VLAWMO

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Black Lake Review, Ramsey County, MN

2024

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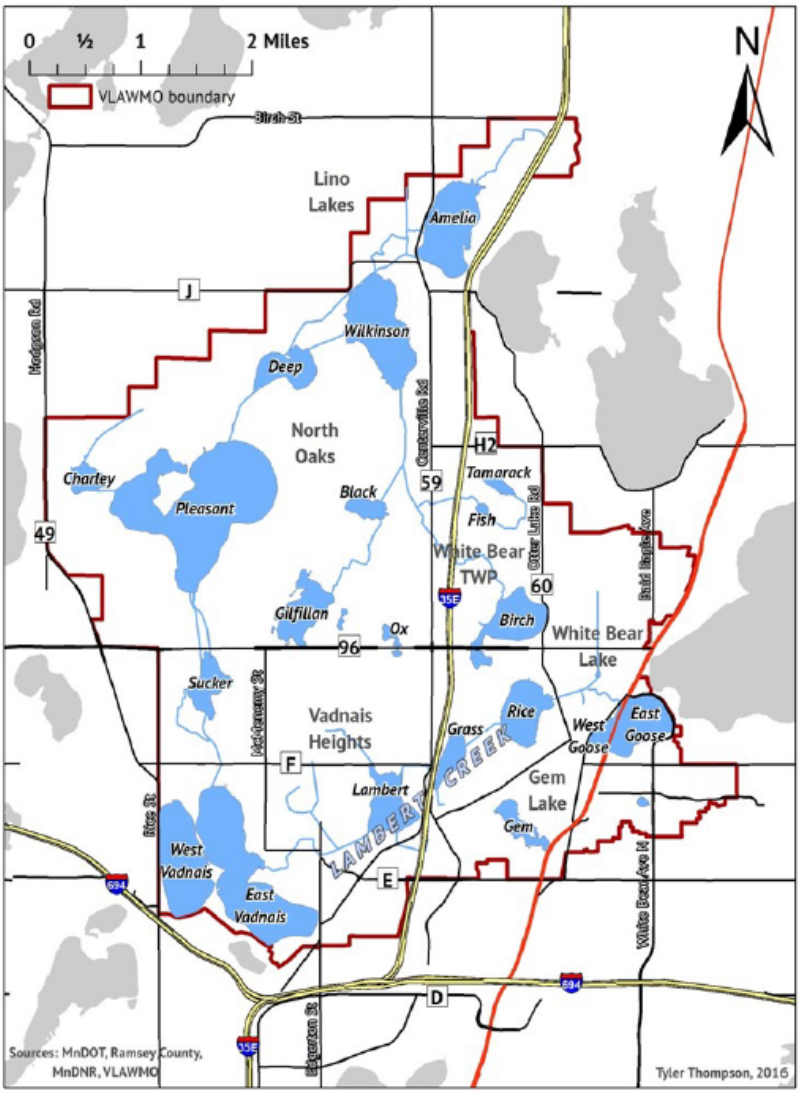
1 INTRODUCTION

1.1 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 in the Gilfillan-Tamarack-Wilkinson subwatershed. The lake's drainage area encompasses approximately 385 acres.

Black Lake is an 11.5-acre shallow lake with a maximum depth of about 12.5 feet. The lake has no public access and is surrounded by private, residential development, mostly on large, wooded lots and open land. There is very little developed land or roads around the lake. The lake has a large wetland fringe. Black Lake is noted for having wild rice present.

Figure 1: Location Map



2 WATERSHED FEATURES

2.1 AERIAL PHOTO HISTORY

Aerial photos are shown here beginning in 1940.

Figure 2: 1940, there are roads in the area but not much development.

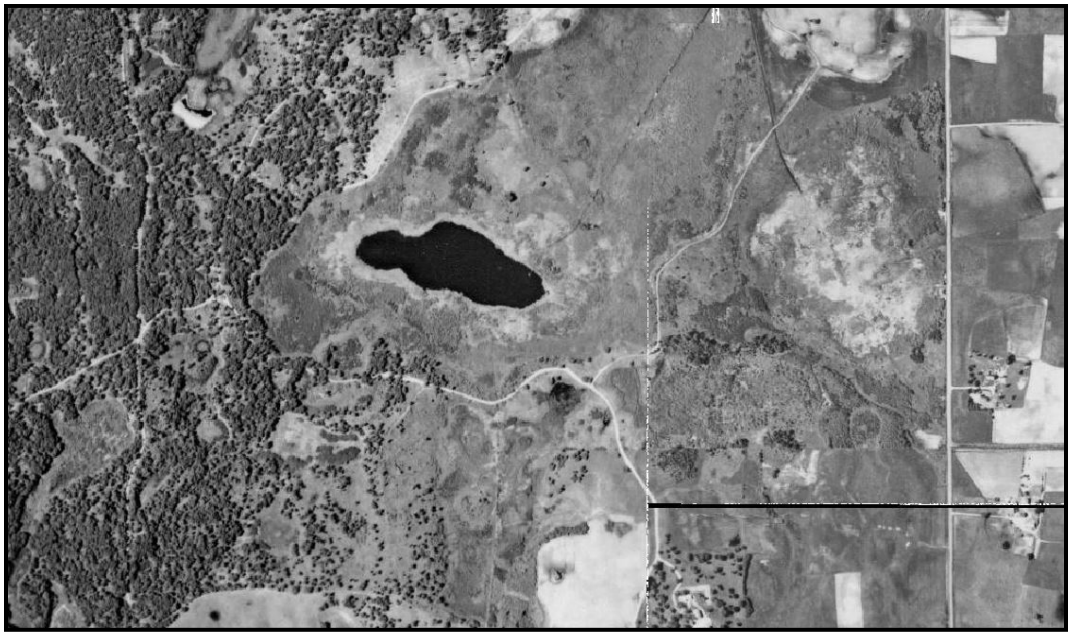


Figure 3: In 1953, the land just south of Black Lake appears to have been excavated to create open water. This area is now considered a wetland.

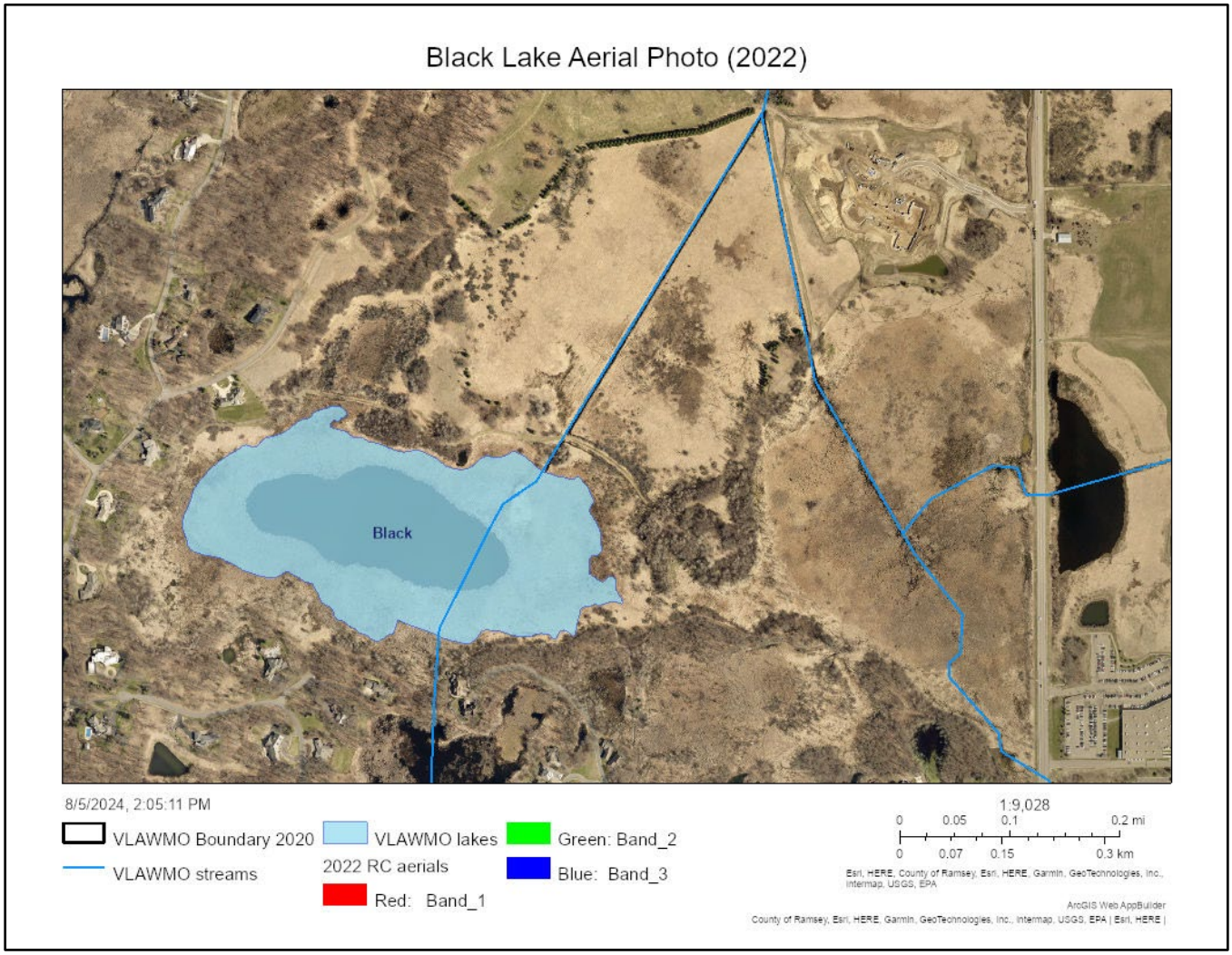
Figure 4: By 1974, residential development is prevalent and I-35E has been constructed east of the lake. Additionally, drainage conduits have been dug which allow water to flow more freely from Black Lake north towards Wilkinson Lake.

Figure 5: In 1985, more residential development has occurred in the area, most notably to the southeast of the lake.

Figure 6: In 2006, the drainage conduits that were dug years earlier are visible as is residential development around the lake. The area north and east of the lake is undeveloped and is used by North Oaks residents for walking and nature viewing.

Figure 7: As of 2012, residential development is still occurring in other areas of North Oaks.

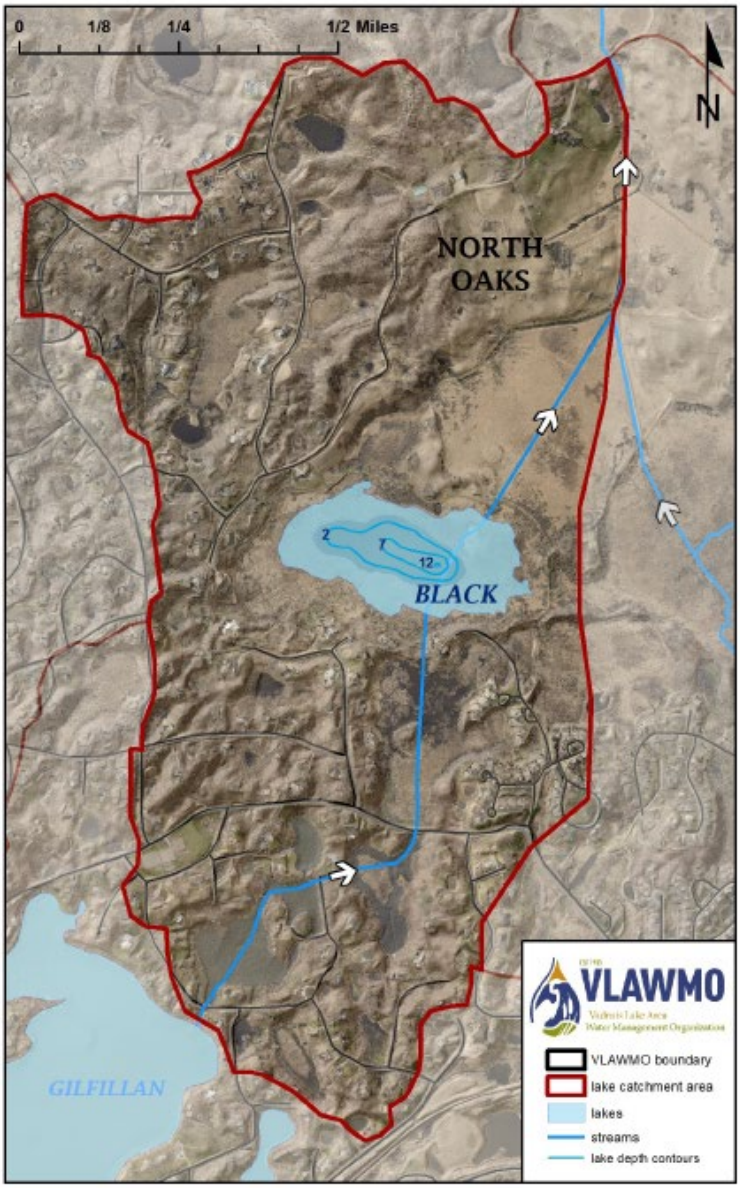
Figure 8: In 2022, residential development is still occurring in other areas of North Oaks.



2.2 BLACK LAKE DRAINAGE AREA

Black Lake 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 9: Black Lake Subwatershed



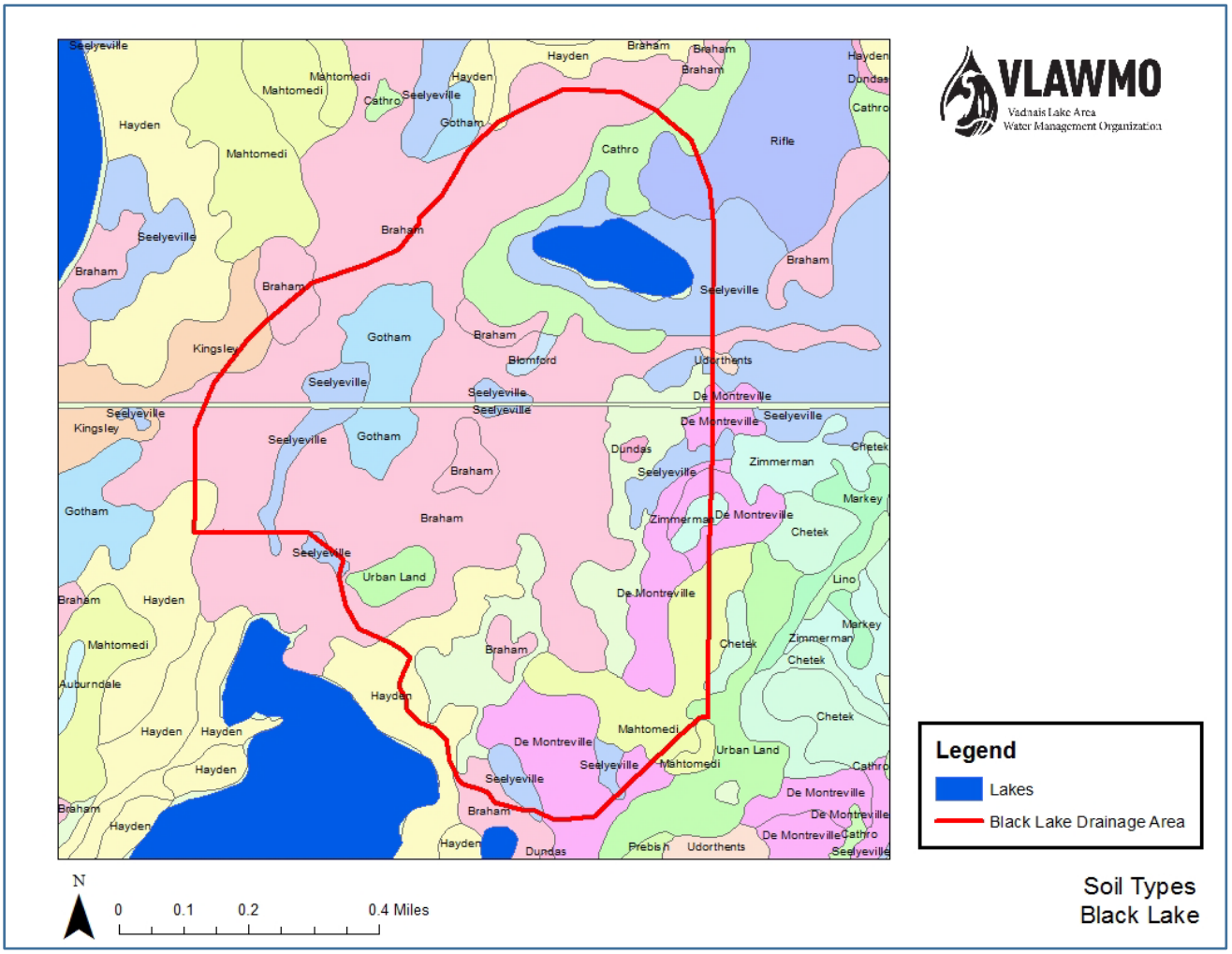
2.3 BLACK LAKE SOILS

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.

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

Figure 10: Black Lake area soils



2.4 BLACK LAKE WETLANDS

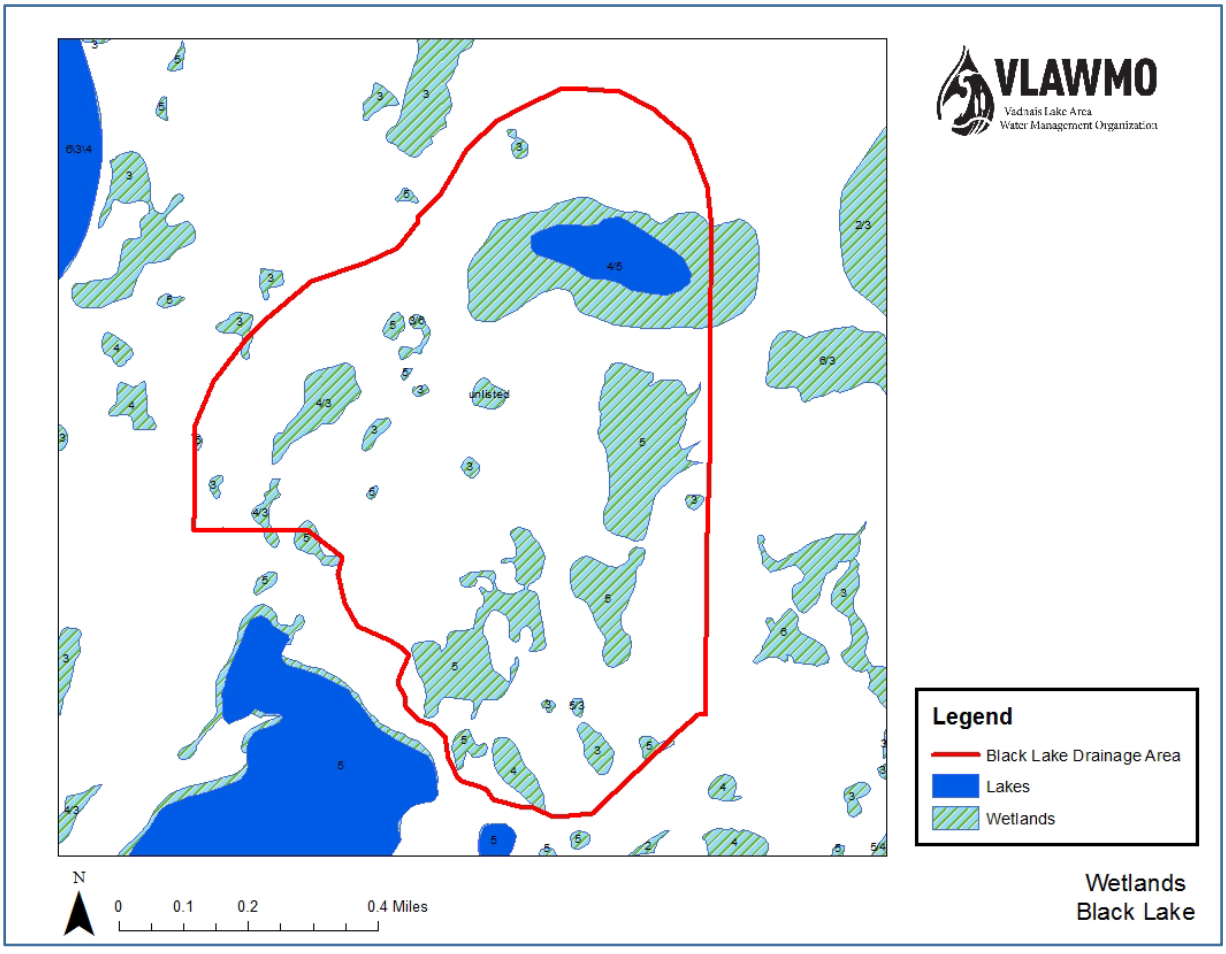
Black Lake and the marsh surrounding it is classified as a Type 4/5 according to the Wetland US Fish & Wildlife Circular 39 classification system. There are other wetlands within the subwatershed classified as either Type 3, 4, 5 or a combination of those numbers.

Type 3 wetlands: inland shallow fresh marshes in which soil is usually waterlogged early during the growing season and often covered with up to 6 inches of water. Vegetation includes grasses, bulrushes, spike rushes, cattails, and smartweeds.

Type 4 wetlands: inland deep fresh marshes where the soil is usually covered with 6 inches to 3 feet of water during the growing season. Vegetation includes cattails, reeds, bulrushes, spike rushes and wild rice. Open areas may have pondweeds, naiads, coontail, water milfoil, and water lilies.

Type 5 wetlands: inland open fresh water, shallow ponds, and reservoirs in which water is usually less than 10 feet deep and fringed by a border of emergent vegetation, much like the type of vegetation found in a Type 4 wetland.

Figure 11: Wetlands around Black Lake



3 LAKE FEATURES

LAKE FEATURES

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.

3.1 LAKE DEPTH AND BOTTOM HARDNESS

A lake depth survey was done in April 2015. A maximum depth of approximately 12.5 feet was found on the eastern side of the lake. The overall depth is approximately 4 feet.

The survey done in April 2015 included analysis of the lake bottom composition (or hardness). Black Lake's bottom is mainly a soft, mucky material. The figure below shows the composition of the lake bottom with the 3-foot intervals of depth information.

Figure 12: Black Lake Depth – 3 foot intervals- 4/29/2015

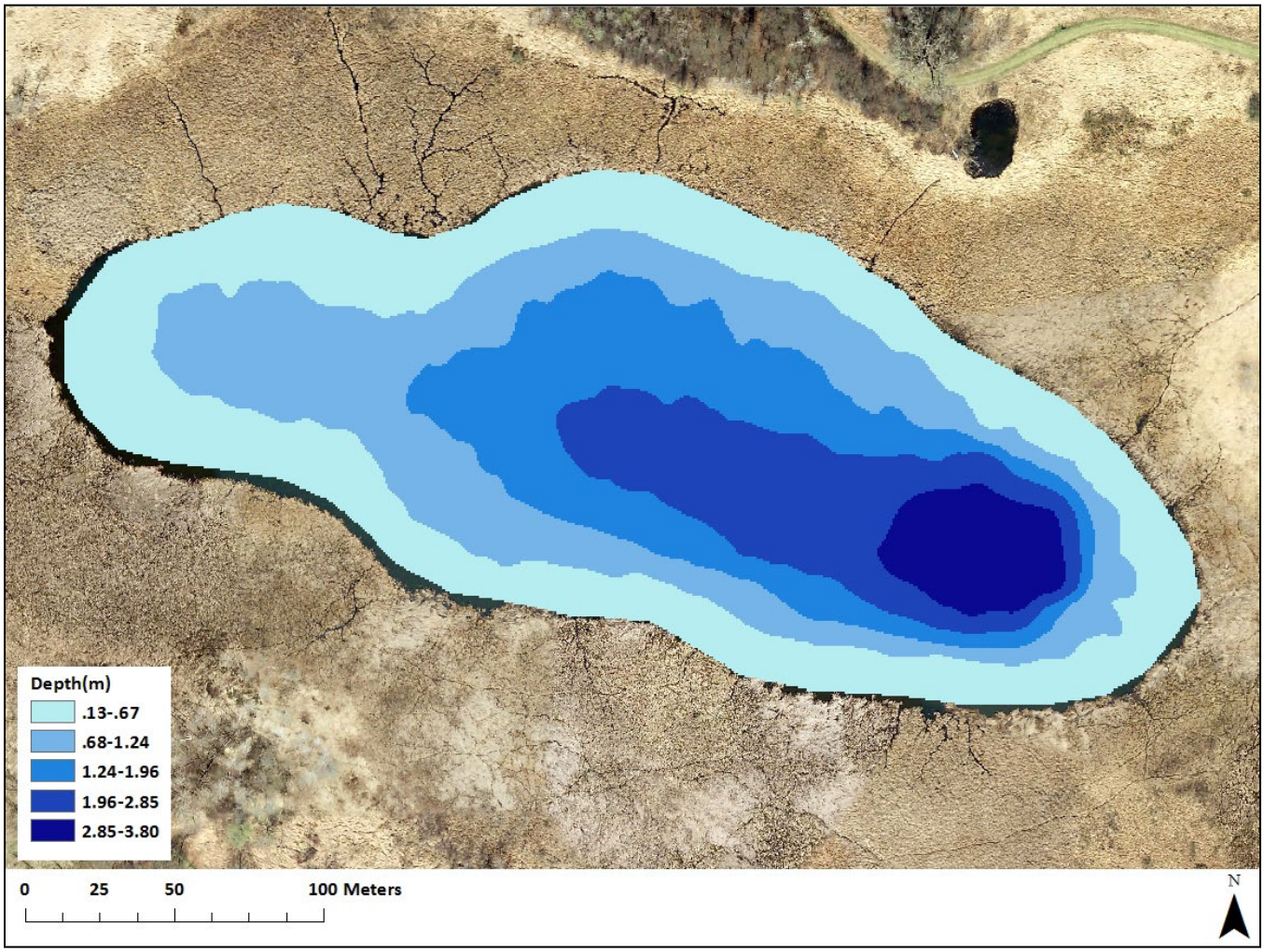
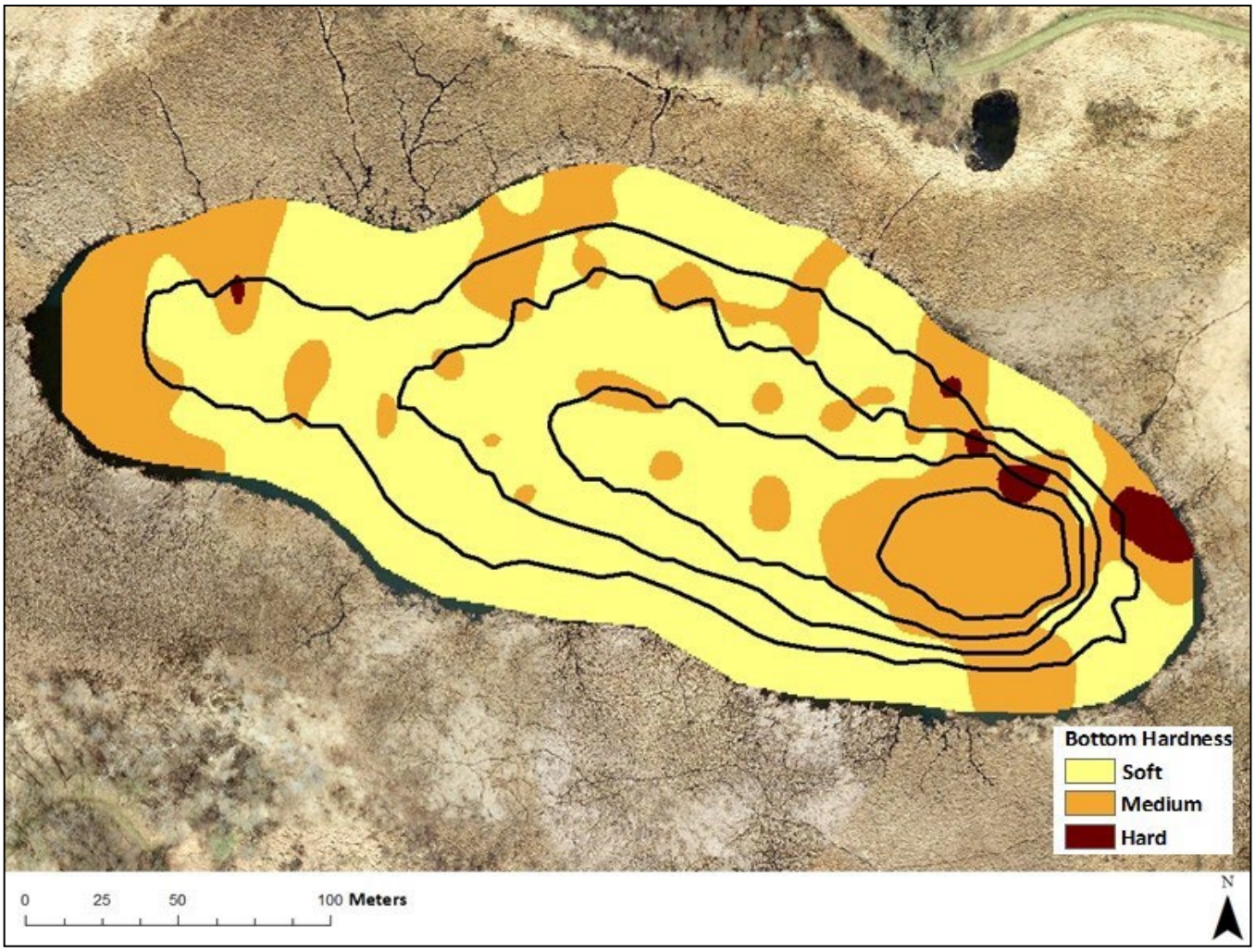


Figure 13: Black Lake Bottom Composition – 4/29/2015



3.2 AQUATIC VEGETATION & BIOVOLUME

In addition to the survey done in April 2015, a lake depth and vegetation survey was also completed in July 2014. Black Lake has abundant aquatic vegetation. Due to the large amount of vegetation found in the lake, it was concluded that the 2015 survey be completed to gather more accurate data as to the depth of the lake because the vegetation found in the height of the growing season was skewing the information that was collected. For the 2014 survey, 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.

No invasive aquatic plants were detected on this survey. Staff has found wild rice on this lake, but the plant was not located at the sampling points, so a separate methodology was used in 2015 to document wild rice extent on the lake. A large wetland fringe surrounds the lake. A visual survey, based on what was observed via canoe while on the lake, resulted in cattails, arrowhead, jewelweed, and purple loosestrife. Purple loosestrife is an invasive species and is located on the western side of the lake.

Figure 14: Aquatic Vegetation Survey Points

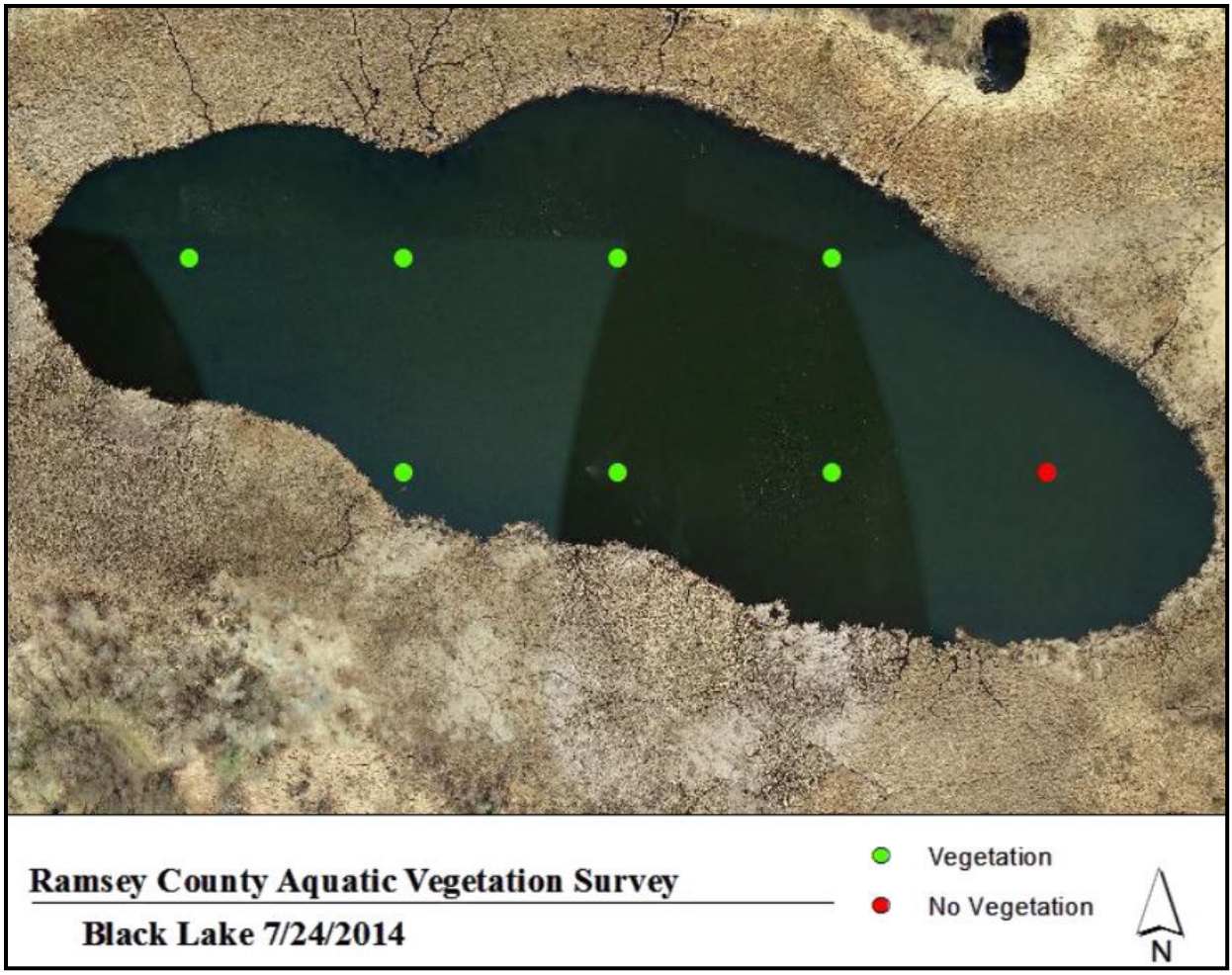


Table 2: Summary of aquatic vegetation found in Black Lake

Common Name	% Occurrence – 7/24/14
Coontail	86%
White waterlilly	43%
Muskgrass	43%
Sago Pondweed	43%
Filamentous algae	14%
Flatstem pondweed	14%

2015 Wild Rice Extent

Wild rice (*Zizania palustris*) grows in shallow lake areas rather than on the shoreline, a separate methodology was used to document presence and abundance of wild rice within Black Lake. This methodology entailed mapping areas of emerging wild rice growth utilizing GoogleMap software and satellite imagery and ground-truthing this data during 2015.

On July 1, 2015 wild rice (Zizania palustris) was observed to have begun emerging. The emerging shoots which were observed around the entire lake shore were approximately 2-3 feet above the water surface. Shoots were moderately dense with approximately 20 shoots per square meter. Wild rice was emerging, but not yet flowering or seeding on the date of the survey as wild rice flowers in early August.

Satellite imagery was utilized to estimate areas of wild rice emergence using Google Earth Technology, which was ground-truthed to field observations. The area of wild rice growth was found to be approximately 16,725 square meters or 40% of the lake surface. Wild rice emergence occurred no deeper than an approximate water depth of 1.25m (4ft) based on contours sampled on May 29, 2015.

Figure 15: Black Lake wild rice emergent areas displayed with April 29, 2015 contours.

Biovolume

Figures 14 and 15 demonstrate the difference in biovolume (abundance of in lake vegetation) from spring and summer conditions. In the summer, the lake is almost entirely filled with vegetation. The spectrum of blue – red indicated the amount of vegetation with blue being little to no vegetation and red being 100% vegetation.

Figure 15: Black Lake Biovolume – Spring Conditions – collected 4/29/2015

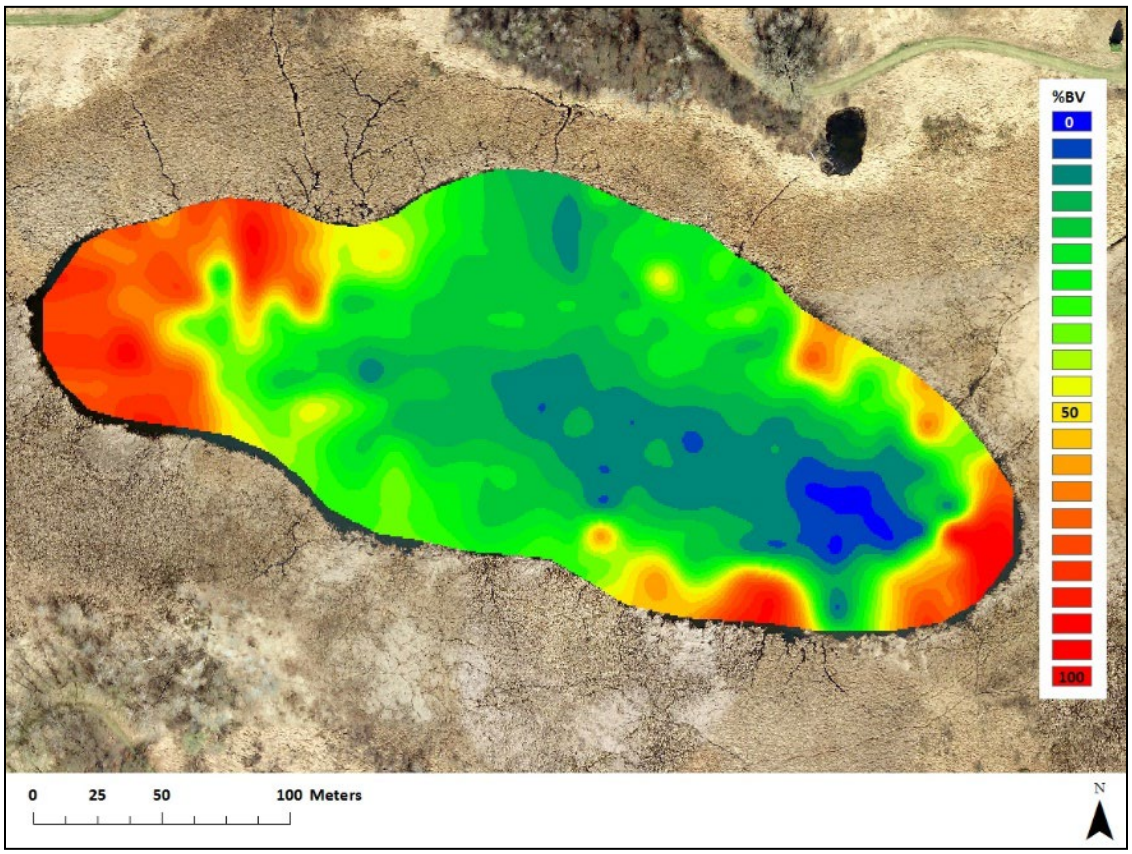


Figure 16: Black Lake Biovolume – Summer Conditions – collected 7/24/2014

3.3 SHORELINE VEGETATION

A total of 30 species were observed, with hybrid cattail (*Typha x glauca*), Northern marsh fern (*Thelypteris palustris*), lake sedge (*Carex lacustris*), jewelweed (*Impatiens* spp.), willow (*Salix* spp.) and reed canary grass (*Phalaris arundinacea*) among the most common species. The native broadleaf cattail (*Typha latifolia*) and invasive narrowleaf cattail (*Typha angustifolia*) were also observed, but in low abundance compared to hybrid cattail, a hybrid between broadleaf cattail and invasive narrow-leaf cattail.

Reed canary grass, an invasive species that reproduces through horizontal underground stems, is a threat to natural wetlands as it out-competes most native species. In the survey completed on July 1, 2015, this species had ~3% coverage relative to other species surrounding the shoreline. In these areas, reed canary grass has not yet begun to form large monotypic stands aside from a few further from the shoreline, but should be monitored in future years for potential management needs.

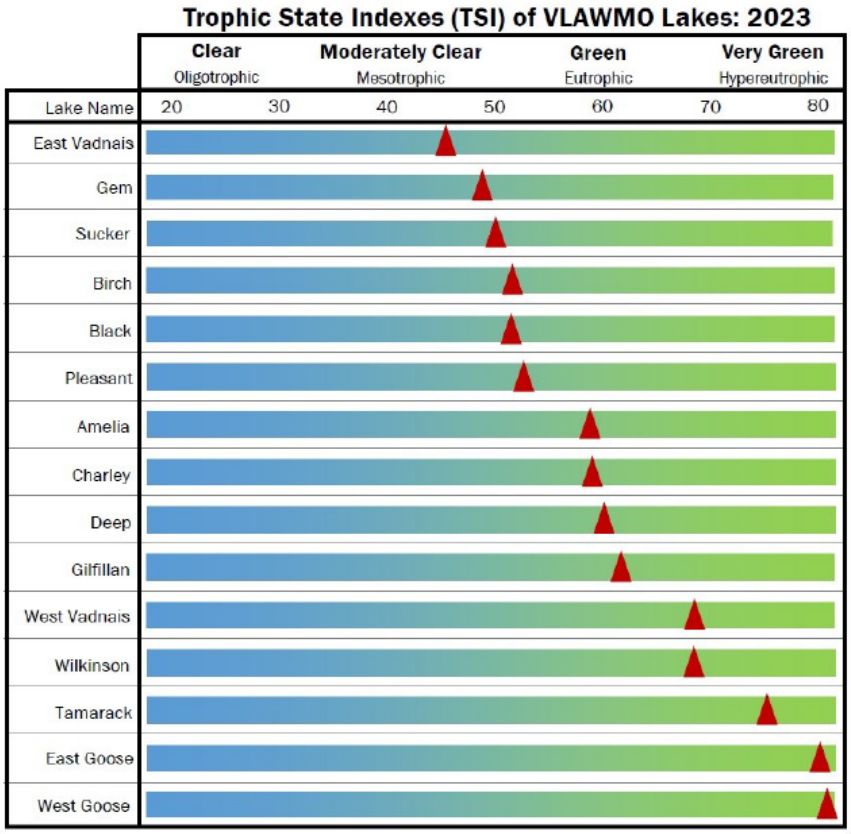
Invasion and dominance of marshes by non-native cattail species, such as hybrid cattail (Typha x glauca), is likely related to alterations in wetland hydrology, commonly from drain tiling, ditching, and impoundments in addition to high levels of nutrient-rich runoff and runoff from roads. Marshes dominated by non-native cattail species are considered to be low-quality or disturbed habitats.

Other notable species include 5 varieties of native sedge (*Carex* spp.) and purple loosestrife (*Lythrum salicaria*). Purple loosestrife, an invasive emergent aquatic species of concern, had ~1% coverage relative to other species, indicating that this species is present and more abundant than most forbs, but not completely invading and overrunning natives. This species should be monitored in future years for increased dominance. Management will be required as plants begin to form large monotypic stands.

3.4 WATER QUALITY SUMMARY

Black Lake is shallow and falls between the moderately clear/mesotrophic and green/eutrophic classifications on the Trophic State Index (TSI) (shown below using the Carlson scale, MPCA). Black Lake had a score of 52 (2022) and 51 (2023).

Figure 20: TSI scores for VLAWMO lakes



VLAWMO has collected water quality (WQ) data on Black Lake since 2009. VLAWMO staff collects WQ data and water samples biweekly, May-September, for water clarity (secchi disk), nutrients (TP, Chl-a, SRP, nitrogen), and chemistry (temperature, conductivity, dissolved oxygen, and potential hydrogen [pH]). Total Phosphorus (TP) and Chlorophyll A (Chl-a) analyses are conducted by a contracted lab.

- TP 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 waste, soil erosion, detergents, septic systems, and stormwater runoff. Internal loading can also be present in a lake. Internal loading can result from P becoming resuspended into the water column from the sediment. High amounts of P in sediments may occur as a result of historical land uses including, but not limited to, waste disposal into the lake.

- Chl-a is a green pigment in algae. Measuring Chl-a concentration gives an indication of algae abundance.

- The MN Pollution Control Agency (MPCA) has impairment standards for the levels of TP and Chl-a. For shallow lakes in Minnesota, the impaired water quality standard levels are: <60µg/L for TP, <20µg/L for Chl-a, and <230 mg/L for Chloride.

- Red numbers indicate values that exceed MN State Standards.

Table 2: Black Lake monitoring data 2009-2023

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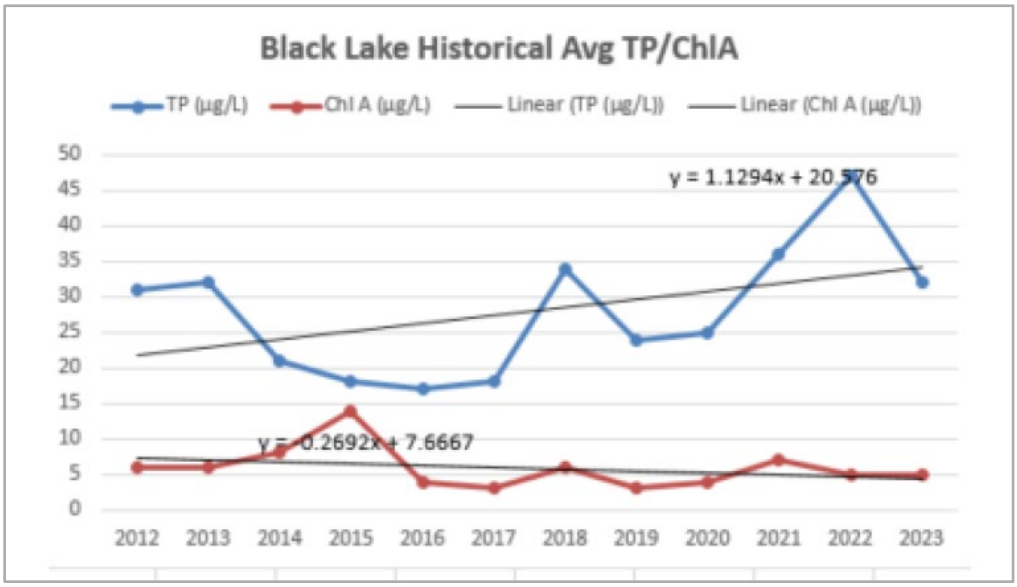
Black Lake Historical Avg TP/Chl A/ SDT/Chloride				
Year	**TP (µg/L)**	**Chl A (µg/L)**	**Secchi (m)**	**Chloride (mg/L)**
2009	23	5.9	2	-
2010	34	6.6	2.1	9
2011	44	6.9	2.3	10
2012	31	6	2.4	8
2013	32	6	2	5
2014	21	8	2	5
2015	18	14	1.6	9
2016	17	4	2	10
2017	18	3	2.1	20
2018	34	6	2	20
2019	24	3	2.2	20
2020	25	4	2	25
2021	36	7	2.4	25
2022	47	5	2	21
2023	32	5	1.8	21

Figure 21: Water quality trends in Black Lake



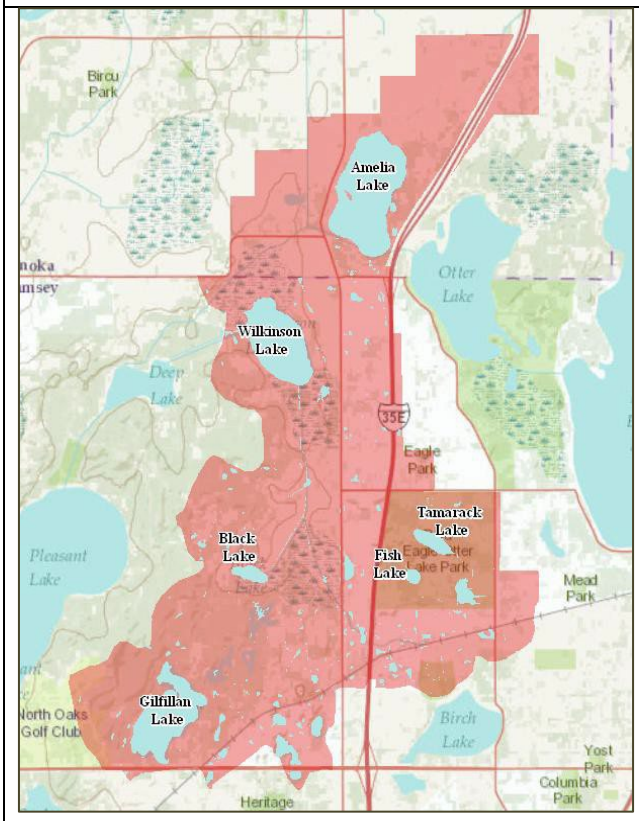
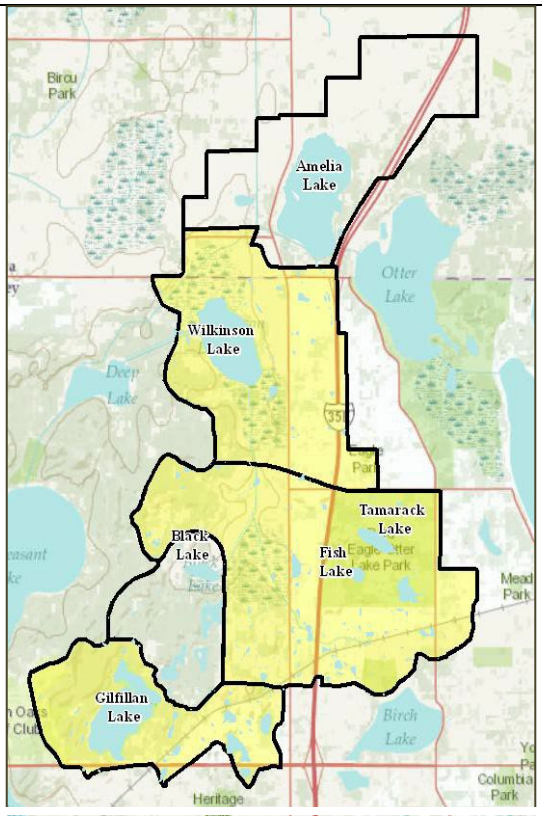
4.1 RETROFIT REPORT

Retrofit Report (2012)

In 2012, the Ramsey Conservation District, now Ramsey County Soil and Water Conservation Division (RCSWCD), completed a Retrofit Report for the Gilfillan, Black, Wilkinson, Amelia, Fish and Tamarack Lake chain of waterbodies. This was part of a larger effort to assess the full watershed and subwatershed scales and identify optimal locations for BMPs. Although Amelia was considered in early development for the project, this lake was not included in the final analysis. As stated in the report at that time:

The Amelia and Black Lake catchments were analyzed through the field reconnaissance process, but were excluded from further analysis within the study due to their current land use consisting of mainly open space and thus eliminating the need to implement retrofit water quality improvement practices.

Figure 22: Initial and final areas considered for retrofit analysis

Initial area considered in 2012	Final area included in analysis; excluding Amelia and Black Lakes due to low need for retrofits
	

4.2 COMPLETED BMPS AND PROJECT PARTNERSHIPS IN THE SUBWATERSHED

Best Management Practices (BMPs) are implemented to improve and protect water quality. Common small-scale examples of BMPs include raingardens, infiltration basins, shoreline restorations, rain barrels, and native restorations and plantings. Larger BMPs include stormwater retention basins, iron-enhanced sand filters, weirs and stormwater conveyance retrofits, and in-lake treatments such an alum treatment, rough fish Management, or aquatic vegetation Management.

Completed BMPs for Black Lake include:

Residential Grant Projects

As one of VLAWMO's core program areas, VLAWMO's grant programs work to implement in-ground BMPs within VLAWMO's boundaries, for the improvement and preservation of water quality. For more information, visit www.vlawmo.org/grants/. Within the Black Lake subwatershed:

Figure 23: Black Lake subwatershed implemented projects and BMPs.