

---

## CEDAR LAKE, SCOTT COUNTY: 2018 AQUATIC VEGETATION REPORT

Report by the Invasive Species Program – Division of Ecological and Water Resources  
Minnesota Department of Natural Resources

---

**Lake:** Cedar (DOW# 70009100)

**Lake Surface Area:** 800 acres

**Littoral Area:** 793 acres

**County:** Scott

**Survey Type:** Point-intercept

**Date of Survey (most recent):** July 2018

**Observer[s]:** Keegan Lund (MnDNR),  
Kylie Cattoor (MnDNR),  
Melissa Bokman (SCWMO)

**Report updated:** March 11th, 2019

**Author[s]:** Keegan Lund  
Email: Keegan.Lund@state.mn.us  
Phone: 651.259.5828



---

### 2018 Summary:

*The most recent aquatic vegetation point-intercept survey of Cedar Lake (DOW #70009100) was completed on July 11 cooperatively with the Scott County Watershed Management Organization. Plants were present throughout the lake to a depth of 2.47 meters (8.1 feet). Within the littoral zone (zone from the 0-15 foot depth range), 20% of sampled points contained native submersed taxa. The average number of native submersed taxa per sample point was 0.3. Cedar Lake has a Lake Vegetation Management Plan (begun in 2013) for the management curly-leaf pondweed. Lake-wide herbicide treatments have reduced curly-leaf pondweed throughout the lake however the native plant community is sparse. Overall plant growth is severely limited by poor water clarity due to an excess of in-lake nutrients.*

**Summary Table.** Summary of aquatic submersed plants in Cedar Lake, Scott County, Minnesota (DOW# 70009100) as indicated by results of point-intercept surveys. Values were calculated from littoral depth range (0-15 feet).

YEAR	Treatment Date	CLP* Acres Treated	PI Survey Date	Max Depth of Growth in feet [95%] <sup>†</sup>	% Points w/ Native Submersed Taxa	Mean Native Submersed Taxa/ Point	# Submersed Taxa	AVG Secchi Depth [m]
2009	-	-	JUN	11	3	< 0.1	3	1.3
2012	MAY	102	SEPT	11	12	0.3	7	0.9
2013	JUN	200	JUL	11	24	0.4	7	1.1
2014	MAY	400	JUL	9	25	0.4	7	1.1
2015	MAY	600	JUN	11	46	0.7	8	1.0
			AUG	8	21	0.4	7	
2016	APR	600	JUN	10	43	0.8	7	1.0
			AUG	9	26	0.6	7	
2017	APR	351	APR	9	11	0.1	5	0.9
			SEPT	6	11	0.3	7	
2018	MAY	396	APR	9	17	0.2	6	1.1
			JUL	7	20	0.3	8	

\*CLP is short for Curly-leaf pondweed

<sup>†</sup>95<sup>th</sup> percentile calculated based on all vegetated sampling points

Taxa refers to groups of submersed aquatic plant species or genera

AVG- average Secchi depth (water clarity measurement) from May-September

## Lake Description:

Cedar Lake is an 800-acre lake northeast of New Prague, Minnesota. The lake is entirely littoral (water depth from 0 to 15 feet) and the maximum depth of water is approximately 3.35 meters (11 feet).

Cedar Lake is a hypereutrophic lake meaning high in nutrients and has low water clarity (see **Table 1-Secchi Averages** below for historic Secchi disk observations). The lake is historically dominated by curly-leaf pondweed in the spring and frequent algal blooms in the summer months. It currently is listed as impaired by the Minnesota Pollution Control Agency as a result of excessive phosphorous. For information concerning; <http://cf.pca.state.mn.us/water/watershedweb/wdip/details.cfm?wid=70-0091-00>.

**Table 1-Secchi Averages.** Average Secchi disk observations in meters for Cedar Lake (DOW #70009100). Data gathered from the Minnesota Pollution Control Agency and SCWMO.

YEAR	MAY	JUNE	JULY	AUG	SEPT	Secchi Depth Average [May-Sept]
<b>2009</b>	1.4	3.1	0.8	0.5	0.7	1.3
<b>2010</b>	1.2	1.0	0.6	0.4	0.4	0.7
<b>2011</b>	1.9	1.4	0.8	0.4	0.5	1.0
<b>2012</b>	1.8	1.1	0.8	0.5	0.5	0.9
<b>2013</b>	1.5	1.6	0.7	0.6	1.0	1.1
<b>2014</b>	1.4	2.1	0.8	0.5	0.6	1.1
<b>2015</b>	1.6	1.8	0.7	0.4	0.7	1.0
<b>*2016</b>	1.6	1.1	0.6	0.8	0.8	1.0
<b>*2017</b>	0.9	0.9	0.8	0.6	1.2	0.9
<b>*2018</b>	1.6	1.7	1.6	.3	.2	1.1

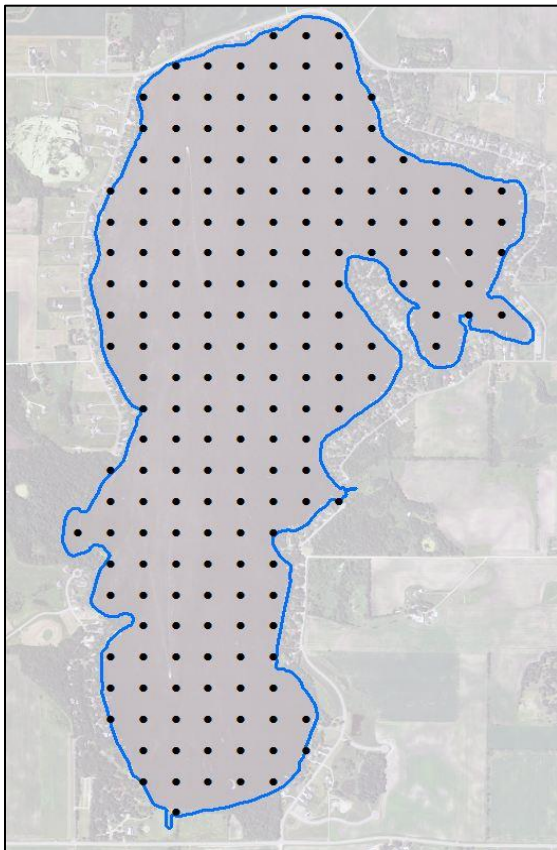
\* data collected by SCWMO

## Management History:

### Survey Objectives:

Point-intercept surveys were used to assess the distribution of aquatic plants in Cedar Lake. The primary purpose for this type of survey is to 1) develop baseline knowledge of the current plant community in a lake, and over time, 2) compare year to year plant variation (in plant presence and spatial location). Moreover, this survey will help the DNR and our partners monitor native plant communities and evaluate possible responses to invasive aquatic plant management efforts. It is important to note that distributions of aquatic plants may vary from year to year due to effects such as differences in weather, as well as the effects from management.

### Survey Methods:



We used a point intercept survey method developed by John Madsen in [“Aquatic Plant Control Technical Note MI-02, 1999”](#). Survey points were placed 130 meters apart using a Geographic Information System (GIS). This spacing allowed for placement of 196 points. Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point. Plant samples were assessed on the boat to determine species and density (scale of zero [no plants] to 3 [abundant or matted on the surface]). Frequencies of occurrence percentages (i.e. how often a plant species was found in the lake) were calculated based on the littoral zone (the portion of the lake is less than 15 feet in depth).

## Survey Observations:

Historically, two annual surveys are conducted in Cedar Lake to capture CLP densities in the spring and to capture the native plant community in mid to late summer. Results for each survey across years are found in their designated section, 'Early Summer' and 'Late Summer'. In general from 2009 to 2018, maximum depth of rooted vegetation was observed between 2.4-3.4 meters (8-11 feet). See **Table 3a&b-Point Intercept Metrics** for historical point-intercept survey calculations, **Table 4a &b- Plant Frequency of Occurrence** for historical plant densities and **Figure 4** for plant growth depth ranges of early-summer and late- summer point intercept surveys.

### Early Summer

'Early summer' surveys were conducted from April to June. Note that surveys in years 2009, 2015-2016 and 2018 were conducted after the CLP treatment while the 2017 survey was conducted before treatment. Note that the most recent early summer survey occurred 1-day post treatment and should be grouped with the pre-treatment survey as it take several days to weeks to see herbicide related effects. In general, post-treatment surveys show a decrease in CLP overtime (frequency of occurrence 95% to 12%, see **Table 4a**) with the greatest reductions observed during large-scale treatment years (2015-2016, up to 600 acres). Pre-treatment surveys in the spring (April 2017 & May 2018) show CLP continue to occupy 47%-69% of the lake each season. Historically, native plants have been limited to coontail and Canadian waterweed in the spring and early summer. The number of native plants taxa increased in the 2015 & 2016 compared to previous years (see **Table 3a**), however summer surveys should provide a better assessment of native plant response towards management. Spring surveys from 2017 & 2018 show that natives are sparse in the early growing season.

**Table 3a- Point Intercept Metrics.** Summary of early summer point intercepts metrics for Cedar Lake, Scott County (DOW# 70009100). Shaded values were calculated from littoral depth range.

Survey Metrics	JUN 24 2009	JUN 17 2015	JUN 24 2016	APR 25 2017	MAY 25 2018
Treated (Y/N)	N	Y	Y	Y	Y
Surveyor	MN DNR	MN DNR	SCWMO	MN DNR	MN DNR
Total # Points Sampled	104	196	196	129	195
Max Depth of Growth (95%)	11	11	10	9	9
# Point in Max Depth Range	98	156	136	129	162
# Points in Littoral (0-15 feet)	104	196	196	189	195
% Points w/ Submersed Native Taxa	3	46	43	11	17
Mean Submersed Native Taxa/ Point	< 0.1	0.7	0.8	0.1	0.2
# Submersed Native Taxa	2	7	7	4	5
# Submersed Non-Native Taxa	1	1	1	1	1

**Table 4a- Plant Frequency Occurrence.** Historic percent frequency of occurrence for submersed vegetation within the littoral zone (0-15 feet) in early summer. Cedar Lake, Scott County (DOW# 70009100).

Taxonomic Name	Common Name	JUN 24 2009	JUN 17 2015	JUN 24 2016	APR 25 2017	MAY 25 2018
<b>SUBMERSED PLANTS</b>						
<i>Potamogeton crispus*</i>	Curly-leaf pondweed*	95	42	12	47	69
<i>Ceratophyllum demersum</i>	Coontail	1	12	14	2	5
<i>Elodea canadensis</i>	Canadian waterweed	0	39	40	9	2
<i>Heteranthera dubia</i>	Water stargrass	0	3	10	1	4
<i>Zannichelia palustris</i>	Horned pondweed	0	10	4	0	9
Floating, Free-floating & Emergent plants observed: <i>Lemna trisulca</i> (Forked duckweed) and <i>Spirodela polyrhiza</i> (Large duckweed)						
Less common (< 5% frequency) submersed vegetation observed: <i>Stuckenia pectinata</i> (Sago pondweed) in 2009-2016, <i>Macroalgae</i> (Muskgrass and Stonewort) in 2015-2018, <i>Najas spp.</i> (Naiad) in 2015, <i>Utricularia macrorhiza</i> (Common bladderwort) in 2016.						

\* denotes invasive aquatic plant



### Late Summer

'Late summer' surveys were conducted between July to September from 2012-2018. Note that September surveys may not be a good representation of the native plant population as most plants senesce during this time of year. In the last two years, number of native taxa per point has decreased while observed natives species in lake has remained constant (see **Table 3b**). In general outside of some seasonal variability, a positive native plant response has not been observed in Cedar Lake due to limited water clarity. In the summer, the most dominant native aquatic plant species observed are coontail, Canadian waterweed, water stargrass, and naiad (see **Table 4b**). In 2018, all native taxa were observed at lower frequencies than in previous surveys. Flat-stem pondweed was noted for the first time in 2018. Additional point intercept surveys were conducted in May and August of 2007 by Blue Water Science, an environmental services consulting firm (data not shown).



Photo of curly-leaf pondweed observed in June 2009 point intercept survey (left). Photo of curly-leaf pondweed surface matting observed in 2012 before early spring treatment (right).

**Table 3b- Point Intercept Metrics.** Summary of late summer point intercepts metrics for Cedar Lake, Scott County (DOW# 70009100). Shaded values were calculated from littoral depth range.

<b>Survey Metrics</b>	<b>SEPT 14 2012</b>	<b>JUL 29 2013</b>	<b>JUL 31 2014</b>	<b>AUG 13 2015</b>	<b>AUG 8 2016</b>	<b>SEPT 22 2016</b>	<b>SEPT 22 2017</b>	<b>JUL 11 2018</b>
Treated (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y
Surveyor	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR	SCWMO	MN DNR	MN DNR
Total # Points Sampled	104	196	196	196	192	194	189	194
Max Depth of Growth (95%)	11	11	9	8	9	9	6	7
# Point in Max Depth Range	51	127	99	60	83	159	47	70
# Points in Littoral (0-15 feet)	104	196	196	196	191	194	189	192
% Points w/ Submersed Native Taxa	12	24	25	21	26	50	11	20
Mean Submersed Native Taxa/ Point	0.3	0.4	0.4	0.4	0.6	0.9	0.3	0.3
# Submersed Native Taxa	6	6	6	6	7	4	6	8
# Submersed Non-Native Taxa	1	1	1	1	1	1	1	1

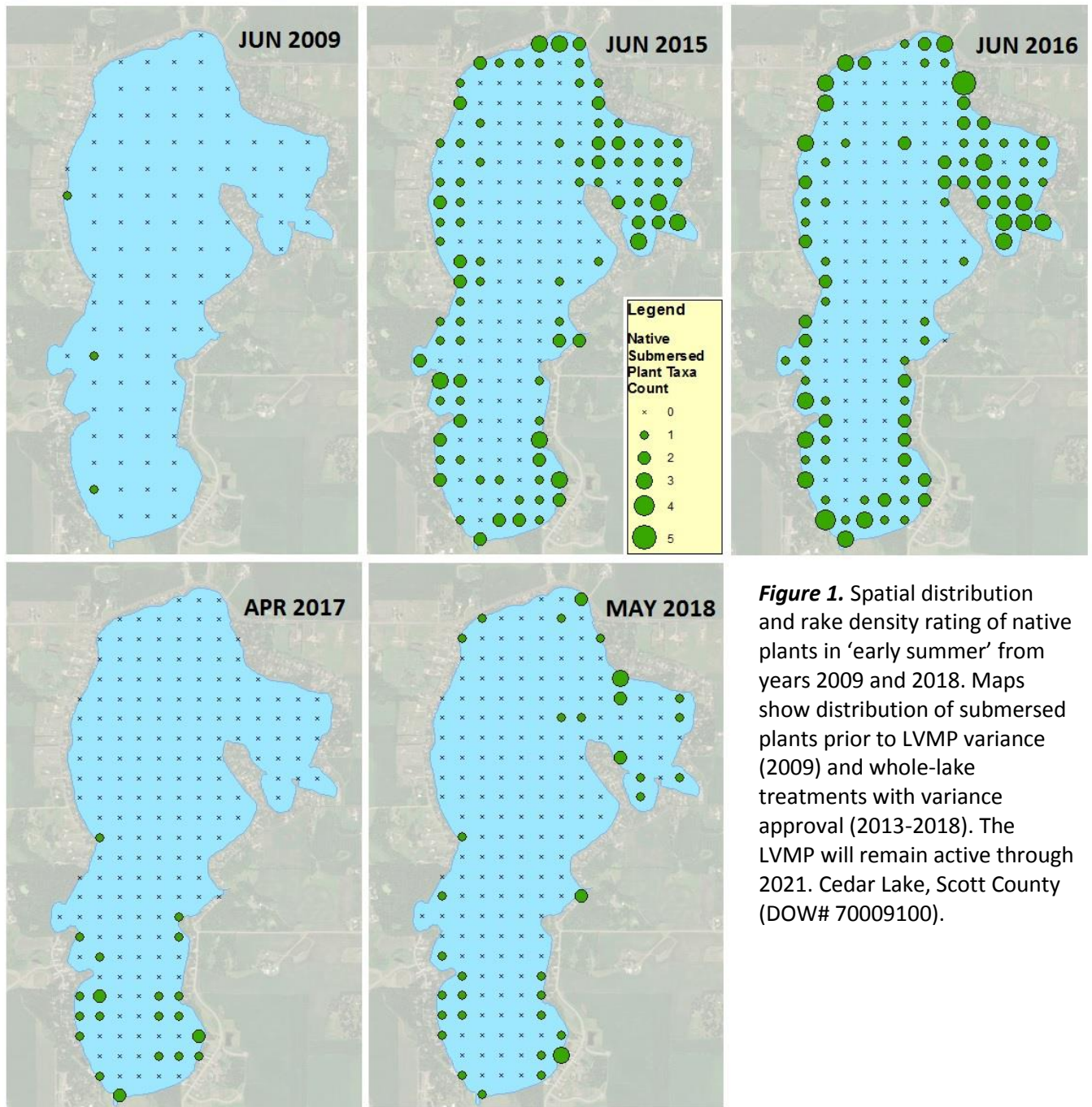


**Table 4b- Plant Frequency Occurrence.** Historic percent frequency of occurrence for submersed vegetation within the littoral zone (0-15 feet) in late summer. Cedar Lake, Scott County (DOW# 70009100).

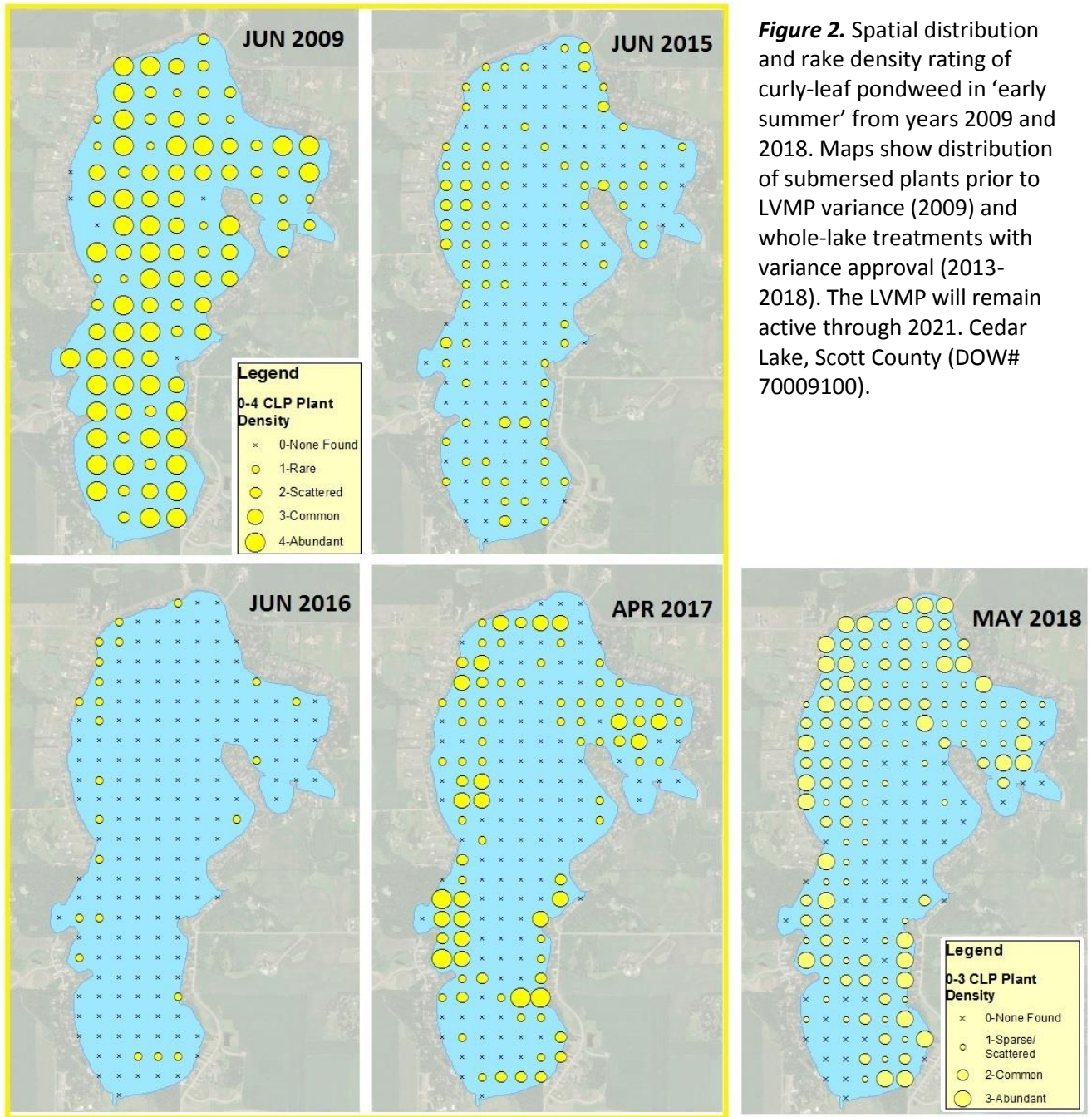
Taxonomic Name	Common Name	SEPT 14 2012	JUL 29 2013	JUL 31 2014	AUG 13 2015	AUG 8 2016	**SEPT 22 2016	SEPT 22 2017	JUL 11 2018
<b>SUBMERSED PLANTS</b>									
<i>Potamogeton crispus</i> *	Curly-leaf pondweed*	1	22	11	3	5	7	4	2
<i>Ceratophyllum demersum</i>	Coontail	10	21	10	7	12	22	6	13
<i>Elodea canadensis</i>	Canadian waterweed	7	12	17	20	24	44	5	10
<i>Heteranthera dubia</i>	Water stargrass	3	3	4	7	7	12	5	1
<i>Najas spp.</i>	Naiad	1	5	9	7	7	0	7	3
<i>Stuckenia pectinata</i>	Sago pondweed	5	3	1	2	4	1	3	1
Floating, Free-floating & Emergent plants observed: Forked duckweed ( <i>Lemna trisulca</i> ), Large duckweed ( <i>Spirodela polyrhiza</i> )									
Less common (< 5% frequency) submersed vegetation observed: <i>Potamogeton pusillus</i> (Small pondweed) in 2012, <i>Zannichelia palustris</i> (Horned pondweed) in 2013, 2016 and 2018, <i>Potamogeton praelongus</i> (White-stem pondweed) in 2014, <i>Macroalgae</i> (Muskgrass and Stonewort) in 2015, 2016 and 2018, <i>Ranunculus aquatilis</i> (White water crowfoot) in 2017, <i>Potamogeton zosteriformis</i> (Flat-stem pondweed) in 2018.									

\* denotes invasive aquatic plant

\*\* data collected by SCWMO

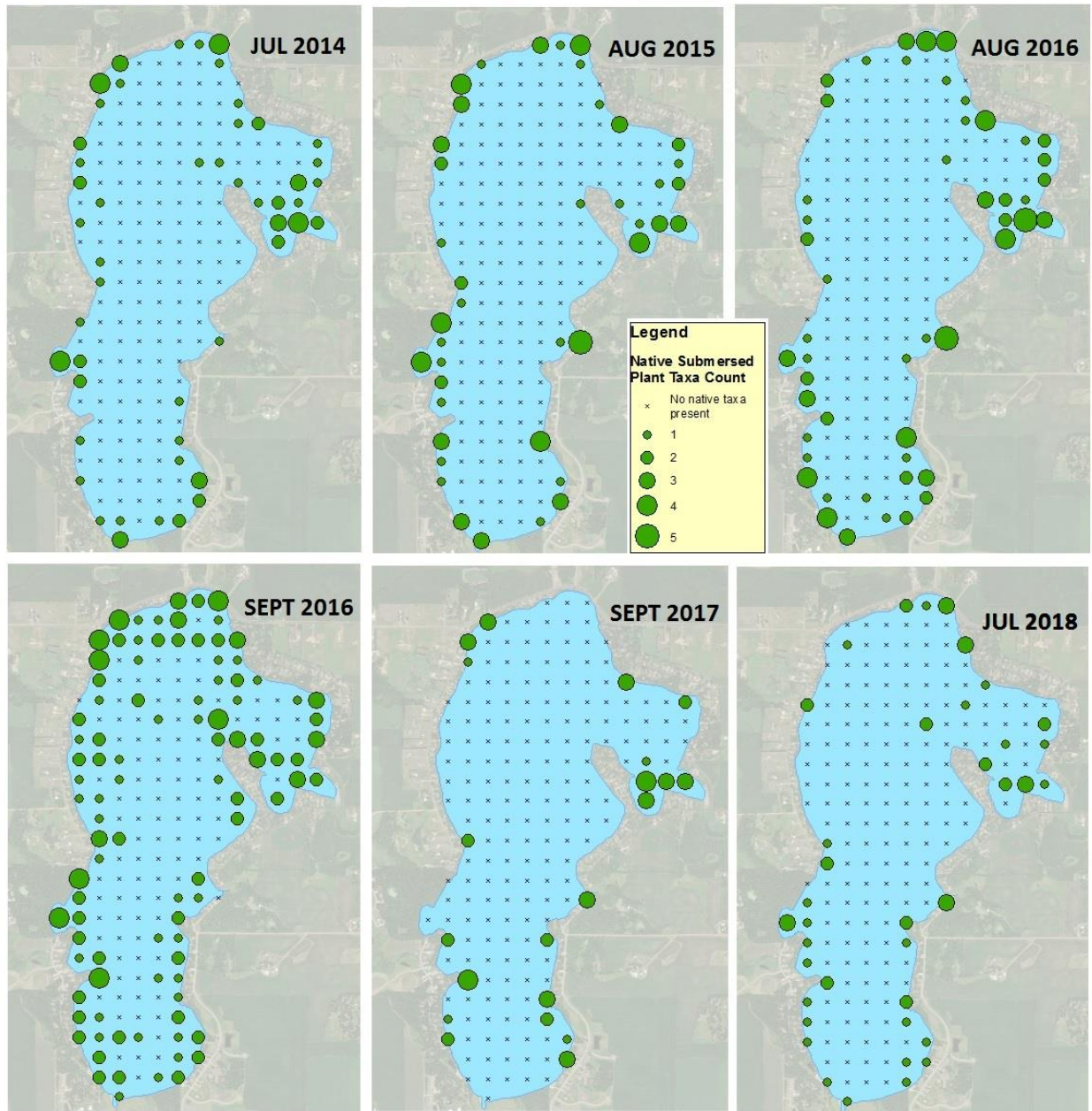


**Figure 1.** Spatial distribution and rake density rating of native plants in ‘early summer’ from years 2009 and 2018. Maps show distribution of submersed plants prior to LVMP variance (2009) and whole-lake treatments with variance approval (2013-2018). The LVMP will remain active through 2021. Cedar Lake, Scott County (DOW# 70009100).

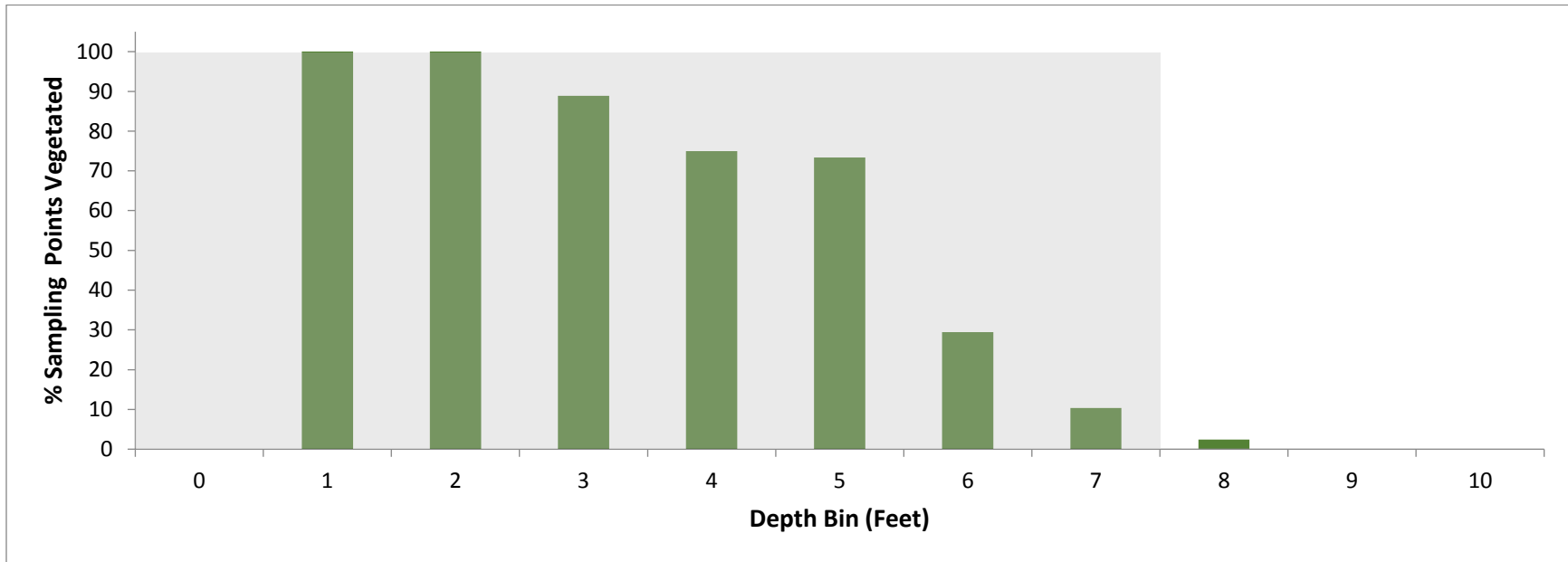


**Figure 2.** Spatial distribution and rake density rating of curly-leaf pondweed in ‘early summer’ from years 2009 and 2018. Maps show distribution of submersed plants prior to LVMP variance (2009) and whole-lake treatments with variance approval (2013-2018). The LVMP will remain active through 2021. Cedar Lake, Scott County (DOW# 70009100).





**Figure 3.** Spatial distribution and species richness (# of native species per sample point) of all native submersed plant species in ‘late summer’ surveys. Maps show distribution of submersed plants prior to LVMP variance (2009) and whole-lake treatments with variance approval (2013-2018). The LVMP will remain active through 2021. Cedar Lake, Scott County (DOW# 70009100).



**Figure 4.** Maximum depth of plant colonization in feet during MnDNR July 2018 point intercept survey. Depths were binned in feet. Percent sampling points vegetated is defined as the number of sampling points with submersed vegetation divided by the total number of sampling points for each depth. Shaded area represents depth range of the 95th percentile of all submersed plants observed. Cedar Lake, Scott County (DOW# 70009100).

This information can be made available in alternative formats such as large print, braille or audio tape by emailing [info.dnr@state.mn.us](mailto:info.dnr@state.mn.us) or by calling 651-259-5016.