



December 19, 2017

To whom it may concern:

This past field season Heidmann Lake in Kewaunee County was part of the DNR Directed Lakes Monitoring Program. Through this program, Heidmann Lake had multiple sampling techniques completed to help determine overall lake health. The largest of these sampling techniques was the aquatic plant index survey. This report details the plant survey and how the results can be interpreted. It also includes the water chemistry and aquatic invasive species survey results.

Plant Index Survey

Importance of Aquatic Plants

Aquatic plants form the foundation of healthy lake ecosystems. They not only protect water quality, but also produce life-giving oxygen. Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus and nitrogen that could stimulate algal blooms. Plant beds stabilize soft lake bottoms and prevent shoreline erosion by reducing the effect of waves and currents. Healthy native aquatic plant communities help prevent the establishment of invasive non-native plants such as Eurasian water milfoil and curly-leaf pondweed. Native aquatic plants also provide important reproductive, food, and cover habitat for fish, invertebrates, and wildlife. By leaving or restoring a natural buffer area of emergent vegetation along the shoreline, property owners can reduce erosion, help maintain water quality, and provide habitat and travel corridors for wildlife.

Point-Intercept Sampling Method

Based on area and depth specific to Heidmann Lake, we mapped a 105-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 (figure 1). 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. For more detailed information on the point-intercept sampling method and how data were collected please visit: <http://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/ecology/Aquatic%20Plants/PI-Protocol-2010.pdf>

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 or zone”). 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

% Frequency of Occurrence (Littoral): This estimation of frequency of occurrence is calculated by taking the total number of times a species is detected in a lake divided 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
Coontail	<i>Ceratophyllum demersum</i>	Submerged	50.00
Muskgrass	<i>Chara</i> sp.	Submerged	41.38
Northern Water Milfoil	<i>Myriophyllum sibiricum</i>	Submerged	29.31
Flat-stem Pondweed	<i>Potamogeton zosterifomus</i>	Submerged	25.86
White Water Lily	<i>Nymphaea odorata</i>	Floating	22.41
Common Bladderwort	<i>Utricularia vulgaris</i>	Free Floating	15.52
Eurasian Water milfoil*	<i>Myriophyllum spicatum</i>	Submerged	10.34
Fries' Pondweed	<i>Potamogeton friesii</i>	Submerged	6.90
Aquatic Moss	<i>Fontinalis antipyretica</i>	Submerged	3.45
Small Bladderwort	<i>Utricularia minor</i>	Free Floating	3.45
Slender Niad	<i>Najas flexillis</i>	Submerged	1.72
Large Leaf Pondweed	<i>Potamogeton amplifolius</i>	Submerged	1.72
Slender Waterweed	<i>Elodea nuttallii</i>	Submerged	1.72
Illinois Pondweed	<i>Potamogeton illinoensis</i>	Submerged	1.72
Small Pondweed	<i>Potamogeton pusillus</i>	Submerged	Visual
Water Horsetail	<i>Equisetum aquaticum</i>	Emergent	Visual

* = species non-native and potentially invasive in WI

Table 2: Overall Survey Summary

	Heidmann Lake	Statewide Average	SWTP Ecoregion Average
Littoral Frequency of Occurrence (%)	75.9%	73.3%	79%
Maximum Depth of Plant Growth (ft)	22	15.3	15.4
Species Richness	13	16.8	15
Floristic Quality Index (FQI)	22.8	24.1	20

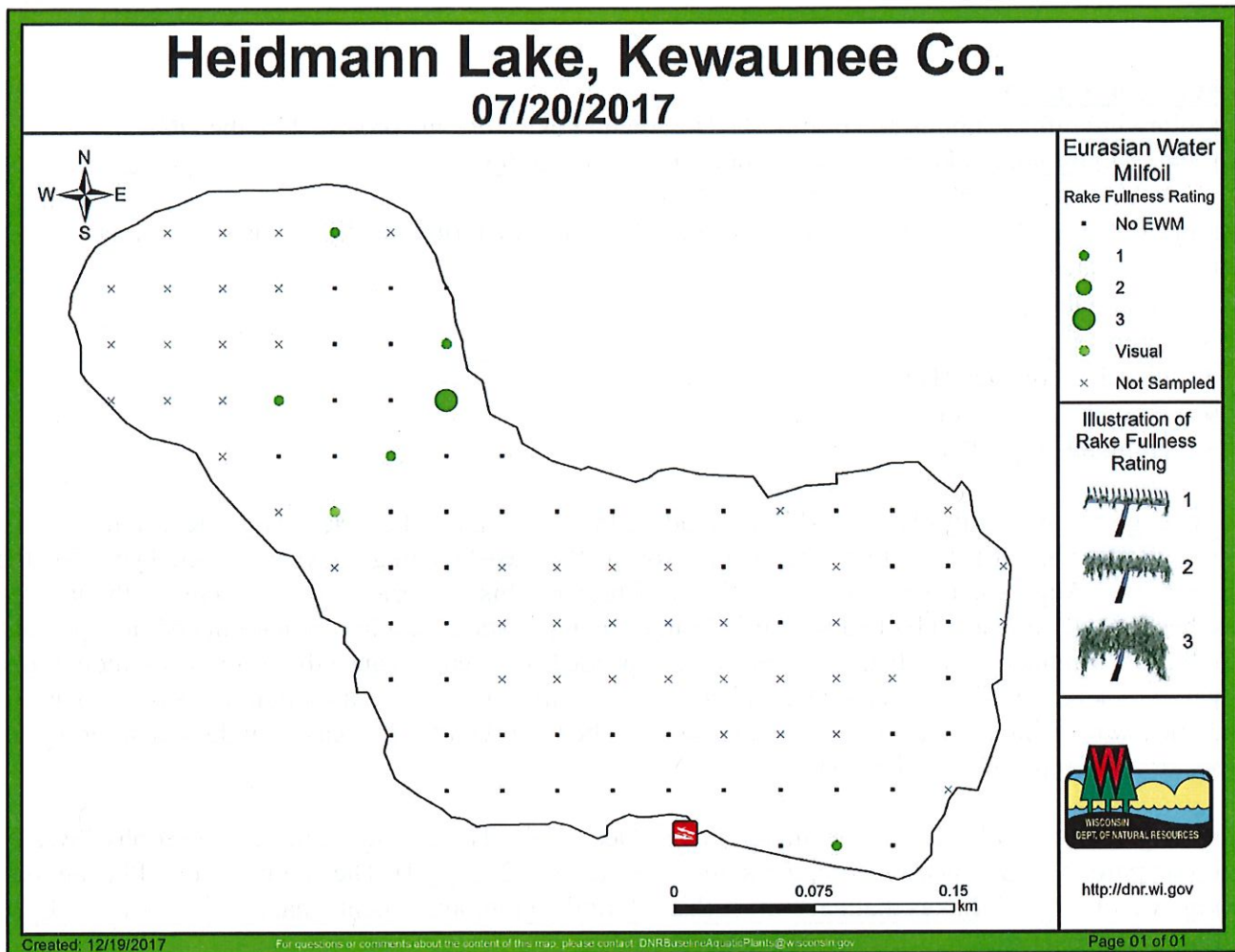


Figure 1: AIS distribution map with rake fullness ratings. Eurasian Water Milfoil (*Myriophyllum spicatum*) was collected on a GPS point. Visuals are made when a plant species is within 6 feet of the rake location without being collected on the rake.

Plant survey Results

As you can see from the overall plant index survey summary, Heidmann Lake is a relatively healthy lake compared to other lakes throughout the state and ecoregion. Heidmann Lake received an average FQI value determining the lake's flora is comparable to other surrounding lakes throughout the state and ecoregion. Heidmann Lake has a relatively high frequency of occurrence in the littoral zone when compared to other lakes throughout the state and ecoregion. With the majority of Heidmann Lake's plant community being three plants, the species richness is less than the statewide and ecoregion averages. This is likely caused by sediment type, water quality, and the lake's bathymetry. Sometimes, a lake's biological conditions are perfect for one or two main plant species to dominate the ecosystem not allowing other plant species to flourish. Other lakes in this area display very similar characteristics.

Water Chemistry

The following information is taken from the Heidmann Lake webpage provided by the DNR.

<http://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=85200>

Heidmann Lake - Deepest Area was sampled 6 different days during the 2017 season. Parameters sampled included:

- water clarity (SD)
- temperature
- dissolved oxygen (D.O.)
- total phosphorus (TP)
- chlorophyll (CHL)

The average summer (July-Aug) secchi disk reading for Heidmann Lake - Deep Hole (Kewaunee County, WBIC: 85200) was 8 feet. The average for the Southeast Georegion was 6.5 feet. Typically, the summer (July-Aug) water was reported as clear and brown. This suggests that the Secchi depth may have been mostly impacted by tannins, stain from decaying matter. Tannins are natural and not a result of pollution. Tannins can be distinguished from suspended sediment because the water, even though it's brown, it looks clear, like tea. Though tannins are not harmful per se, they are often not perceived as aesthetically pleasing as clear water. Tannins can also be important for decreasing light penetration into the water and decreasing algal growth.

Chemistry data was collected on Heidmann Lake - Deep Hole. The average summer Chlorophyll was 3 $\mu\text{g/l}$ (compared to a Southeast Georegion summer average of 25.3 $\mu\text{g/l}$). The summer Total Phosphorus average was 15.1 $\mu\text{g/l}$. Lakes that have more than 20 $\mu\text{g/l}$ and impoundments that have more than 30 $\mu\text{g/l}$ of total phosphorus may experience noticeable algae blooms.

The overall Trophic State Index (based on chlorophyll) for Heidmann Lake - Deep Hole was 43. The TSI suggests that Heidmann Lake - Deep Hole was mesotrophic. Mesotrophic lakes are characterized by moderately clear water, but have an increasing chance of low dissolved oxygen in deep water during the summer.

Lake Water Quality 2017 Annual Report

Heidmann Lake
Kewaunee County
Waterbody Number: 85200

Lake Type: SEEPAGE
DNR Region: NE
GEO Region: SE

Site Name	Storet #
Heidmann Lake - Deep Hole	313031

Date	SD (ft)	SD (m)	Hit Bottom	CHL	TP	TSI (SD)	TSI (CHL)	TSI (TP)	Lake Level	Clarity	Color	Perception
05/29/2017	13	4	NO			40			NORMAL	CLEAR	BLUE	1-Beautiful, could not be nicer
06/27/2017	6.5	2	NO			50			HIGH	MURKY	BROWN	1-Beautiful, could not be nicer
07/19/2017				2.3	17.1		41	50				
07/19/2017										CLEAR	BROWN	
08/22/2017										CLEAR	BROWN	
08/22/2017	8	2.4	N	3.62	13.1	47	45	48				
09/11/2017	12	3.7	NO	3.96		41	45			CLEAR	BROWN	

07/19/2017		
Depth METERS	Temp. DEGREES C	D.O. MG/L
1	26.2	7.7
2	25.3	7.8
3	23.8	7.3
4	19.7	2.4
5	13.8	.7
6	10.5	.4
7	8	.2
8	6.8	.1

08/22/2017		
Depth METERS	Temp. DEGREES C	D.O. MG/L
1	23.97	7.05
2	23.96	7.09
3	23.98	6.97
4	21.7	1.12
5	16.06	.55
6	11.35	.33
7	9.68	.3
	24.0	7.1

09/11/2017		
Depth METERS	Temp. DEGREES C	D.O. MG/L
1	18.7	6.47
2	18.58	6.43
3	18.46	6.29
4	18.17	4.46
5	17.43	1.09
6	12.61	.63
7	9.25	.41
8	7.52	.26
9	7.13	.23
	18.7	6.4

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Aquatic Invasive (AIS) Species Survey

AIS found while monitoring consists of Narrow-leaf Cattail (*Typha angustifolia*) as well as Hybrid Cattail and Eurasian Water Milfoil (*Myriophyllum spicatum*). To learn more about aquatic invasive species and become more familiar with each specific species please visit the WDNR aquatic invasive species webpage: <http://dnr.wi.gov/topic/Invasives/>

This report summarizes the 2017 monitoring results. To add to this data set, I am planning to collect water chemistry samples in Heidmann Lake again in the summer of 2018. This monitoring effort will be a repeat of what was collected in 2017 as part of the Directed Lakes Program

If you have any questions regarding the survey results from Heidmann Lake, please feel free to contact me at 920-662-5497 or at holly.stegemann@wisconsin.gov.

Sincerely,

A handwritten signature in cursive script that reads "Holly A. Stegemann".

Holly Stegemann

Water Resources Management Specialist

Wisconsin Department of Natural Resources