Curlyleaf Pondweed Growth on June 13, 2011 on Prior Lake

Upper and Lower Prior Lakes, Scott County, Curlyleaf Pondweed Assessment for 2011

Assessment Dates: May 10 (55°F) and June 13, 2011 (71°F)

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2011

Upper and Lower Prior Lakes, Scott County, Curlyleaf Pondweed Assessment for 2011

Summary

Overview: Based on curlyleaf pondweed data gathered on May 10, 2011 (Figure 1), it appeared a couple of areas around Lower and Upper Prior Lakes had the potential to produce heavy curlyleaf growth by the middle of June. However no open water treatments were recommended. A second curlyleaf assessment on June 13, 2011 found several areas had moderate growth (Figure 2). No open water treatments were conducted in 2011, although some residents had shoreline areas treated out to 150 feet. It appears most areas of heavy curlyleaf pondweed (CLP) growth will be in water 5 to 10 feet deep. Typically, up to 5 acres of heavy CLP are predicted in Lower Prior and up to 13 acres of heavy CLP are predicted in Upper Prior on an annual basis. Shoreline treatments will control most of the heavy growth that restricts navigation.

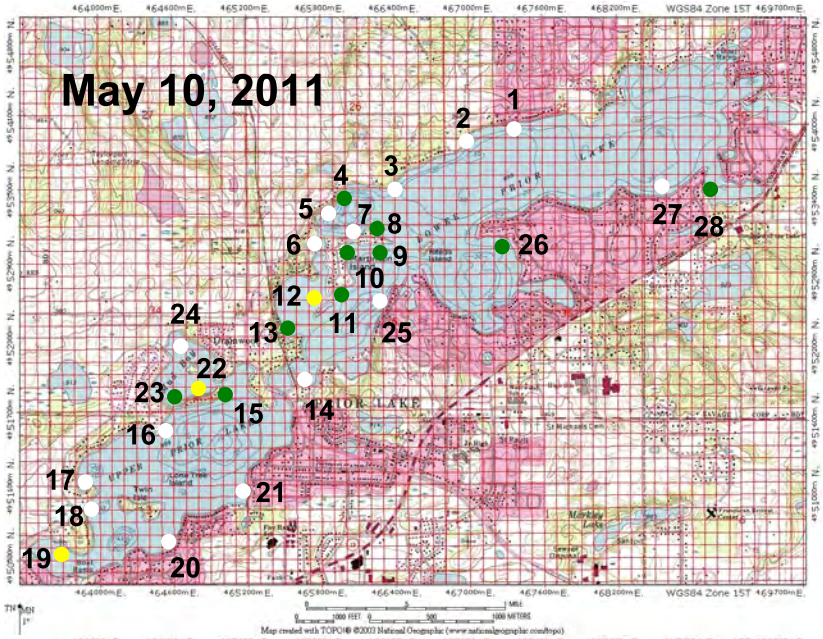


Figure 1. Map of curlyleaf pondweed assessment sample areas for May 10, 2011. Colored sample areas indicate growth conditions in late April - early May of 2011 for curlyleaf pondweed. White = no curlyleaf; Green = no problem or light growth; Yellow = moderate growth; Red = heavy growth.

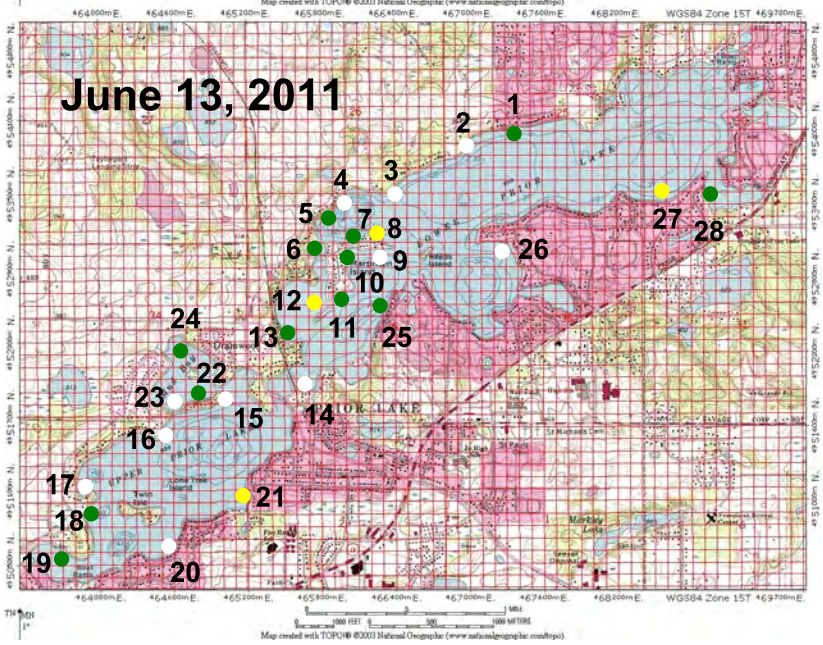


Figure 2. Map of curlyleaf pondweed assessment sample areas for June 13, 2011. Colored sample areas indicate growth conditions in late June, 2011 for curlyleaf pondweed. White = no curlyleaf; Green = no problem or light growth; Yellow = moderate growth; Red = heavy growth.

Curlyleaf Pondweed Distribution in 2011: Curlyleaf pondweed distribution was common but at a low density on the first assessment on May 10, 2011. Sites 12, 19, and 22 had the densest growth and other areas had light growth (Table 1). Distribution increased slightly from May 10 to June 13, 2011 (Table 1). At several sites, curlyleaf density increased, but growth was still light to moderate for most of the Upper and Lower Prior sample sites.

Table 1. Aquatic plant stem densities based on rake sampling for May 10, 2011 and June 13, 2011. Densities are based on a scale from 1 to 5 with 5 being the densest. The number in parentheses is the number of stems on the rake sampler.

Site	Depth (ft)	Curlyleaf Pondweed density	
		May 10, 2011	June 13, 2011
1	10		1 (1)
2	8		
3	9		
4	10	2 (6)	
5	8		1 (1)
6	8		1 (2)
7	10		1 (1)
8	9	1 (2)	3 (20)
9	9	1 (3)	
10	10	1 (3)	1 (2)
11	9	2 (5)	2 (9)
11.5	8		
12	10	3 (9)	3 (25)
13	10	2 (8)	1 (2)
14	10		
15	10	1 (4)	
16	10		
17	10		
18	12		1 (1)
19	6	3 (10)	2 (5)
20	12		
21	11		3 (10)
22	6	2 (11)	1 (1)
23	6	2 (7)	
24	6		1 (1)
24.5	6		
25	9		2 (8)
26	8	2 (8)	
26.5	11	2 (5)	
27	10		3 (10)
28	8	1 (4)	2 (8)
Number of sites		14	17

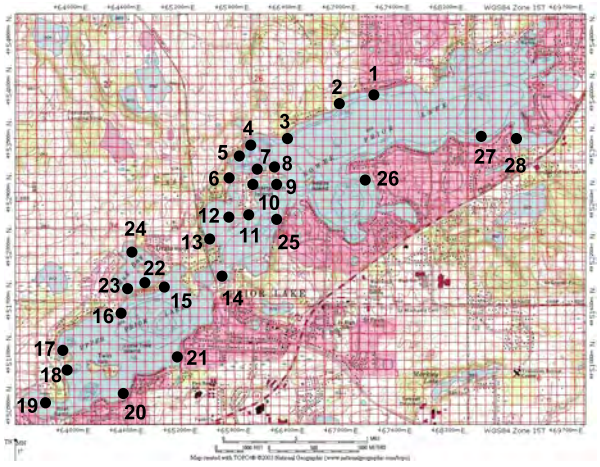


Figure 3. Site locations for the two assessments are shown with black dots.

Curlyleaf Pondweed Growth Characteristics in 2011

May 10, 2011

May 10, 2011

June 13, 2011

June 13, 2011

Comparing Growth from 2010 to 2011: Curlyleaf pondweed distribution and density was greater in 2010 compared to 2011 (Table 3 and Figure 4). In 2010, in Lower Prior, there was heavy curlyleaf growth in the Martinson Island area (Sites 5, 10, 11, and 12). In Upper Prior, the heaviest growth was at Sites 19, 22, and 23. In 2011, curlyleaf growth in those areas was lighter (Table 3). The possible increase in lake levels combined with a heavy snow pack on the ice may have curtailed curlyleaf growth in 2011.

Table 3. Aquatic plant stem densities based on rake sampling for June 2, 2010 and June 13, 2011. Densities are based on a scale from 1 to 5 with 5 being the densest.

Site	Curlyleaf Pondweed density	
	2010 (June 2)	2011 (June 13)
1	3	1
2		
3		
4	1	
5	4	1
6	2	1
7	2	1
8	3	3
9	2	
10	5	1
11	4.5	2
11.5	4	
12	4	3
13	2	1
14	1	
15	1	
16	2	
17	0.5	
18	1	1
19	4.5	2
20	2	
21	5	3
22	5	1
23	5	
24	2	1
24.5	--	
25	4	2
26	3.5	
26.5	2	
27		3
28	4	2
Number of Sites	27	17

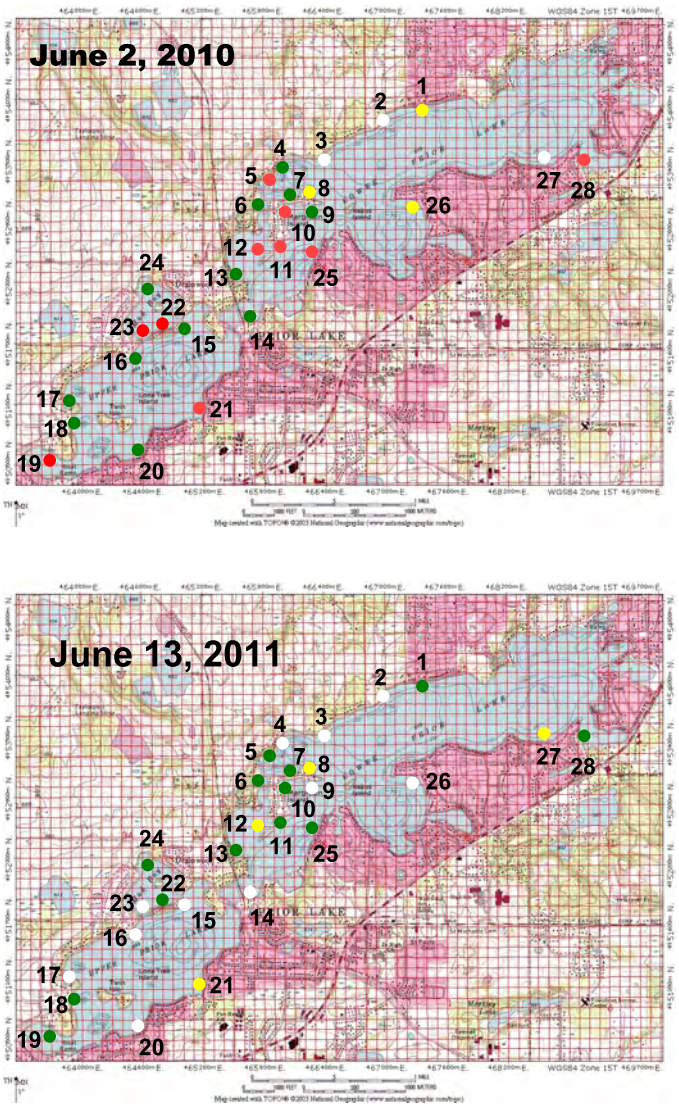


Figure 4. Curlyleaf densities in Upper and Lower Prior for 2010 and 2011. Colored dots indicate curlyleaf growth conditions: white = no curlyleaf, green = light growth, yellow = moderate growth, red = heavy growth.

Upper and Lower Prior Lakes Curlyleaf Growth Potential Based on Lake Sediment Characteristics: 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 Figure 5. Curlyleaf pondweed growth is predicted to produce mostly low to moderate nuisance growth (where plants top out) at only several locations in Upper and Lower Prior Lake (Figure 5).

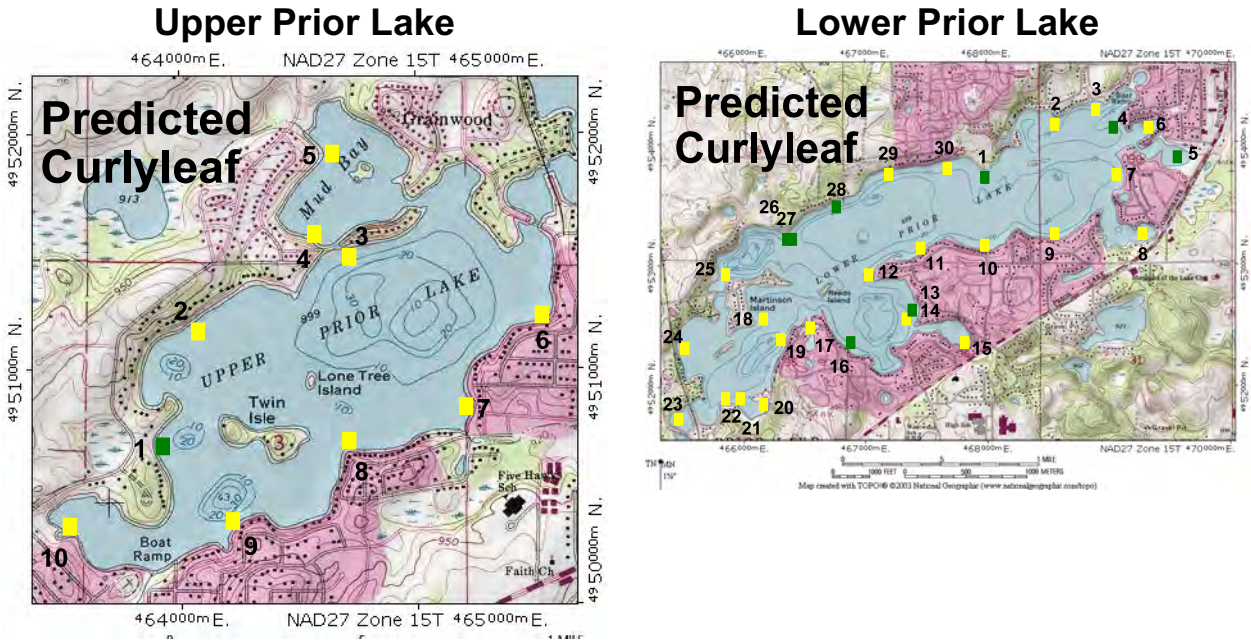


Figure 5. Predicted curlyleaf pondweed growth is based on lake sediment characteristics. Green squares = light growth; yellow squares = moderate growth.

Summary: For Lower Prior, the Martinson Island area had heavy growth in 2009 and 2010 but light to moderate growth in 2011. Between the channel and open water areas about 5 acres of curlyleaf could be considered for future treatment.

For Upper Prior, Mud Bay, had heavy growth in 2009 and 2010 but light growth in 2011. Approximately 10 acres of matted curlyleaf growth was observed in 2009 and 2010, but not in 2011. Areas along the undeveloped shoreline are a low priority while the shoreline area with houses is a higher priority for treatment. Approximately 10 to 15 acres of curlyleaf could be treated in Mud Bay in the future.

Growth conditions appear to be influenced, to some degree, by lake levels. If the Prior Lakes come up a foot or two and stay there, curlyleaf growth could be diminished. Plant assessments in May of 2012 are recommended to evaluate curlyleaf conditions for possible treatment considerations.

Curlyleaf Pondweed Surveys for Upper and Lower Prior Lakes for 2011

May Curlyleaf Pondweed Assessment in Prior Lake

A total of 28 sites were monitored with rake sampling on May 10, 2011. Curlyleaf was found at 15 sample sites out of the 30 that were monitored (Table 1).

Table 1. Aquatic plant stem densities based on rake sampling for May 10, 2011. Densities are based on a scale from 1 to 5 with 5 being the densest.

Site	Depth (ft)	Prior Lake - May 10, 2011							Curlyleaf Notes
		Chara	Coontail	Curlyleaf pondweed		Eurasian Watermilfoil	Flatstem Pondweed	Northern Watermilfoil	
				density	stems per rake				
1								1	
2	8		1						
3	9								
4				2	6				50 meters from shore
5	8	1	1				1		
6									
7	10								
8	9			1	2				
9	9			1	3				70 meters from shore, stems about 6 inches long
10				1	3				40 meters from shore (50 meters from shore 1-2 stems)
11	9			2	5		1	1	50 meters from shore, stems about 1 foot long
12		1		3	9				
13	10			2	8				50 meters from shore
14									
15	10			1	4				30 meters from shore
16									
17	10								
18	12								
19	6		2	3	10				
20	12								
21	11								
22	6			2	11				
23	6			2	7				stems about 1 foot long
24	6		0.1						
25	9								30 meters from shore
26	8			2	8				50 meters from shore
26.5		1		2	5				25 meters from shore
27			1					1	
28				1	4	1			Stems about 14 inches long

Curlyleaf Conditions in Prior Lakes, May 10, 2011

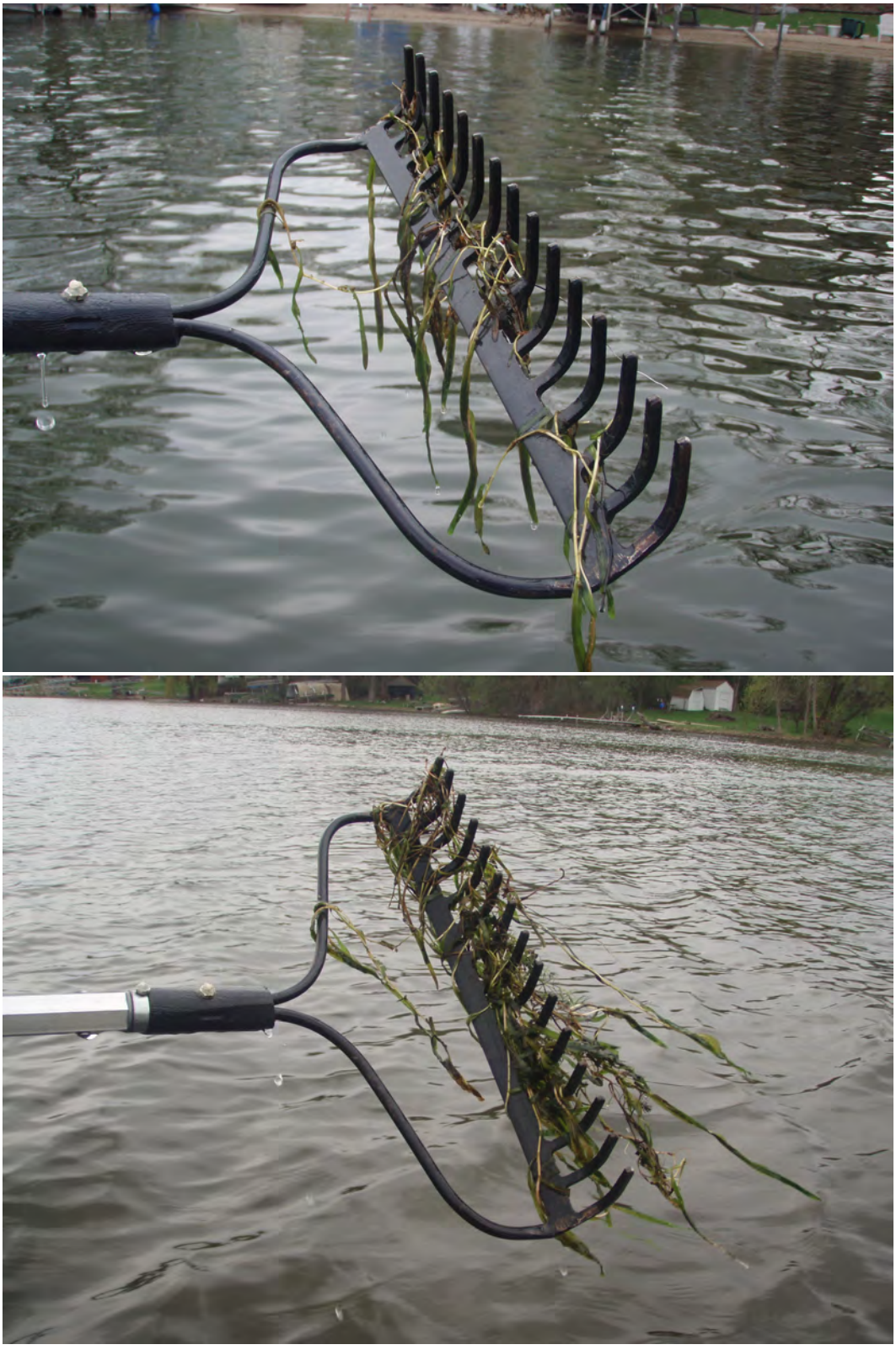


Figure 3. Curlyleaf pondweed was found around Prior Lake on May 10, 2011. Here curlyleaf was at a density of a "1" [top photo] and at a density of a "3" [bottom photo].

June Curlyleaf Pondweed Assessment in Prior Lake

A total of 28 sites were monitored with rake sampling on June 13, 2011. Curlyleaf was found at 17 sample sites out of the 28 that were monitored (Table 2). At 8 of the sites, curlyleaf is expected to grow to the surface before it dies back by the end of June.

Table 2. Aquatic plant stem densities based on rake sampling for June 13, 2011. Densities are based on a scale from 1 to 5 with 5 being the densest.

Site	Depth (ft)	Prior Lake - June 13, 2011												Notes
		Cabbage	Chara	Clasping-leaf	Coontail	Curlyleaf Pondweed		Eurasian water-milfoil	Flatstem pond-weed	Northern water-milfoil	Stringy pond-weed	Water stargrass	White-stem pond-weed	
						density	stems							
1	8					1	1							
1	11													
2	7		3											
2	9													
3	11								2					
4	10				1							1		
5	10					1	1				1		1	
6	8	1				1	2	1					1	
7	6			1		1	1							
8	11					3	20							
9	10				1					1	1			
10	11				3	1	2							
11	6			4		1								
11	10					2	9							
12N	9					3								
12	11					3	25							
13	11					1	2							
14	10													
14	11													
15	5				1.5			1						
15	8													
16	9													
17	10													
18	8					1	1	1						
19	7					2	5							
19	7					1	1							
20	9													
20	11													
21	6					1	2							
21	6					3	10							
21	6					3								Curlyleaf at surface.
21	11													
22						0.5	1							
23	6													
24	5					1	1							
25	10					2	8							Curlyleaf 3 feet tall, 6-7 feet below surface.
27	11					3	10				1			
27	13													
27	15													
28	7					2	8	3						
28	8					1	2	3						

Curlyleaf Conditions in Prior Lakes, June 13, 2011

Figure 4. Curlyleaf pondweed was found around Prior Lake on June 13, 2011. Here curlyleaf was at a density of a "1" [top photo] and at a density of a "3" [bottom photo].

Comparing Curlyleaf Pondweed Growth from May to June, 2011

Curlyleaf growth increased from May to June at some sites where curlyleaf was observed in May (Table 3).

In the June survey, several areas were found with heavy curlyleaf growth, but mostly concentrated around sites 8 and 12 in Lower Prior and Site 21 in Upper Prior. These areas had growth characteristics that are sometimes treated.

It was found that assessing plants in May was the best month to evaluate growth for potential treatment. Assessments in April may be too early and assessments in June would be too late to conduct an effective treatment.

Table 3. Aquatic plant stem densities based on rake sampling for May 10, 2011 and June 13, 2011. Densities are based on a scale from 1 to 5 with 5 being the densest.

Site	Curlyleaf Pondweed density	
	May 10, 2011	June 13, 2011
1		1
2		
3		
4	2	
5		1
6		1
7		1
8	1	3
9	1	
10	1	1
11	2	2
11.5		
12	3	3
13	2	1
14		
15	1	
16		
17		
18		1
19	3	2
20		
21		3
22	2	1
23	2	
24		1
24.5		
25		2
26	2	
26.5	2	
27		3
28	1	2

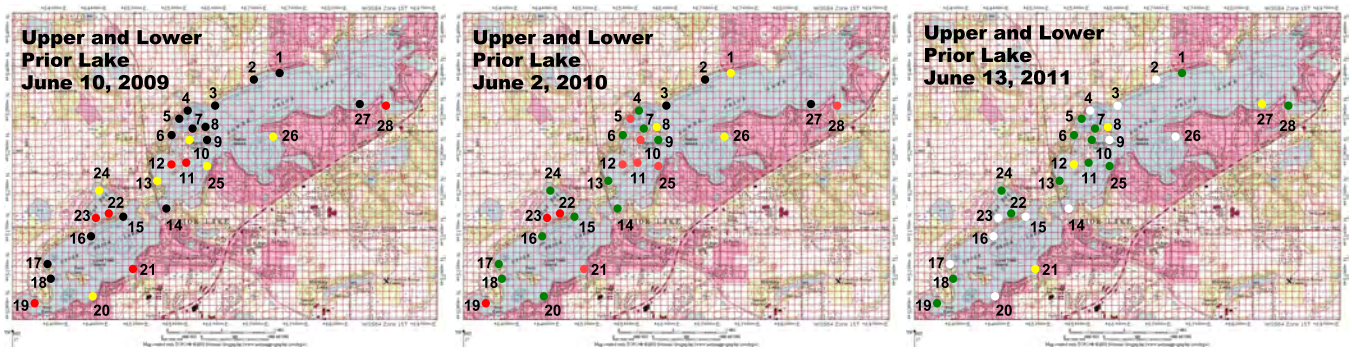
Comparison of 2009, 2010, and 2011 Curlyleaf Conditions

Lower Prior Lake

June 10, 2009 | June 2, 2010 | June 13, 2011

Upper Prior Lake

June 10, 2009 | June 2, 2010 | June 13, 2011



June 10, 2009 | June 2, 2010 | June 13, 2011

Figure 5. [top and middle] Lower and Upper Prior Lakes conditions in June 2009, 2010, and 2011. [bottom] Curlyleaf conditions in June 2009 and 2010 based on June assessments. Black = no curlyleaf; green = light growth; yellow = moderate growth; and red = heavy growth.

Upper Prior Lake Curlyleaf Growth Potential Based on Lake Sediment Characteristics: 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 4 and Figure 6.

Curlyleaf pondweed growth is predicted to produce mostly low to moderate nuisance growth (where plants top out) at only several locations (Figure 6).

Table 4. Upper Prior Lake sediment data and ratings for potential heavy curlyleaf pondweed growth.

Site	pH (su)	Organic Matter (%)	Fe:Mn Ratio	Potential for Heavy Curlyleaf Pondweed Growth
Light Growth	**6.8**	**5**	**4.6**	**Light (green)**
Moderate Growth	**6.2**	**11**	**5.9**	**Moderate (yellow)**
Heavy Growth	**>7.7**	**>20**	**<1.6**	**Heavy (red)**
1	7.6	0.5	1.6	Light
2	7.3	0.5	2.1	Moderate
3	8.1	0.5	2.6	Moderate
4	7.8	1.3	6.8	Moderate
5	7.7	1.7	4.9	Moderate
6	7.9	0.7	12.0	Moderate
7	8.1	0.5	4.2	Moderate
8	8.2	0.5	2.6	Moderate
9	8.1	0.5	1.7	Moderate
10	7.0	11.0	8.0	Moderate

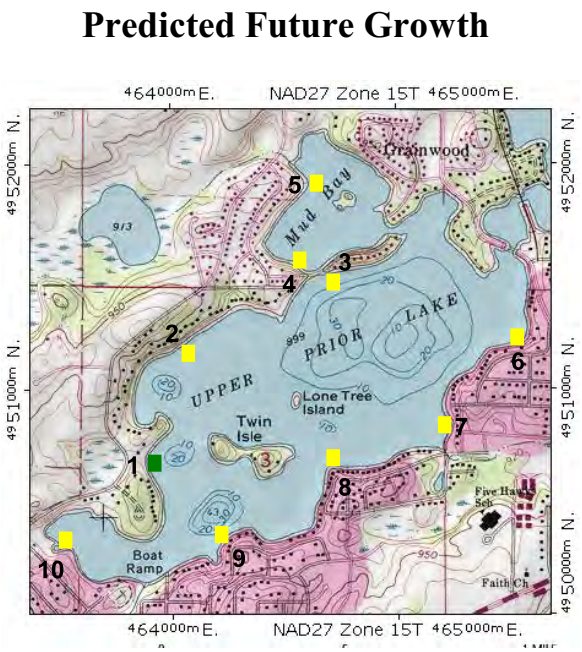


Figure 6. Sediment sample locations are shown with a square. The square color indicates the potential for nuisance curlyleaf pondweed to occur at that site. Key: green = light; yellow = moderate; red = heavy potential.

Lower Prior Lake Curlyleaf Growth Potential Based on Lake Sediment Characteristics: 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 7.

Curlyleaf pondweed growth is predicted to produce mostly low to moderate growth (where plants top out) at only several locations (Figure 7).

Table 5. Lower Prior Lake sediment data and ratings for potential heavy curlyleaf pondweed growth.

Site	pH (su)	Organic Matter (%)	Fe:Mn Ratio	Potential for Heavy Curlyleaf Pondweed Growth
Light Growth	6.8	5	4.6	Light (green)
Moderate Growth	6.2	11	5.9	Moderate (yellow)
Heavy Growth	>7.7	>20	<1.6	Heavy (red)
1	8.1	0.5	4.7	Light
2	8.2	1.0	5.8	Moderate
3	8.0	1.4	7.2	Moderate
4	8.3	0.4	5.1	Light
5	7.7	4.6	13.7	Light
6	7.7	3.9	10.1	Moderate
7	7.9	0.8	6.7	Moderate
8	7.9	2.0	11.3	Moderate
9	8.1	0.7	7.9	Moderate
10	8.1	0.9	5.2	Moderate
11	8.3	0.5	3.3	Moderate
12	8.2	0.6	4.3	Moderate
13	8.3	0.2	4.4	Light
14	8.1	0.6	5.3	Moderate
15	8.2	0.5	10.3	Moderate
16	8.2	0.3	6.0	Light
17	8.2	0.5	4.9	Moderate
18	8.1	0.8	3.5	Moderate
19	8.3	0.3	2.7	Moderate
20	7.8	6.4	6.3	Moderate
21	8.0	1.0	3.5	Moderate
22	8.0	0.9	3.9	Moderate
23	8.1	0.6	5.1	Moderate
24	8.1	0.6	4.6	Moderate
25	8.1	0.5	4.0	Moderate
26	8.2	0.1	6.3	Light
27	8.2	0.3	7.6	Light
28	8.2	0.4	3.8	Light
29	8.1	0.9	7.4	Moderate
30	8.2	0.7	6.2	Moderate

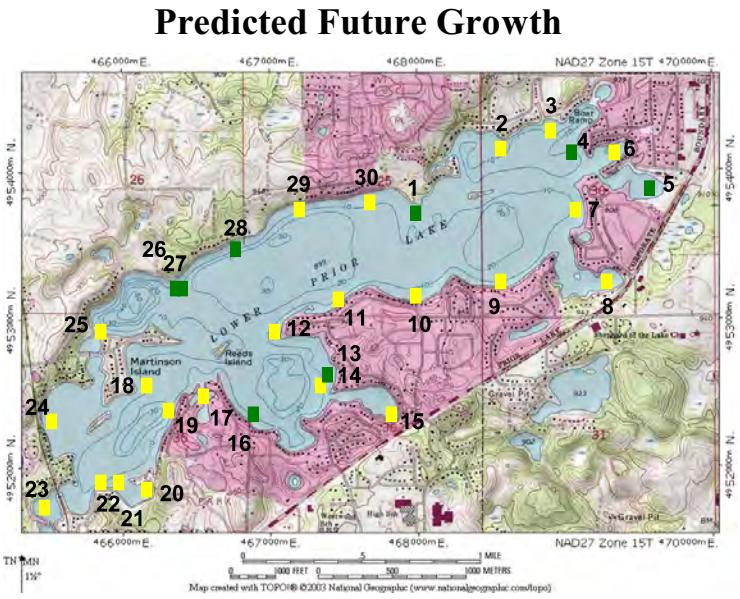
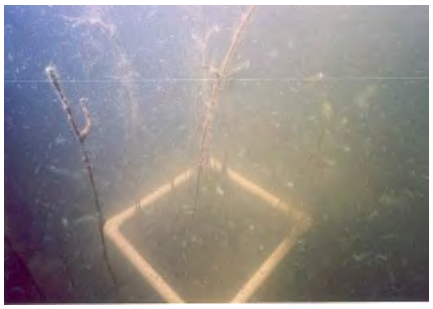


Figure 7. Sediment sample locations are shown with a square. The square color indicates the potential for nuisance curlyleaf pondweed to occur at that site. Key: green = light; yellow = moderate; red = heavy potential.

Curlyleaf Pondweed Growth Characteristics

(source: Steve McComas, Blue Water Science, unpublished)

Light Growth Conditions



Plants rarely reach the surface.

Navigation and recreational activities are not generally hindered.

Stem density: 0 - 160 stems/m^2
Biomass: 0 - 50 g-dry wt/m^2
Estimated TP loading: <1.7 lbs/ac

MnDNR rake sample density equivalent for light growth conditions: 1, 2, or 3.

Moderate Growth Conditions

Broken surface canopy conditions.

Navigation and recreational activities may be hindered.

Lake users may opt for control.

Stem density: 100 - 280 stems/m^2
Biomass: 50 - 85 g-dry wt/m^2
Estimated TP loading: 2.2 - 3.8 lbs/ac

MnDNR rake sample density equivalent for moderate growth conditions: 2, 3 or sometimes, 4.

Heavy Growth Conditions

Solid or near solid surface canopy conditions.

Navigation and recreational activities are severely limited.

Control is necessary for navigation and/or recreation.

Stem density: 400+ stems/m^2
Biomass: >300 g-dry wt/m^2
Estimated TP loading: >6.7 lbs/ac

MnDNR rake sample density has a scale from 1 to 4. For certain growth conditions where plants top out at the surface, the scale has been extended: 4.5 is equivalent to a near solid surface canopy and a 5 is equivalent to a solid surface canopy. Heavy growth conditions have rake densities of a 4 (early to mid-season with the potential to reach the surface), 4.5, or 5.