Curlyleaf Pondweed on June 8, 2016 in Medicine Lake

Curlyleaf Pondweed Delineation, Treatment, and Assessment for Medicine Lake, Plymouth, Minnesota, 2016

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pre-Herbicide Plant Evaluation:	May 6	Apr 22	Apr 24	Apr 17	May 4	Apr 22	Apr 20	Apr 28	Apr 9	May 13	May 16	Apr 27	Apr 18
Herbicide Application:	**May 8-11**	**Apr 19, 21**	**Apr 18**	**no herbicide**	**May 12**	**May 1**	**Apr 23**	**May 9**	**May 10**	**May 23**	**May 22**	**May 1**	**May 2**
Post Herbicide Plant Evaluation and/or Curlyleaf Assessment	Jun 14	Jun 2	May 25	Apr 27, May 30	Jun 9	Jun 12	Jun 4	Jun 16	Jun 5	Jun 21	Jun 25	Jun 9	June 8
Herbicide Use:	1,668 gallons 317 ac treated	1,400 gallons 325 ac treated	1,400 gallons 325 ac treated	0 gallons (no treatment)	345 gal 80 ac treated	415 gal 62 ac treated	194 gal 29 ac treated	98.5 gal 14.7 ac treated	405 gal 59 ac treated	155 gal 30.9 ac treated	305 gal 47.0 ac treated	352 gal 59.4 ac treated	208.3 gal 36.5 ac treated

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Summary

The early season curlyleaf pondweed delineation in Medicine Lake (925 acres) on April 18, 2016 found growth was slightly less compared to the previous two years. Based on this delineation, about 37 acres of curlyleaf pondweed in 9 areas were treated on May 2, 2016. A curlyleaf assessment was conducted on June 8, 2016 after the herbicide treatment and it was found that curlyleaf was controlled 7 out of 9 treated areas (Table S1). In Treatment Areas 5 and 9, curlyleaf control was poor. In Treatment Areas 6, 7, and 8, curlyleaf was present, but at relatively light growth and a low density.

Table S1. Summary of curlyleaf pondweed results for 9 treatment areas. Density scale is 1-4 with 4 being the heaviest.

| Treatment Area	Size (ac)	Pre-Treatment		Post Treatment		CLP Control
		% occurrence	Potential Density	% occurrence	Actual Density	
1	8.6	75	2.9	40	0.9	Excellent
2	2.8	80	3.2	33	0.7	Excellent
3	6.8	89	2.7	10	0.1	Excellent
4	9.7	59	2.0	9	0.1	Excellent
5	1.7	75	2.5	67	2.7	Poor
6	3.3	71	2.6	90	2.2	Fair
7	1.7	60	2.3	83	1.8	Fair
8	1.5	100	3.4	100	2.0	Fair
9	1.2	50	2.0	80	2.8	Poor
TOTAL	37.3					
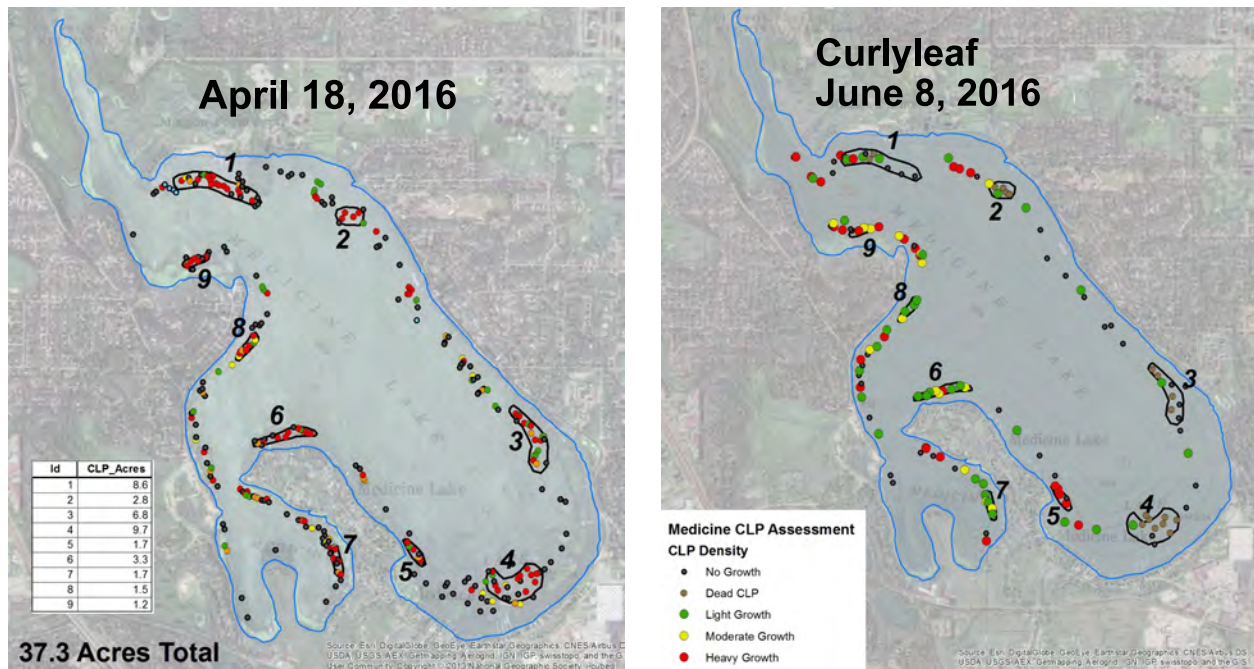
Figure S1. [left] Potential curlyleaf pondweed density based on stems per rake sample at sample sites on April 18, 2016. [right] Curlyleaf pondweed density based on stems per rake sample at sample sites on June 8, 2016. Curlyleaf was treated in the 9 circled areas totaling about 37 acres on May 2, 2016.
Key: green dots = light growth, yellow dots = moderate growth, and red dots = heavy growth. Black dots = sample location.

In Medicine Lake, a general curlyleaf growth pattern has emerged over the years based on early season yearly monitoring. Curlyleaf pondweed in Medicine Lake appears to exhibit heavy growth in roughly the same areas at several locations on an annual basis. The areas of heavy growth are in the north and south ends and in the eastern side of the southwest lobe of the lake. In other areas, there are years of heavy growth and then years of light growth in similar locations. The boom and bust growth cycles of curlyleaf pondweed in these specific areas are not well understood. It appears lake sediment conditions indicate an average long-term growth potential but predicting annual light or heavy growth of curlyleaf pondweed based on early season scouting remains challenging.

Table S2. Curlyleaf pondweed treatment history in Medicine Lake from 2004-2016.

Year	Acres Treated with an Endothall Herbicide	Curlyleaf Control Result
2004	317	Complete control.
2005	325	Complete control.
2006	325	Complete control.
2007	0	Moderate to heavy regrowth.
2008	79.8	Good control.
2009	62.0	Good control.
2010	29.1	Good control.
2011	14.7	Limited control.
2012	59	Good control.
2013	30.9	Limited control in south end with moderate to heavy growth, fair to good control in north end.
2014	47.0	Good control
2015	59.3	Good control
2016	36.5	Limited control with moderate to heavy growth in 2 out of the 9 treated areas

Future Considerations: Heavy curlyleaf growth can hinder navigation and the curlyleaf dieback may indirectly contribute to an increase in algal growth. The heavy curlyleaf growth is the kind of growth that is considered for control. Curlyleaf pondweed growth potential based on Medicine Lake sediment conditions is shown in Figure S2. In the future, if heavy curlyleaf growth is based on an early season delineation combined with the potential growth based on lake sediment characteristics it is predicted up to a maximum of 60 acres of heavy growth could be considered for treatment. For delineating areas to treat, the cumulative experience in Medicine Lake indicates if there are four or more curlyleaf stems collected on a rake sample in April or May there is a strong likelihood of heavy curlyleaf growth in that area in June. This approach can be used to help delineate areas for treatment.
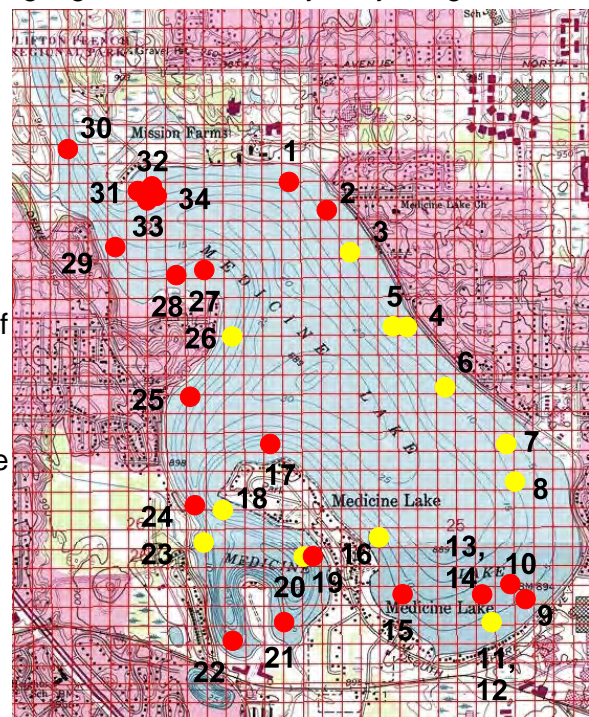
Figure S2. Sediment sample locations are shown with a dot. The dot color indicates the type of curlyleaf pondweed growth predicted to occur at that site. Key: green = light; yellow = moderate; red = heavy.

Curlyleaf Pondweed Delineation, Treatment, and Assessment For Medicine Lake, Plymouth, Minnesota in 2016

Introduction

Medicine Lake is 925 acres in area located in Plymouth, Minnesota. The objectives of early season curlyleaf pondweed delineations are to determine areas of curlyleaf to treat before it produces heavy growth. Not all the curlyleaf is delineated for treatment. Areas that are predicted to produce mostly light growth are not treated. After a treatment, a follow-up assessment is conducted to determine how the curlyleaf was controlled.

Curlyleaf Delineation Methods (from McComas et al 2015*)

At the time of the spring curlyleaf delineations, only a fraction of the peak curlyleaf biomass is present. For spot treatments, the areas to be treated should be delineated prior to curlyleaf developing peak biomass. Curlyleaf stem counts on a rake sampler were used to identify areas that had a potential to produce dense curlyleaf. After a short sweep of about 1-foot (30 cm), 4 curlyleaf stems or more per rake sample generally indicated some plants had developed runners and would likely produce heavy growth in the next few weeks. Alternatively, sites where 3 stems or less were collected per rake sample were not predicted to produce dense growth at the peak growing period. These areas were not treated. This delineation method was used for spot lake treatments in Gleason Lake and has worked for other lakes as well (McComas et al, 2015).

*McComas, S.R., Y.E. Christianson, and U. Singh. 2015. Effects of curlyleaf pondweed control on water quality and coontail abundance in Gleason Lake, Minnesota. Lake and Reservoir Management. 31:109-114.

Results

Early Season Delineation, April 18, 2016: The entire nearshore area of Medicine Lake was surveyed and specific sampling and notes were taken at 300 sites on April 18, 2016 (Appendix A). Curlyleaf pondweed stem densities had a wide range with the stems collected with a rake sample often numbering greater than 4 stems per rake with a maximum of 20 stems/rake. Areas where curlyleaf was sampled with 4 or more stems per rake were delineated for treatment. A rake typically samples an area of about 0.1 m^2. Therefore stem densities ranged from 0 stems/m^2 up to 200 stems/m^2. Based on the April 18, 2016 scouting results, treatment areas were delineated for a herbicide application. A delineation map is shown in Figure 1.
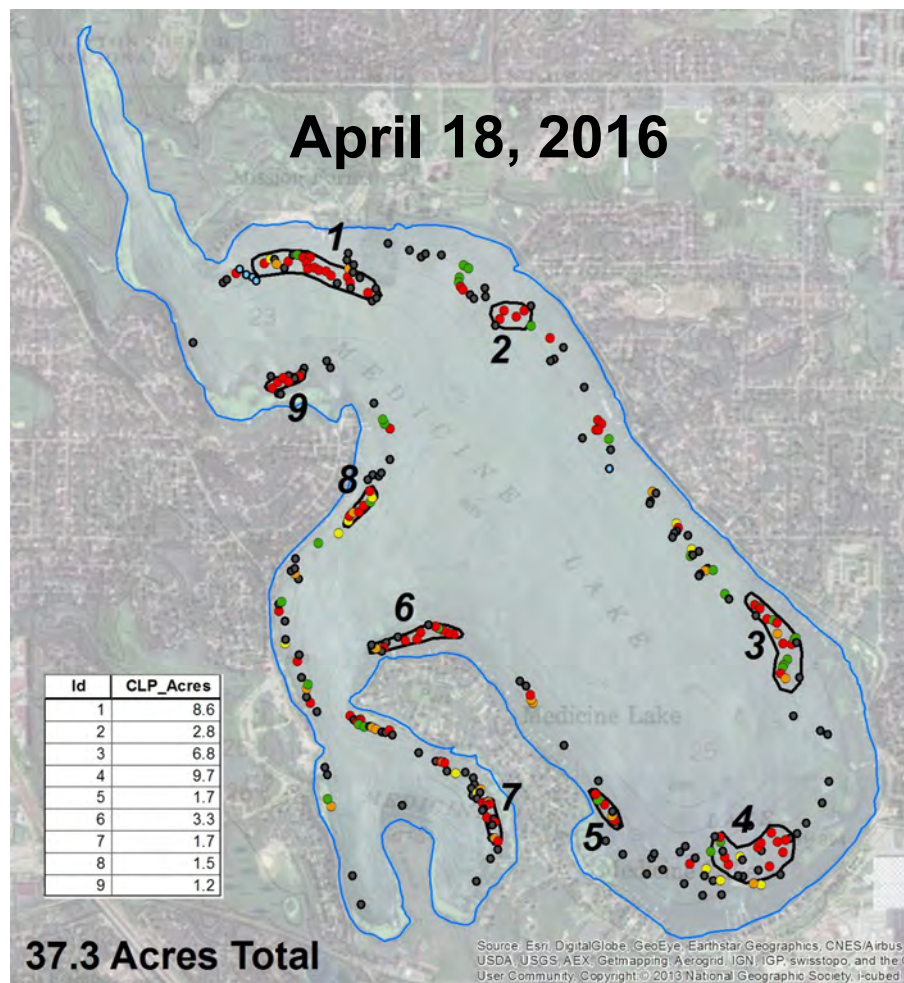
Figure 1. Curlyleaf pondweed density based on stems per rake sample at sample sites on April 18, 2016 is shown with green dots = light potential growth, yellow dots = moderate potential growth, and red dots = heavy potential growth. Black dots = no CLP. Curlyleaf was treated in the 9 circled areas totaling about 37 acres on May 2, 2016.

Curlyleaf Pondweed Treatment, May 2, 2016: Nine treatment areas with a total treatment area of 36.5 acres were treated using 208 gallons of an endothall herbicide at 0.95 gallons per acre feet at an average of 6 feet on May 2, 2016. A treatment map with boat tracks used to deliver herbicides is shown in Figure 2.

Figure 2. Curlyleaf pondweed treatment map for 2016. Treatment was conducted on May 2, 2016 by PLM Lake and Land Management Corp. The red line is the path the boat took when it was traveling around Medicine Lake (map supplied by PLM).

Follow-Up Curlyleaf Pondweed Assessment, June 8, 2016: On June 8, 2016, the entire nearshore area of Medicine Lake as well as the 9 treatment areas were surveyed about 5 weeks after an herbicide treatment and sites of curlyleaf growth were noted (details are in Appendix A). A total of about 36.5 acres of curlyleaf were treated on May 2, 2016 and the objective of the assessment was to determine if the herbicide treatment was successful and if curlyleaf was present in untreated areas (Figure 3). Survey results found some control in 7 out of 9 treatment areas. Two areas, 5 and 9, had poor curlyleaf control.
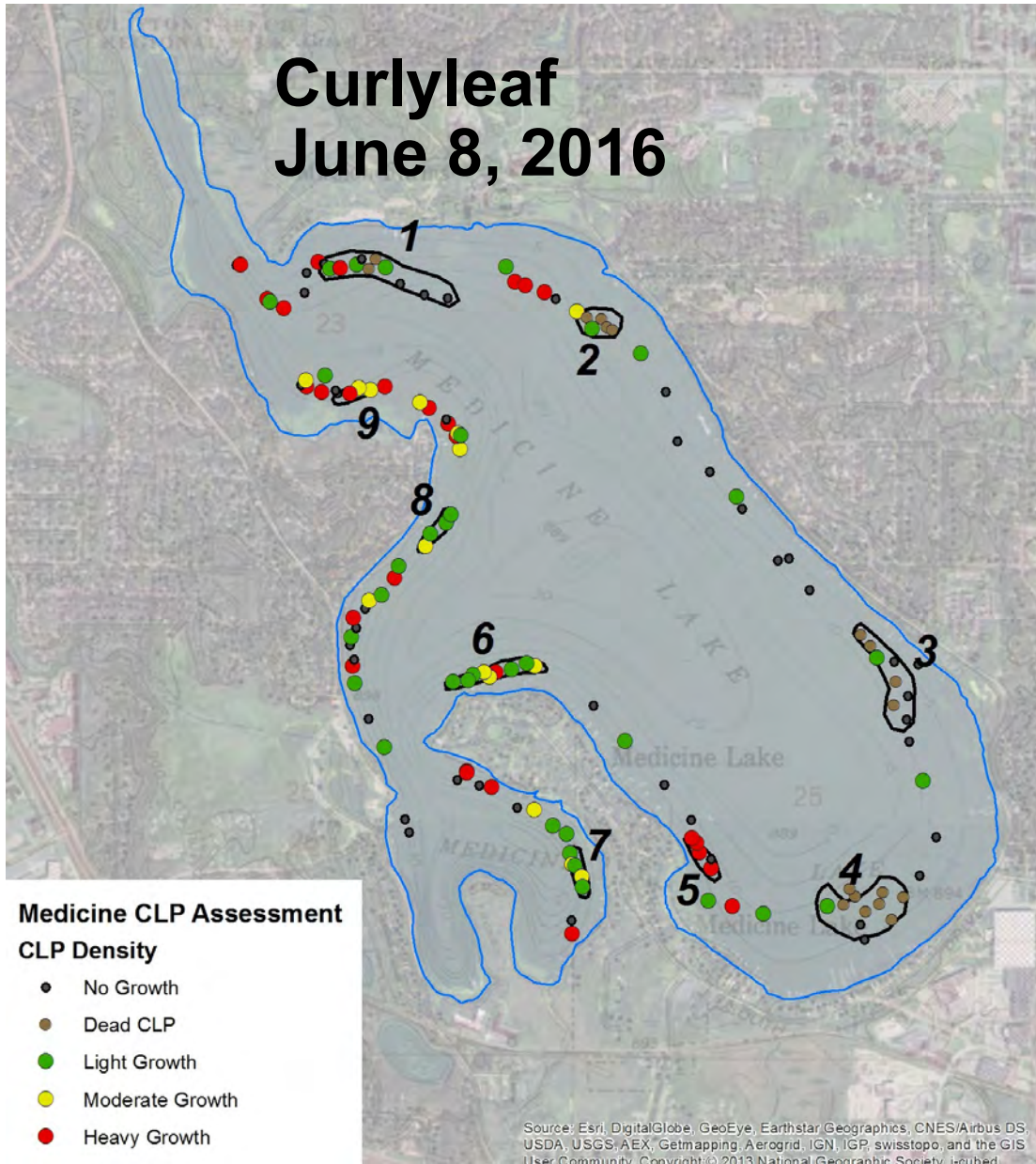
Figure 3. Curlyleaf pondweed density at various sites on June 8, 2016 is shown with black shading = no curlyleaf pondweed sampled, green shading = light growth, and yellow shading = moderate growth. Curlyleaf pondweed was treated on May 2, 2016.

Curlyleaf Pondweed Treatment and Response in 2016: In 2004, there was significant curlyleaf pondweed growth in Medicine Lake. This was the first year of an aggressive curlyleaf treatment program that ran from 2004-2006. There was no treatment in 2007 and curlyleaf started to grow back. Partial treatments have occurred from 2008-2016. In 2016, 37.3 acres were delineated and 36.5 acres were treated (Figures 4 and 5). Curlyleaf abundance on June 8, 2016 is shown in Figure 6.

Curlyleaf April 18, 2016

Id	CLP_Acres
1	8.6
2	2.8
3	6.8
4	9.7
5	1.7
6	3.3
7	1.7
8	1.5
9	1.2

37.3 Acres Total
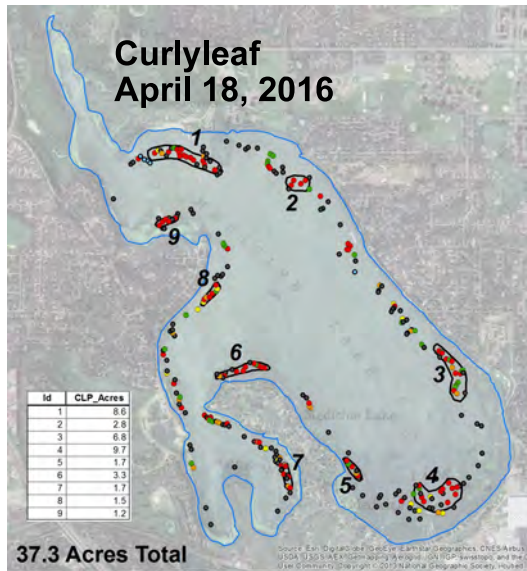
Figure 4. Curlyleaf delineation on April 18, 2016 are shown with dots. Green dots = light potential growth, yellow = moderate potential growth, and red dots = heavy potential growth. Black dots = sample site.
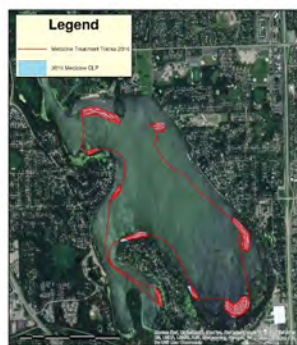
Curlyleaf Treatment of 36.5 acres on May 2, 2016

Figure 5. Treatment areas are shown with red lines.

Curlyleaf June 8, 2016
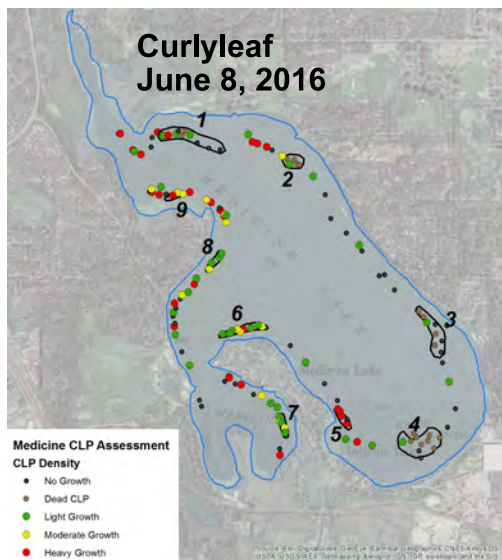
Figure 6. Curlyleaf density on June 8, 2016 is shown with dots. Green dots = light growth, yellow dots = moderate growth, black dots = no growth, brown dots = dead curlyleaf. Black circled areas show the treatment areas.

Curlyleaf Pondweed Growth Characteristics in April and June 2016

The methods for predicting the expansion and growth of curlyleaf pondweed for the early growing season to the late growing season is ongoing. In the June 8, 2016 assessment it was observed that curlyleaf was not controlled at all treatment areas (Figure 7).

April 18, 2016	June 8, 2016

Figure 7. [left] Curlyleaf stem densities in April are typically moderate to heavy. Curlyleaf at this rake density would be expected to produce heavy growth in June. This site was scheduled for treatment. [right] Curlyleaf on June 8, 2016. Curlyleaf pondweed growth was abundant in several treated areas of Medicine Lake.

Curlyleaf Pondweed Treatment Areas from 2008-2016

2008 Curlyleaf Treatment - 80 acres

2009 Curlyleaf Treatment - 62 acres
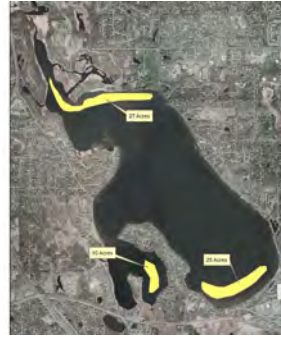
2010 Curlyleaf Treatment - 29.1 acres

2011 Curlyleaf Treatment - 14.7 acres

2012 Curlyleaf Treatment - 59 acres

2013 Curlyleaf Treatment - 30.9 acres

2014 Curlyleaf Treatment - 47 acres

2015 Curlyleaf Treatment - 59.4 acres

2016 Curlyleaf Treatment - 36.5 acres
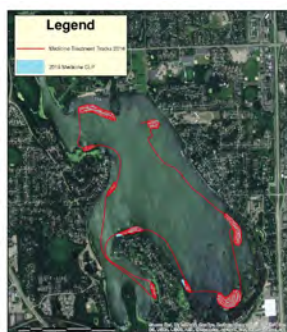
Tracking Curlyleaf Pondweed Density at Four Locations from 2004-2016

Curlyleaf stem densities at four locations were evaluated with rake sampling in 2016 (Table 2). These same four locations have been checked since 2004. In 2016, at the long-term curlyleaf monitoring sites, Sites 1, 3, and 4 , curlyleaf growth was mostly light at these sites.

Table 2. Curlyleaf pondweed stem densities at four sites in Medicine Lake in 2016.

		April 18, 2016	June 8, 2016
		Curlyleaf Stems (stems/m^2)	Curlyleaf Stems (stems/m^2)
Site 1	6 ft	5	70
	9 ft	45	61
Site 2	6 ft	15	26
	9 ft	15	0
Site 3	6 ft	51	0
	9 ft	67	5
Site 4	6 ft	76	75
	9 ft	10	21
Average		36	32
6 ft average		37	43
9 ft average		34	22

2016 Curlyleaf Treatment - 36.5 acres
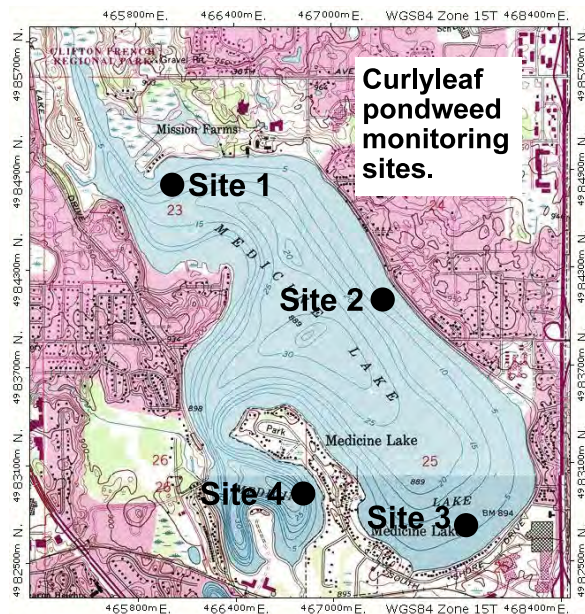
Figure 8. [left] Curlyleaf treatment areas are shown with light shading.
[right] Curlyleaf monitoring sites to collect stem densities are shown with black dots.

Curlyleaf Pondweed Densities at Four Sites from 2004 - 2016: A summary of curlyleaf pondweed stem densities from the four permanent sample sites that have been monitored since 2004 is shown in Table 3. Stem densities at all four sites were high at the start of the curlyleaf control program in 2004 (Table 3). Stem densities were measured on May 6, 2004 and this was the reference condition. After three years of aggressive herbicide treatment with over 300 acres treated per year (in 2004, 2005, and 2006), stem densities had declined when early season stem densities from 2007 - 2016 were compared to the May 6, 2004 measurements (Table 3).

The three consecutive years of whole-lake herbicide treatments (2004, 2005, 2006) reduced the early season curlyleaf stem densities in Medicine Lake. Curlyleaf was not treated in 2007 and the late season curlyleaf stem densities increased at 3 out of 4 sites. Early season stem densities increased in 2008 compared to 2007 indicating curlyleaf stem density was coming back in 3 out of 4 sites that were not treated in 2007. Two sites were treated in 2008 with good control. At the untreated Site 4, curlyleaf increased from the early to late season sampling. In 2009, three sites were treated, and late season curlyleaf growth was light at all four monitoring sites including monitoring Site 2 which was not treated. In 2010, three sites (1, 3, and 4) were treated and Site 2 was not treated. Curlyleaf pondweed stem densities were light at all four monitored sites (Table 3 and Figure 12).

In 2011, the same three sites were treated that were treated in 2010 and 2009. However, in 2011, curlyleaf stem density control was not nearly as effective as compared to 2009 and 2010. In 2012, Sites 1, 3, and 4 were treated and viable curlyleaf was not observed in the late survey (Table 3). At Site 2, curlyleaf was not treated directly, but stem densities decreased from April to June. In 2013, Sites 1 and 3 were treated (Table 3). Curlyleaf was at low to moderate densities before treatment. In the late survey, curlyleaf increased in density at all four sites, including Site 3, which was treated.

In 2014, early season curlyleaf densities were low compared to 2004. Late season densities were low at the three treated sites. At Site 2, the untreated site, curlyleaf growth did not increase and actually appeared to decrease from early season to late season measurements.

In 2015, early season curlyleaf densities were low compared to 2004. Late season densities were low at the all treated sites. At Site 2 and Site 4, no curlyleaf was found in the June survey.

In 2016, early season curlyleaf densities were low compared to previous years. Late season densities were low at the all treated sites but control was only fair. At Site 2, the low CLP density was not treated and the June densities remained low (Table 3).

Table 3. Summary of curlyleaf pondweed stem densities for early (typically April) and late season (typically June) conditions for individual sites. Sites that were not treated are shown in blue shading.

		Sites (average of 6 ft and 9 ft depths)(#/m^2)				Average (all sites)
		1	2	3	4	
2004	early	667	680	611	273	558
	late	2	2	0	0	1
2005	early	304	408	27	385	281
	late	0	0	0	0	0
2006	early	31	114	130	68	86
	late	0	16	73	25	29
2007	early	8	16	9	23	14
	late	61	80	152	15	77
2008	early	131	83	18	20	63
	late	0	59	0	402	116
2009	early	43	21	3	49	29
	late	4	0	0	5	2
2010	early	13	1	9	32	14
	late	0	11	39	39	12
2011	early	24	2	28	89	36
	late	171	8	155	149	121
2012	early	415	214	480	278	347
	late	0	214	0	0	0.6
2013	early	29	38	52	57	44
	late	73	56	280	194	151
2014	early	3	32	29	51	29
	late	1	8	5	1	8
2015	early	8	29	25	44	26
	late	15	0	5	0	5
2016	early	25	15	59	43	36
	late	66	13	3	48	32
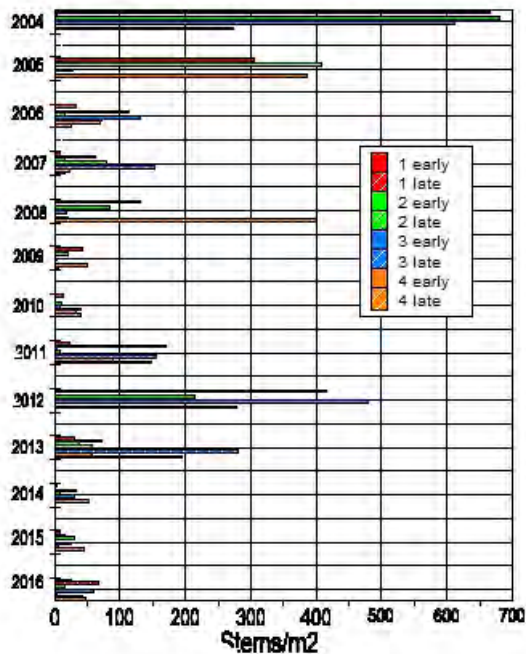
Figure 9. Medicine Lake curlyleaf pondweed stem densities from 2004-2015 for four sites for early and late spring conditions. Initial stem densities were high in 2004.

Discussion

Aquatic plant management in Medicine Lake keeps evolving. A 3-year lake-wide curlyleaf pondweed (CLP) control program treated between 317 to 325 acres was conducted in 2004, 2005, and 2006. This was a CLP distribution control strategy where all curlyleaf was treated with the objective to restrict curlyleaf by diminishing or depleting all turions in the lake. Then in 2007 no curlyleaf was treated.   During the 2007 growing season, curlyleaf re-growth was uneven but significant with some areas showing light growth and other areas approaching heavy growth.

Much was learned from this aggressive CLP distribution control program, chiefly, that a three-year lake-wide treatment would not keep curlyleaf from coming back in Medicine Lake. Starting in 2008, the CLP distribution control strategy changed to a CLP biomass control strategy, where only the heavy curlyleaf growth was treated using selective treatments. This CLP biomass control strategy has been employed from 2008 through 2016.

Selective treatments of 29 to 80 acres from 2008 to 2010 were effective for controlling heavy CLP growth. In 2011, 14.7 acres were treated and heavy CLP growth resulted in about 65 acres. This selective treatment attempt was not very effective. In 2013, a total of 30.9 acres of CLP was treated with some heavy growth of CLP observed in the south end of the lake. In 2014, 47 acres of CLP were treated. In 2015, about 60 acres of CLP were treated. In 2016, about 37 acres of CLP were treated.

The 65 acres of heavy curlyleaf growth observed in 2011 is about the maximum that has been found in Medicine Lake in years past and is not likely to be greater than that amount, although curlyleaf growth could be present in other areas, but at light to moderate levels. A likely curlyleaf treatment range for 2016 is between 30 to 60 acres.

Predicting the exact acres of heavy growth with subsequent early season herbicide treatments remains challenging. It is recommended that in the future, early season scouting should be combined with previous growth history and lake sediment information to delineate areas to treat. The CLP biomass control strategy which just treats areas of heavy growth is a more cost-effective and ecologically-sound option than the CLP distribution management strategy which treats all curlyleaf, regardless of growth status.

There appears to be a potential for ongoing heavy curlyleaf growth in specific areas in Medicine Lake (Figure 10). Lake sediment sampling results from 2009 have been used to predict lake bottom areas that have the potential to support three types of curlyleaf pondweed plant growth: light, moderate, or heavy based on the key sediment parameters of pH, the Fe:Mn ratio, sediment bulk density, and organic matter (McComas, unpublished). Curlyleaf pondweed growth is predicted to produce a combination of moderate growth (where plants may occasionally top out in a broken canopy) and heavy growth (mostly a solid canopy) in Medicine Lake. The north and south ends of the lake appear to be conducive to heavy growth with some areas of heavy growth in the southwestern lobe.

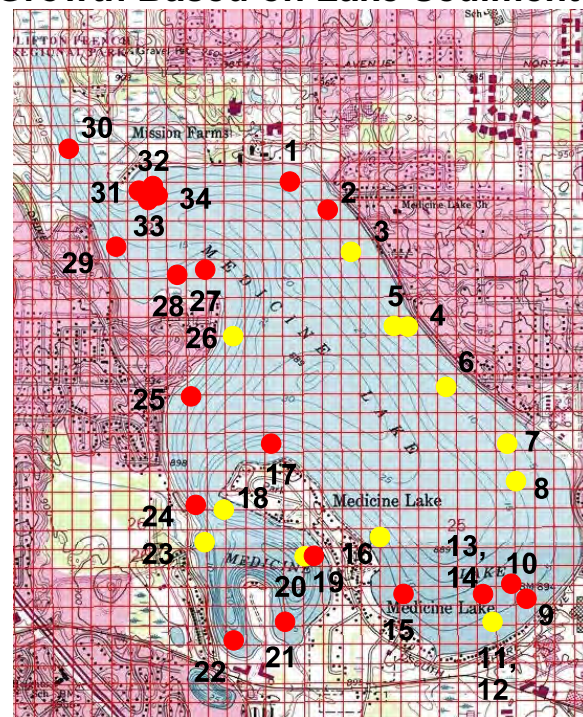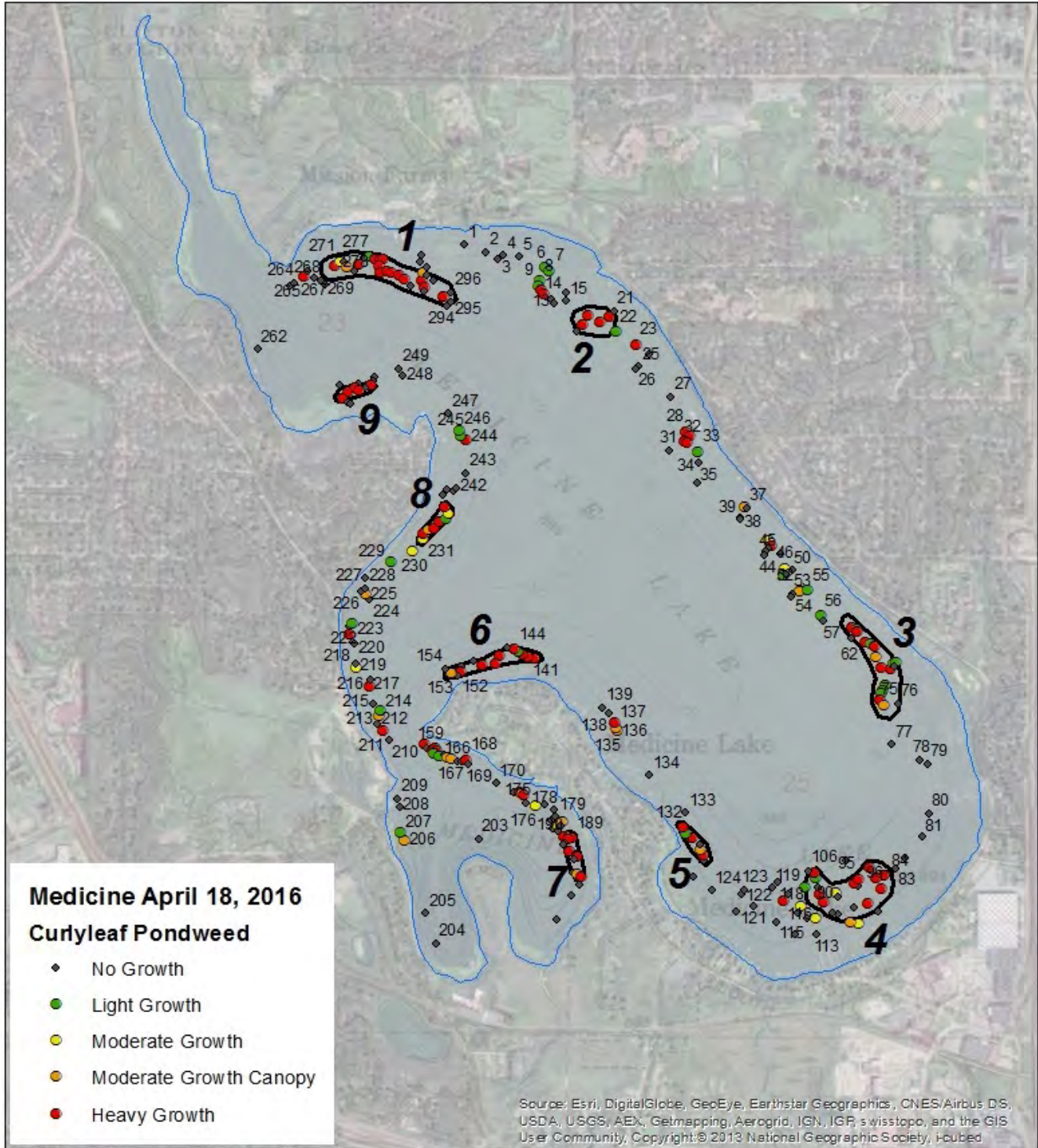## Predicted Curlyleaf Pondweed Growth Based on Lake Sediments

Figure 10. Sediment sample locations are shown with a circle. The circle color indicates the type of curlyleaf pondweed growth predicted to occur at that site. Key: green = light; yellow = moderate; red = heavy.

APPENDIX A

Medicine Lake Curlyleaf Pondweed Delineation April 18, 2016

2016: Observations of curlyleaf pondweed density for April 18, 2016. Treatments areas are shaded.

Area	Site	Depth (ft)	CLP stems on Rake Sampler
	1	3	0
	2	4	0
	3	4	0
	4	4	0
	5	4	0
	6	5	2
	7	5	1
	8	5	2
	9	6	1
	10	6	10
	11	6	10
	12	6	0
	13	6	0
	14	4	0
	15	5	0
2	16	7	12
	17	9	10
	18	10	0
	19	7	15
	20	5	8
	21	4	0
	22	10	1
	23	6	8
	24	3	0
	25	8	0
	26	9	0
	27	5	0
	28	7	8
	29	7	12
	30	9	6
	31	12	0
	32	8	8
	33	5	1
	34	4	0
	35	8.5	0,0,0,2,2
	35	6.5	1,2,3,0
	36	5	4
	37	5	0
	38	8	0
	39	9	0
	40	6	3
	41	7	10
	42	9	0
	43	11	0
	44	10	0
	45	4	0
	46	7	3
	47	8	0
	48	8	2
	49	7	0
	50	5	0
	51	5	0
	52	7	4
	53	9	0
	54	9	0
	55	3	2
	56	8	1
	57	8	0
3	58	5	8
	59	5	2
	60	6	12
	61	14	0
	62	7	20
	63	6	2
	64	5	18
	65	8	4
	66	7	10
	67	5	9
	68	4	2
	69	5	1
	70	5	0
	71	7	2
	72	7	2
	73	7	1
	74	7	5
	75	6	4
	76	4	0
	77	13	0
	78	4	0
	79	4	0
	80	5	0
	81	5	0

Area	Site	Depth (ft)	CLP stems on Rake Sampler
	82	6	0
	83	6	0
	84	6	0
4	85	6	10
	86	8	15
	87	7	12
	88	11	0
	89	8	3
	90	8	0
	91	7	0
	92	7	10
	93	8	0
	94	8	12
	95	8	15
	96	7	6
	97	6	0
	98	6	3
	99	7	4
	100	7	0
	101	7	0
	102	8	6
	103	9	8
	104	9	0
	105	9	1
	106	10	6
	107	10	0
	108	9	2
	109	7	3
	110	6	0
	111	7	0
	112	7	3
	113	4	0
	114	3	0
	115	5	0
	116	8	6
	117	8	0
	118	10	0
	119	10	0
	120	7	0
	121	5	0
	122	11	0
	123	12	0
	124	5	0
	125	4	0
	126	7	0
	127	8	8
	128	9	4
5	129	11	0
	130	8	15
	131	6	2
	132	6	7
	133	13	0
	134	5	0
	135	8	4
	136	8	4
	137	9	10
	138	10	0
	139	11	0
6	140	6	20
	141	6	10
	142	6	12
	143	6	2
	144	7	8
	145	12	0
	146	7	10
	147	5	12
	148	5	5
	149	12	0
	150	7	0
	151	5	12
	152	4	0
	153	6	4
	154	11	0
	155	5	20
	156	10	0
	157	10	14
	158	5	15
	159	5	8
	160	5	10
	161	10	1
	162	8	2
	163	7	0

Area	Site	Depth (ft)	CLP stems on Rake Sampler
	164	7	4
	165	9	4
	166	11	0
	167	11	0
	168	8	10
	169	12	0
	170	12	0
	171	9	0
	172	5	10
	173	4	3
	174	3	7
	175	12	0
	176	4	3
	177	4	0
	178	3	0
	179	5	0
	180	10	0
	181	15	0
	182	5	3
	183	3	4
	184	5	0
	185	11	0
7	186	5	15
	187	4	6
	188	3	3
	189	4	12
	190	5	10
	191	7	0
	192	10	0
	193	10	15
	194	4	0
	195	4	12
	196	9	0
	197	12	0
	198	5	4
	199	5	12
	200	6	0
	201	10	0
	202	10	0
	203	22	0
	204	16	0
	205	20	0
	206	10	4
	207	4	2
	208	5	0
	209	4	0
	210	10	0
	211	5	12
	212	4	0
	213	6	4
	214	11	1
	215	4	0
	216	7	10
	217	11	0
	218	4	3
	219	8	0
	220	12	0
	221	4	8
	222	4	0
	223	9	1
	224	14	0
	225	4	4
	226	4	0
	227	4	0
	228	4	0
	229	4	2
	230	5	3
	231	5	3
8	232	5	10
	233	5	4
	234	7	12
	235	7	8
	236	9	1
	237	7	3
	238	5	6
	239	3	0
	240	4	0
	241	5	0
	242	5	0
	243	9	0
	244	8	12
	245	8	1

Area	Site	Depth (ft)	CLP stems on Rake Sampler
	246	8	2
	247	13	0
	248	6	0
	249	10	0
	250	13	0
	251	10	0
9	252	9	20
	253	10	0
	254	10	0
	255	13	0
	256	7	8
	257	3	0
	258	3	0
	259	8	15
	260	7	5
	261	7	12
	262	16	0
	263	3	0
	264	4	0
	265	5	5
1	266	6	0,3,0,1,0
	267	6	0,0,1,0,0
	268	8	1,12,0,4,20
	269	6	2,4,2,0,2
	270	7	8
	271	6	3
	272	6	0
	273	9	4
	274	11	0
	275	7	6
	276	5	0
	277	5	1
	278	6	10
	279	5	8
	280	6	8
	281	7	10
	282	9	14
	283	7	20
	284	7	16
	285	7	14
	286	7	6
	287	11	0
	288	6	15
	289	5	4
	290	4	0
	291	8	6
	292	11	0
	293	6	8
	294	12	0
	295	5	0
	296	4	0
	297	4	0
	298	4	0
	299	4	0
	300	3	0

Medicine Lake Curlyleaf Pondweed Assessment June 8, 2016

Medicine CLP Assessment

CLP Density

- ◆ No Growth
- ● Dead CLP
- ● Light Growth
- ● Moderate Growth
- ● Heavy Growth

N
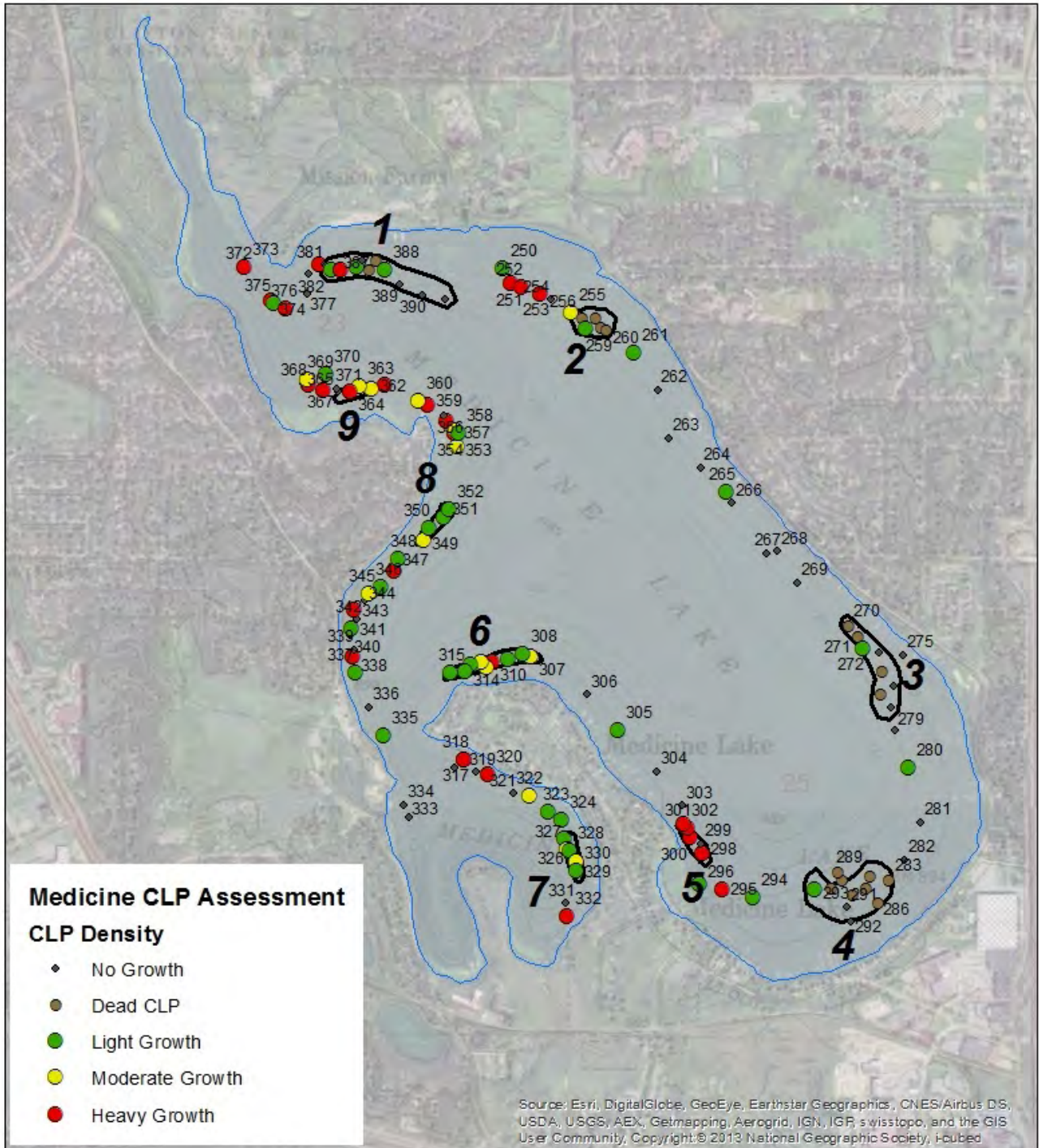
UTM NAD 83
Prepared by Blue Water Science
Field Work: April 18, 2016

2016: Observations of curlyleaf pondweed density for June 8, 2016. Treatment areas are shaded.

Area	Site	Depth (ft)	CLP Density (Scale 1 to 5)	CLP - Dead	EWM	Chara	Coon-tail	Natives	No plants
	250	5	1		3			3	
	251	5	4						
	252	7	4						
	253	7	4						
	254	5							1
2	255	7	3						
	256	7		2					1
	257	7		2	1				
	258	8		1					1
	259	9	1						
	260	8		2					1
	261	7	2						
	262	5					1		
	263	10							1
	264	4							1
	265	6	1				2		
	266	12							1
	267	11							1
	268	5			3				
	269	5			2		2		
3	270	5		3	3				
	271	6		4	1				
	272	10	1				2		
	273	5					2		
	274	8		3					
	275	2					3		
	276	5		2					
	277	7		1					1
	278	6				3			
	279	7			1	3			
	280	7	2						
	281	5					2		
	282	5					3		
4	283	7		1			3		
	284	8		2			2		
	285	7		1			1		
	286	6		1				1	
	287	8		1					1
	288	9		4					1
	289	10		6					1
	290	9		10	2				
	291	7			1		2		
	292	6					2		
	293	9	1		3				
	294	9	2				3		
	295	8	4						
	296	4	2				3		
5	297	6							1
	298	7	4						
	299	11							1
	300	8	5						
	301	8	4						
	302	8	4						
	303	12							1
	304	7			1				
	305	7	1						
	306	13							1
6	307	6	3						
	308	7	2		1				
	309	5	2						
	310	5	4						
	311	6	3						
	312	8	3						
	313	7	1						
	314	8	2						
	315	6	2						
	316	13							1
	317	5	5						
	318	8	4						
	319	13					1		
	320	4	4		1				
	321	13							1

Area	Site	Depth (ft)	CLP Density (Scale 1 to 5)	CLP - Dead	EWM	Chara	Coon-tail	Natives	No plants
	322	3	3						
	323	4	2			2			
	324	3	2						
7	325	6	2				2		
	326	9							1
	327	7	3						
	328	6	2						
	329	6	3						
	330	7	1						
	331	13							1
	332	5	5						
	333	14							1
	334	13							1
	335	6	2				3		
	336	4						2	
	337	3	1					2	
	338	6	5						
	339	11							1
	340	6							1
	341	10	1						
	342	12							1
	343	6	4						
	344	11							1
	345	5	3						
	346	7	2						
	347	8	4						
	348	5	1						
8	349	6	3						
	350	6	1			2			
	351	7	2						
	352	8	2						
	353	4	3						
	354	4	4						
	355	4	4						
	356	11					2		
	357	8	3						
	358	8	2						
	359	4	4				3		
	360	4	3				3		
9	361	4	4						
	362	7	3						
	363	8	3						
	364	8	4						
	365	12							1
	366	4	4						
	367	5	4						
	368	11							1
	369	7	3						
	370	10	1						
	371	13							1
	372	12							1
	373	8	5						
	374	8	5						
	375	8	2						
	376	7	4						
	377	5					3		
	378						3		
	379	6	4				3		
	380	6							1
	381	6					3		
1	382	8	1						
	383	8	4						
	384	8	2						
	385	7					3		
	386	10		2					
	387	6		1					
	388	7	2						
	389	11							1
	390	13							1
	391	6					2		