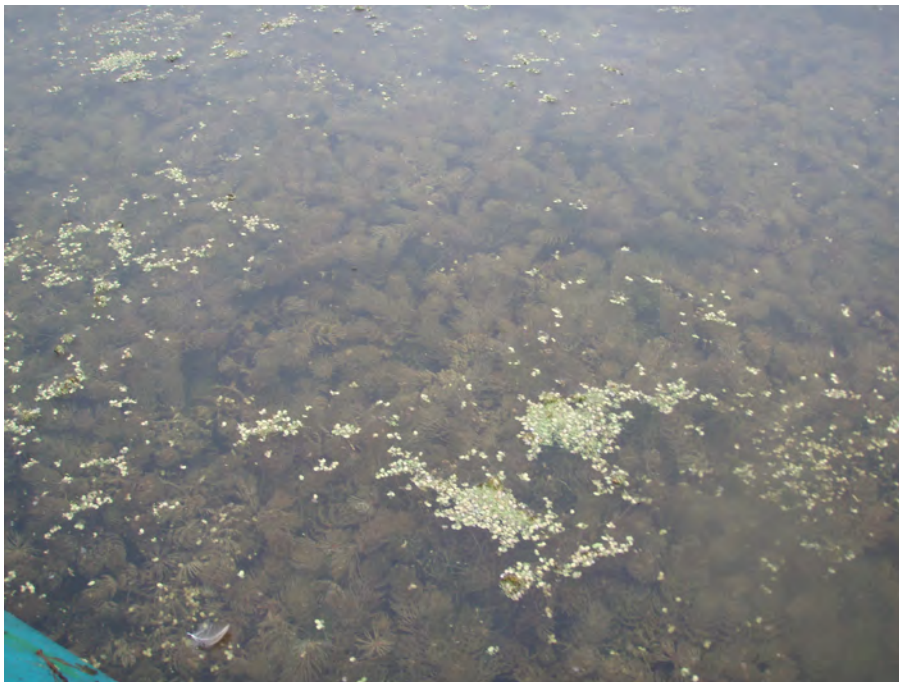


Figure 3. Buck Lake has fairly good water clarity, especially in areas with thick coontail growth. Duckweed (shown floating on the water) was common as well.

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 5 and Figure 4.

Curlyleaf pondweed growth is predicted to produce mostly low to moderate nuisance growth (where plants top out) at only several locations (Figure 4).

Table 5. 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

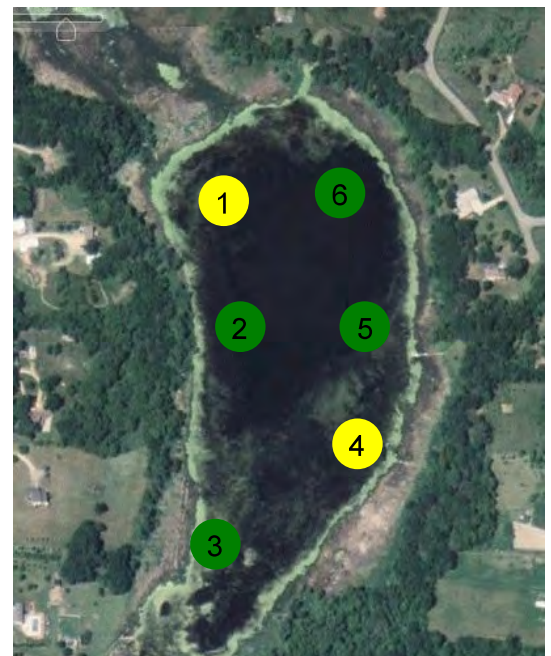


Figure 4. Curlyleaf pondweed growth is predicted to be light to moderate based on lake sediment characteristics. Green circles = light growth and yellow circles = moderate growth.

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 6. 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

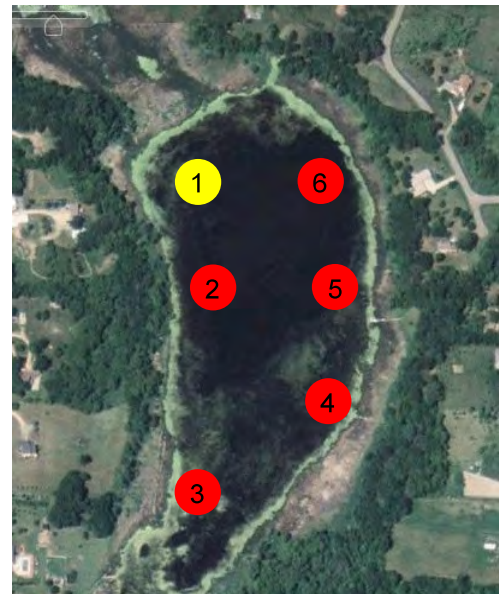


Figure 5. Eurasian watermilfoil growth is predicted to be moderate to heavy. Yellow circle = moderate growth and red circles = heavy growth.

Summary

Lake Sediments: The lake sediments have moderate to heavy fertility, with high Olsen phosphorus and ammonia nitrogen levels. Iron is high while most other parameters are average for typical lake sediments.

Aquatic Plants: No non-native plant species (curlyleaf or milfoil) were observed. Diversity was relatively low and coontail was the dominant plant.

Potential for Future Non-Native Plant Growth: Neither curlyleaf nor Eurasian watermilfoil are observed in Buck Lake at this time. However, if they get introduced, there is a low potential for heavy curlyleaf but there is a high potential for heavy Eurasian watermilfoil growth.



Figure 6. Flatstem pondweed and coontail were both common plants found in Buck Lake in 2010. Coontail was more abundant than flatstem.