

Sustainable Lake Management Plan

Black Lake

Ramsey County, MN



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Vadnais Lake Area Water Management Organization
2014

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1. Acknowledgements

VLAWMO wishes to thank the following:

- The City of North Oaks
- The North Oaks Homeowner's Association
- The North Oaks Company for allowing access to Black Lake to collect water quality samples.
- Ramsey Conservation District for assistance with surveys and studies done on Black Lake and in the subwatershed area.

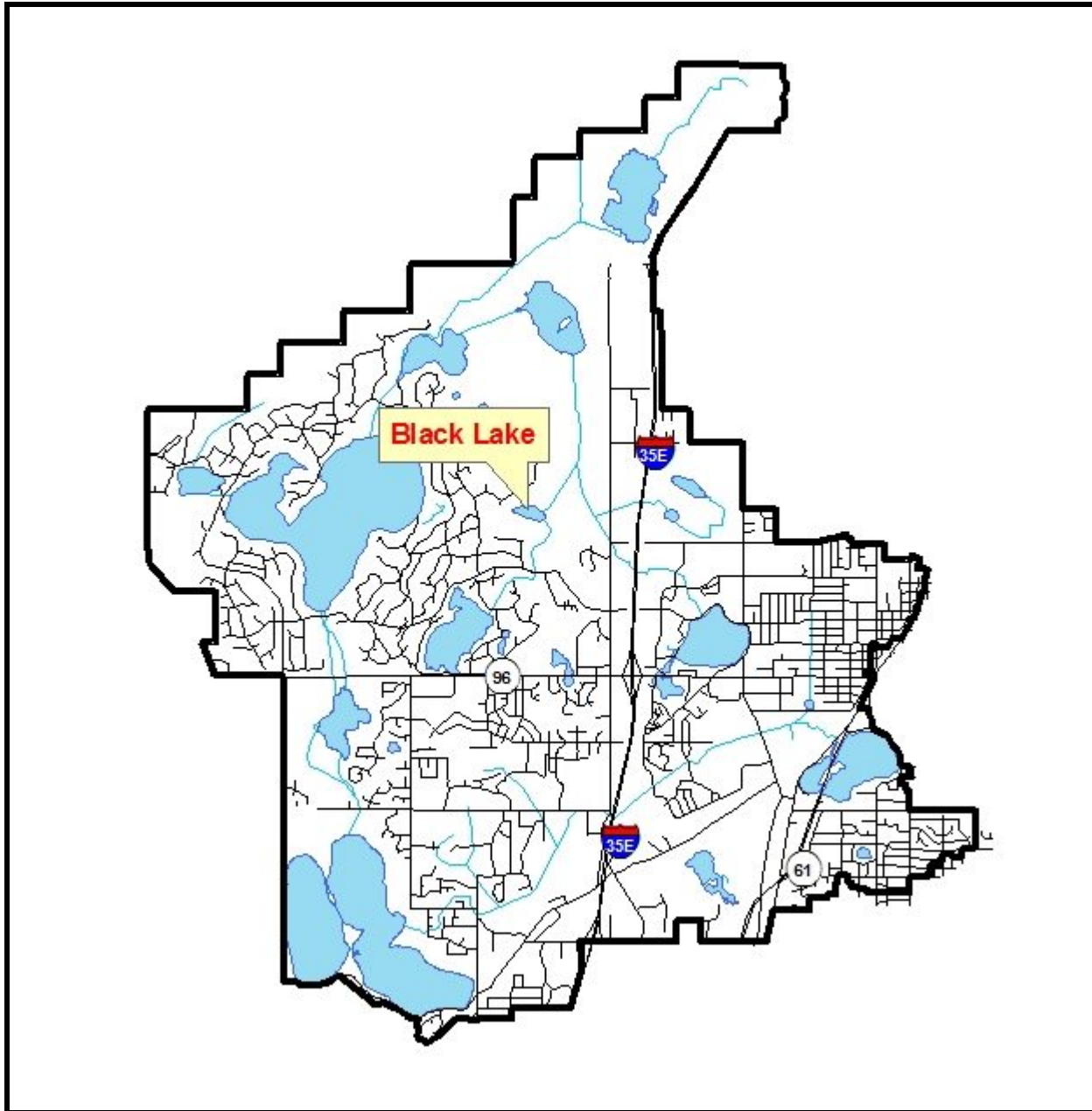
VLAWMO's mission is to protect and enhance the water resources within the watershed. Activities include water quality monitoring, wetland protection, and water quality improvement projects. The cornerstone of VLAWMO's success is our vital partnerships; without the help of all those listed above, we would not be able to fulfill our mission. We appreciate all of your work and assistance.

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2. Introduction

Black Lake is located in the City of North Oaks, Ramsey County (Figure 1) and lies within the Vadnais Lake Area Water Management Organization (VLAWMO) watershed area. Black Lake is an 11.5 acre shallow lake with a maximum depth of about 13 feet. The lake has no public access and is surrounded by private, residential development, mostly on large, wooded lots and open land.

Figure 1: Location Map



A watershed is the land area that contributes runoff to a particular point along a waterway. Watersheds can be broken down into smaller geographic units called subwatersheds and then even further down into drainage areas. Black Lake lies within the Gilfillan-Tamarack-Wilkinson subwatershed. The lake's drainage area encompasses approximately 385 acres.

This Sustainable Lake Management Plan (SLMP) will look at the overall conditions of the lake and drainage area and tie in the findings from other studies and reports to serve as a tool towards future projects and programs to help protect and enhance the water quality of the lake.

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3. Watershed Features

A. History

Figure 2: 1940 Aerial photo of Black Lake



In 1940, there are roads in the area but not much in the way of development.

Figure 3: 1953 Aerial photo of Black Lake



In 1953, the land just south of Black Lake appears to have been excavated to create open water. This area is now considered a wetland.

Figure 4: 1974 Aerial photo of Black Lake



By 1974, residential development is prevalent and I-35E has been constructed east of the lake. Additionally, drainage conduits have been dug which allow water to flow more freely from Black Lake north towards Wilkinson Lake.

Figure 5: 1985 Aerial photo of Black Lake



In 1985, more residential development has occurred in the area, most notably to the southeast of the lake.

Figure 6: 2006 Aerial photo of Black Lake



In the 2006 photo, you can clearly see the drainage conduits that were dug years earlier and the residential development around the lake. The area north and east of the lake has remained undeveloped and is used by North Oaks residents for walking and nature viewing.

Figure 7: 2012 Aerial photo of Black Lake



As of the 2012 photo, no further changes to the surrounding land appears to have taken place. Residential development is still occurring in other areas of North Oaks.

B. Black Lake Drainage Area

Black receives water from stormwater runoff, groundwater sources, and via streams. The drainage area is approximately 385 acres in size. The subwatershed area is about 33 times larger than the surface area of the lake. The land use within the subwatershed is primarily undeveloped or residential. The lake is surrounded by boggy wetland land which helps to filter pollutants. The water flows north through this drainage area through streams and drainage conduits to Wilkinson Lake.

Figure 8: Black Lake Drainage Area



A Retrofit Study was done within the larger subwatershed area of Gilfillan-Tamrack-Wilkinson. This study was done to determine the locations for possible future water quality projects (called Best Management Practices or BMPs for short) that would provide a positive impact within the subwatershed area. That study did not recommend any BMPs within the Black Lake area due to the low development around the lake.

C. Soils

There are a variety of soils found in the Black Lake drainage area. The area has a combination of mucky soils and well drained soils. The mucky soils are found in the wetland areas and/or around Black Lake.

Figure 9: Soils around Black Lake

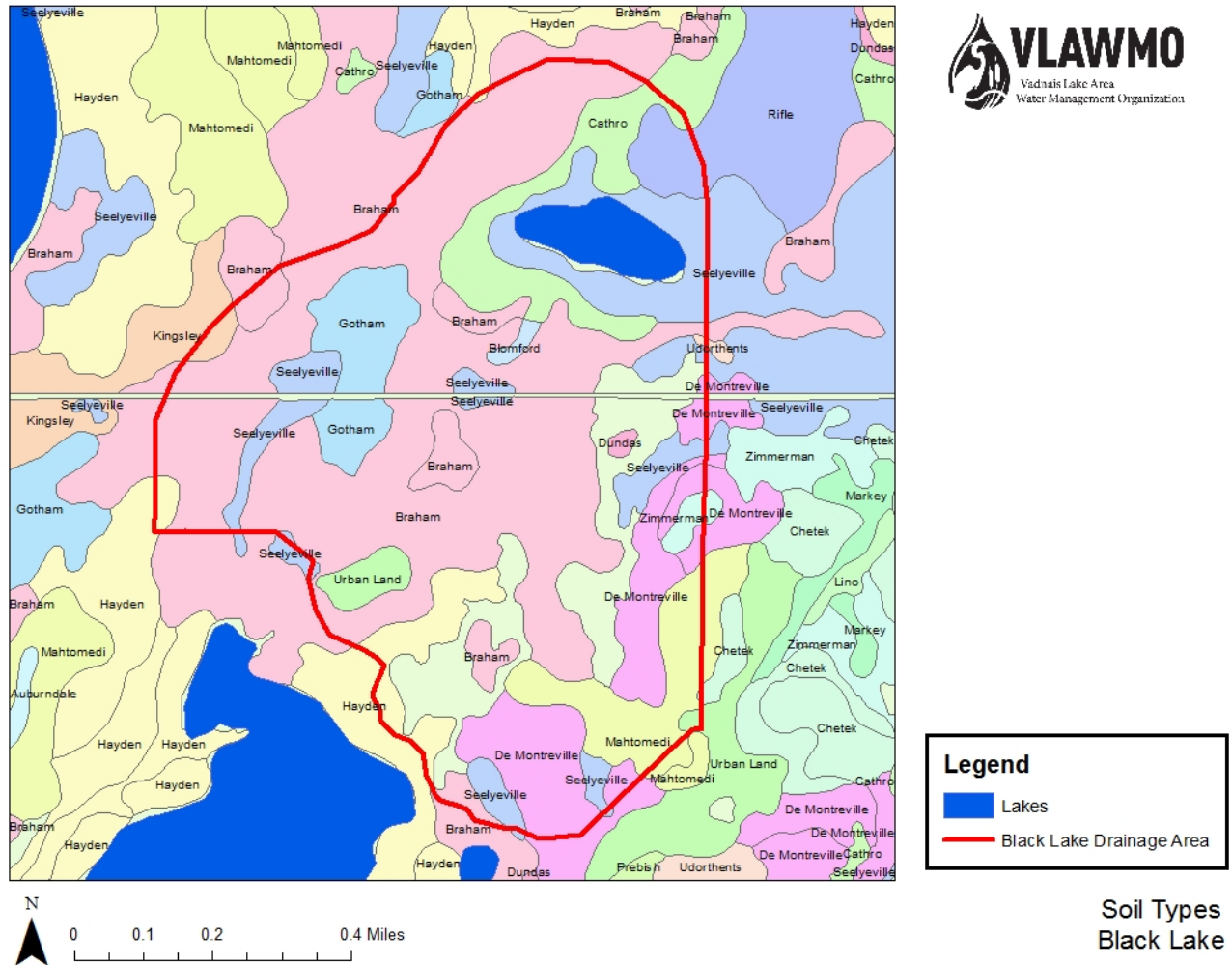


Table 1: Soil types within Black Lake drainage area

Soil Name	Characteristics
Seelyeville	Organic muck
Gotham	Well drained soils with rapid permeability; found in agriculture and prairie settings
Braham	Well drained soils with rapid permeability; found in agriculture and forest settings
Cathro	Organic soil, poorly drains; found in woodlands as well as in sedge and cattail areas
De Montreville	Well drained soils with rapid permeability; found in agriculture and forest settings
Mahtomedi	Soil drains easily; found in agriculture and forest areas; good for homesites

4. Lake Features

A. Shoreline Inventory

The land immediately surrounding Black Lake is either open land or low density residential. Homes are situated on large lots with no access into Black Lake. There are no obvious signs of shoreline erosion.

B. Lake Depth

A vegetation and lake depth survey was done in July 2014. Due to dense vegetation within Black Lake, another depth survey may be done in the spring 2015 to better determine the depth. Based on this survey there was a spot that was 13 feet deep but most of the lake is 1-9 feet deep. The lines on the lake in Figure 11 are at 3 foot intervals.

Figure 11: Black Lake Depth



C. Aquatic Vegetation

As stated earlier, a vegetation and lake depth survey was conducted in July 2014. Black Lake has abundant aquatic vegetation and the complete findings are included with Appendix A – Macrophyte & Biovolume Analysis Survey 7/24/14. Data was collected at 8 points with vegetation found at 7 of the points. For the point where no vegetation was found, it was at one of the deepest areas of the lake. Once water gets deeper than 4 feet, it is difficult for vegetation to grow because the sunlight cannot reach that deep. None of the vegetation found is considered invasive to Minnesota lakes.

Figure 12: Aquatic Vegetation Survey Points

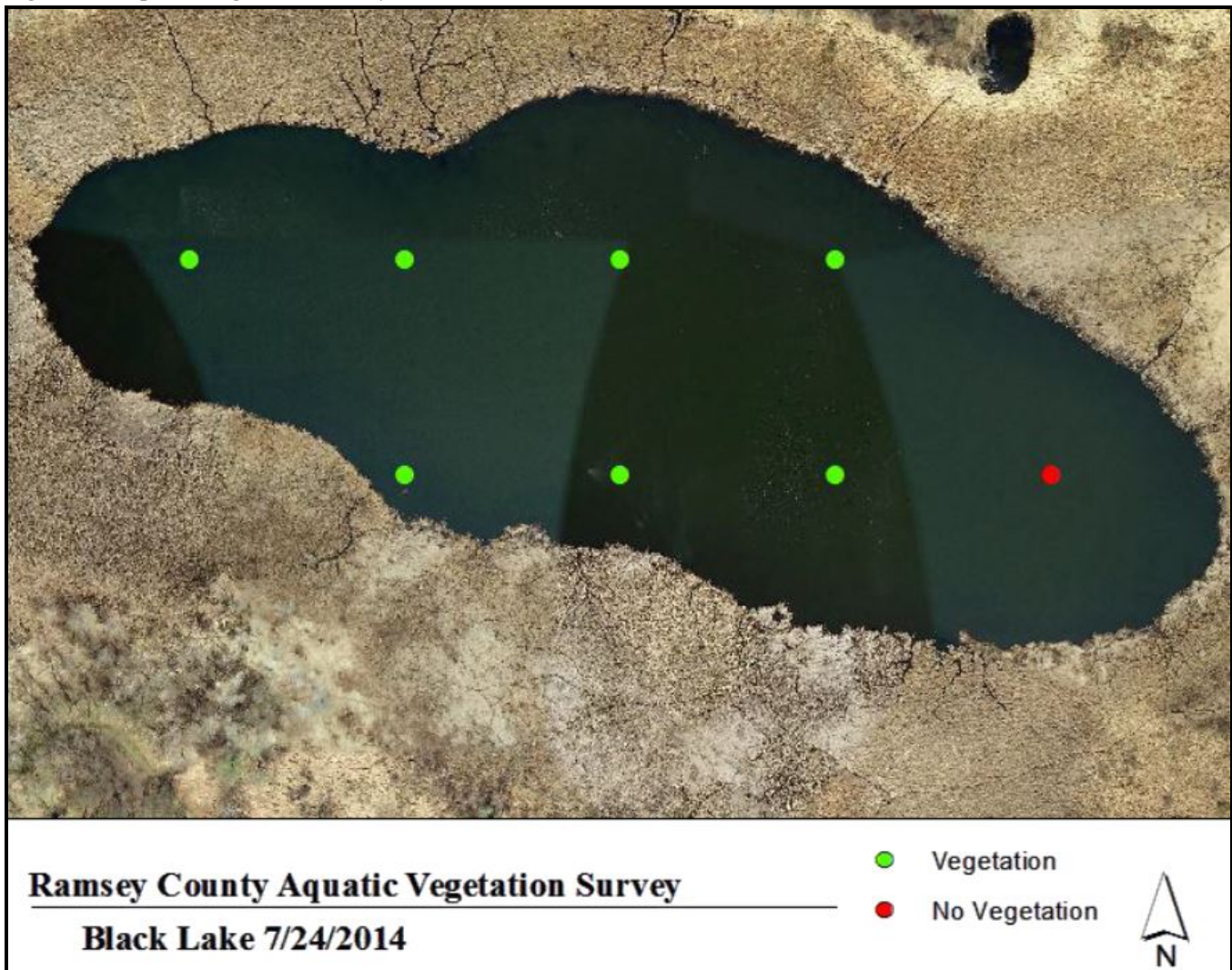


Table 2: Summary of aquatic vegetation found in Black Lake

Common Name	% Occurrence – 7/24/14
Coontail	85.71%
White waterlily	42.86%
Muskgrass	42.86%
Sago Pondweed	42.86%
Filamentous algae	14.29%
Flatstem pondweed	14.29%

D. Water Quality Summary

Water quality data has been collected on Black Lake since 2009 and the yearly averages are shown in Table 3. Samples from the lake are collected every two weeks from May through September and tested for Total Phosphorus (TP) and Chlorophyll A (Chl A) and a Secchi Depth Transparency (SDT) measurement is taken. Phosphorus is the primary cause of excessive plant and algae growth in lake systems. Phosphorus originates from a variety of sources, many of which are human related. Major sources include human and animal wastes, soil erosion, detergents, septic systems and stormwater runoff. There can also be internal loading of phosphorus in a lake from the sediment. Chl A is a green pigment in algae. Measuring Chl A concentration gives an indication of how abundant algae are in a waterbody. The State of Minnesota has established water quality standards which state that a shallow lake should have TP levels at 60ug/L or below, Chl A levels at 20 ug/L or below and a SDT of 1 meter or greater. When monitoring data shows that a lake is not meeting these standards, they are placed on the Impaired Waters List and a TMDL study is done to determine sources of pollution and set goals for reductions. Black Lake's data shows that it is not impaired and therefore a TMDL study will not be required.

Table 3: Black Lake Water Quality Annual Averages

Black Lake Historical Avg TP/Chl A/SDT			
Year	TP (ug/L)	Chl A (ug/L)	Secchi (m)
2009	23	5.9	2
2010	34	6.6	2.1
2011	44	6.9	2.3
2012	31	6	2.4
2013	32	6	2
2014	21	8	2

Another water quality indicator VLAWMO monitors is the level of Chloride in the lake. In the spring, just as ice out occurs, a sample is collected. Table 3 shows results from 2010-2014. Since salt is heavily used on roads to clear them of ice and snow, monitoring chloride is important. The State of Minnesota is still working on developing what the limit should be for a lake but given all the discussions that have taken place to date, none of VLAWMO's lakes are in danger of being listed as impaired for chloride levels.

Table 4: Black Lake Chloride Results

Black Lake Chloride Results (mg/L)	
2010	9
2011	10
2012	8
2013	5
2014	5

Another measurement of a lake's health is the Tropic State Index. This is used by State and Federal agencies to track overall health. The data gathered from monitoring (TP, Chl A, and SDT) is put into an equation and the results correspond to a characteristics for the lake. Based on 2014 data, Black Lake falls within the Mesotrophic lake description. Mesotrophic lakes have moderately clear water but may undergo anoxic (low oxygen) levels in the summer.

5. Lake Management Plan for Black Lake

Black Lake is an overall healthy shallow lake. It is surrounded by nature and does not have any direct runoff from roads or commercial and industrial areas. The lake should continue to be monitored for TP and Chl A and if levels start to rise, we will be able to implement other action items.

Table 5: Action List for Black Lake

Action Item	Description	Leader	Cost Estimate \$ = <\$1,000 \$\$ = \$1,000-\$2,500 \$\$\$ = \$2,500-\$5,000 \$\$\$\$ = \$5,000-\$25,000 \$\$\$\$\$ = \$25,000-\$100,000 \$\$\$\$\$\$ = >\$100,000
Continued Lake Monitoring	Continue current monitoring program of twice monthly lake sampling to measure nutrient levels, dissolved oxygen and temperature levels.	VLAWMO	\$
Enhanced Monitoring	Collect storm samples within the Black Lake Subwatershed to determine areas of concern.	VLAWMO & Ramsey Co	\$\$
Fish Survey	Conduct a fish survey to determine abundance and type of fish found in Black Lake	VLAWMO	\$\$