



Curlyleaf Pondweed Growth on May 17, 2013 on Prior Lake

Curlyleaf Pondweed Delineation and Assessment Surveys for Upper and Lower Prior Lake, Scott County, 2013

Delineation: May 17, 2013

Herbicide Treatment: May 24, 2013

Assessment Dates: May 17 and June 24, 2013

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



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Curlyleaf Pondweed Delineation and Assessment Surveys for Upper and Lower Prior Lake, Scott County, 2013

Summary

Curlyleaf pondweed (CLP) distribution and abundance were initially evaluated on May 17, 2013. 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 (Figure S1).

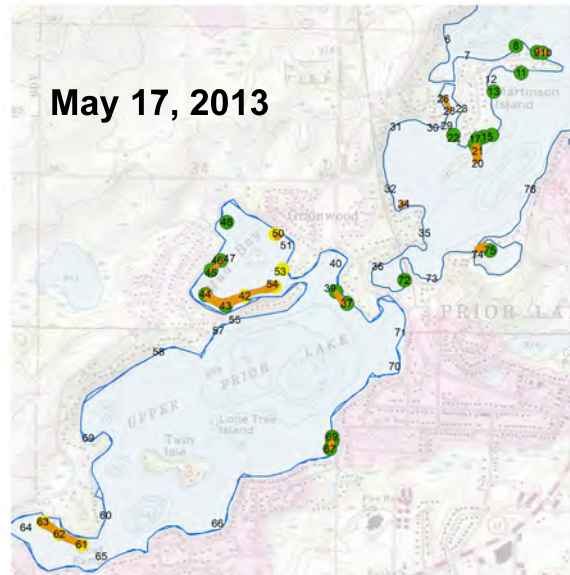
Curlyleaf was fairly widespread in May (Figure S2) and although the density was mostly light in May, there was the potential for heavy curlyleaf growth in some areas by June. Curlyleaf areas delineated on May 17, 2013 totaled 12.9 acres.

However, when curlyleaf pondweed treatment was conducted on May 24, 2013, CLP growth had expanded and a total of 23 acres were treated including 15 acres in Upper Prior and 8 acres in Lower Prior (Figure S3). Lake Restoration conducted the treatment.

A follow-up curlyleaf assessment was conducted on June 24, 2013. The June 24 curlyleaf assessment found, in the treated areas, the distribution and abundance of CLP was mostly controlled (Figure S4).



Figure S1. Curlyleaf pondweed was sampled in Prior Lake on May 17, 2013. Here curlyleaf pondweed is sampled at a density of a 2.



Prior Lake CLP Treatment Tracks 2013

Figure S2. DELINEATION: Map of curlyleaf pondweed delineation sites for May 17, 2013. Key: Green circles = light growth and yellow circles = moderate growth. Orange shading = proposed CLP treatment areas.

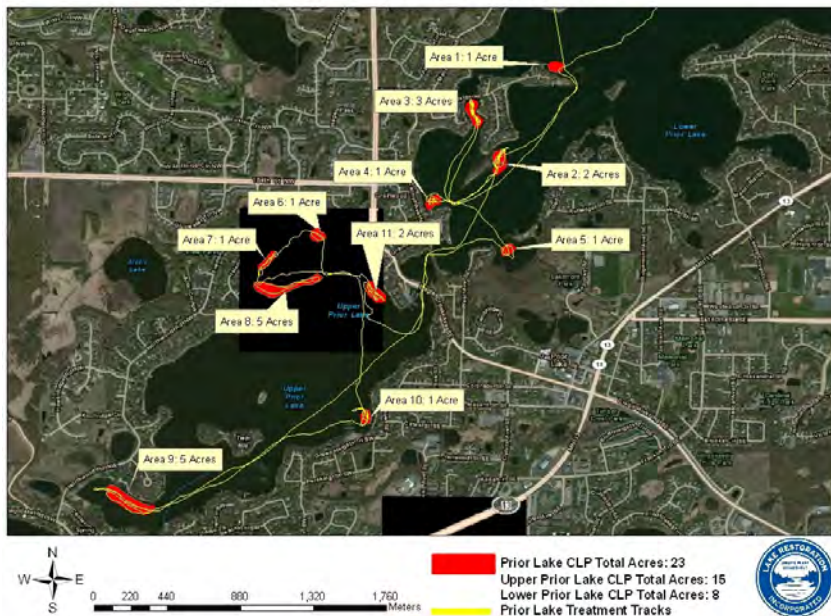


Figure S3. TREATMENT: Prior Lake curlyleaf pondweed treatment areas May 24, 2013. A total of 23 acres were treated using about 95 gallons of Aquathol K.

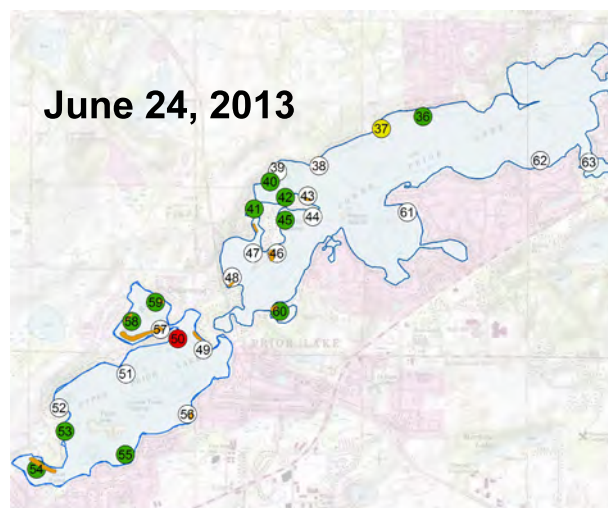


Figure S4. ASSESSMENT: Map of curlyleaf pondweed assessment sites for June 24, 2013. Colored sample areas indicate the growth in June, 2013 for curlyleaf pondweed. Key: Green = light growth, yellow = moderate growth and red = heavy growth. White = no CLP.

Summary (concluded)

Curlyleaf Planning for 2014: Treating heavy growth of curlyleaf pondweed based on early season curlyleaf distribution is a challenge. Curlyleaf in April and 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 2014.



Example of heavy growth of curlyleaf pondweed in Prior Lake on May 17, 2013.



Example of heavy growth of curlyleaf pondweed in Prior Lake on June 24, 2013.

Curlyleaf Pondweed Delineation and Assessment Surveys for Upper and Lower Prior Lake, Scott County, 2013

Introduction and Methods

Upper and Lower Prior Lakes combined have an area of 1,343 acres with a total littoral area of 732 acres (MnDNR). An initial curlyleaf pondweed delineation was conducted on May 17, 2013 and a follow-up curlyleaf pondweed assessment was conducted on June 24, 2013 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 years. A chart showing examples of curlyleaf growth conditions are shown on the next page.

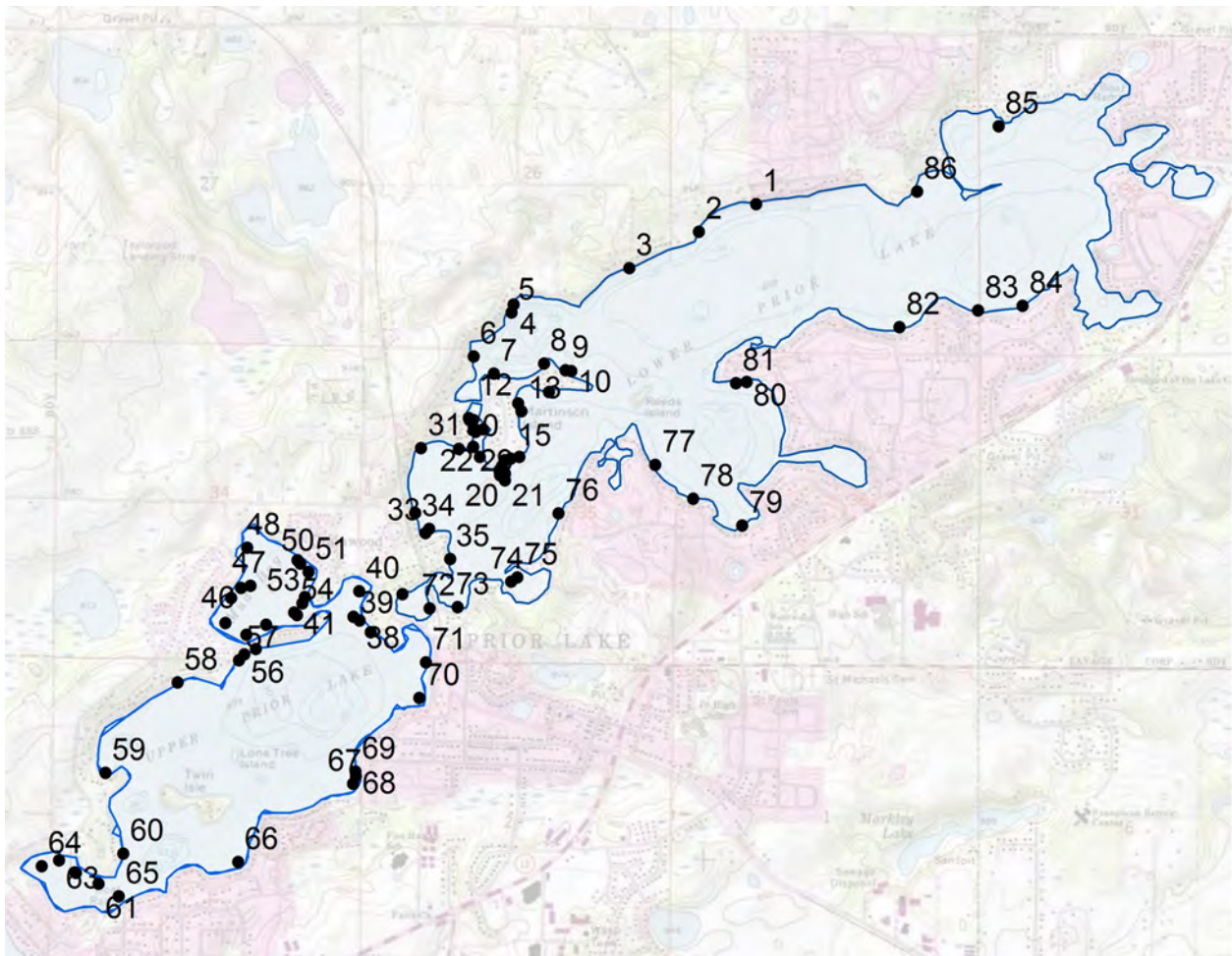


Figure 1. Sites of curlyleaf assessment sampling are shown on a lake map.

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/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.

Curlyleaf Pondweed Delineation on May 17, 2013 in Upper and Lower Prior Lake

A total of 86 sites around Upper and Lower Prior Lake were monitored with rake sampling on May 17, 2013. At some sites more than one sample was collected. Curlyleaf was found at low to moderate densities at 25 out of 86 sites. A total of 12.9 acres of curlyleaf were delineated as having the potential to develop moderate to heavy growth conditions by June (Table 1 and Figures 2, 3, and 4).

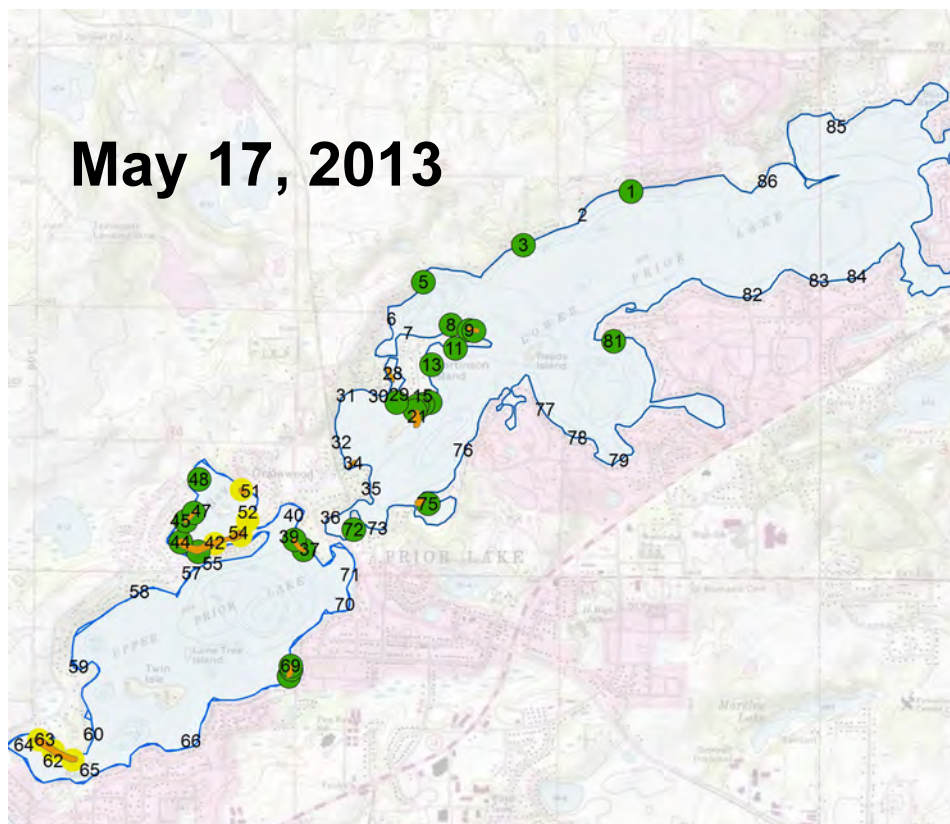


Figure 2. Curlyleaf delineation in Lower and Upper Prior Lake on May 17, 2013. Green circles = light density and yellow circles = moderate density. Orange lines = proposed treatment areas. For Upper Prior: total CLP acres: 9.7 acres. For Lower Prior: total CLP acres: 3.2 acres.



Curlyleaf pondweed density of 2.



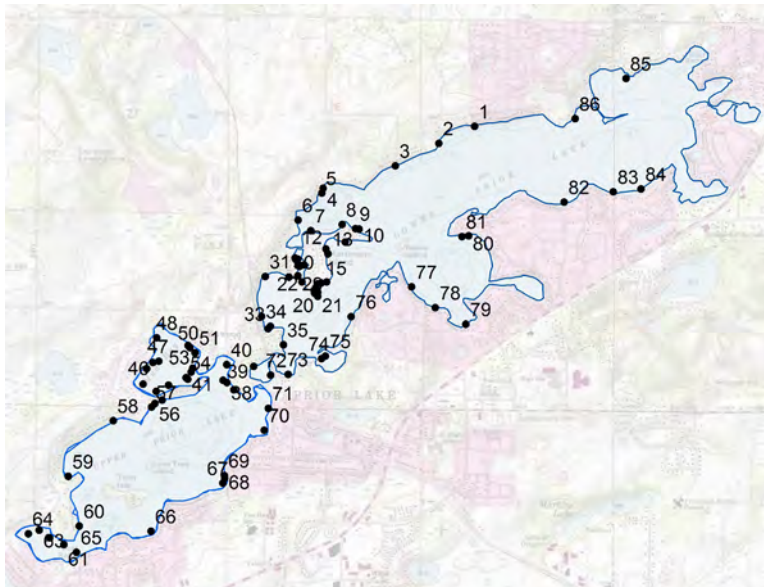
Curlyleaf pondweed density of 2.

Table 1. Aquatic plant densities based on rake sampling for May 17, 2013. Densities are based on a scale from 1 to 3 with 3 being the densest. Curlyleaf stems per rake sample were also noted. Areas with green shading have light growth and areas with yellow shading have moderate curlyleaf growth. Treatment was generally considered for a site when a site had 4 or more CLP stems.

Treatment Area	Site	Depth	Curlyleaf	Curlyleaf STEMS	Curlyleaf Length	Curlyleaf TREAT	Clasping-leaf	Coontail	EWM
	1	8	1	1	3	N			
	2	6							
	3	6	2	8	6	N			
	4	5		3	6				
	5	8	1	3	10				
	6	8					1		
	7	9							1
	8	8	1	1	6				
1	9	7	1	3	8	Y			
1	9	9	2	6	9	Y			
1	9	10	2	6	10	Y			
1	10	11	2	4	11	Y			
	11	7	1	1	4		1		
	12	8							
	13	7	1	4	10	?			
	14	8	1	1	5				
	15	8	1	1	6				
	15	9	1	1	7				
2	16	7	2	8	10	Y			
2	16	6	1	1					
2	17	9	2	14	13	Y			
2	18	8	1	8		Y			
2	19	9	1	12		Y			
	20	12				N			
	21	12				N			
	22	10	1	1	10	N			
	23	8		3				1	
3	24	8	1	3		Y			
3	25	7	1	5	25	Y			
3	26	7	1	5	20	Y			
3	27	7	1	6		Y			
3	28	7	1			N			
3	29	11	1	5		Y			
	30	10				N			
	31	9		4		N			
	32	8		2					
4	33	9	1	10	17	Y			
4	34	9	1	15	20	Y			
	35	6					1		
	36	9							
11	37	9	1	6	14	Y			
11	38	8	1	6	20	Y			
	39	8		1		N			
	40	8							
8	41	6	3	20+	30+	Y			
8	42	7	3			Y			
8	43	7	3			Y			
8	44	7	2			Y			
7	45	6	2	10		Y			
7	46	7	2	8		Y			
	47	9							
	48	7	2	5	20+	Y			
	48	6		2		N			
	48	5				N			
6	49	6	3	20+		Y			
6	50	6	3	20+		Y			
6	51	6	1	1		N			
6	52	7	3	15+		Y			
	53	8							

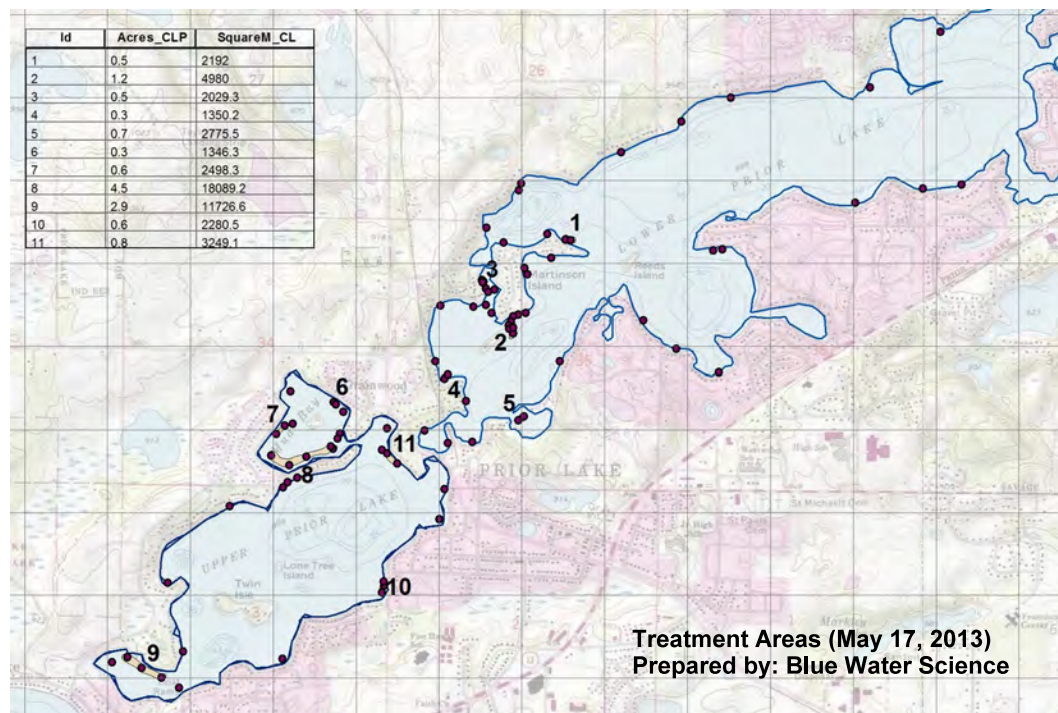
Table 1. Aquatic plant densities based on rake sampling for May 17, 2013. Densities are based on a scale from 1 to 3 with 3 being the densest. Curlyleaf stems per rake sample were also noted. Areas with green shading have light growth and areas with yellow shading have moderate curlyleaf growth. Treatment was generally considered for a site when a site had 4 or more CLP stems.

Treatment Area	Site	Depth	Curlyleaf	Curlyleaf STEMS	Curlyleaf Length	Curlyleaf TREAT	Clasping-leaf	Coontail	EWM
	54								
	55	8		4		N			
	56	8		6		Y			
	57	8				N			
	58	9		10		Y			
	59	8							
	60	7							
9	61	7	3	20	18+	Y			
9	62	7	3	20+		Y			
9	63	6	3	15+		Y			
	64	6							
	65	7							
	66	9		1					
10	67	8	1	9		Y			
10	68	8	1	4		Y			
10	69	8	2	6		Y			
	70	10							
	71	10			10	N			
	72	8	1	3					
	73	8				N			
5	74	6	1	10		Y			
5	75	6	1	8		Y			
	76	8	1	1					
	77	9	1	3					
	78	8							
	79	6							
	80	7							
	81	9	2	8		Y			
	82	10							
	83								
	84	6							
	85	9							
	86								
Average occurrence (86 sample sites)			1.5	4.6	9.6		1.0	1.0	1.0
Percent occurrence			25	49	24		3	1	1
			27	53	26		3	1	1



Prior Lake sample site map.

Curlyleaf Pondweed Treatment Areas on May 24, 2013



Prior Lake CLP Treatment Tracks 2013

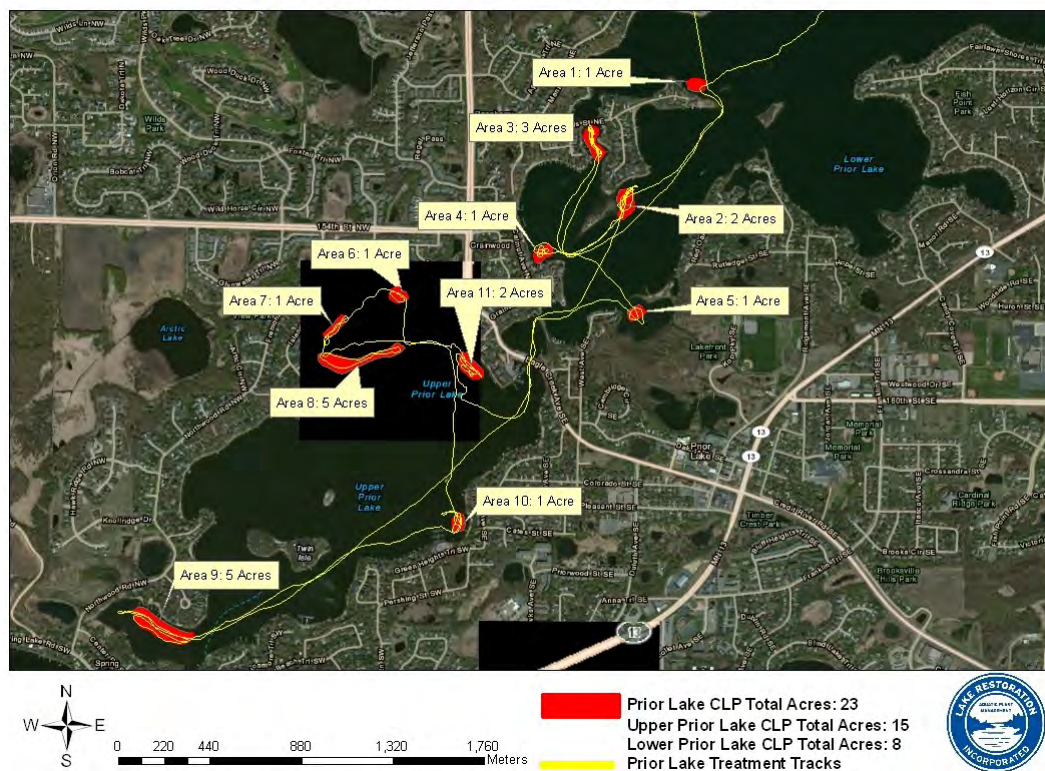
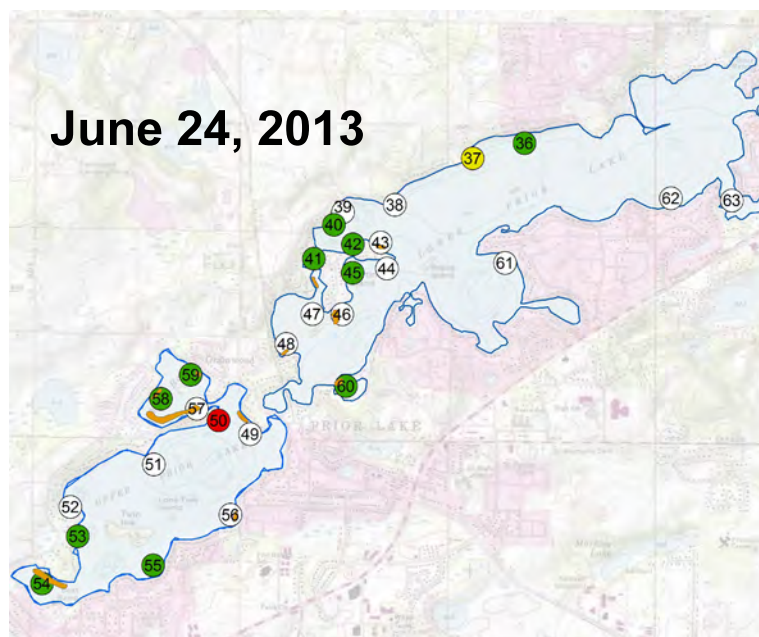


Figure 3. [top] Curlyleaf pondweed delineation and recommended treatment areas (based on Blue Water Science survey).
[bottom] Curlyleaf pondweed treatment areas for May 24, 2013 (source: Lake Restoration).

Table 4. Aquatic plant densities based on rake sampling for June 24, 2013. Densities are based on a scale from 1 to 5 with 5 being the densest. Areas with green shading had light 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.

Treatment Area	Site	Depth	Clasp-ingleaf	Coontail	Curly-leaf	Elodea	Flatstem	NWM	Sago	Stringy	Water-celery	White-stem	FA	No Plants
	36	7			1		1	1			1	1		
	37	9			3			1						
	38	8		1					1					
	39	10										1		
	40	9			1							1		
3	41	10			2									
	42	9			1									
1	43	5												1
	44	7	3											
	45	6			1									
2	46	7		1										
	47	7												1
4	48	6												1
11	49	8												1
	50	9			4									
	51	6												1
	52	6												1
	53	7			1									
9	54	6			1									
	55	5			1					2			1	
10	56	8												1
8	57	5												1
7	58	9			1									
6	59	7			1									
5	60	6			1									
	61	8				1								
	62	8												
	63	9												



Prior Lake sample site map.

Comparison of Early Season to Late Season Curlyleaf Growth

Mostly light growth of curlyleaf pondweed was found in the May 17 delineation for treatment areas (Table 7). A curlyleaf assessment on June 24, 2013 found curlyleaf to be growing at a range of densities, from light to heavy with several sites displaying heavy growth where no treatment occurred. In areas where herbicides were applied, control was generally good (Figure 5).

Table 7. Comparison of curlyleaf pondweed stem densities based on rake sampling for May 17 and June 24, 2013. Densities are based on a scale from 1 to 5 with 5 being the densest.

Treatment Area	May 17, 2013 - Delineation		June 24, 2013 - Assessment	
	Site	CLP density	Site	CLP density
1	9 - 10	2	43	0
2	16 - 19	1	46	0
3	24 - 29	1	41	2
4	33 - 34	1	48	0
5	74 - 75	1	60	1
6	49 - 52	3	59	1
7	45 - 46	3	58	1
8	41 - 44	2	57	0
9	61 - 63	3	54	1
10	67 - 69	1	56	0
11	74 - 75	1	49	0

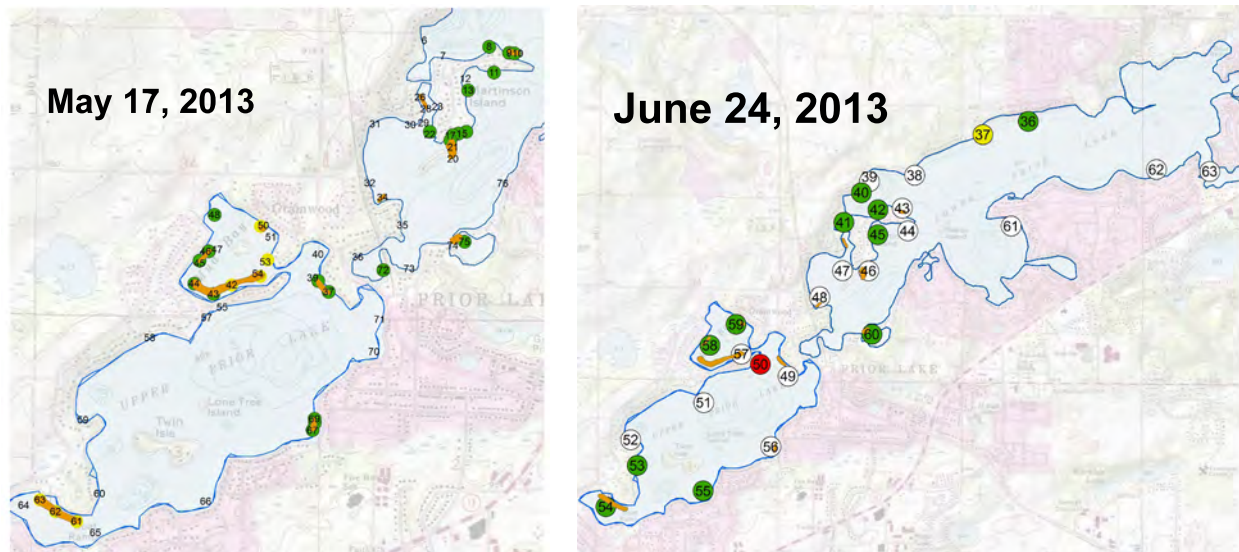


Figure 5. Maps of curlyleaf pondweed distribution are shown on the left (May 17, 2013) and right (June 24, 2013) maps.

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