



April 15, 2015 (corrected aquatic plant data May 22, 2020)

## MCLA and Silver Lake District,

Since the late 1980's DNR, Manitowoc County, the Silver Lake District, MCLA and other partners have worked together to improve the water quality, fisheries and the public use of Silver Lake. This letter is to give you an update on aquatic plant and water quality monitoring results on Silver Lake for your information.

### **Aquatic Plants:**

An aquatic plant survey was conducted on Silver Lake in Manitowoc County on August 6, 2014 and on July 27, 2012. Results from the 2014 survey are presented in Table 1.

Survey methods: Based on area and depth specific to Silver Lake, we mapped a 234-point sampling grid over the entire lake surface. Using a GPS, we navigated by boat to each of the pre-determined grid points. At each point we used a two-sided rake to sample approximately 1 foot along the bottom. After pulling the plants to the surface, the overall rake as well as individual species on the rake were assigned a fullness rating of 1, 2 or 3 to estimate density of plant growth (see Figure 1 for descriptions of rake fullness ratings). We also recorded visual sightings of species within six feet of the sample point, as well as any additional species seen in the lake during a general boat survey. Species frequencies of occurrence reflect the percentage of times a species was found out of the total number of points sampled. Littoral frequency of occurrence (given in Table 1) indicates how often a species was found considering only areas of the lake that are capable of supporting plant growth (known as the "littoral area"). The maximum depth of plant growth is the deepest depth at which plants were found in the lake. Species richness is a count of the total number of different plant species found in a lake. The Floristic Quality Index (FQI) is a metric that evaluates the closeness of the flora in a lake to that of an undisturbed condition. The higher a FQI value, the closer that plant community is to an undisturbed ecosystem. Statewide and ecoregion averages are calculated from a subset of approximately 250 lakes across Wisconsin.

**Table 1: Species Present Silver Lake 2014**

% Frequency of Occurrence (Littoral): This estimation of frequency of occurrence is calculated by taking the total number of times a species is detected by the total number of points in a lake at which the growth of plants is possible.

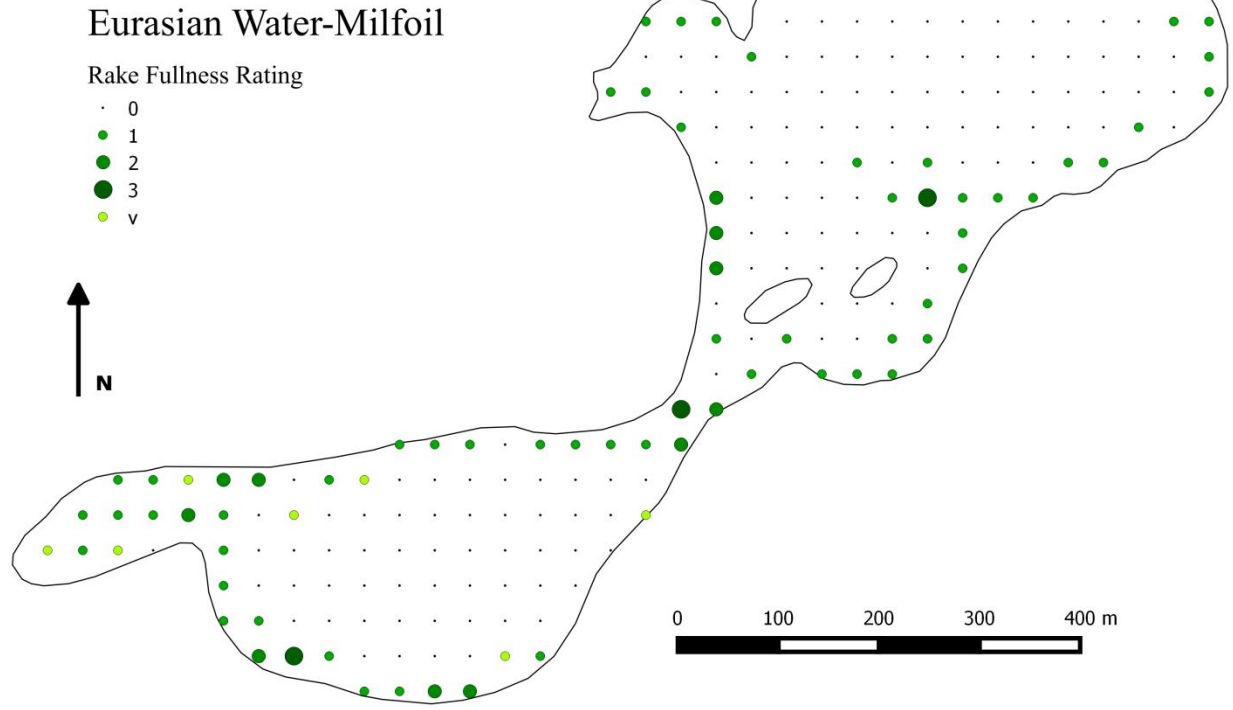
Common Name	Scientific Name	Growth Form (Floating, free floating, submerged, emergent)	% Frequency of Occurrence
Eurasian/hybrid water milfoil	<i>Myriophyllum spicatum</i> * ( <i>M. spicatum</i> x <i>M. sibiricum</i> )	Submergent	52.1
Coontail	<i>Ceratophyllum demersum</i>	Submergent	27.4
Elodea	<i>Elodea canadensis</i>	Submergent	11.6
Leafy pondweed	<i>Potamogeton foliosus</i>	Submergent	4.1
Muskgrasses	<i>Chara</i> spp.	Submergent	1.4
Flat-stem pondweed	<i>Potamogeton zosteriformis</i>	Submergent	1.4
Sago pondweed	<i>Stuckenia pectinata</i>	Submergent	0.7
Spatterdock	<i>Nuphar variegata</i>	Floating	0.7
Forked duckweed	<i>Lemna trisulca</i>	Submergent	0.7
Large-leaf pondweed	<i>Potamogeton amplifolius</i>	Submergent	visual
Soft-stem bullrush	<i>Schoenoplectus tabernaemontani</i>	Emergent	visual
Wild celery	<i>Vallisneria americana</i>	Submergent	visual

\*Species non-native and potentially invasive in Wisconsin

### Survey Summary

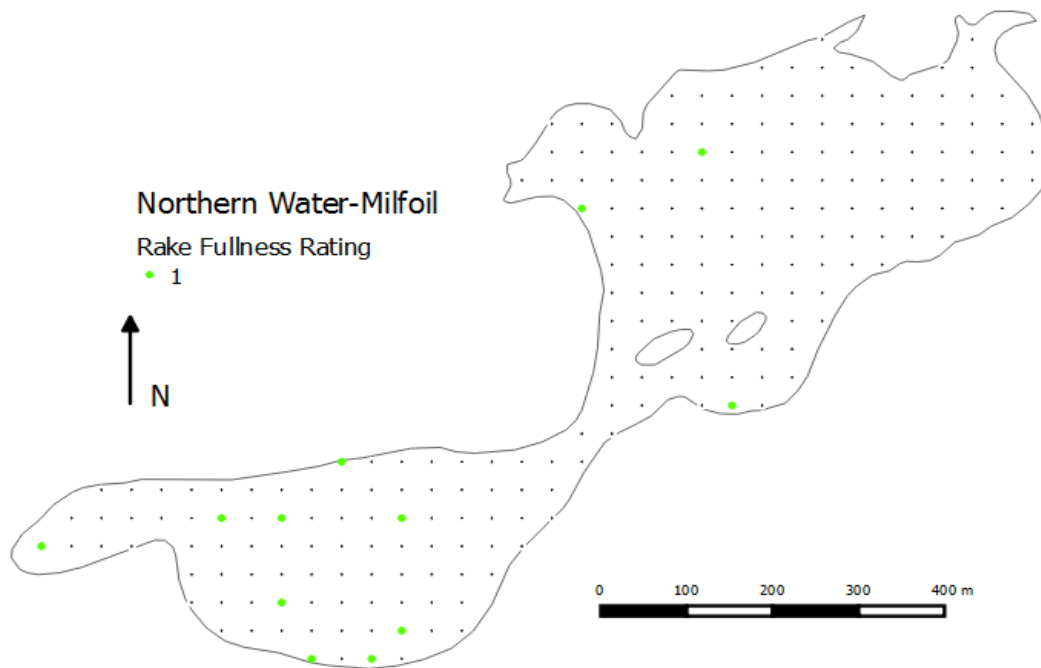
	SILVER LAKE	STATEWIDE AVERAGE	SWTP ECOREGION AVERAGE
Littoral Frequency of Occurrence (%)	81.1	74.3	79.0
Maximum Depth of Plant Growth	8.0	15.3	15.4
Species Richness	9.0	16.8	15.0
Floristic Quality Index (FQI)	14.1	24.1	20.0

### Silver Lake - August 6, 2014 - Manitowoc County

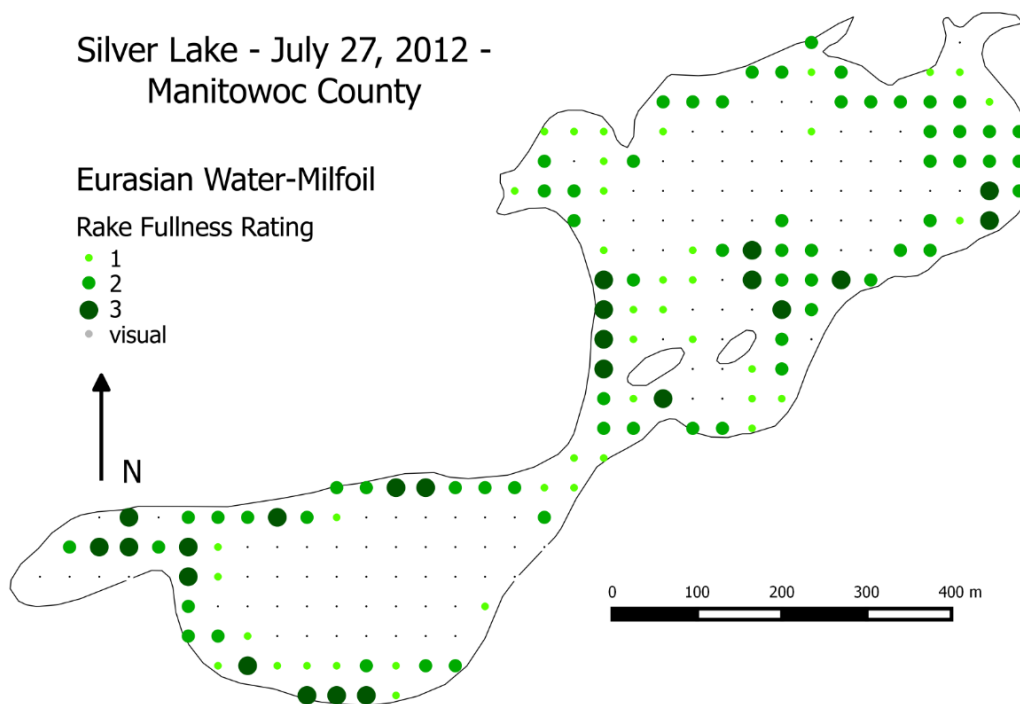


Milfoil locations are shown in Figure 1. The first map is of Eurasian water milfoil in 2104.

Figure 1: Map of the approximate location of milfoil in 2014.



Silver Lake - July 27, 2012 -  
Manitowoc County



Milfoil was also mapped by Onterra in 2012 and is included as an appendix. Although milfoil mapping was not completed in 2014, I think it fair to say the milfoil was not as dense in 2014 as it was in 2012.

### **Milfoil Chemical Treatment:**

The Department has heard speculation that the aquatic plant chemical treatment on Silver Lake may have contributed to the fish kill. It is unlikely that this small treatment could have impacted the overall dissolved oxygen levels in Silver Lake. Silver Lake was treated for hybrid water milfoil and filamentous algae on June 30, 2014. The three small treatment areas totaled 0.12 acres out of a 69 acre lake. The treatment was limited to around the two fishing piers and at the boat landing. The boat landing was treated to provide nuisance relief for boat access out into the lake. The fishing pier treatments were to provide some nuisance relief for fishing activities in the park. The boat landing treatment was 50 feet long X 20 feet wide and both fishing piers were 30 feet wide X 75 feet long. Diquat (a fast acting contact herbicide) and Cutrine (a cleated copper compound) were used. A certified pesticide applicator did the treatments. The same areas were treated in 2013 and 2012.

### **Water Quality:**

On September 30, 2014, the DNR collected a total phosphorus profile from the deep spot in Silver Lake. Those results show that the phosphorus concentration in the lower half of the lake has very high levels of phosphorus during summer stratification. This indicates that the alum layer is buried and phosphorus is being released from the new sediment layer on top of the alum.

Thanks to the reliable volunteer monitor for Silver Lake, water quality data (phosphorus, chlorophyll and secchi) continues to be collected on Silver Lake. Specific results can be found on the DNR website at: <http://dnr.wi.gov/lakes/waterquality/Station.aspx?id=363312>

Overall, summer water quality varies and fluctuates year to year but has not significantly changed in the last few years as summarized in Table 2 below. Summer mean concentrations of trophic variables still appear to be better than it was prior to the stream diversion and alum treatment.

**Table 2. Summer mean concentrations of the trophic variables.** The stream was diverted in 2002 and fish eradication and alum treatment occurred between the summer of 2003 and 2004.

	<b>Total Phosphorus (<math>\mu\text{g L}^{-1}</math>)</b>	<b>Chlorophyll a (<math>\mu\text{g L}^{-1}</math>)</b>	<b>Secchi Depth (ft)</b>
1996	186	91	6.9
2003	107	38	4.3
2004	34	19	6.2
2005	27	8	3.8
2006	27	10	4.6
2007	28	8	6.8
2008	45	13	5.5
2010	40	16	3.5

2012	20	6	8.3
2013	46	17	4.3
2014	35	18	8.4

The DNR received information of a fish kill under the ice on Silver Lake in February 2015. Fisheries staff collected data (Table 3) which showed very little dissolved oxygen from the surface to the bottom of Silver Lake. Fisheries staff will conduct surveys on Silver Lake in 2015 to further assess the situation.

**Table 3. Dissolved oxygen and temperature monitoring in east basin of Silver Lake Feb. 23, 2015.**

<b>Water Depth (m)</b>	<b>Water Temperature °C</b>	<b>Dissolved Oxygen (mg/l)*</b>
Surface	1.1	0.84
1	2.9	0.58
2	2.9	0.50
3	3.1	0.39
4	3.4	0.36
5	3.8	0.32
6	3.8	0.29
7	3.8	0.25

\*Wisconsin water quality standard is 5 mg/l.

This is just a brief summary of recent aquatic plant and water quality monitoring results on Silver Lake for your information. If you have any questions, please feel free to contact me at 920-662-5489 or at [mary.gansberg@wisconsin.gov](mailto:mary.gansberg@wisconsin.gov).

Sincerely,

Mary Gansberg  
Water Resources Management Specialist  
Wisconsin Department of Natural Resources

C: Steve Hogler, Fisheries Biologist

Appendix



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