



Bone Lake, Washington County, Minnesota, May 28, 2013

Point-Intercept Aquatic Plant Surveys for Bone Lake, Washington County, Minnesota

Early Season Survey: May 28, 2013
Late Season Survey: September 13, 2012

Prepared for:
Comfort Lake/Forest Lake
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Point-Intercept Aquatic Plant Surveys for Bone Lake, Washington County, Minnesota

Summary

Early Season Survey: Bone Lake (MnDNR ID #82-0054) is a 221 acre lake located in Washington County, Minnesota. Water clarity has a summer average of 1.4 meters in 2011 (source: MPCA Citizen Lake Monitoring Program). An aquatic plant survey was conducted on May 28, 2013 by Blue Water Science to characterize conditions of native plants and to look for Eurasian watermilfoil.

Results of the point intercept aquatic plant survey indicated Bone Lake has a low diversity of aquatic plants, with four submerged aquatic plant species in the early summer. Eurasian watermilfoil was observed at 1 site out of 33 sites that were located out to 7 feet of water depth, the maximum depth of plant colonization (Figure S-1). A summary of plant occurrences and relative densities are listed in Table S-1. The most common plant in the lake was coontail. This plant is a desirable species to have in a lake but it can grow to nuisance conditions.

Table S-1. Aquatic plant occurrence and density in Bone Lake, May 28, 2013.

	White waterlily	Chara	Coontail	Curlyleaf pondweed	Eurasian Watermilfoil
Average Density	1.0	1.3	1.2	1.0	1.0
Occurrence (33 sites)	2	3	17	10	1
% occurrence	6	9	52	30	3

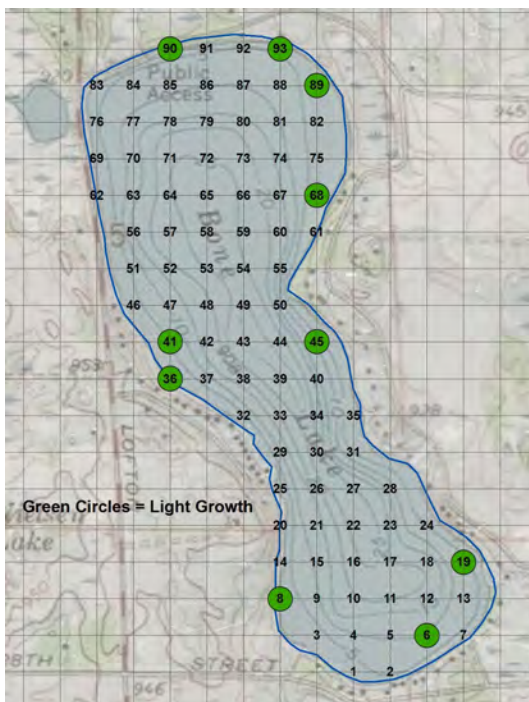


Figure S-1. Curlyleaf pondweed coverage for Bone Lake on May 28, 2013. Green circles = light growth.

Late Season Survey: An aquatic plant survey was conducted on September 13, 2012 by Blue Water Science to characterize conditions of native plants and to look for Eurasian watermilfoil. Eurasian watermilfoil was verified in Bone Lake in 2006.

Results of the point intercept aquatic plant survey indicated Bone Lake has a low diversity of aquatic plants, with four submerged aquatic plant species and two floatingleaf species. Eurasian watermilfoil was observed at 8 sites out of 45 sites that were located out to 6 feet of water depth, the maximum depth of rooted plant colonization (Figure S-2). A summary of plant occurrences and relative densities are listed in Table S-2. The most common plant in the lake is coontail.

Table S-2. Aquatic plant occurrence and density in Bone Lake, September 13, 2012.

	Spatterdock	White waterlily	Chara	Coontail	Eurasian Watermilfoil	Moss
Average Density	1.8	2.4	1.0	2.1	1.4	1.0
Occurrence (45 sites)	4	9	3	30	8	1
% occurrence	9	20	7	67	18	2

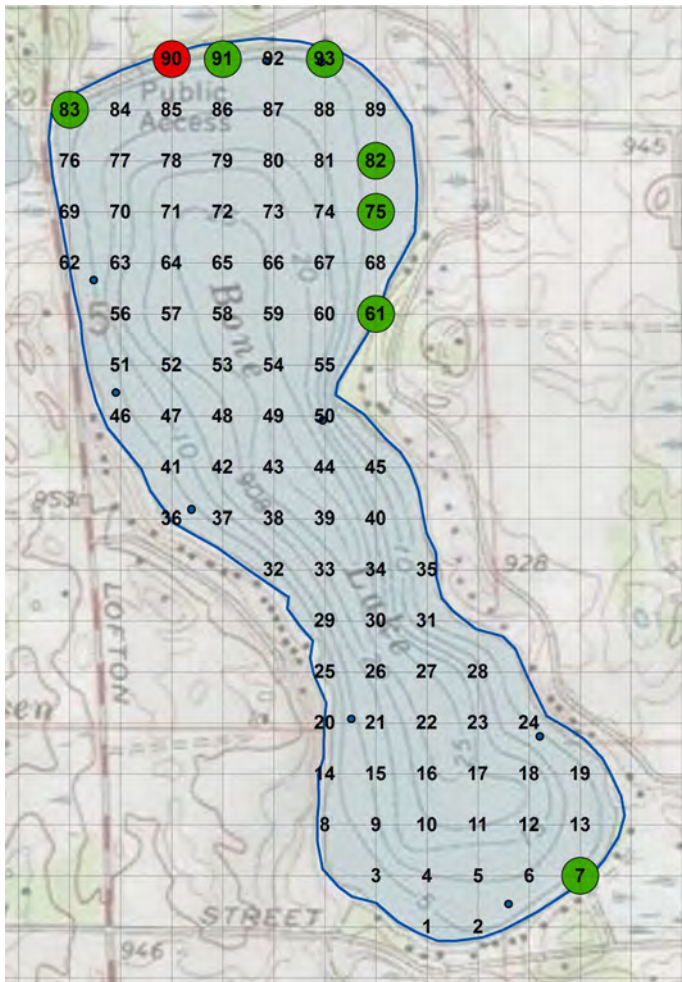


Figure S-2. Eurasian watermilfoil coverage for Bone Lake on September 13, 2012. Green circles = light growth and red circles = heavy growth.

Point-Intercept Aquatic Plant Surveys for Bone Lake, Washington County, Minnesota

Bone Lake, Washington County (ID: 82-0054)

Size: 221 acres (MnDNR)

Littoral area: 124 acres (MnDNR)

Maximum depth: 30 ft (MnDNR)

Introduction

An early season aquatic plant survey was conducted on May 28, 2013 on 221 acre Bone Lake, Washington County. The objective of the survey was to characterize the aquatic plant community and check the distribution and abundance of curlyleaf pondweed. The early season survey of 2013 has been added to the late season survey conducted in 2012. Both surveys are included in this report.

Methods

Point-intercept aquatic plant surveys of Bone Lake were conducted by Blue Water Science on May 28, 2013 and September 13, 2012. In the May 28, 2013 survey 33 points were found out to 7 feet of water depth, the deepest depth of plant colonization in Bone Lake (Figure 1) although depths out to 13 feet were sampled. In the September 13, 2012 survey 45 points were sampled. Sample points were placed 100 meters apart on a grid that covered the lake. Each sample point was equal to 2.4 acres. 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, plant distribution maps were constructed.

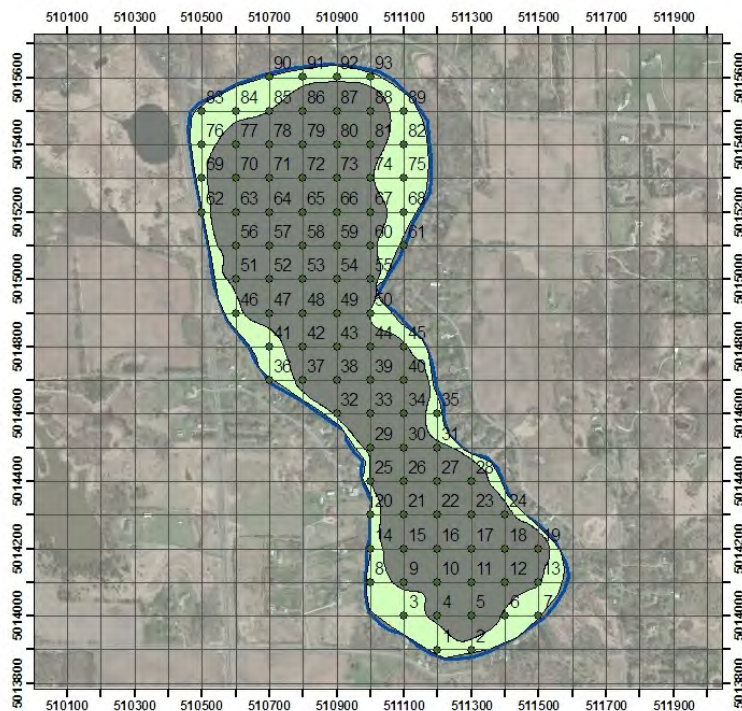


Figure 1. Sample location map for the aquatic plant surveys conducted on Bone Lake. Green shading represents the littoral zone of Bone Lake.

Results for the May 28, 2013 Survey

Results of the early summer aquatic plant survey conducted on May 28, 2013 found there were four submerged plants and coontail was the dominant plant in the lake (Table 1). There was also one floatingleaf species found (Table 1).

Results from the point-intercept plant survey found that coontail was found growing out to a depth of 7 feet (Table 2) otherwise other submerged plants were found out to water depths of 6 feet. Aquatic plants covered approximately 58 acres (26% of the lake).

Table 1. Bone Lake aquatic plant occurrences and densities for the May 28, 2013 survey based on 45 sites. Density ratings are 1-5 with 1 being low and 5 being most dense.

	All Stations (n=33)		
	Occur	% Occur	Density
White waterlily (<i>Nymphaea tuberosa</i>)	2	3	1.0
Coontail (<i>Ceratophyllum demersum</i>)	17	52	1.2
Chara (<i>Chara spp</i>)	3	9	1.3
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	1	3	1.0
Curlyleaf pondweed (<i>Potamogeton crispus</i>)	10	30	1.0

Table 2. Occurrence of plants by depth in Bone Lake out to a depth of 7 feet.

Depth (feet)	Number of Sites Sampled	White waterlilies	Chara	Coontail	Curlyleaf pondweed	Eurasian watermilfoil
1	0					
2	0					
3	4	1		2		
4	9	1	3	3	2	1
5	8			6	4	
6	8			4	4	
7	4			2		
8	3					
9	4					
10	1					
11	0					
12	0					
13	1					
Sites Sampled to 7 feet	33	2	3	17	10	1

Native aquatic plants are distributed around the perimeter of Bone Lake and cover much of the nearshore area (Figure 2). In 2013 aquatic plants were found to grow at a moderate densities and only in a few areas was plant growth producing nuisance conditions for navigation.

Eurasian watermilfoil (EWM) was found at 1 site on May 28, 2013. However, curlyleaf pondweed was found at ten sites at light densities on May 28, 2013 (Figure 3).

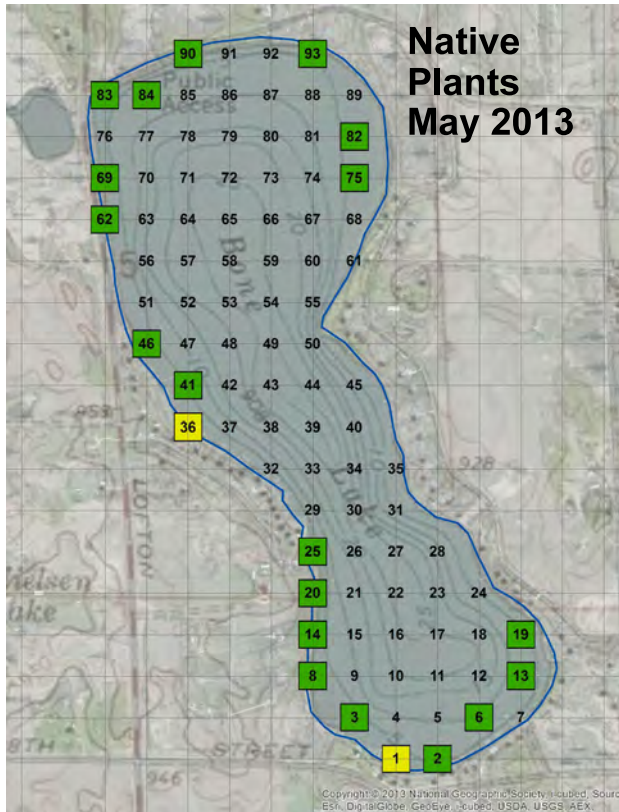


Figure 2. Native plant coverage for Bone Lake on May 28, 2013. Green = light growth, yellow = moderate growth, and red = heavy growth.

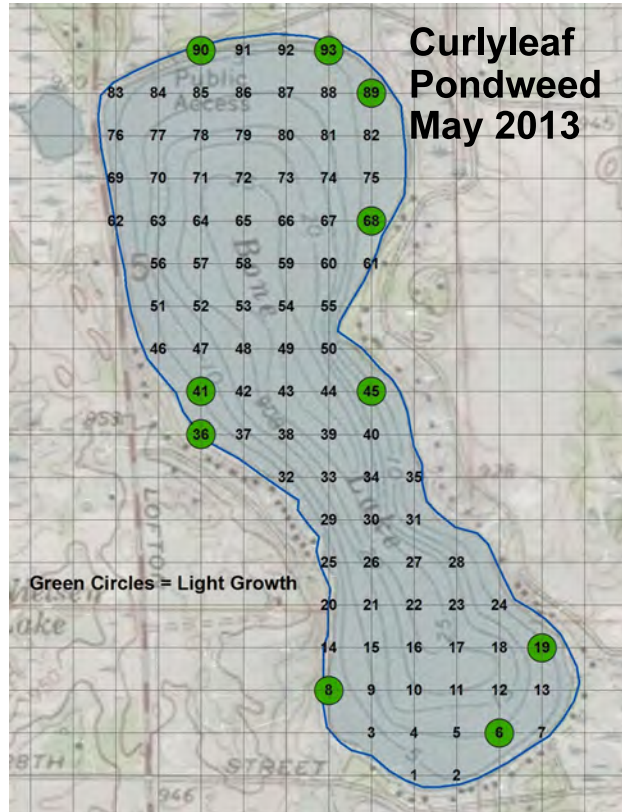


Figure 3. Curlyleaf pondweed coverage for Bone Lake on May 28, 2013. Green = light growth.

Bone Lake Aquatic Plants on May 28, 2013



Figure 4. Aquatic plant growth was spotty in Bone Lake.

Individual Sample Point Plant Data

Low plant diversity was found in Bone Lake with a total of six aquatic plant species (Table 3). Coontail was the most common plant observed in this survey.

Table 3. Aquatic plant occurrence and density for individual sample points in Bone Lake, May 28, 2013.

Site	Depth (ft)	White Lilies	Chara	Coontail	Curlyleaf	Curlyleaf STEMS	Curlyleaf Length	EWM	No Plants
1	3			3					
2	5			1					
3	3	1		1					
5	8								1
6	6			1	1	1	4		
7	4								1
8	5			1	1	2	5		
13	5			1					
14	7			1					
19	6			1	1	1	4		
20	6			1					
24	8								1
25	7			1					
28	9								1
29	9								1
31	13								1
32	8								1
35	3								1
36	5			3	1	1	4		
40	7								1
41	4		2		1	2	4		
45	6				1	2	4		
46	4			1					
47	9								1
50	3								1
51	7								1
55	6								1
58	10								1
61	9								1
62	4		1						
68	5				1	1	4		
69	5			1					
75	4			1				1	
75	5								1
82	4		1						
83	4	1							
84	4			1					
89	4				1	4	6		
90	5			1	0.5	1	3		
91	6								1
92	6								1
93	6			1	1	1	6		
Average		1.0	1.3	1.2	1.0	1.6		1.0	
occurrence (42 sites)		2	3	17	10	10		1	18
% occurrence		5	7	40	24	24		2	

Results for the September 13, 2012 Survey

Results of the late summer aquatic plant point-intercept survey conducted on September 13, 2012 found there were four submerged plants, two floatingleaf species, and coontail was the dominant plant in the lake (Table 4).

Results from the point-intercept plant survey found that coontail was growing out to a depth of 6 feet (Table 5) otherwise other submerged vascular plants were found out to water depths of 4 feet. An aquatic moss (a non-rooted plant) was found at one site in 9 feet of water. Aquatic plants covered approximately 72 acres (33% of the lake).

Table 4. Bone Lake aquatic plant occurrences and densities for the September 13, 2012 survey based on 45 sites. Density ratings are 1-5 with 1 being low and 5 being most dense.

	All Stations (n=45)		
	Occur	% Occur	Density
Spatterdock (<i>Nuphar variegatum</i>)	4	9	1.8
White waterlily (<i>Nymphaea tuberosa</i>)	9	20	2.4
Coontail (<i>Ceratophyllum demersum</i>)	30	67	2.1
Chara (<i>Chara spp</i>)	3	7	1.0
Moss (<i>Drepanocladus spp</i>)	1	2	1.0
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	8	18	1.4

Table 5. Occurrence of plants by depth in Bone Lake out to a depth of 9 feet.

Depth (feet)	Number of Sites Sampled	Spatterdock	White waterlilies	Chara	Coontail	EWM	Moss
1	3		1		1	1	
2	11		5	3	11	3	
3	8	3	2		7	2	
4	7	1	1		7	2	
5	4				3		
6	3				1		
7	4						
8	2						
9	3						1
10	4						
11	0						
12	1						
13	1						
14	4						
15	1						
16	1						
Sites Sampled to 9 feet	45	4	9	3	30	8	1

Native aquatic plants are distributed around the perimeter of Bone Lake and cover much of the nearshore area (Figure 5). In 2012 aquatic plants were found to grow at a moderate densities and only in a few areas was plant growth producing nuisance conditions.

Eurasian watermilfoil (EWM) was found at 8 sites on September 13, 2012 (Figure 5).

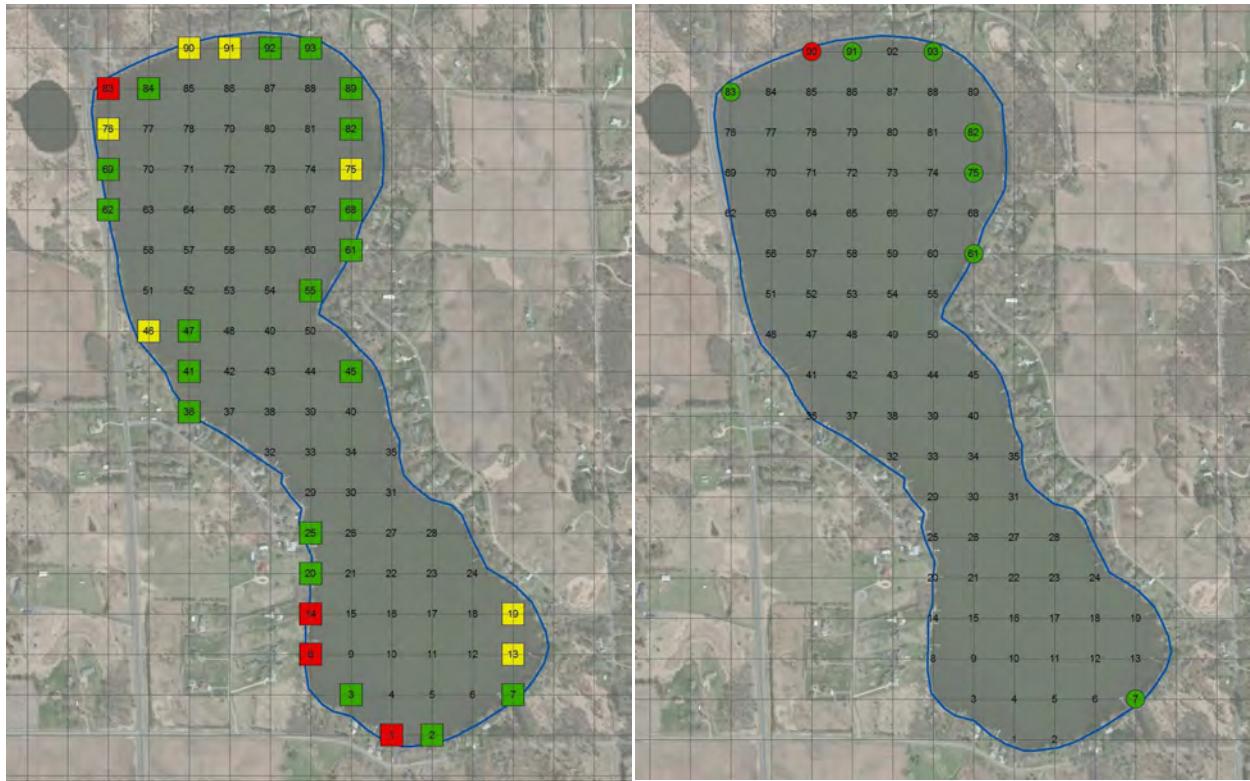


Figure 5. (left) Native aquatic plant coverage for Bone Lake on September 13, 2012. Green squares = light growth, yellow squares = moderate growth, and red squares = heavy growth. (right) Eurasian watermilfoil coverage on September 13, 2012. Green circles = light growth and red circle = heavy growth.

Bone Lake Aquatic Plants on September 13, 2012

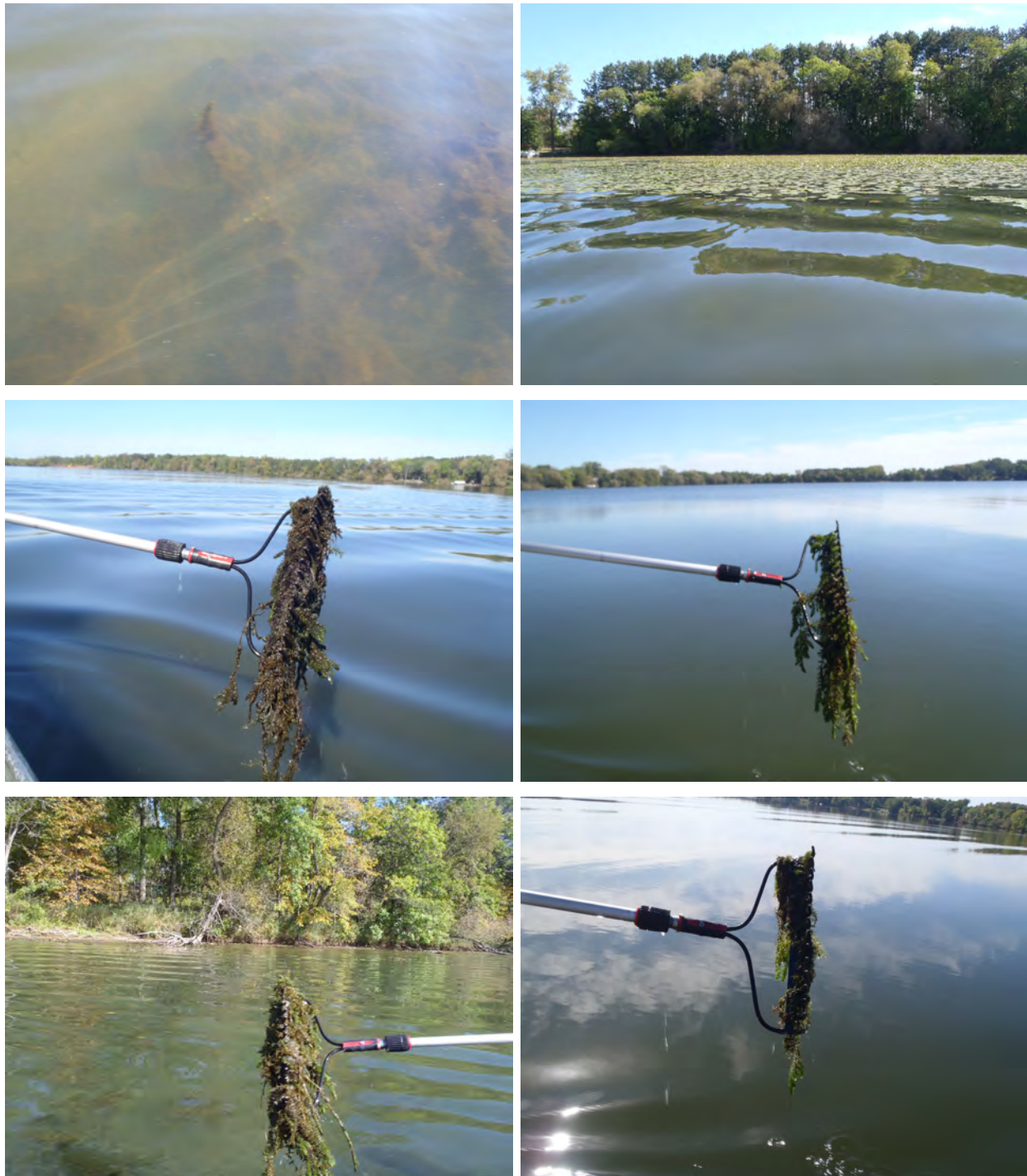


Figure 6. Aquatic plant growth was spotty in Bone Lake. Some areas had no plants while other areas had dense plant growth.

Individual Sample Point Plant Data

Low plant diversity was found in Bone Lake with a total of six aquatic plants (Table 6). Coontail was the most common plant observed in this survey.

Table 6. Aquatic plant occurrence and density for individual sample points in Bone Lake, September 13, 2012.

Site	Depth (ft)	Spatterdock	White lilies	Chara	Coontail	EWM	Moss
1	2		4		3		
2	3	1			2		
3	3		4		2		
5	13						
6	6						
7	4				2	1	
8	2		4		2		
9	7						
13	5				3		
14	3	4			3		
15	14						
18	12						
19	4				3		
20	4	1			2		
21	TD						
23	TD						
24	8						
25	4		2		2		
27	TD						
28	10						
28.5	5				1		
29	6						
31	14						
32	3						
34	TD						
35	1						
36	2		1		1		
37	9						
40	15						
41	2			1	2		
42	16						
44	23						
45	6				2		
46	3				3		
47	9						1
50	1						
51	7						
55	5				2		
56	5						
56	14						
60	14						
61	1		1		1	1	
62	2			1	1		
67	10						
68	2				2		
69	2				1		
74	7						
75	2				3	1	
76	4				3		
81	10						
82	3				1	1	
83	3	1	4		2	1	
84	4				2		
85	7						
86	8						
87	10						
88	9						
89	2		1	1	2		
90	2		1		3	4	
91	4				3	1	
92	3				2		
93	2				2	1	
Average		1.8	2.4	1.0	2.1	1.4	1.0
occurrence (45 sites)		4	9	3	30	8	1
% occurrence		9	20	7	67	18	2

Comparing Aquatic Plants from Early Season to Late Season: Aquatic plants increased slightly in distribution and density from early to late season surveys in 2012 and 2013 (Figure 7). It appears Eurasian watermilfoil increases in distribution from early to late season which is fairly typical for milfoil as well as other plant species (Table 7).

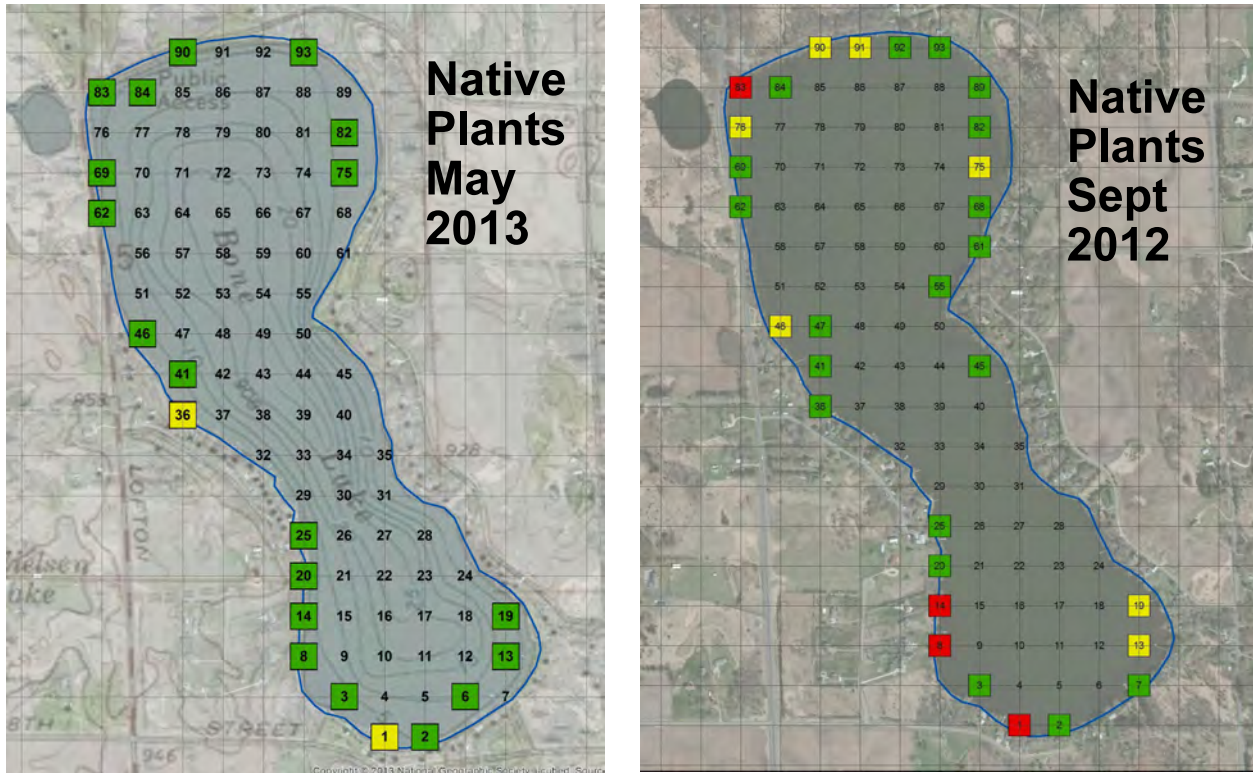


Figure 7. (left) Native aquatic plant coverage for Bone Lake on May 28, 2013. (right) Native aquatic plant coverage for Bone Lake on September 13, 2012. Green squares = light growth, yellow squares = moderate growth, and red squares = heavy growth.

Table 7. Bone Lake aquatic plant occurrences and densities for the September 13, 2012 survey based on 45 sites. Density ratings are 1-5 with 1 being low and 5 being most dense.

	May 28, 2013 (33 sites)	September 13, 2012 (45 sites)
	% Occur	% Occur
Spatterdock (<i>Nuphar variegatum</i>)	--	9
White waterlily (<i>Nymphaea tuberosa</i>)	6	20
Coontail (<i>Ceratophyllum demersum</i>)	52	67
Chara (<i>Chara spp</i>)	9	7
Moss (<i>Drepanocladus spp</i>)	--	2
Curlyleaf pondweed (<i>Potamogeton crispus</i>)	30	--
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	3	18