



Curlyleaf Pondweed Growth on April 27, 2010 on Prior Lake

Upper and Lower Prior Lakes, Scott County, Early Season Curlyleaf Pondweed Assessment for 2010

Assessment Dates: April 27 (57°F) and June 2, 2010 (75°F)

Prepared for:
Prior Lake/Spring Lake Watershed District
Prior Lake, Minnesota

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

January 2011

Aquatic Plant Assessments for Prior Lake, Scott County, Minnesota, 2010

Summary

Overview: Based on curlyleaf pondweed data gathered on April 27 (Figure 1), it appears several areas around Lower and Upper Prior Lakes could produce heavy curlyleaf growth by the middle of June. A curlyleaf assessment on June 2, 2010 found several areas had heavy growth (Figure 2). No open water treatments were conducted in 2010, 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 (Figure 3). Shoreline treatments will control most of the heavy growth that restricts navigation.

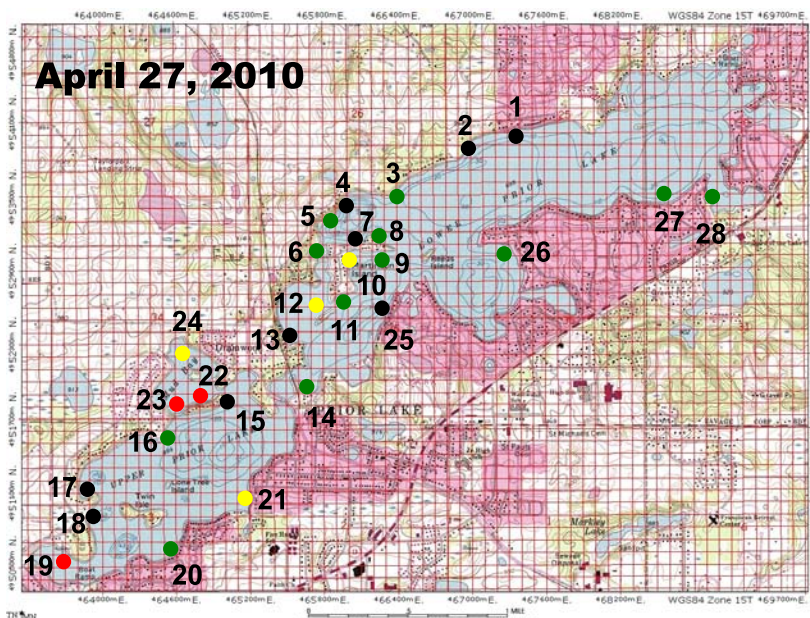


Figure 1. Map of curlyleaf pondweed assessment sample areas for April 27, 2010. Colored sample areas indicate growth conditions in late April - early May of 2010 for curlyleaf pondweed. Black = no curlyleaf; Green = no problem or light growth; Yellow = moderate growth; Red = heavy growth.

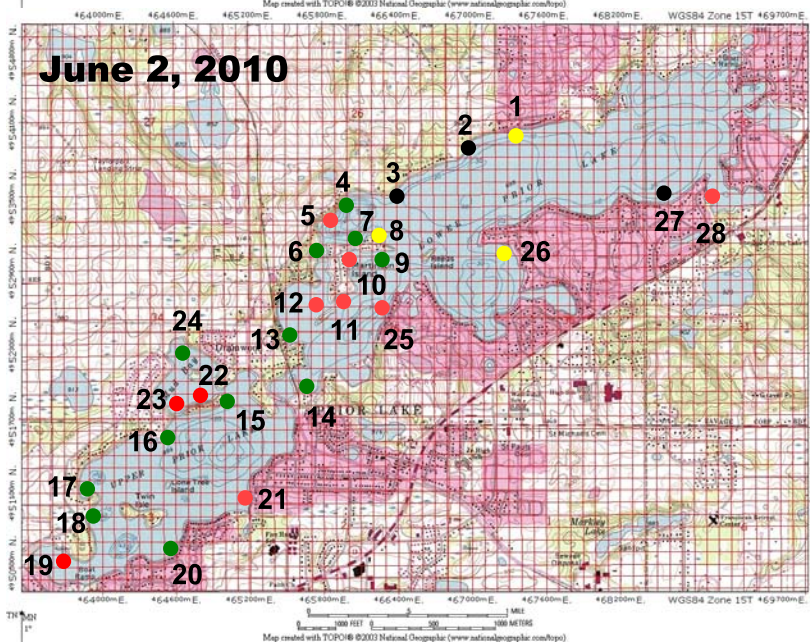


Figure 2. Map of curlyleaf pondweed assessment sample areas for June 2, 2010. Colored sample areas indicate growth conditions in late June, 2010 for curlyleaf pondweed. Black = no curlyleaf; Green = no problem or light growth; Yellow = moderate growth; Red = heavy growth.

Recommendations for 2011: For Lower Prior, the Martinson Island area had heavy growth in 2009 and 2010. Between the channel and open water areas about 5 to 10 acres of curlyleaf could be considered for treatment.

For Upper Prior, Mud Bay, also had heavy growth in 2009 and 2010. Approximately 10 acres of matted curlyleaf growth was observed. Areas along the undeveloped shoreline are a low priority while the shoreline area with houses is a higher priority for treatment. Approximately 5 to 10 acres of curlyleaf could be treated in Mud Bay.

Growth conditions in the future will be influenced to some degree by lake levels. If the Prior Lakes come up a foot or two, curlyleaf growth could be diminished. Plant assessments in May are recommended to evaluate curlyleaf conditions.

Table 1. Aquatic plant stem densities based on rake sampling for April 27, 2010 and June 2, 2010. Densities are based on a scale from 1 to 5 with 5 being the densest.

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

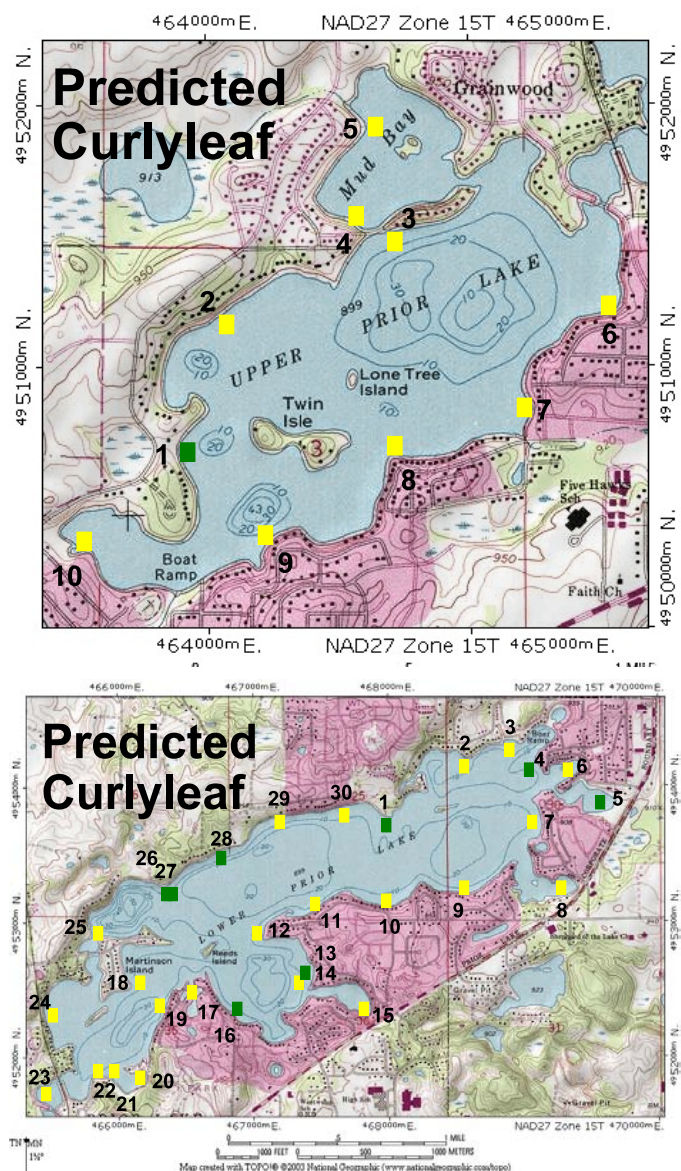


Figure 3. Predicted curlyleaf pondweed growth is based on lake sediment characteristics. Green squares = light growth; yellow squares = moderate growth.

Curlyleaf Pondweed Surveys for Prior Lake (Upper and Lower for 2010)

April Curlyleaf Pondweed Assessment in Prior Lake

A total of 28 sites were monitored with rake sampling on April 27, 2010. Curlyleaf was found at 19 sample sites out of the 28 that were monitored (Table 1). At 8 of the sites, curlyleaf is expected to grow to the surface.

Table 1. Aquatic plant stem densities based on rake sampling for April 27, 2010. Densities are based on a scale from 1 to 5 with 5 being the densest.

Site	Depth (ft)	Prior Lake - April 27, 2010						Notes
		Chara	Coontail	Curlyleaf Pondweed		Flatstem Pondweed	Northern Watermilfoil	
				density	stems			
1	8	1					1	
2	5	1	1				1	
3	10			2	3	1		Could be problem but a narrow band.
4	9							
5	6.5			1	1.5			
6	8			1	2.5			150 feet from shore. Patchy.
7								Patchy curlyleaf growth, rocky, potentially good zebra mussel area.
8	5			1	4.5			Patchy CLP growth.
9	7			2	6			Moderate growth.
10	9			3	2			120 feet from shore. 1-5 acres of potential problems.
11	10			2	5 - 8			150 feet from shore. 1-3 acres.
12				3	12			12 stems on rake, 1-2 feet long.
13	9		1					
14	10			2	7			
15	8							
16				2	7			
17	10							
18	10							
19	5			4	20			Up to 8-10 acres but by the boat ramp not a problem.
20	8			2	6			Within 150 feet of shore.
21				3	11			10-12 stems/rake will be heavy growth.
22	4.5			4	8			Mud Bay: CLP to surface.
23	5			4	12			Mud Bay: good part of the bay will be socked in with plants.
24	5			3	1 - 7			Dense but spotty plant growth in this area.
24.5	5			3	3			
25								
26	9	1		2	4			150 feet from shore, moderate growth.
26.5	11							Moderate growth.
27	8			2	6			Moderate to heavy growth.
28	7			2	7			Moderate to heavy growth.

Curlyleaf Conditions in Lower Prior Lake, April 27, 2010



0 130 260 520 780 1,040 Meters

Site 12, left side CLP area: 1.3 ac
Site 11, right side CLP area: 1.6 ac
(site numbers refer to areas in Table 1 and labeled areas on maps in the summary)



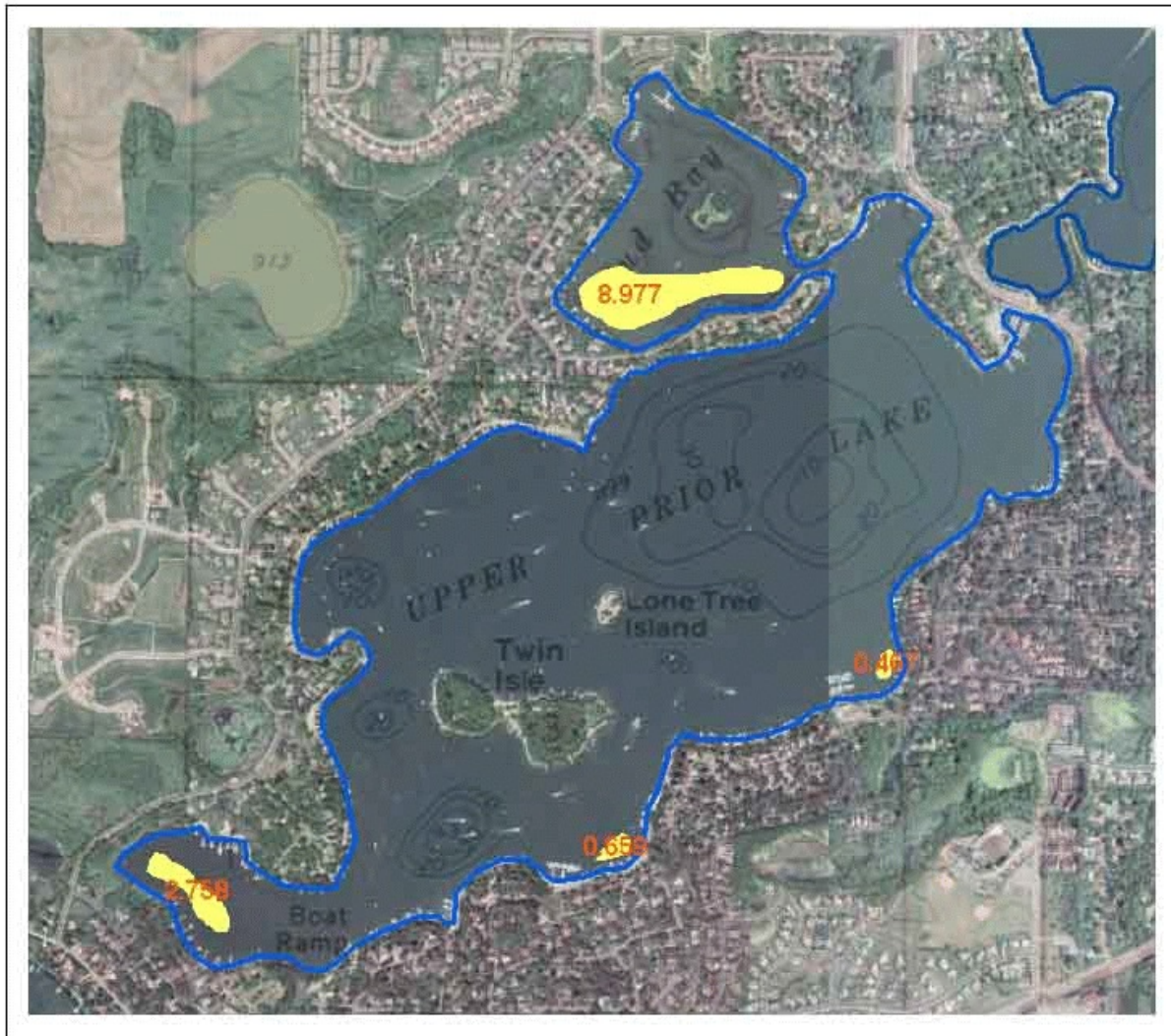
Legend

-  Prior_CLP
-  Lower_Prior

UTM NAD 83
May 3, 2010
Blue Water Science

Figure 1. Potential treatment areas for Lower Prior Lake based on the April 27, 2010 assessment.

Curlyleaf Conditions in Upper Prior Lake, April 27, 2010



0 112.5 225 450 675 900 Meters

Site 22, 23, Mud Bay: 9 ac
 Site 19, left of boat ramp: 2.8 ac
 Site 20, south of Twin Isle: 0.6 ac
 Site 21, East of Twin Isle: 0.5 ac
 (site numbers refer to areas in Table 1 and labeled areas on maps in the summary)



Legend

- Upper_Prior
- Prior_CLP

UTM NAD 83
 May 3, 2010
 Blue Water Science

Figure 2. Potential treatment areas for Upper Prior Lake based on the April 27, 2010 assessment.

Curlyleaf Conditions in Prior Lakes, April 27, 2010



Figure 3. Curlyleaf pondweed was found around Prior Lake on April 27, 2010. Here curlyleaf was at a density of a “3” [top photo] and at a density of a “2” [bottom photo]. Typical curlyleaf density of a “2” found in Lower Prior.

June Curlyleaf Pondweed Assessment in Prior Lake

A total of 28 sites were monitored with rake sampling on June 2, 2010. Curlyleaf was found at 25 sample sites out of the 28 that were monitored (Table 2). At 8 of the sites, curlyleaf is expected to grow to the surface.

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

Site	Depth (ft)	Depth of Plants Below Surface (ft)	Prior Lake - June 2, 2010										Notes		
			Cabbage	Clasping-leaf	Coontail	Curlyleaf Pondweed		Eurasian Water-milfoil	Flatstem Pondweed	Northern Water-milfoil	Stringy Pondweed	Water Celery		Water Stargrass	
						density	stems								
1	10	2 - 3				3									
2	8									1		2	1		
3	7			1					1	1					
4	10	8				1			1						
5	12	5 - 6				4									
6	8	4 - 5	1			2			1						
7	12	6				2									
8	10	3				3	20		1		2				
9	10	5				2									
10						5									
11	11	2 - 3				4.5									
11.5	8	2				4									2 out of 3 homeowners treated?
12	10	2 - 3				4									
13	9	1 - 2				2									Treated?
14	10					1									
15	8					1									
16	10	5				2									
17	9					0.5		1							Treated?
18	10					1		1							
19	6				2	4.5									4 acres of EWM topping out
20	9	3 - 5				2									½ acre of curlyleaf topping out
21	6					5		1							
22	6					5									Treated?
23	6					5		1							Treated?
24						2		1							Treated?
25	11	3 - 4				4									
26	11	4 - 5				3.5									
26.5	12	10				2									
27	11										1				
28	8	0.5				4		4							

Curlyleaf Conditions in Prior Lakes, June 2, 2010



Figure 4. Curlyleaf pondweed was found around Prior Lake on June 2, 2010. Here curlyleaf was at a density of a “3” [top photo] and at a density of a “4” [bottom photo]. Here curlyleaf is at a density of a “5”.

Curlyleaf Pondweed Growth from April to June, 2010

Curlyleaf growth increased from April to June at all 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 10 in Lower Prior and Sites 22, 23, and 24 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 April 27, 2010 and June 2, 2010. Densities are based on a scale from 1 to 5 with 5 being the densest.

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

Comparison of 2009 and 2010 Curlyleaf Conditions

Lower Prior Lake



June 10, 2009



June 2, 2010

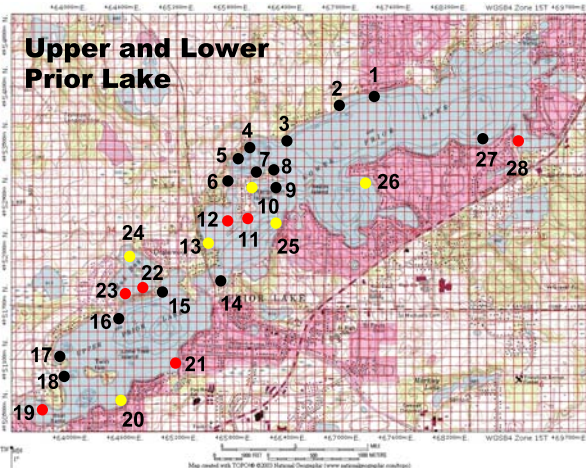
Upper Prior Lake



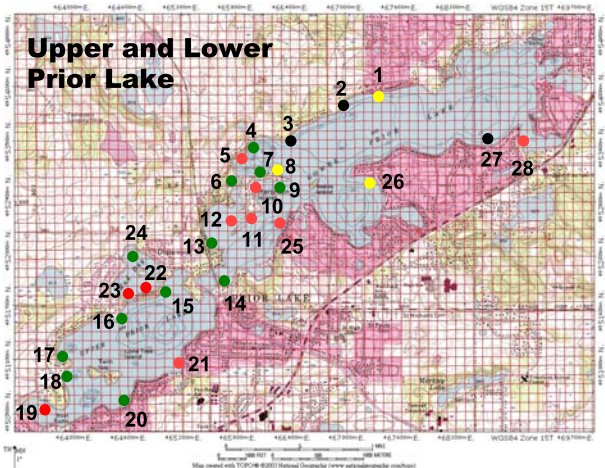
June 10, 2009



June 2, 2010



June 10, 2009



June 2, 2010

Figure 5. [top and middle] Lower and Upper Prior Lakes conditions in June 2009 and 2010. [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

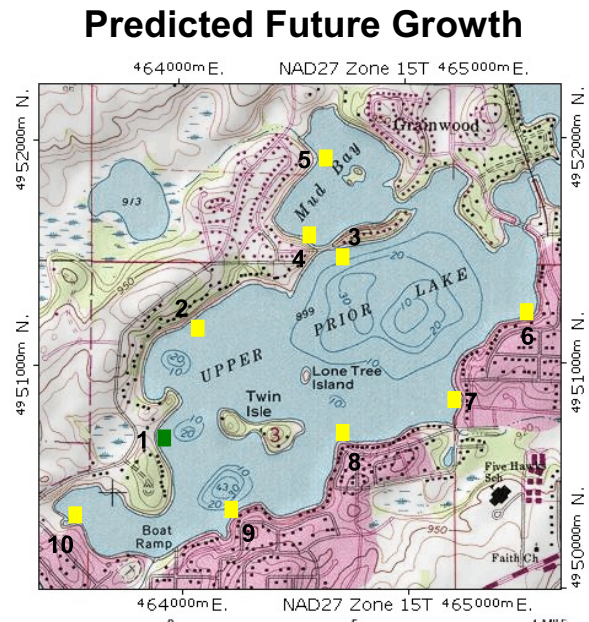


Figure 6. Sediment sample locations are shown with a square. The square color indicates the potential for nuisance curlyleaf pondweed to occur at that site. Key: green = light; yellow = moderate; red = heavy potential.

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

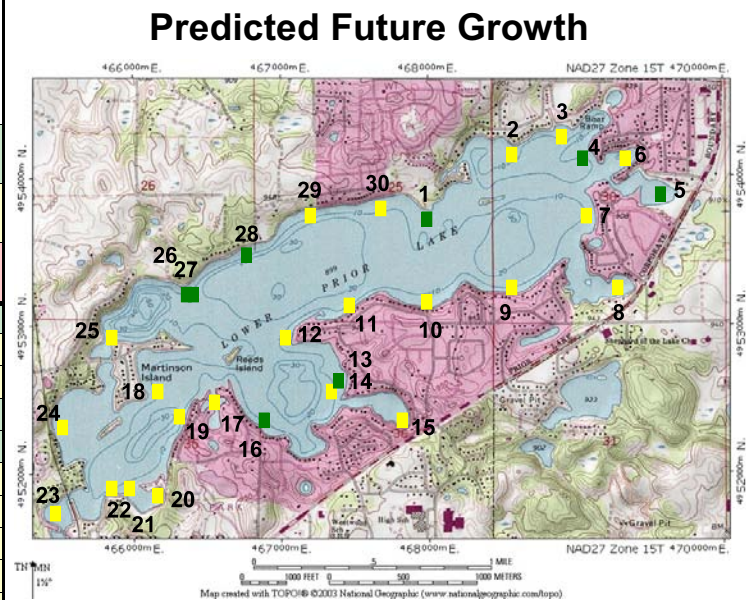


Figure 7. Sediment sample locations are shown with a square. The square color indicates the potential for nuisance curlyleaf pondweed to occur at that site. Key: green = light; yellow = moderate; red = heavy potential.

Curlyleaf Pondweed Growth Characteristics

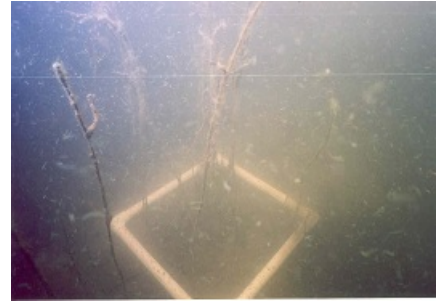
(source: Steve McComas, Blue Water Science, unpublished)

Light Growth Conditions

Plants rarely reach the surface.

Navigation and recreational activities are not generally hindered.

Stem density: 0 - 160 stems/m²
Biomass: 0 - 50 g-dry wt/m²
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/m²
Biomass: 50 - 85 g-dry wt/m²
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/m²
Biomass: >300 g-dry wt/m²
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.