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2015 Assessment of Additional Plots in Red Cedar Lake

Northern Bay and Pigeon Creek Inflow Site
Red Cedar Lake *(#2109600)*
Barron County, WI

Aquatic Plant Survey / Curlyleaf Pondweed Assessment – June 1, 2015
Sediment Turion Surveys – Oct 22, 2015

Surveying, Analysis, and Reporting by:

James A. Johnson – *Aquatic Ecologist, Freshwater Scientific Services, LLC*

NALMS Certified Lake Manager
www.NALMS.org

Funding Provided by:

Red Cedar Lake Association (Mikana, WI)

Introduction

Purpose of Surveys

The Red Cedar Lake Association asked Freshwater Scientific Services to evaluate curlyleaf pondweed growth and sediment turion abundance in two additional areas of Red Cedar Lake (*Plot 1* in north-central bay, *Plot 2* near Pigeon Creek inflow site) to help determine whether these areas should be considered for management in 2016 and beyond.

Survey & Analysis Methods

Point-Intercept Surveys

Freshwater Scientific Services completed aquatic plant surveys in both of the new plots on June 1, 2015 using the point-intercept method described by Madsen (1999). These surveys incorporated assessments at a total of 50 sample points (22 in Plot 1, 28 in Plot 2; Fig 1, page 4). We generated these sample points using desktop GIS software and the MDNR *Random Sample Generator* extension to project a grid of points (20-m spacing) over maps of the designated plots (plot boundaries provided by David Blumer). We then loaded the selected sample locations onto a handheld GPS unit (Garmin GPSMAP-78) to enable navigation to each point while in the field.

At each designated sample location, we collected plants using a double-headed, 14-tine rake on a pole (for sites <10 ft deep) or a similar rake on a rope (for sites ≥10ft deep). For each rake sample, all of the retrieved plants were piled on top of the rake head and assigned density ratings from 1 to 3 (Fig 2) for each species individually, and for all plants collectively. At each location, we also documented water depth, overall plant height.

We used desktop GIS software to map the distribution and abundance of plants in each plot for each survey. We then calculated the frequency (% occurrence) and mean rake density for each encountered plant species (Tables 1 and 2).

Figure 1. Map showing the new plots surveyed in 2015 and sampled locations in the Red Cedar Lake and Hemlock Lake plots.

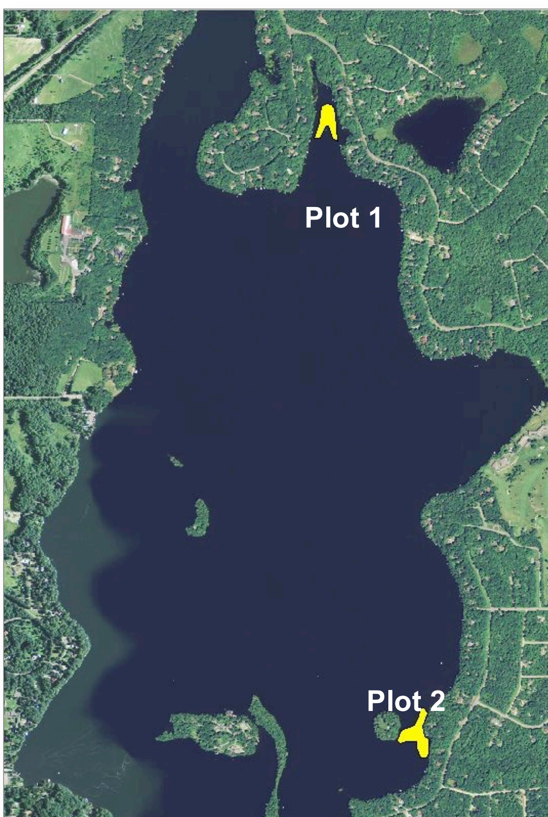


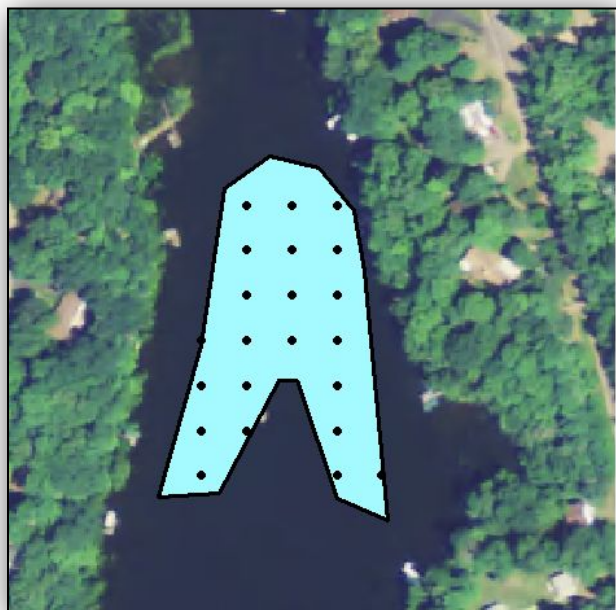
Figure 2. Density ratings based upon rake coverage

Density Rating	Rake Coverage	Description
1		Only a few plants retrieved
2		Plants cover full length of rake head, but do not cover the tines completely
3		Plants completely cover rake head and tines

Red Cedar Lake: 2015 New Plots

Point-Intercept Plant Survey Points

Plot 1 *(North-Central Bay)*

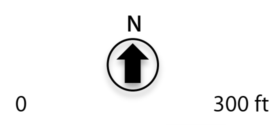


Plot 2 *(Pigeon Creek)*

Surveyed Locations

- Surveyed Points

Surveyed: Jun 1, 2015
Surveyor: JA Johnson
Affiliation: Freshwater Scientific Services
Methods: Rake, Sonar, Depth Rod



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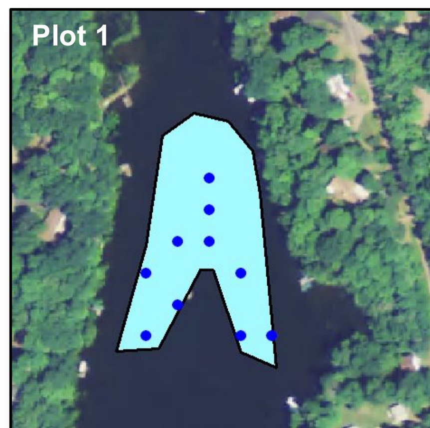
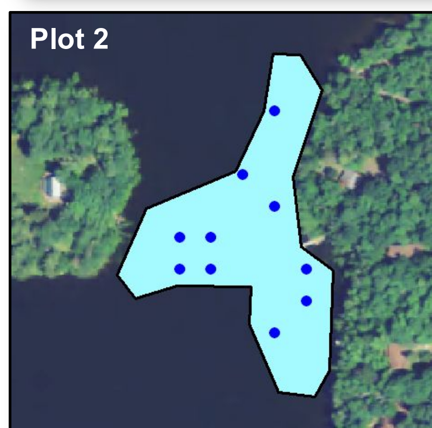
Sediment Turion Surveys

Freshwater Scientific Services, LLC conducted a sediment turion survey in both of the new plots on Oct 22, 2015 to assess the abundance and distribution of curlyleaf turions in the lake sediments. For this survey, we collected sediment samples with a petite Ponar dredge (225 cm^2 basal area, Fig 3) at 20 locations (10 in each plot). These turion sample locations were randomly selected from the set of points used for the 2015 vegetation surveys (Fig 4). Upon retrieving each sediment sample, we removed any plants and debris from the outside of the closed Ponar dredge, emptied its contents into a sifting bucket (1-mm screen), and gently sifted the sample in the field to remove fine sediment. The contents remaining in the bucket after sifting were placed into a labeled plastic bag and stored in a cooler while in the field. In the lab, we manually sorted turions from other debris and recorded total turion counts for each sample. Small turion fragments that did not included a portion of a central turion stem and severely decayed turions that did not retain their shape when lightly squeezed were discarded and were not included in the final turion counts. Turion counts from each sample were divided by the sampled area (0.0225 m^2) to yield sediment turion abundance (turions/m^2) for each sampled site (Table 2, Fig 5, page 10).

Figure 3. JA Johnson (Freshwater Scientific Services) preparing to collect a sediment sample with the Ponar dredge.

Figure 4. Locations where we collected fall 2015 sediment samples in the two new plots in Red Cedar Lake.





Results

2015 Statistical Summary of CLP and Native Aquatic Plants

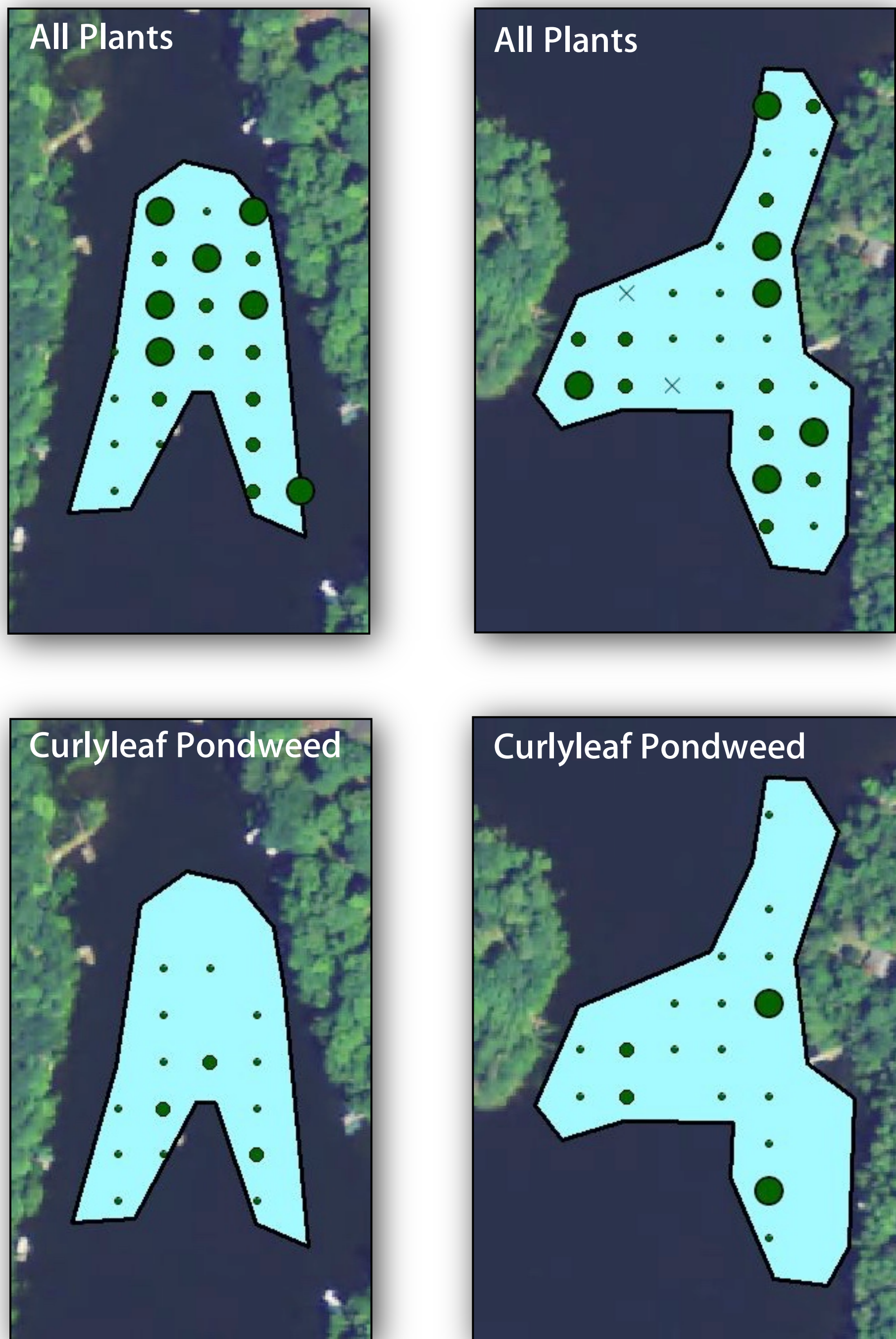
Table 1. Frequency (% occurrence) and abundance (mean rake density rating) of plant species found during the June 1, 2015 surveys in the two new Red Cedar Lake plots. % Occurrence and mean density were calculated using all surveyed points in each plot.

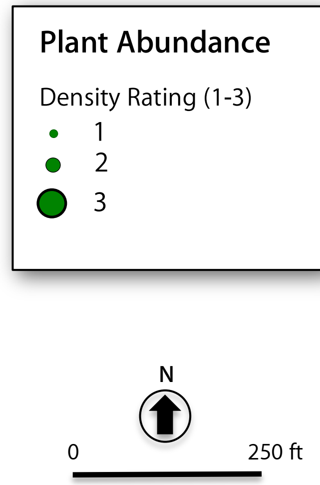
		% OCCURRENCE		MEAN DENSITY	
Plant Species	**Common Name**	**Plot 1**	**Plot 2**	**Plot 1**	**Plot 2**
All Vegetation		**100**	**93**	**2.1**	**1.7**
Potamogeton crispus	Curlyleaf Pondweed	68	64	0.8	0.9
Ceratophyllum demersum	Coontail	91	39	1.5	0.6
Potamogeton zosteriformis	Flat-stem pondweed	27	36	0.3	0.4
Myriophyllum sibiricum	Northern watermilfoil	14	32	0.1	0.4
Potamogeton praelongus	White-stem pondweed	9	21	0.1	0.3
Potamogeton robbinsii	Fern-leaf pondweed	23	11	0.4	0.1
Potamogeton amplifolius	Large-leaf pondweed	–	14	–	0.1
Potamogeton foliosus	Leafy pondweed	5	7	0.1	0.1
Elodea canadensis	Canadian waterweed	5	4	0.1	<0.1
Aquatic Moss	Aquatic moss	–	4	–	<0.1
Nitella sp.	Nitella	–	4	–	<0.1
Potamogeton richardsonii	Clasping-leaf	–	4	–	<0.1
Ranunculus aquatilis	Stiff water crowfoot	–	4	–	<0.1
Vallisneria americana	Wild celery	–	4	–	<0.1
Zosterella dubia	Water stargrass	–	4	–	<0.1
Lemna trisulca	Star duckweed	9	P	0.1	–

Red Cedar Lake: 2015 New Plots

Aquatic Plant Abundance

Plot 1 *(North-Central Bay)* **Plot 2** *(Pigeon Creek)*





Date: Jun 1, 2015
Surveyor: JA Johnson
Affiliation: Freshwater Sci. Serv.
Methods: Point-Intercept Survey

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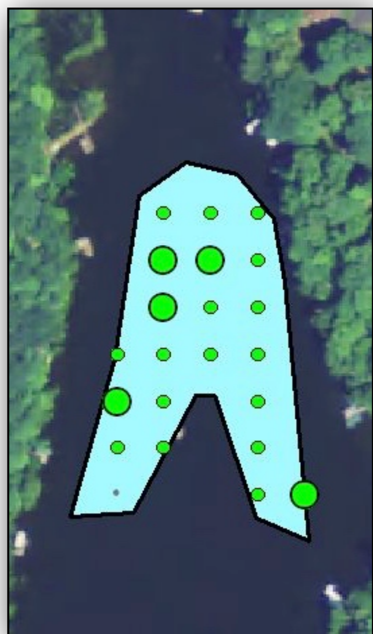
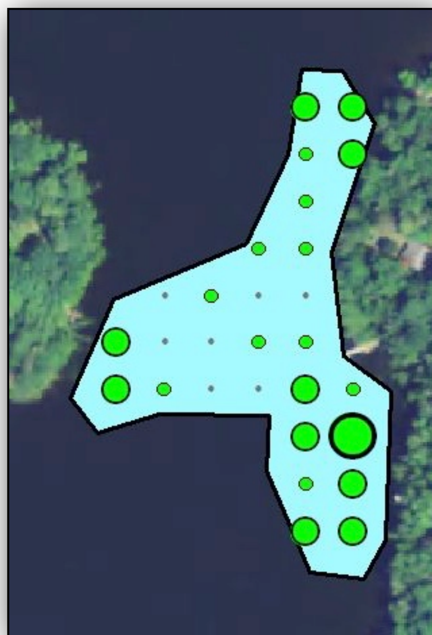
Red Cedar Lake: 2015 New Plots

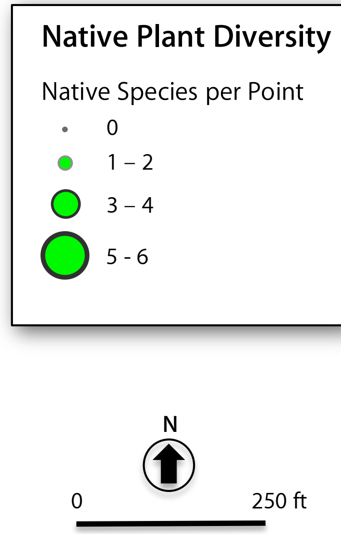
Native Plant Diversity

Plot 1 *(North-Central Bay)*



Plot 2 *(Pigeon Creek)*





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Curlyleaf Pondweed Turion Production on Plants

Dense curlyleaf growth was not widespread in either plot (patchy dense spots surrounded by more widespread light curlyleaf growth), but the curlyleaf plants we did find generally had many small turions and some larger turions attached. Past studies have shown that most newly produced turions are viable (Johnson et al. 2012). This means that the curlyleaf infestation in these locations is established and will not likely decrease without management. If sediment conditions are favorable, these new turions may also lead to increases in the density and extent of the curlyleaf growth at these sites.

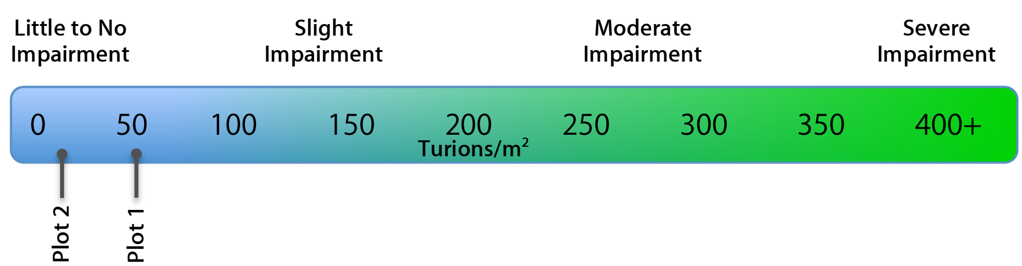
Curlyleaf Pondweed Turion Abundance in Sediment

We found curlyleaf turions at 50% of the sampled sites in plot 1, and at 10% of the sampled sites in plot 2 (Table 2). In plot 1, this % occurrence of turions is similar to the % occurrence of curlyleaf plants we observed in June (50% vs. 68%). This suggests that there is a widespread bank of buried turions in plot 1 that would likely take multiple years to reduce through treatment. However, in plot 2, the % occurrence of turions was substantially lower than the % occurrence of curlyleaf plants (10% vs. 64%). This discrepancy suggests that the curlyleaf growth in plot 2 is very patchy and that this site has not experienced a buildup of turions in the sediment. This lack of turion accumulation may be due to firmer sediments that prevent deep burial of turions. If this is the case in plot 2, most of the turions deposited there would be exposed to environmental sprouting cues, and prevention of turion production through management at this site could lead to a rapid depletion of turions in the sediment and a corresponding reduction in curlyleaf abundance.

Table 2. Summary of curlyleaf pondweed turion abundance in the new Red Cedar plots on Oct 22, 2015.

	Plot 1	**Plot 2**
# Samples	10	10
% Sites with Turions	50%	10%
Mean Turions/m^2	53	13
Std Error	23.7	13.3
Max Turions/m^2	222	133

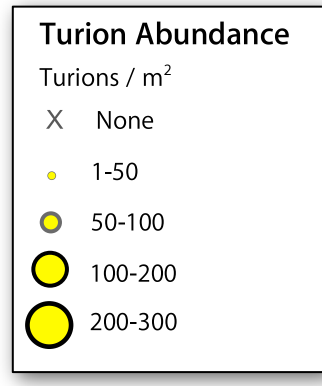
Figure 5. Sediment turion abundance (average turions/m^2 in each plot) and estimated curlyleaf pondweed nuisance potential in the new Red Cedar Lake plots. Ranges for impairment potential were estimated from subjective assessments of nuisance level (Low, Med, High) and turion abundance data from Johnson et al. 2012.

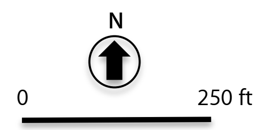


Red Cedar Lake: 2015 New Plots

Sediment Turion Abundance

Plot 1 *(North-Central Bay)* **Plot 2** *(Pigeon Creek)*





Date: Oct 22, 2015 / Oct 25, 2012
Surveyor: JA Johnson
Affiliation: Freshwater Sci. Serv.
Methods: Point-Intercept Survey

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Management Context

Curlyleaf Pondweed Growth

Curlyleaf pondweed was fairly widespread in both plots in 2015, but neither plot appeared to support dense growth to an extent that would severly impair recreation. Both plots did supported small isolated patches of denser growth; if these patches continue to expand, they could eventually impair boat access for local shoreland homeowners. The level of infestation at both of these sites appears to be too great to hand-pull, but too low to warrant intensive herbicide treatments for nuisance management. If there is evidence that the curlyleaf extent or density have increased over time, the RCLA should consider treating to prevent further increases. However, if the level of infestation has been stable for years, treatment may not be warranted.

Note: The small size of these plots and the proximity of plot 2 to the inflow of Pigeon Creek means that treatments at these sites may experience a high amount of herbicide dilution and dispersion that could lead to ineffective control.

Turion Distribution and Abundance

In general, plot 1 appeared to have more widespread and more abundant turions than plot 2. This suggests that plot 1 currently has a greater potential for more widespread and denser curlyleaf growth than plot 2. However, plot 2 also appered to support denser patched of curlyleaf despite low turion numbers. In plot 2, we found turions at only one location, but saw several patches of denser curlyleaf along the eastern edge of the plot in June. As stated on page 9, this discrepancy between turion abundance and curlyleaf growth may be due to (1) a very patch distribution of curlyleaf, or (2) firmer sediments that do not favor burial of deposited turions. If firmer sediments are indeed the cause, this would favor treating this site to prevent turion production and rapidly deplete turions in the sediment. Given the fairly low turion abundance in both of these plots, treatments would reduce the current level of infestation to a point where hand-pulling would be more feasible, but could also have adverse impacts on the native plants if management is too aggressive.

Native Plants

Both plots supported abundant native plants. Based upon past observations in Red Cedar Lake, fern-leaf pondweed (*Potamogeton robinsii*) appears to grow densely at the deep edge of plant growth (10-15 ft). This dense fern-leaf appears to compete well with curlyleaf. Any future treatments in these plots should be careful not to impact this important native plant, as this may open up additional areas for curlyleaf expansion.

Future Treatments

Past studies have shown that the greatest reductions in curlyleaf abundance and turion density occur during the first 2-3 consecutive years of treatment (Johnson et al. 2012). Any future treatments of these plots should be continued for 2 to 3 years to provide some degree of long-term control.

References

Johnson JA, Jones AR, Newman RM. 2012. Evaluation of lakewide, early season herbicide treatments for controlling invasive curlyleaf pondweed (*Potamogeton crispus*) in Minnesota lakes. Lake and Reserv Manage **28:** 346-363.

Madsen JD. 1999. Point intercept and line intercept methods for aquatic plant management. Aquatic Plant Control Technical Note MI-02. Vicksburg, MS, U.S. Army Engineer Research and Development Center: 16 pp.

