Curlyleaf Pondweed Growth on May 29, 2012 on Prior Lake

Upper and Lower Prior Lake, Scott County, Early and Late Season Curlyleaf Pondweed Assessments for 2012

Assessment Dates: April 6 and May 29, 2012
(Water Temperatures were 58°F and 67°F respectively)

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Summary

Curlyleaf pondweed distribution and abundance were initially evaluated on April 6, 2012. Based on the curlyleaf pondweed densities on both Upper and Lower Prior, several areas were delineated as having the potential for heavy curlyleaf growth later in the spring.

Curlyleaf was fairly widespread in April (Figure A) and although the density was mostly light in April, there was the potential for heavy curlyleaf growth in some areas by June. Curlyleaf areas delineated in 2012 totaled 32 acres.

A follow-up curlyleaf assessment was conducted on May 29, 2012. The May 29 curlyleaf assessment found an increase in distribution and abundance compared to the April 6 assessment (Figure B).

It appears, if weather conditions are mild in early spring, an herbicide application in 2013 may be needed to reduce heavy growth of curlyleaf in Upper and Lower Prior Lake.

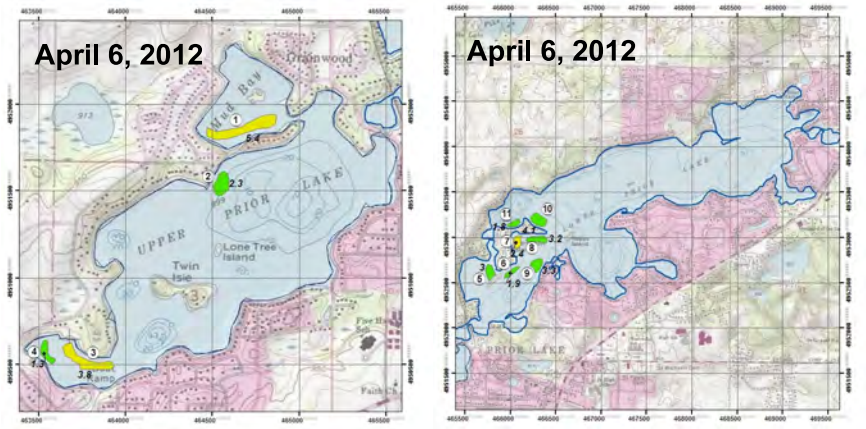


Figure A. Map of curlyleaf pondweed assessment sample areas for April 6, 2012. Colored sample areas indicate the growth for curlyleaf pondweed. Green = light growth of curlyleaf pondweed; Yellow = moderate growth; Red = heavy growth.

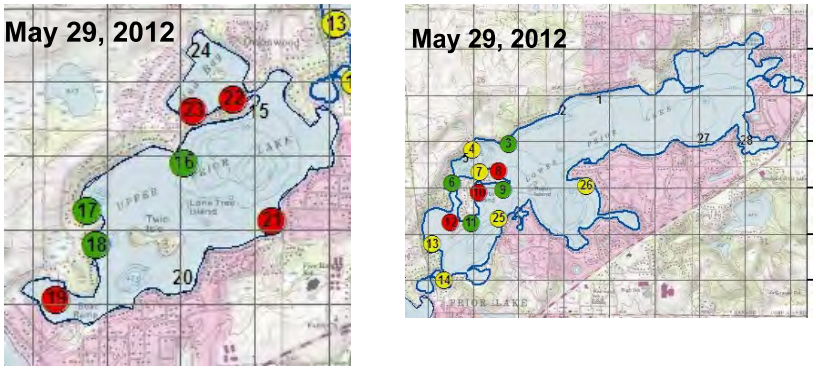


Figure B. Map of curlyleaf pondweed assessment sample areas for May 29, 2012. Colored sample areas indicate the growth in late May, 2012 for curlyleaf pondweed. Green = light growth of curlyleaf pondweed; Yellow = moderate growth; Red = heavy growth.

Upper Prior, Scott County (70-007200)
Lake area: 386 ac
Littoral area: 329 ac
CLP delineation in April: 12.8 ac

Lower Prior, Scott County (70-002600)
Lake area: 957 ac
Littoral area: 373 ac
CLP delineation in April: 19.7 ac

Summary (concluded)

Curlyleaf Planning for 2013: Treating heavy growth of curlyleaf pondweed based on early season curlyleaf distribution is a challenge. Curlyleaf in April and early May has just started to go into a rapid growth phase. However, not all early season curlyleaf growth will result in heavy curlyleaf growth in late May and June. It appears there are factors that limit curlyleaf growth and significant variables are associated with sediment conditions. The question is how to best delineate areas to treat what could be heavy growth in June but not overtreat areas where growth wouldn't be a nuisance for the season.

Currently, for Upper and Lower Prior Lake, the method has been to use past CLP growth history combined with early season scouting. Then if curlyleaf growth has indications of producing potential heavy growth, those areas are delineated and treatment is considered. That is the approach to be considered for 2013.

Example of heavy growth of curlyleaf pondweed in Upper Prior Lake on May 29, 2012.

Example of heavy growth of curlyleaf pondweed in Lower Prior Lake on May 29, 2012.

Upper and Lower Prior Lake, Scott County, Early and Late Season Curlyleaf Pondweed Assessments for 2012

Introduction and Methods

Upper and Lower Prior Lake combined has an area of 1,343 acres with a total littoral area of 732 acres (MnDNR). An initial curlyleaf pondweed assessment was conducted on April 6, 2012 and a follow-up curlyleaf pondweed assessment was conducted on May 29, 2012 to characterize the status of curlyleaf pondweed at it's peak growing period. Sample sites are shown in Figure 1 and sites were selected based on areas where curlyleaf had been found over the last 5 years. A chart showing examples of curlyleaf growth conditions are shown on the next page.

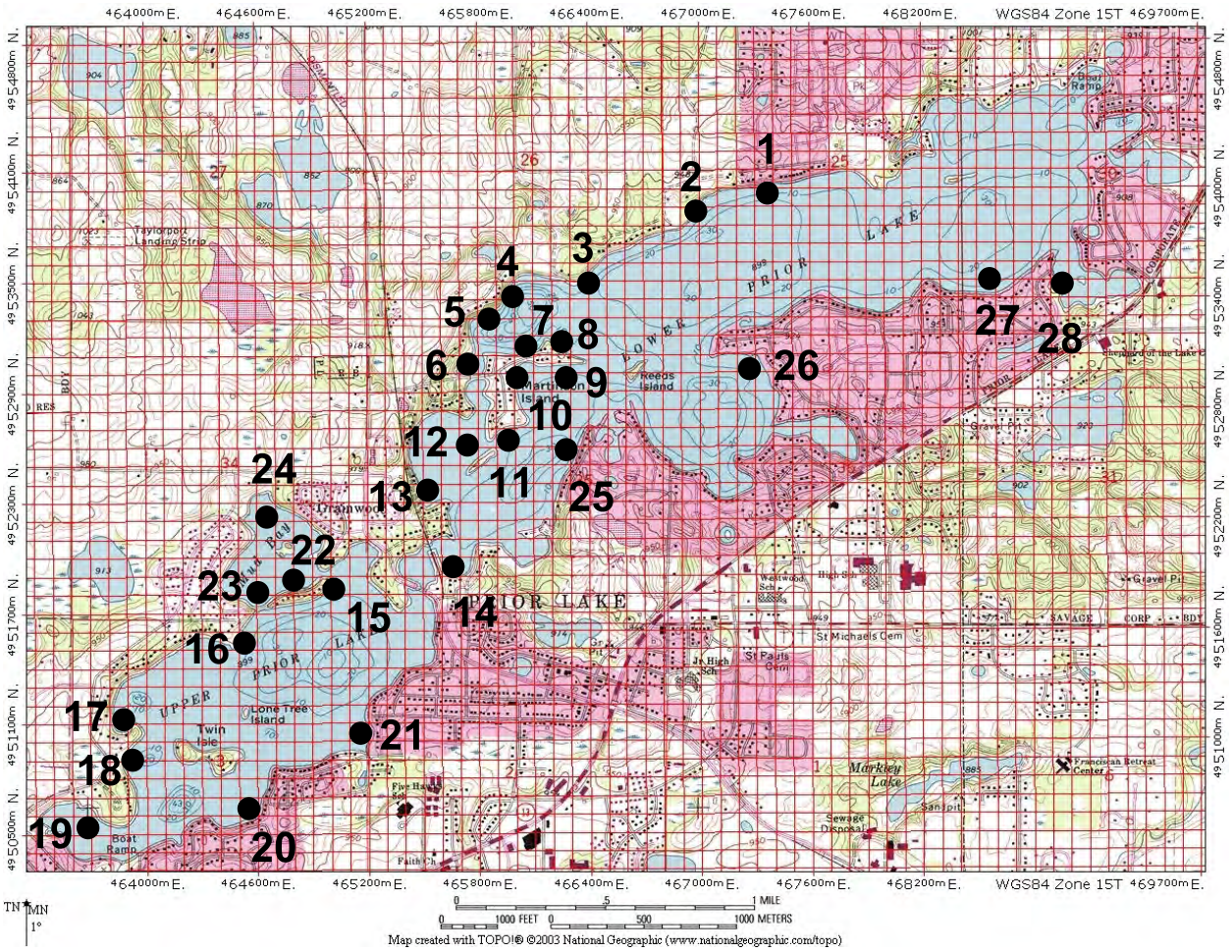
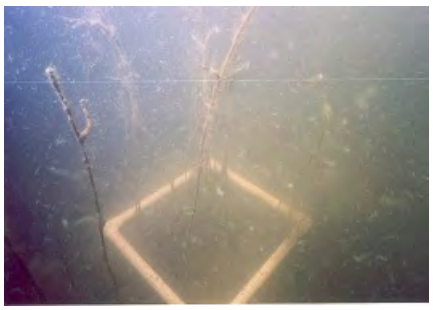


Figure 1. Sites of curlyleaf assessment sampling are shown on a lake map with 100-meter grid spacings. UTM coordinates are shown on the borders.

Methods: Curlyleaf pondweed densities are represented on a scale of 1 to 5 with 5 being densest.

Light Growth Conditions



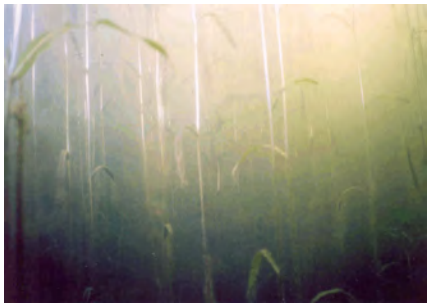
Plants rarely reach the surface.

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.

Curlyleaf Pondweed Assessment on April 6, 2012 in Upper and Lower Prior Lake

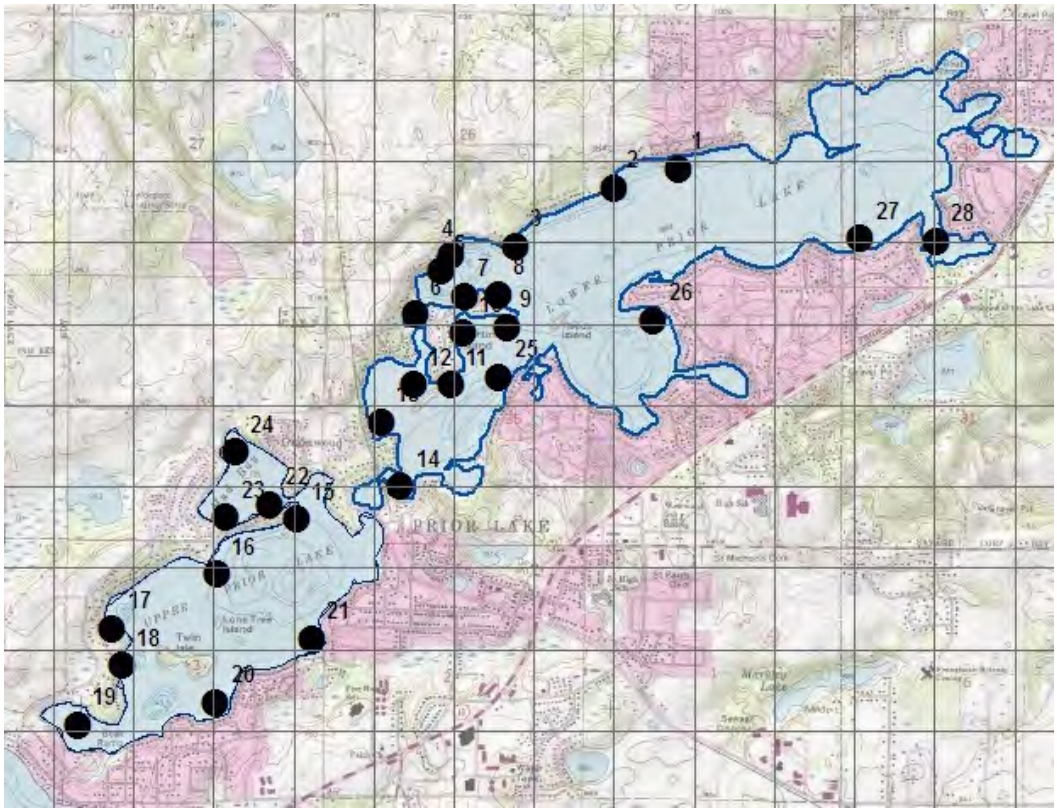
A total of 28 sites around Upper and Lower Prior Lake were monitored with rake sampling on April 6, 2012. Curlyleaf was found at low to moderate densities at 11 out of 28 areas. A total of 32.5 acres of curlyleaf were delineated as having the potential to develop moderate to heavy growth conditions by June. It was estimated that there would be heavy growth covering 11.6 acres based on April 6 stem densities (Table 1 and Figures 2-4).

Table 1. Aquatic plant densities based on rake sampling for April 6, 2012. Densities are based on a scale from 1 to 5 with 5 being the densest. Curlyleaf stems per rake sample were also noted. Areas with green shading are predicted to have light to moderate growth at the peak of the curlyleaf growth cycle. Areas with yellow shading are predicted to have moderate to heavy curlyleaf growth.

Area	Depth (ft)	Curlyleaf pondweed	*Curlyleaf stems on the rake sampler*	Chara	Claspingleaf	Coontail	No plants
1	6			2			
2	6			2			
3	6	1	*1*				
	10						1
4	6						1
	8						1
5	6					1	
6	6	1	*1*				
7	7	1	*1*				
8	8	1	*2*				
9	8	1	*3*			2	
	9	1	*3*				
10	6	1	*6*				
11	2	1	*4*				
	4						1
	6	1	*3*				
	8	1	*1*				
	9	1	*1*				
12	6	1	*1*				
	10	1	*1*				
13		1	*2*				
	10						1
	10					1	
	11						1
14							1
15	13						1
16		1	*1*				
	10						1
17	10						1
18	9						1
	10						1

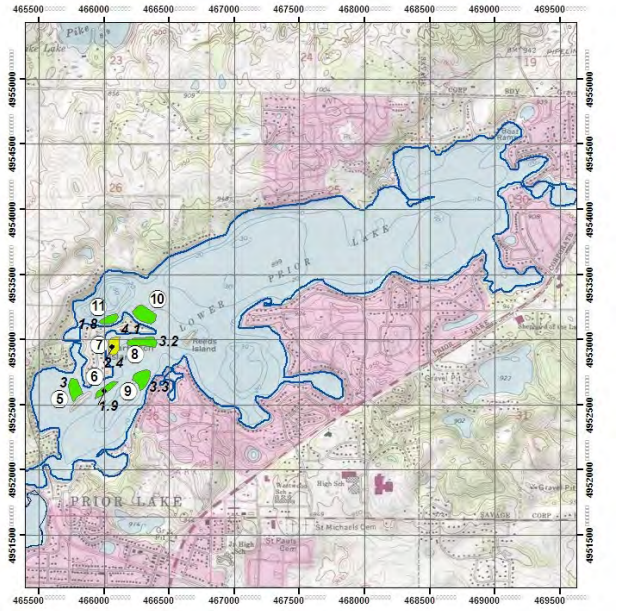
Table 1. Concluded.

Area	Depth (ft)	Curlyleaf pondweed	*Curlyleaf stems on the rake sampler*	Chara	Claspingleaf	Coontail	No plants
19		1	*4*				
	4					2	
	4	1	*1*				
	5	1	*3*				
	4	2	*9*			3	
	4					2	
	5	2	*9*				
	5	2					
	6	2	*11*				
	7						1
	7	1	*1*		1		
	8						1
20	7						1
21	6	1	*1*				
	9						1
22	4	3	*18*				
23	4.5	1	*6*				
24	8						1
24.5	7						1
25	7	1	*3*				
	9						1
26	6						1
	9	1	*3*			2	
27	8						1
28	7					2	



Prior Lake sample site map.

Curlyleaf Conditions in Upper and Lower Prior Lake, April 6, 2012



Upper Prior, Scott County (70-007200)
Lake area: 386 ac
Littoral area: 329 ac

Upper Prior: total clp acres: 12.8 acres. Green shaded areas = 3.6 acres and yellow shaded areas = 9.2 acres

Lower Prior, Scott County (70-002600)
Lake area: 957 ac
Littoral area: 373 ac

Lower Prior: total clp acres: 19.7 acres. Green shaded areas = 17.3 acres and yellow shaded areas = 2.4 acres.

Water temperature on April 6, 2012: 58^{o}F

Larger lake maps are shown in Figures 3 and 4.

Curlyleaf pondweed density of 1.

Curlyleaf pondweed density of 2.

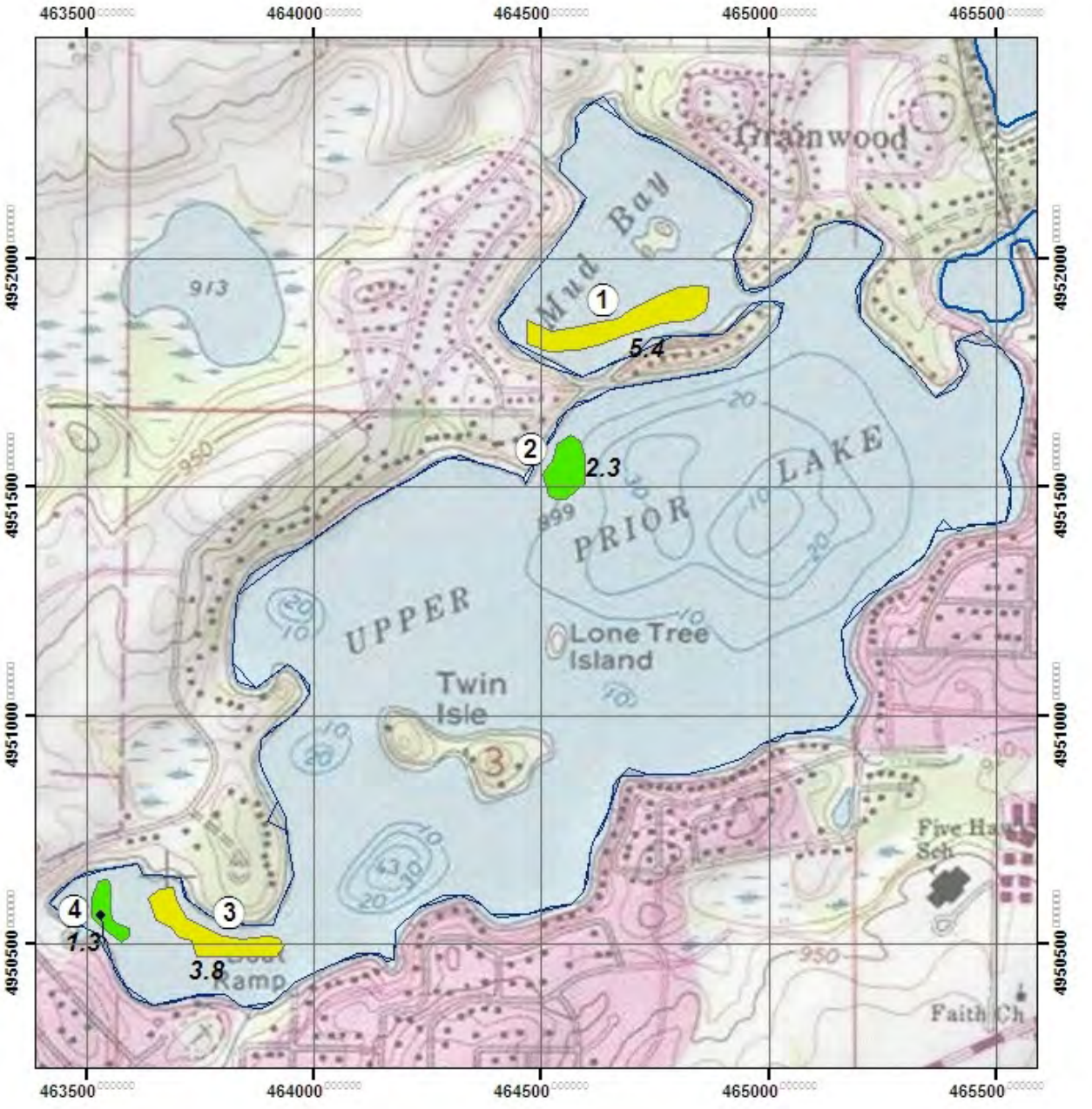


Figure 3. Upper Prior Lake curlyleaf delineation. Areas 1 and 3 have the potential to produce heavy curlyleaf growth in June. The other two areas, Areas 2 and 4 are expected to produce light to moderate growth.

Table 2. Curlyleaf areas.

Area	Curlyleaf Acres	Curlyleaf Density
1	5.4	2
2	2.3	1
3	3.8	2
4	1.3	1
TOTAL	12.8	--

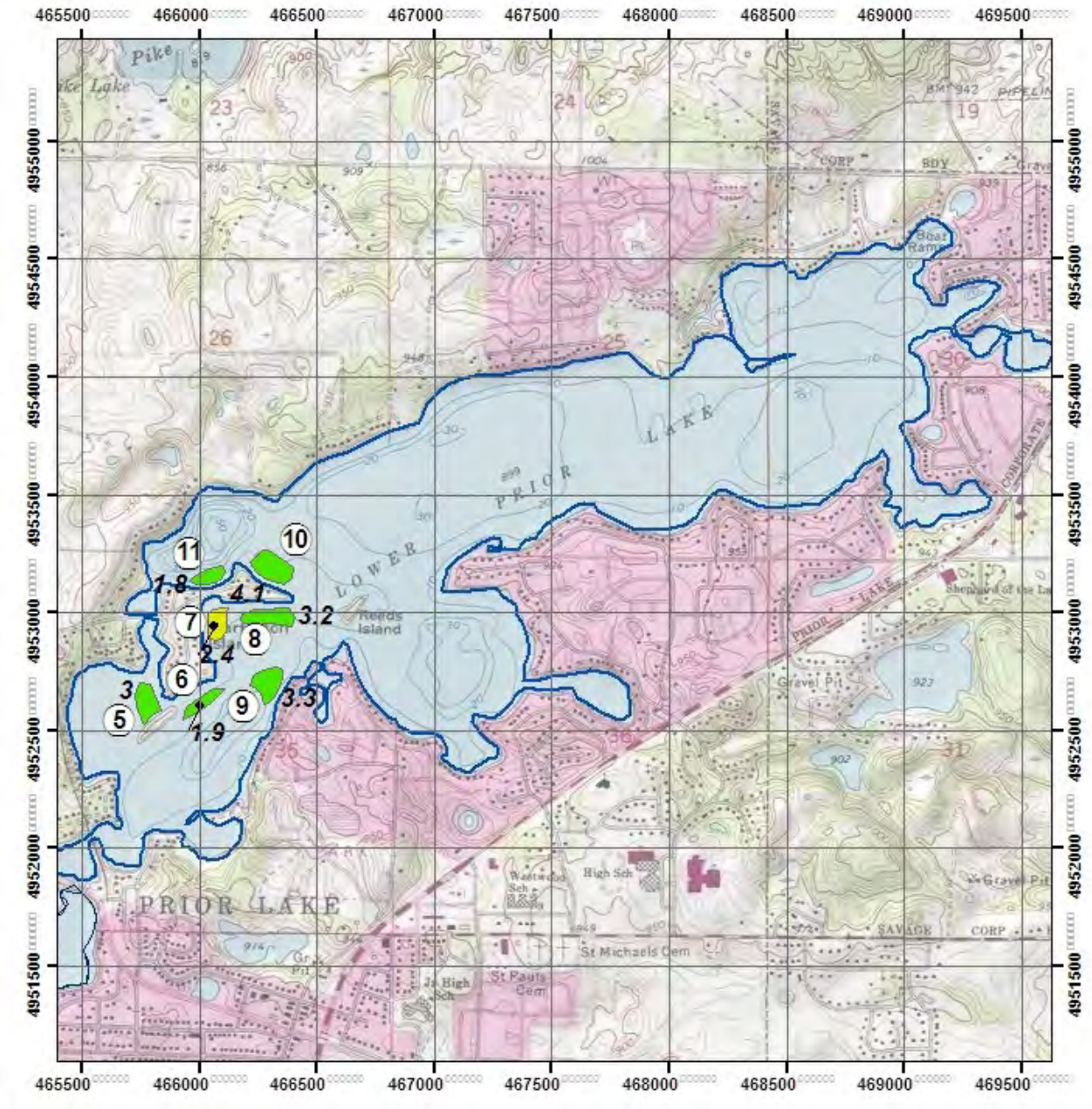


Figure 4, Lower Prior Lake curlyleaf delineation. Area 7, Martinson Island, has the potential for about 2.4 acres of heavy curlyleaf growth. The other areas of curlyleaf growth are expected to have light growth based on stem densities in the April 6 assessment.

Table 3. Curlyleaf areas.

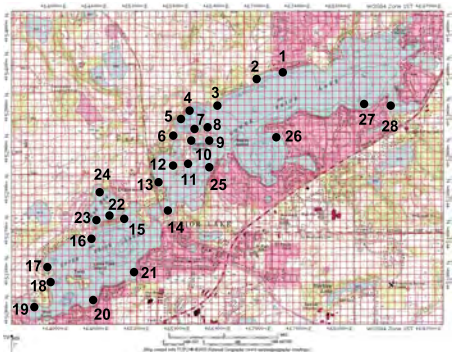
Area	Curlyleaf Acres	Curlyleaf Density
5	3.0	1
6	1.9	1
7	2.4	2
8	3.2	1
9	3.3	1
10	4.1	1
11	1.8	1
TOTAL	19.7	

Curlyleaf Pondweed Assessment on May 29, 2012 in Upper and Lower Prior Lake

A total of 27 sites around Upper and Lower Prior Lake were resampled with rake sampling on May 29, 2012. Curlyleaf was found at low to moderate densities at 15 out of 27 areas. Curlyleaf was found at high densities at 7 out of 27 areas. A total of 32 acres of curlyleaf was delineated in April and in June, it is estimated that there was moderate to heavy growth covering about 25 acres based on May 29 stem densities (Table 4 and Figures 5-7).

Table 4. Aquatic plant densities based on rake sampling for May 29, 2012. Densities are based on a scale from 1 to 5 with 5 being the densest. Curlyleaf stems per rake sample were also noted. Areas with green shading had light to moderate growth at the peak of the curlyleaf growth cycle. Areas with yellow shading had moderate growth and areas with red shading had heavy curlyleaf growth.

Site	Depth (ft)	Curlyleaf pondweed	*Curlyleaf stems on the rake sampler*	Clasping-leaf	Eurasian watermilfoil	Illinois pondweed	Stringy pondweed	Water celery	No plants
1									
2	8						1	2	
3		1	*1*	1					
4		3	*20*						
5	9			1			1		
6	5	1	*3*			2			
7	7	3		1			1		
8		4							
9		2	*10*						
10	11	4							
11		2	*9*						
12		4							
13		3	*18*						
14	7	3							
15	8				2				
16	7	2	*10*						
17	9	1	*7*						
18	9	1	*6*						
19		5							
20	10								X
21	9	4.5							
22	6	3							
		4							
23		5							
24	6								X
25	8	3	*25*						
26	8	3					1		
	10	3			1				
27	11						1		



Curlyleaf Conditions in Upper and Lower Prior Lake, May 29, 2012

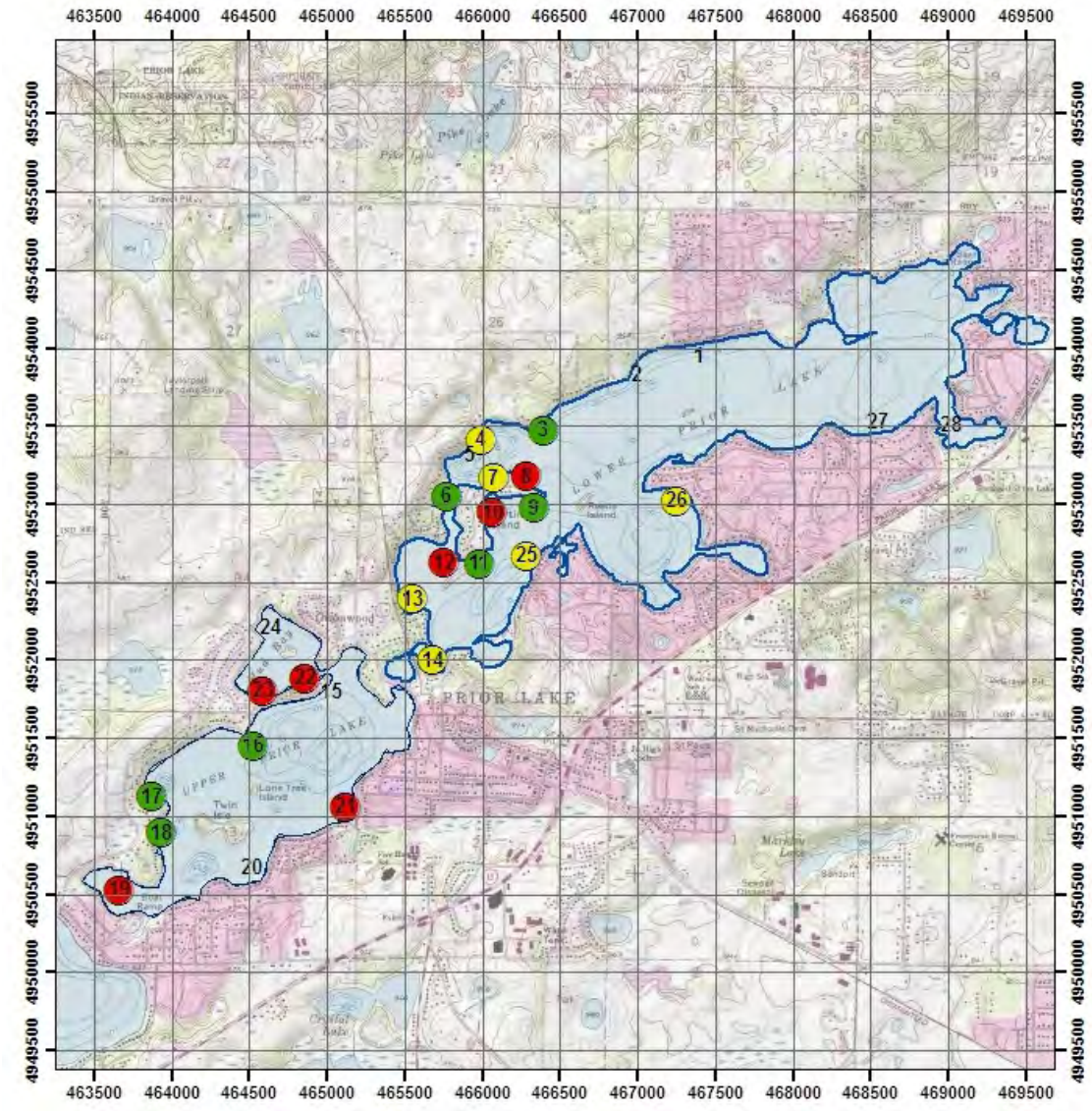


Figure 5. Curlyleaf density on May 29, 2012.

Curlyleaf pondweed density of 1.

Curlyleaf pondweed density of 3.

Zebra mussels were found growing on curlyleaf pondweed during the May 29 assessment.

Comparison of Early Season to Late Season Curlyleaf Growth

Mostly light growth of curlyleaf pondweed was found in the April 6 assessment (Table 7). A curlyleaf reassessment on May 29, 2012 found curlyleaf to be growing at a range of densities, from light to heavy with several sites displaying heavy growth (Table 7 and Figure 6).

Table 7. Comparison of curlyleaf pondweed stem densities based on rake sampling for April 6 and May 29, 2012. Densities are based on a scale from 1 to 5 with 5 being the densest.

site	April 6, 2012	May 29, 2012
1		
2		
3	1	1
4		3
5		
6	1	1
7	1	3
8	1	4
9	1	2
	1	
10	1	4
11	1	2
	1	
	1	
	1	
12	1	4
	1	
13	1	3
14		3
15		
16	1	2
17		1
18		1
19	1	5
	1	
	1	
	2	
	2	
	2	
	2	
	1	
20		
21	1	4.5
22	3	3
		4
23	1	5
24		
24.5		
25	1	3
26		3
	1	3
27		
28		
Average	**1.2**	**2.9**
occurrence (28 samples)	**16**	**20**
Percent occurrence	**57**	**71**

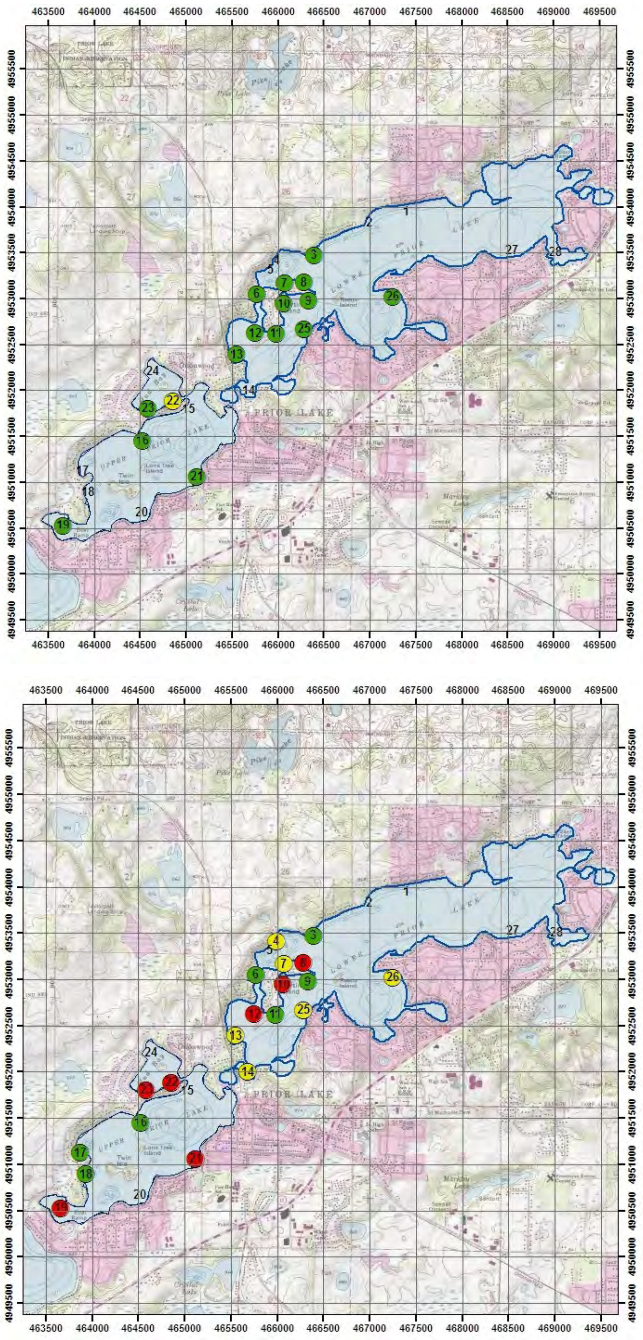


Figure 6. Maps of curlyleaf pondweed distribution are shown on the top (April 6, 2012) and bottom (May 29, 2012) maps.

Curlyleaf Planning for 2013: Treating heavy growth of curlyleaf pondweed based on early season curlyleaf distribution is a challenge. Curlyleaf in April and early May has just started to go into a rapid growth phase. However, not all early season curlyleaf growth will result in heavy curlyleaf growth in late May and June. It appears there are factors that limit curlyleaf growth and significant variables are associated with sediment conditions. The question is how to best delineate areas to treat what could be heavy growth in June but not overtreat areas where growth wouldn't be a nuisance for the season.

Currently, for Upper and Lower Prior Lake, the method has been to use past CLP growth history combined with early season scouting. Then if curlyleaf growth has indications of producing potential heavy growth, those areas are delineated and treatment is considered. That is the approach to be considered for 2013.

Example of heavy growth of curlyleaf pondweed in Upper Prior Lake on May 29, 2012.

Example of heavy growth of curlyleaf pondweed in Lower Prior Lake on May 29, 2012.