VLAWMO

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Gilfillan Lake Review

Ramsey County, MN

2024

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1 INTRODUCTION

1.1 INTRODUCTION

Gilfillan Lake is located in the City of North Oaks and within the Vadnais Lake Area Watershed. Gilfillan Lake is surrounded by light residential land cover and features cost-share shoreline restorations that have been completed in partnership with VLAWMO. A Sustainable Lake Management Plan (SLMP) was originally completed in 2010 with assistance from the Ramsey County Soil and Water Conservation Division (RCSWCD), Conestoga-Rover & Associates, and Wenck Associates, Inc. Information that was compiled for that effort is included in this lake review and has been updated where work has occurred since the SLMP was developed.

Historically, the lake was a wetland. In 1950, was dredged to convert it from a wetland to an open surface water lake. Augmentation was necessary to maintain consistent water levels. Augmentation was ceased in 1989 – 1990 by the State.

The photo below shows the exposed water level gauge and lake bottom in July 2009, when water levels were especially low.

The lake level dropped noticeably between 2009 and 2010. The Lake Gilfillan Improvement Association (LGIA) had been active prior to this time and was formed by residents living around the lake. In 2009, residents formed the Lake Gilfillan Watershed Association (LGWA) and worked to augment water from Pleasant Lake into Gilfillan. Permission was granted by the DNR and other agencies to go ahead with the augmentation. In 2011 and 2012, water was pumped to increase the lake level to its ordinary high water level (OHWL). The pumps are run at the beginning of every season for maintenance purposes, but not since 2012 have they been run to maintain the lake's water level. The project was funded by the citizens living around the lake. A weir that was constructed by the LGWA as part of the augmentation effort is now managed by the North Oaks Home Owners' Association (NOHOA) is part of the water-level management effort. In 2023, NOHOA took over management of water levels with a broader perspective toward management of water levels in connected waterbodies including ponds.

1 INTRODUCTION

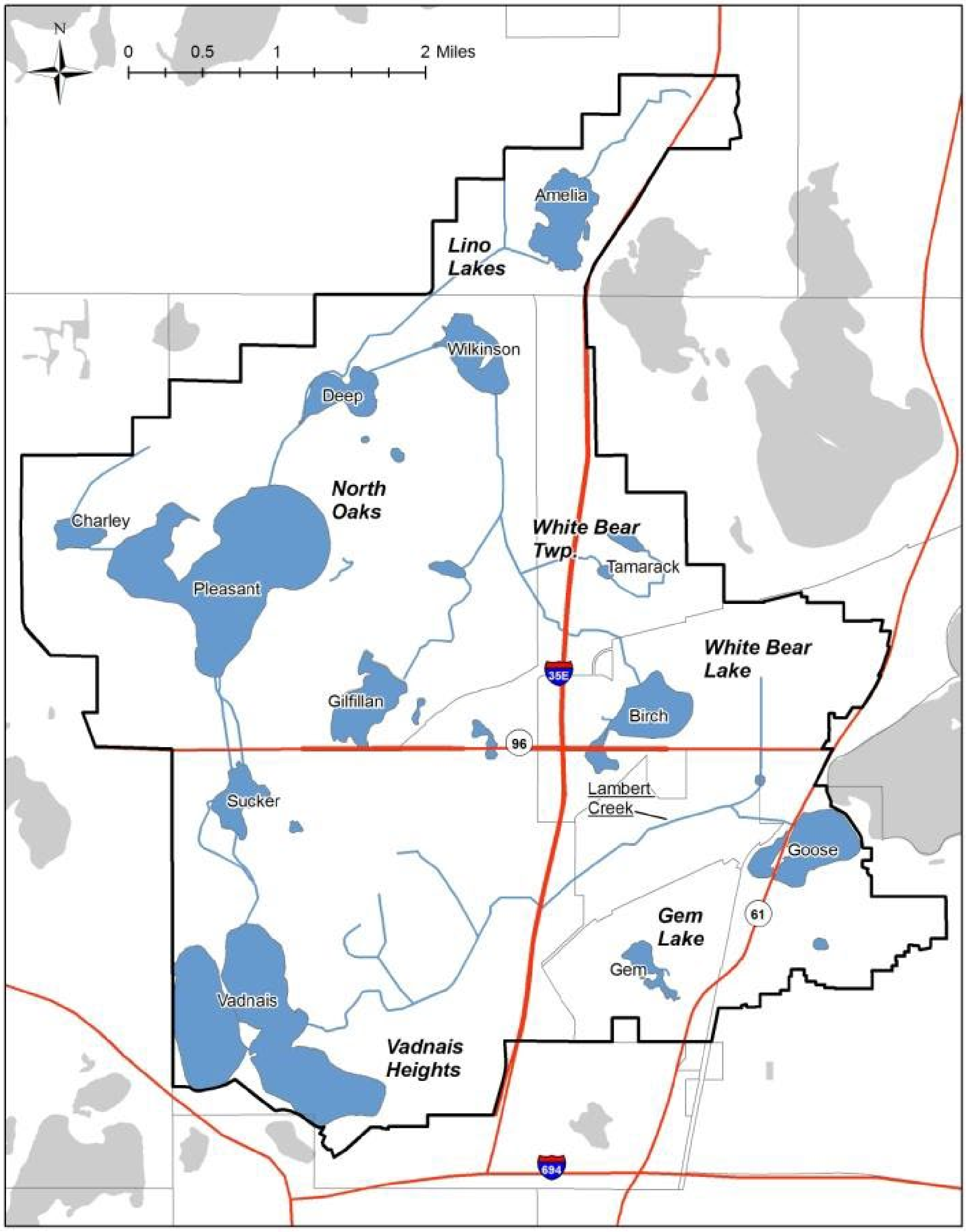
Gilfillan Lake (MN DNR Lake ID: 62-0027-00) is a shallow lake with a maximum depth of ~7.5 feet (source: 2023 aquatic vegetation survey). The 101-acre lake (source: MN DNR Lake Finder) has a healthy native plant community and is infested by Curly-leaf pondweed (*Potamogeton crispus*). Gilfillan Lake is in 645-acre subwatershed (source: VLAWMO Lake Fact Sheet) and receives little runoff from storm events and snowmelt. The lake is surrounded by private homes and features a large lot that belongs to NOHOA. That lot was the focus of a cost-share partnership restoration project with VLAWMO. Maintenance has been the responsibility of NOHOA following that restoration effort.

Bald eagles, Trumpeter swans, geese, otters, and muskrats are some of the wildlife that are frequently observed onsite.


Otters observed mating during April 2022
Photo credit: Steve Pikala

1 INTRODUCTION

Figure 1: The Vadnais Lake Area Watershed map shows Gilfillan Lake's position in the watershed. Gilfillan is largely landlocked but flows north to Black Lake, through Wilkinson and Deep, and into Pleasant Lake during periods of high water.



1 INTRODUCTION

Gilfillan Lake was listed on the State of Minnesota's 303(d) Impaired Waters List in 2010 due to high levels of nutrients (phosphorus), which inhibit aquatic recreation. Gilfillan was included in the completed Total Maximum Daily Load (TMDL) that was completed in 2013. According to the MN DNR Lake Finder page, Gilfillan Lake is "not always suitable for swimming and wading due to low clarity or excessive algae caused by the presence of nutrients such as phosphorus in the water."

2 WATERSHED FEATURES

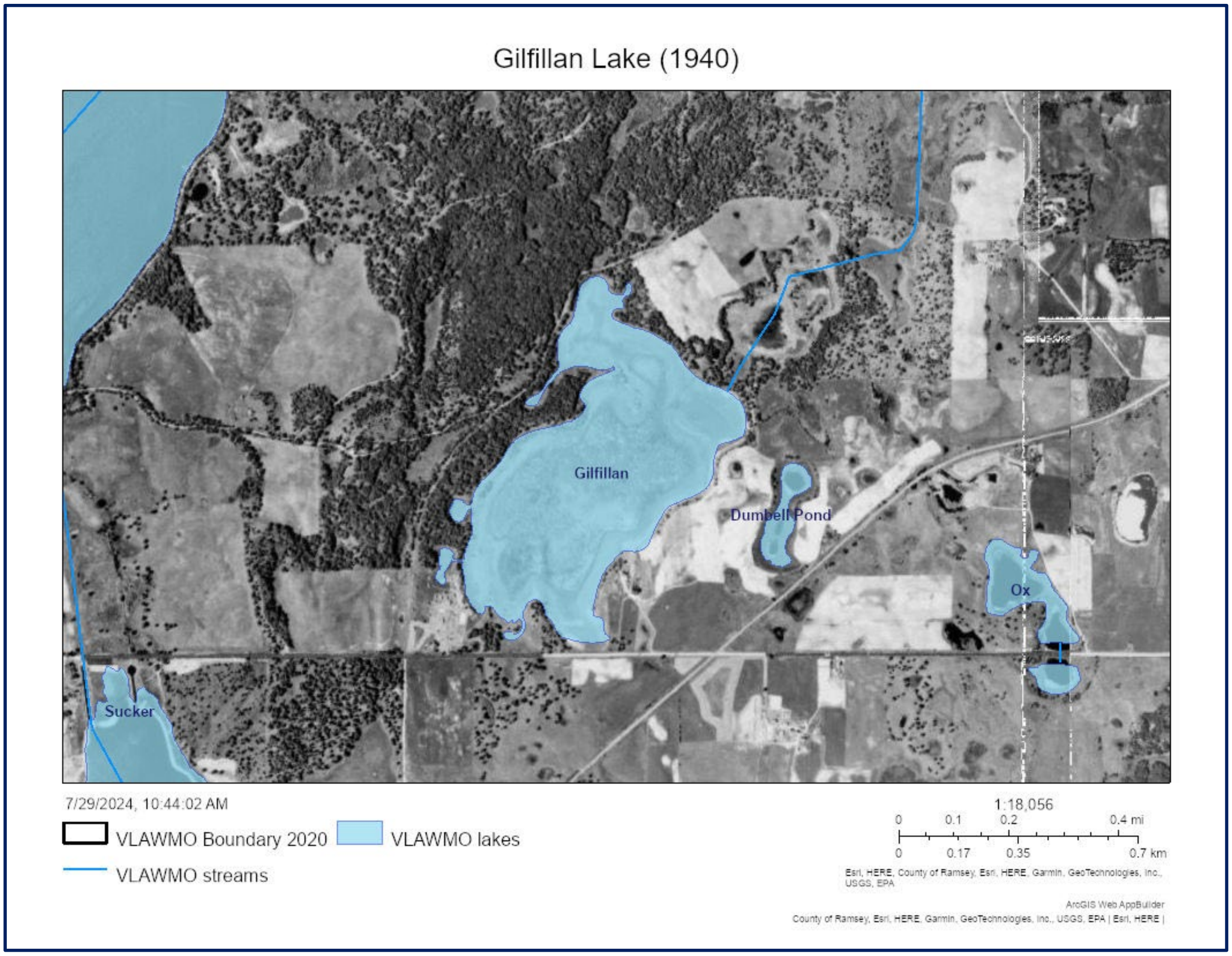
2.1 Aerial Photo History

In 1883, railroad magnet James J. Hill purchased 3,500 acres of land in Moundsview and White Bear Townships from Charles D. Gilfillan. Hill named his property North Oaks Farm, and in the next few years purchased adjacent farms to increase his land ownership to about 5,500 acres.

His son Louis Hill later owned North Oaks Farm until death in 1948. Ownership passed to Louis' children who decided to develop the land into a residential community. They incorporated the North Oaks Company with a mission to build with respect for the natural environment. To help ensure their mission, land was subdivided and sold with a warranty deed that created the North Oaks Home Owners' Association (NOHOA) to be responsible for roads and recreation. Each deed placed each home's property line halfway into the street, placing all roads into private ownership.

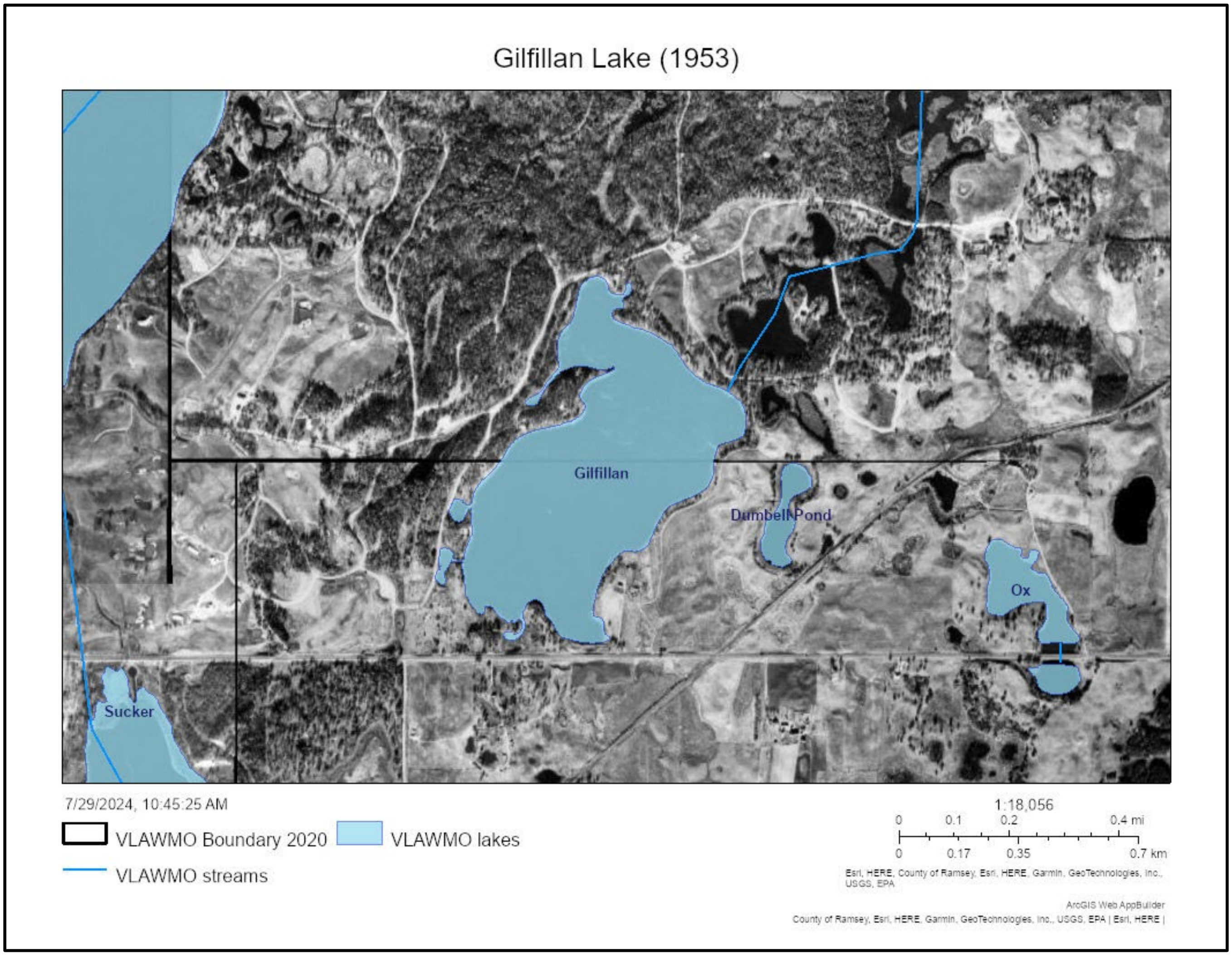
Remaining land in the city is owned by the North Oaks Company. The original farm buildings have been restored and the farm site is listed on the National Register of Historic Places. (Source: City of North Oaks, History of North Oaks: https://www.northoaksmn.gov/about-north-oaks/pages/history-north-oaks)

Figure 2: 1940 aerial photo of Gilfillan Lake



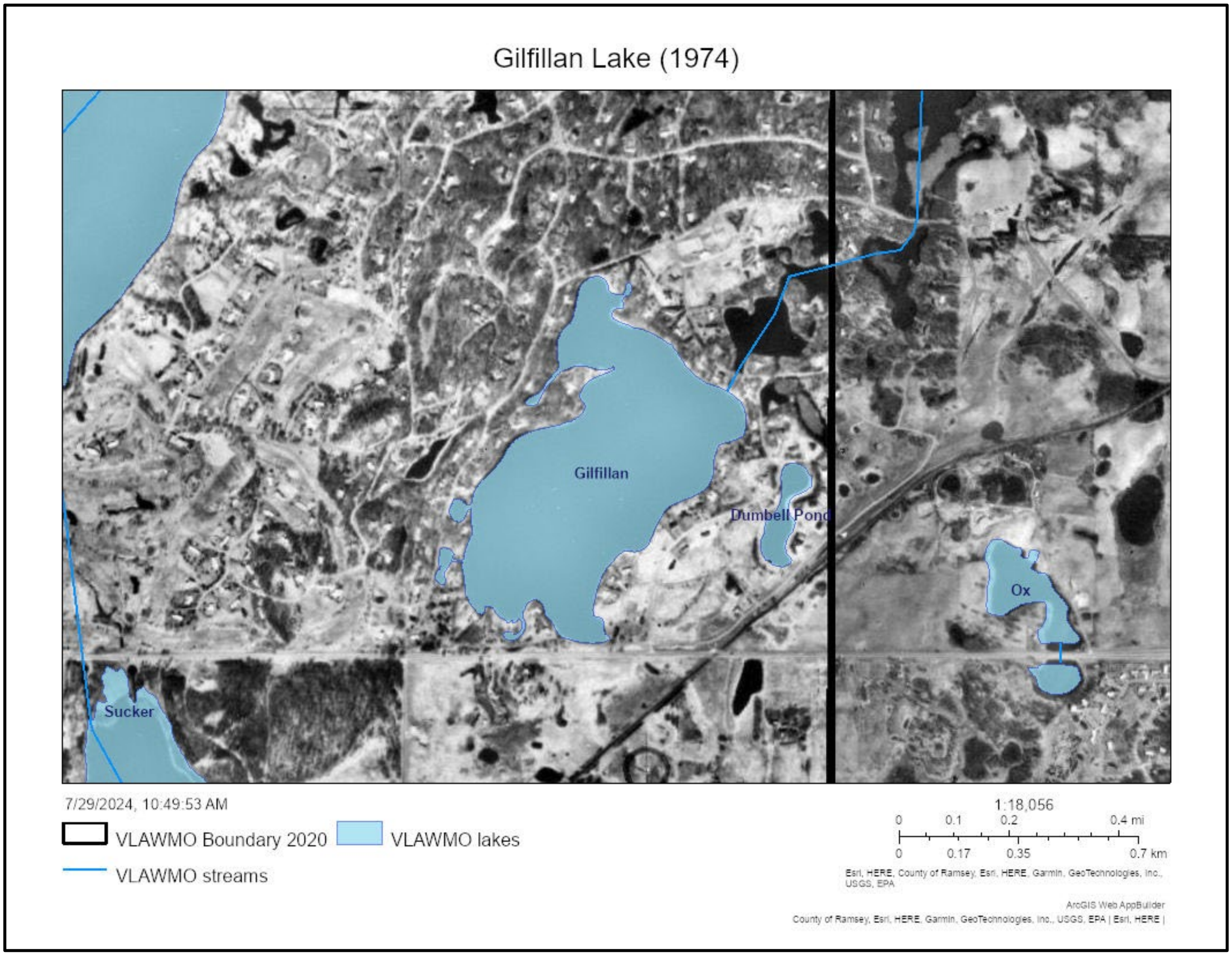
This aerial photo shows the wetland that would become Gilfillan Lake. There is very little standing water visible in the photo. The area is a wetland/bog.

Figure 3: 1953 aerial photo of Gilfillan



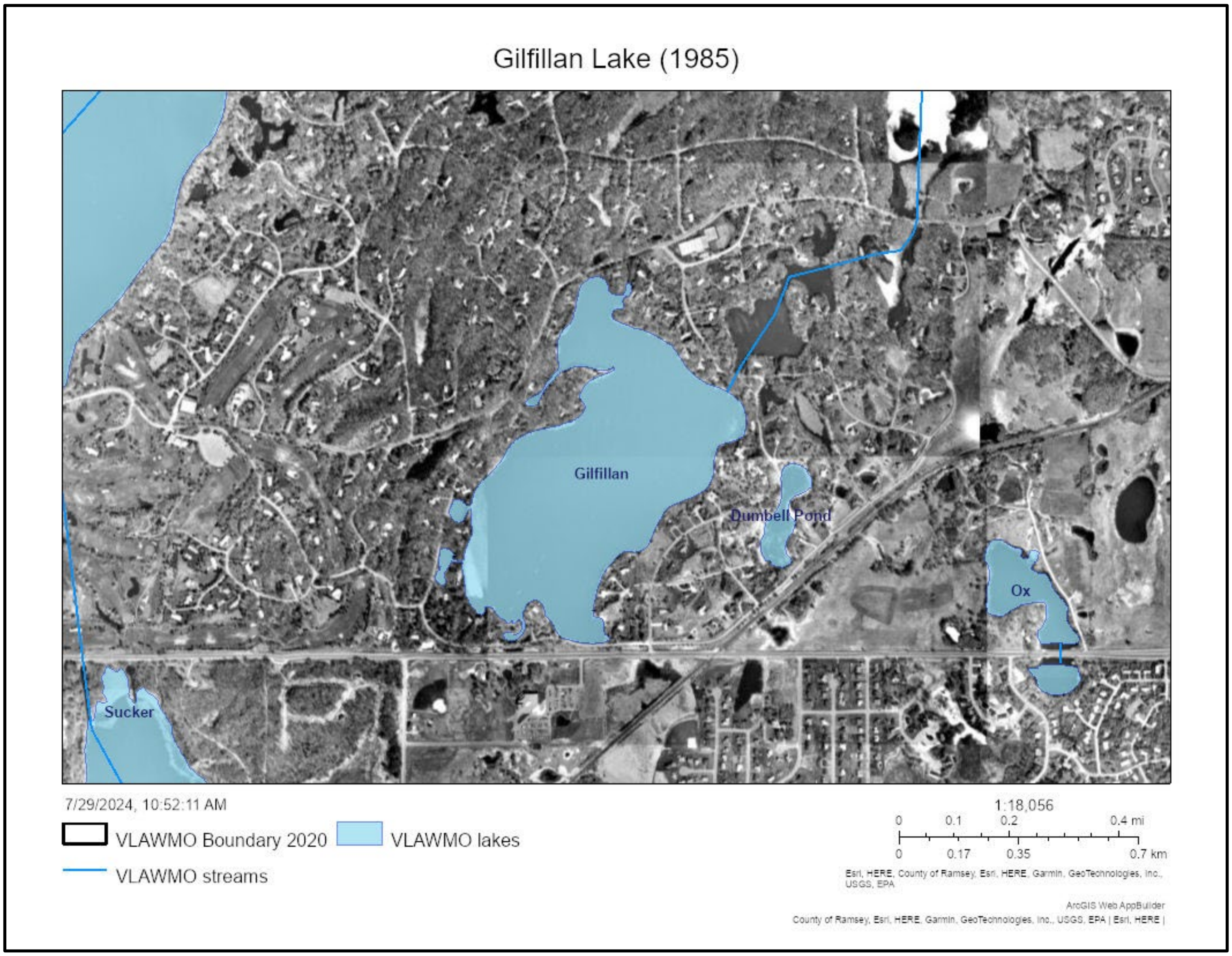
Gilfillan was dredged in 1950 and augmented to sustain a constant water level between 908 and 910 ft above sea level. The results of that dredging and augmentation effort are clearly visible in this 1953 aerial photo. Roads are now present with a few homes and residential structures.

Figure 4: 1974 aerial photo of Gilfillan



More residential homes are appearing around Gilfillan, and lake augmentation is active.

Figure 5: 1985 aerial photo of Gilfillan



Residential development continues, including a new development area between Gilfillan Lake and Dumbell Pond. Lake augmentation is still active (and continued until 1989/1990).

Figure 6: 1991 aerial photo of Gilfillan

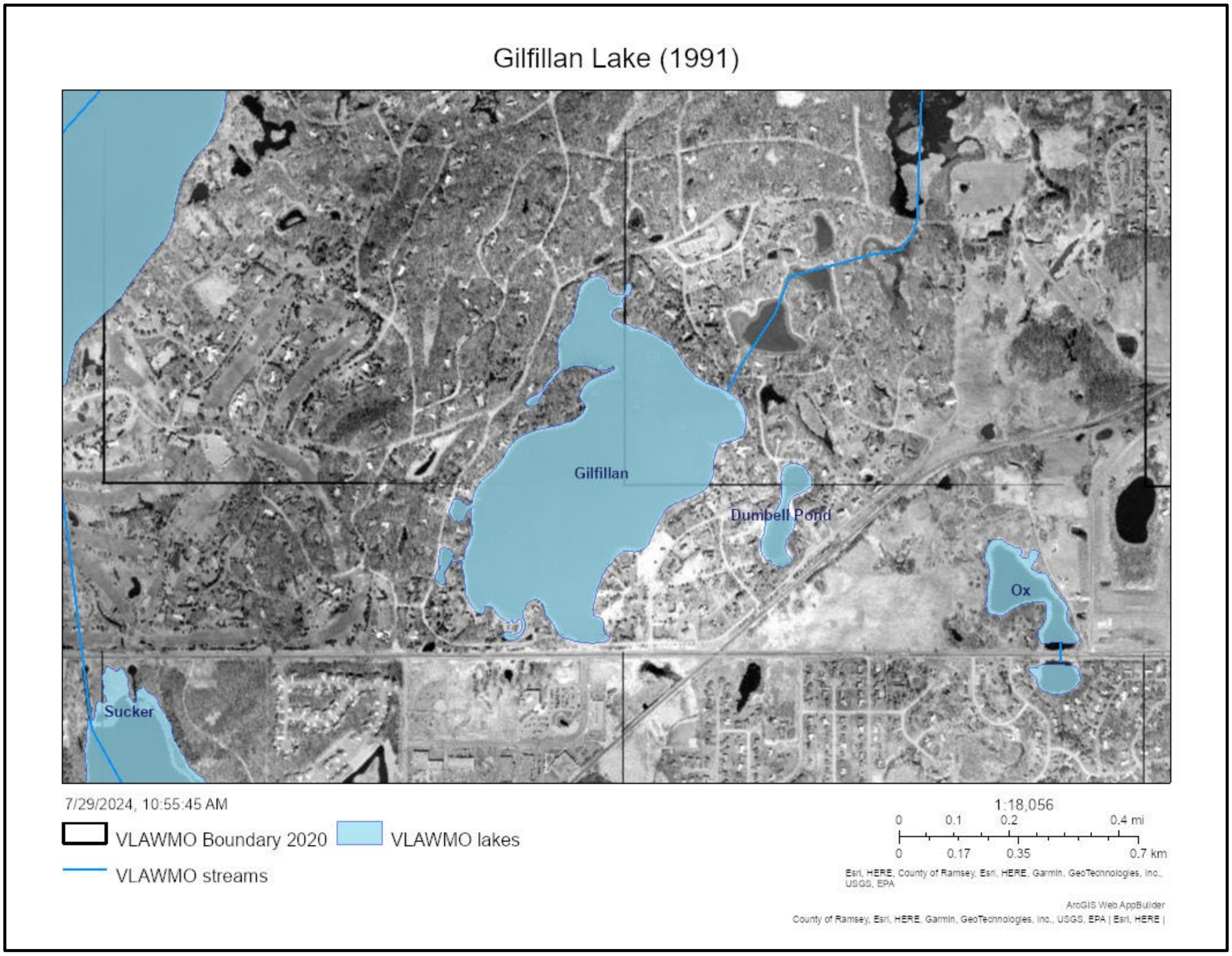
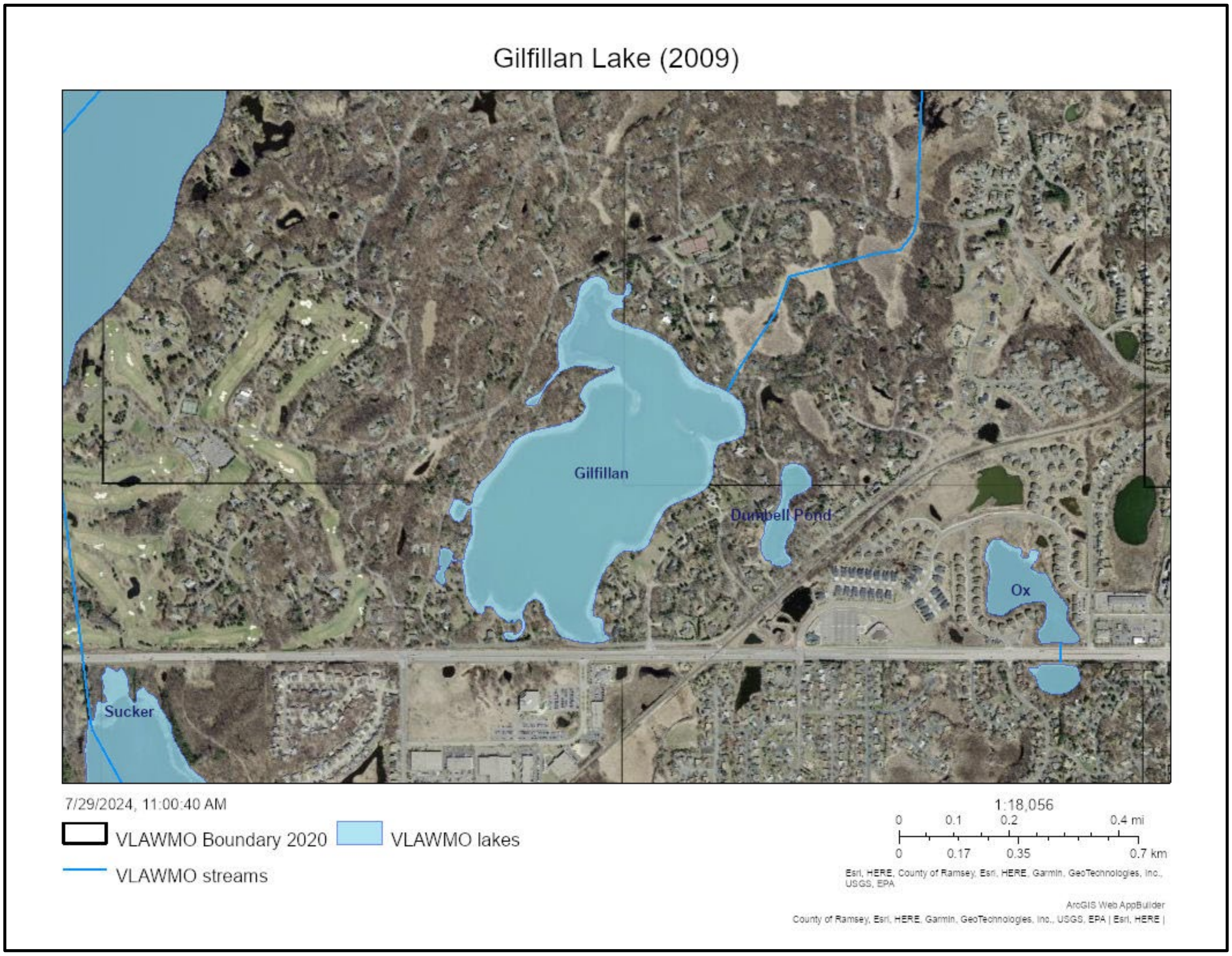


Figure 7: 2006 aerial photo of Gilfillan

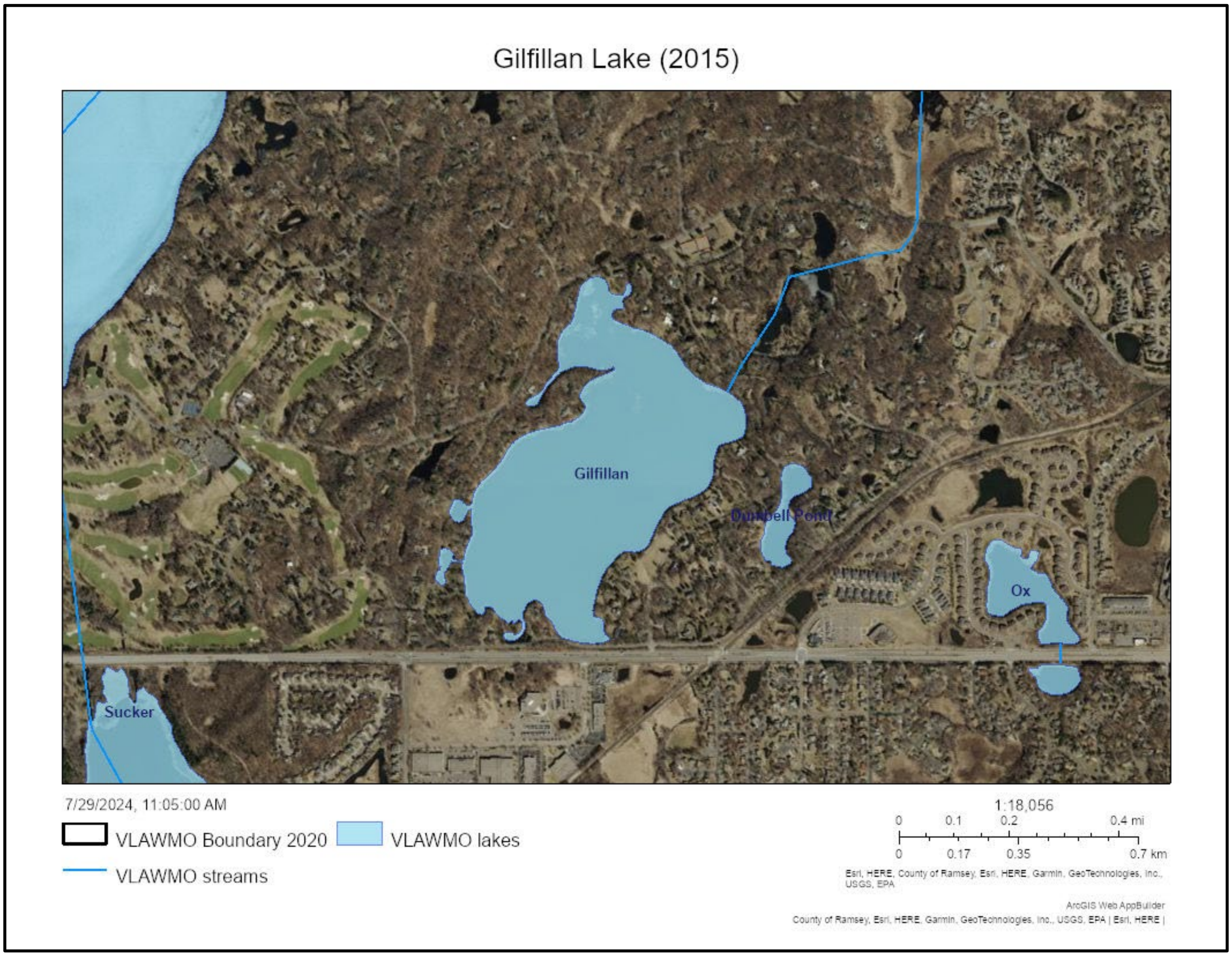
Highway 96 was widened, and development around the lake had been completed. Legislation was passed by the State to stop lake augmentation in 1990. The green color of the lake is visible from high chlorophyll levels.

Figure 8: 2009 aerial photo of Gilfillan



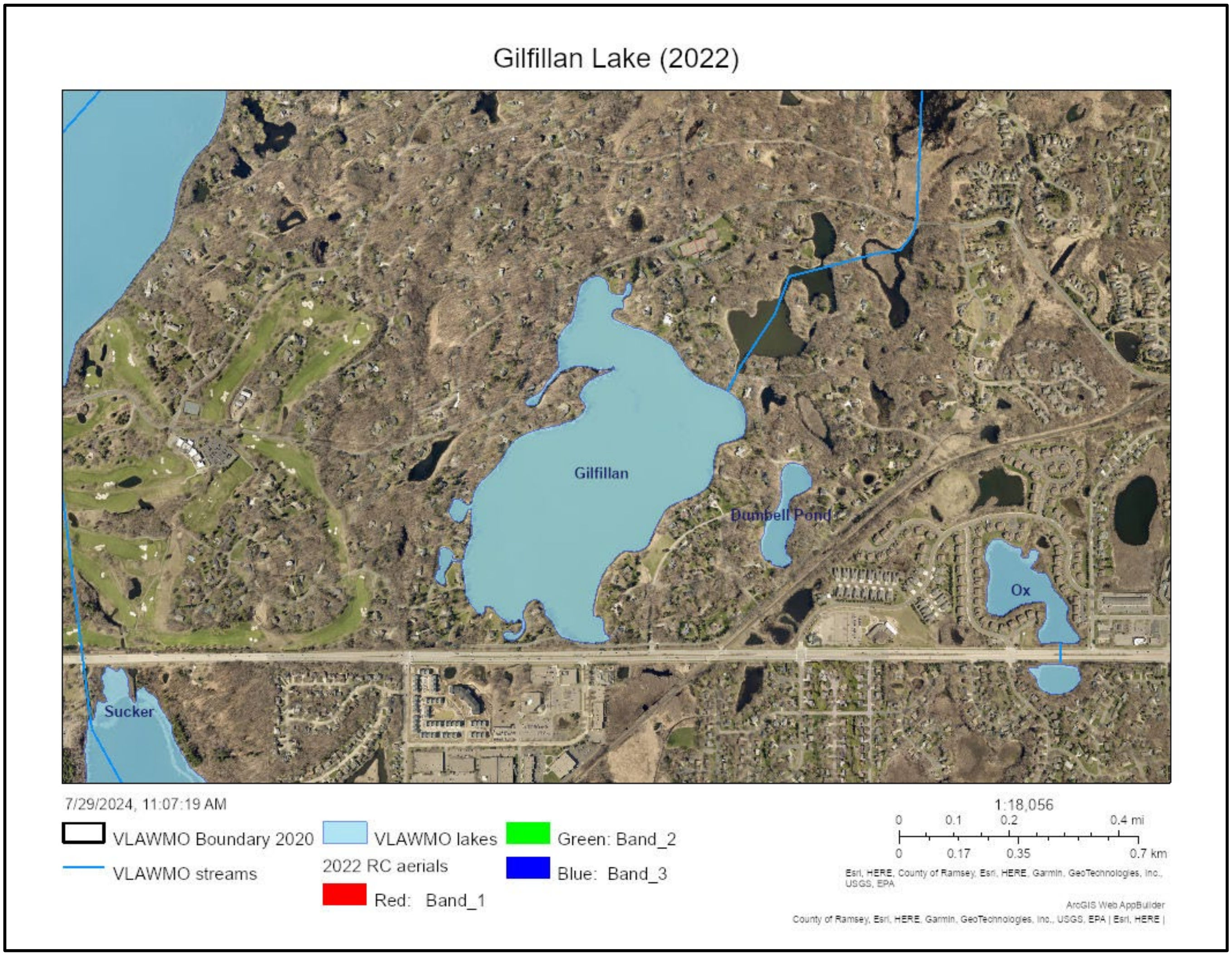
High chlorophyll levels remain visible, indicated by the green water color compared to that of the surrounding ponds. The receding shoreline is also noticeable, from the continued drought. As of July 2009, lake level was 906.72 ft above sea level.

Figure 9: 2015 aerial photo of Gilfillan



As of 2015, water levels year-to-year fluctuate slightly.

Figure 10: 2022 aerial photo of Gilfillan



2.2 LAKE DRAINAGE AREA

The drainage area into Gilfillan Lake is approximately 645 acres, compared to the surface area of the lake which is 101 acres. During normal to high rainfall years runoff from Highway 96 can enter Gilfillan Lake through a series of ponds and culvers on the south side of the highway. During dry years, runoff from the highway doesn't make it to the lake. Water enters the lake primarily through rain events and possibly ground water. The augmentation well was constructed near Sora Pond. A system of culverts connecting the ponds provided flow from Sora Pond to Teal Pond and then to Gilfillan Lake and John Pond. North and South Mallard ponds are also connected to this system, however, flow from Teal Pond was controlled manually. There is a culvert under Duck Pass Road connecting Gilfillan with Teal Pond. The invert of this outlet culvert is 909.46 ft.

Figure 11: Drainage flow into and out of Gilfillan Lake

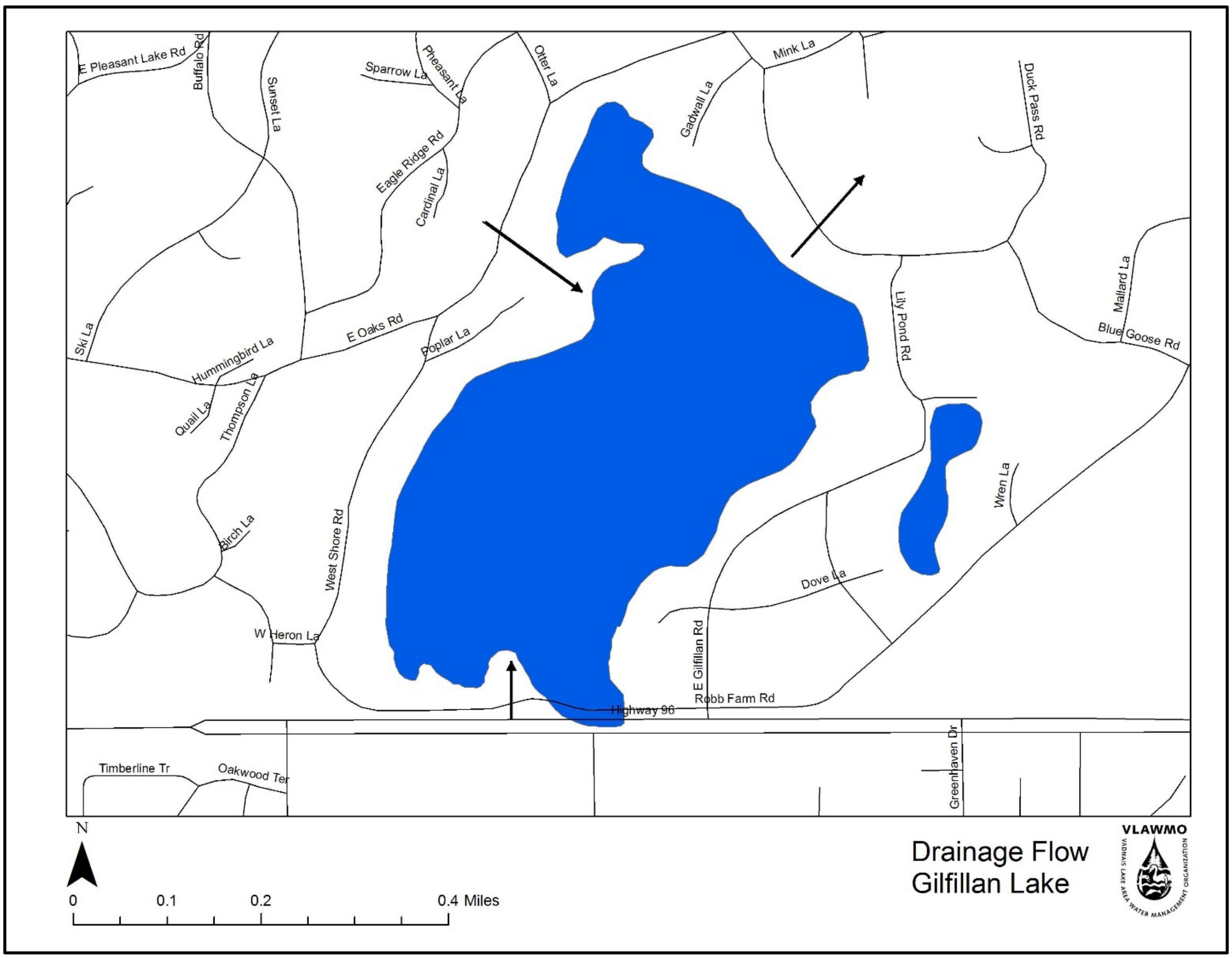
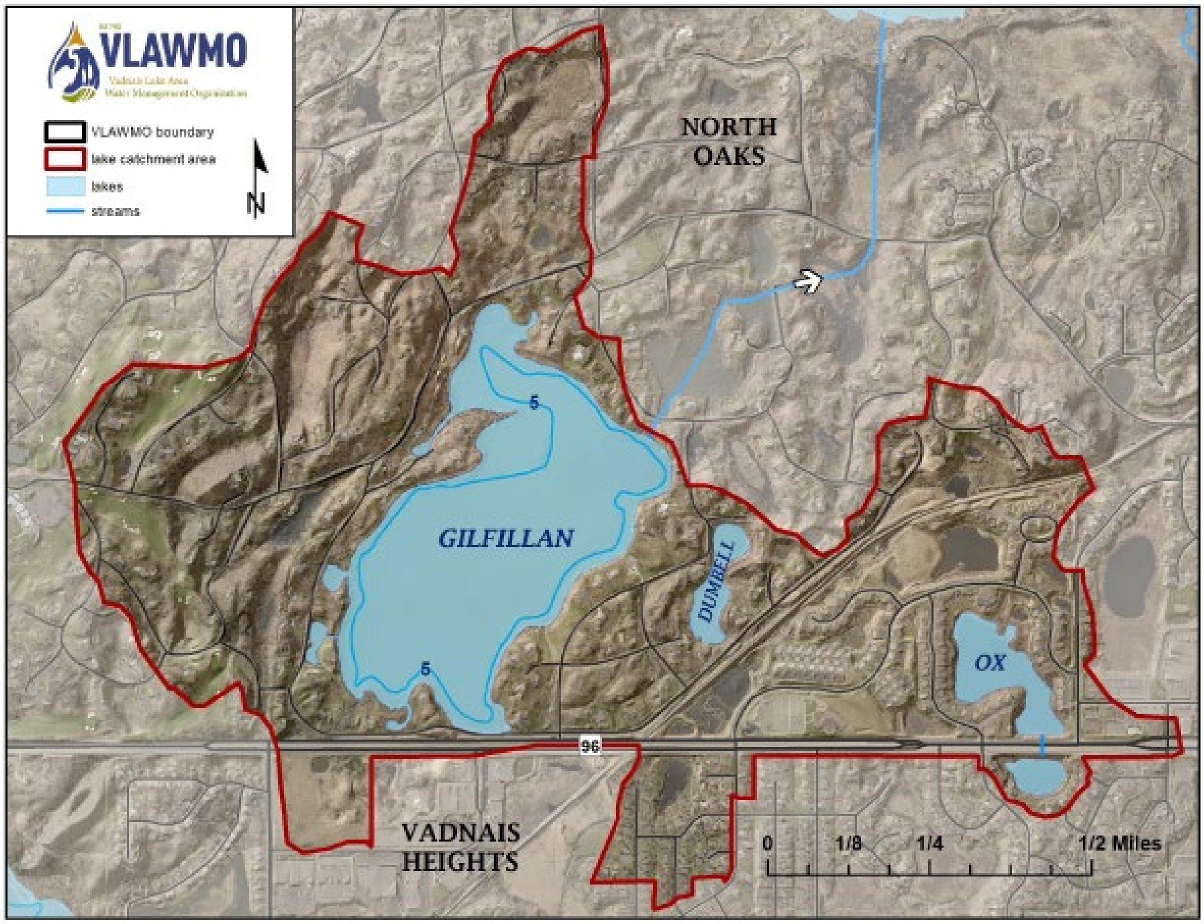


Figure 12: Gilfillan Lake Subwatershed

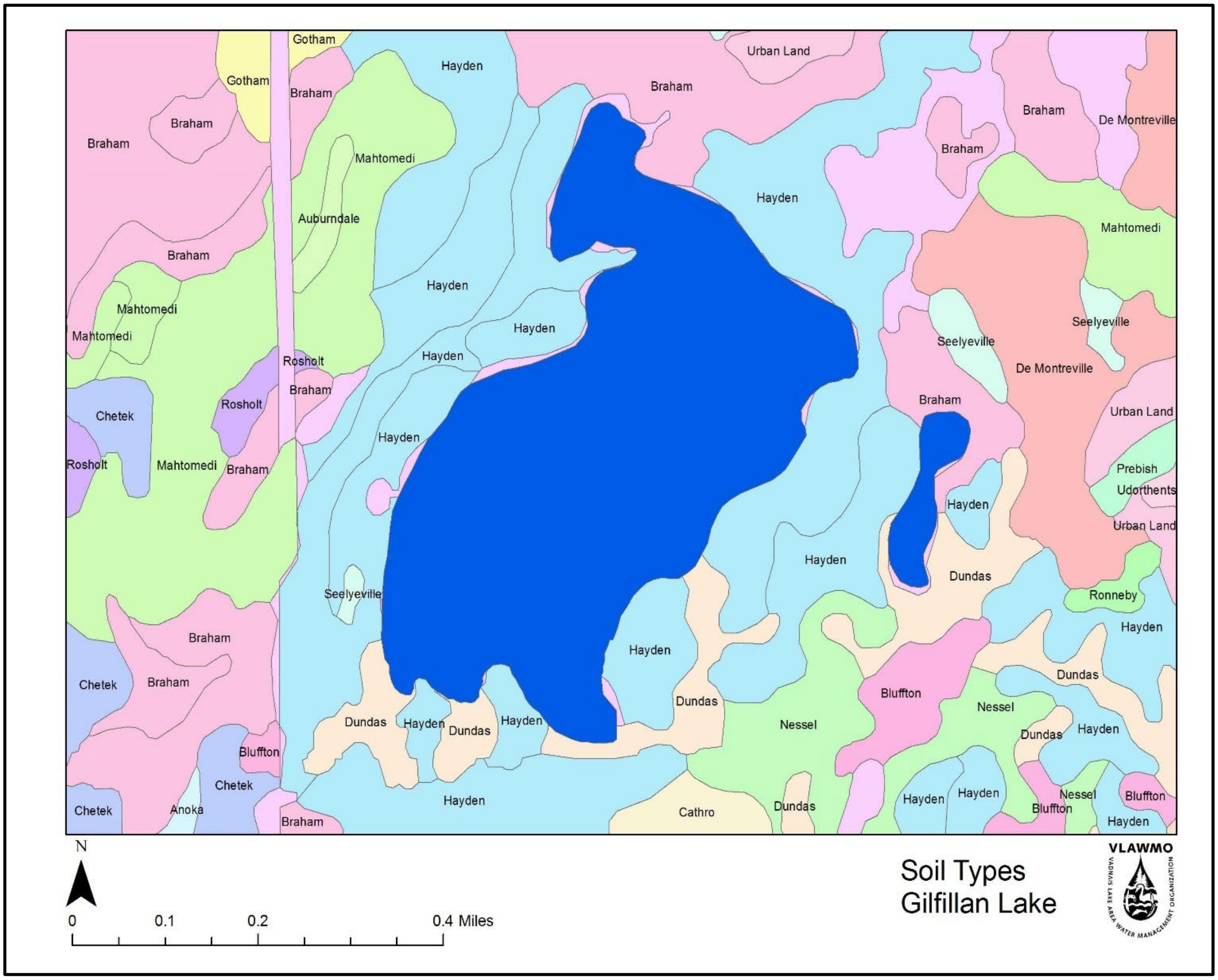


2.3 Soils

Soils in the Gilfillan Lake subwatershed are dominated by Hayden fine sandy loam. This soil type tends to drain well, allowing infiltration. However, with development, much of the soil has been compacted, moved, and covered, pushing rain water into storm sewer systems or away from the lake. Additionally, a survey was conducted to examine the sediment of the lake bottom and the detailed results are addressed in the attached report. The sediments did not cause concern but did support an internal loading possibility due to above normal phosphorus levels contained in the sediment. Rough fish present in the lake can stir up this sediment, releasing the nutrients trapped in it causing the high nutrient levels we see in the lake today. A few locations also showed high copper and potassium levels. This could be due to runoff from highway 96, chemicals used in the past to control weeds (copper sulfate for example), atmospheric deposits form rain or leaking septic tanks.

A contaminated plume under the lake has been anecdotally mentioned as a possible source of contaminates in the lake. There was no evidence of this contamination interaction documented in the reporting done to investigate the sediment. Further investigation into this could be an option in the future.

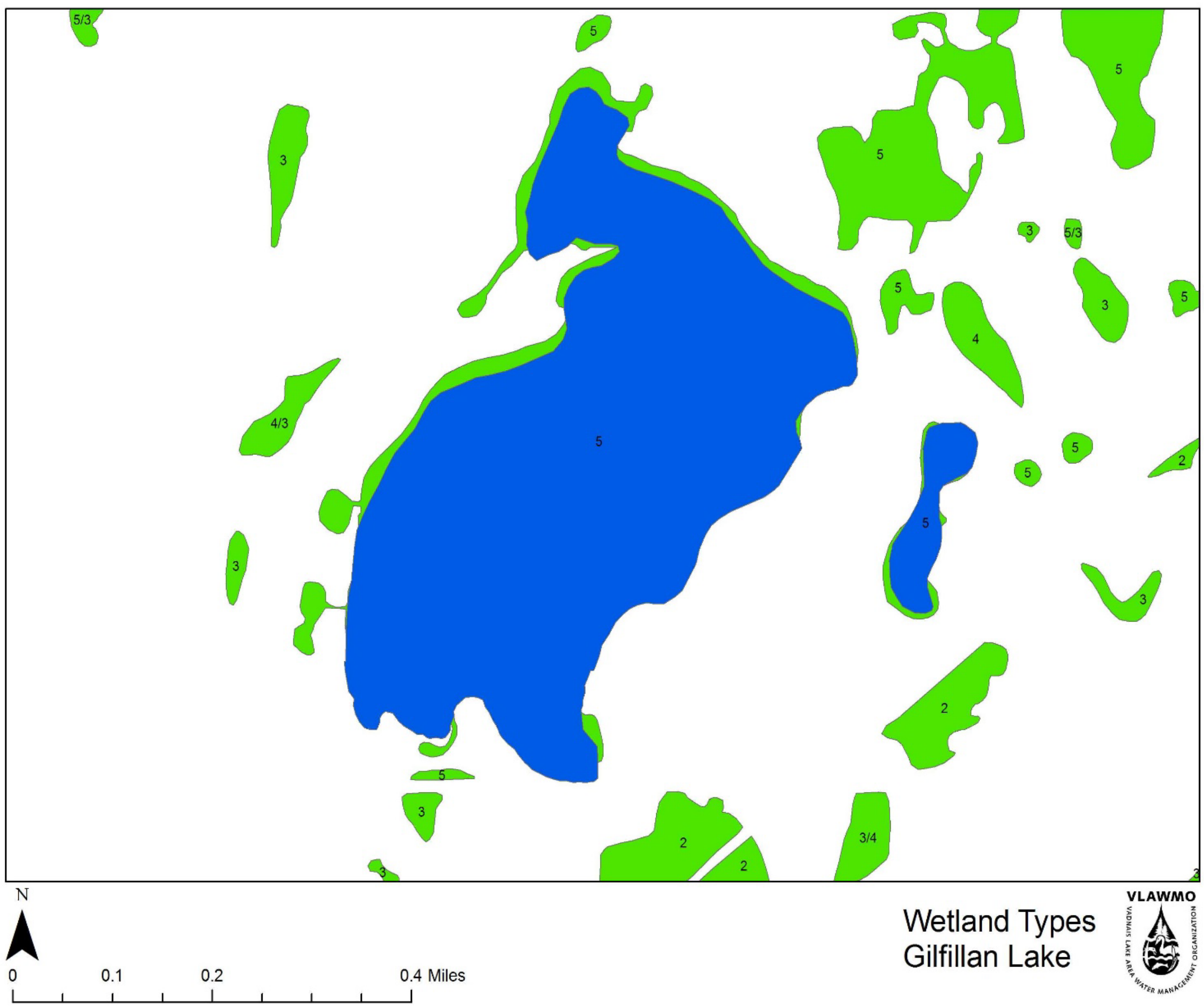
Figure 13: Soil types in and around Gilfillan Lake



2.4 WETLANDS

There are ~25 delineated wetlands around Gilfillan Lake, only 5 within the immediate 220-acre subwatershed immediately surrounding the lake. Little area drains into Gilfillan, and the lake level is dependent on what water falls onto the lake and the recharge of the perched aquifer the lake sits on. Gilfillan Lake and the surrounding ponds were Type 3 and 4 wetlands before dredging and augmentation. Given time, it is likely the ponds will revert back to their natural wetland conditions. Wetlands are numbered on the map and the key is below.

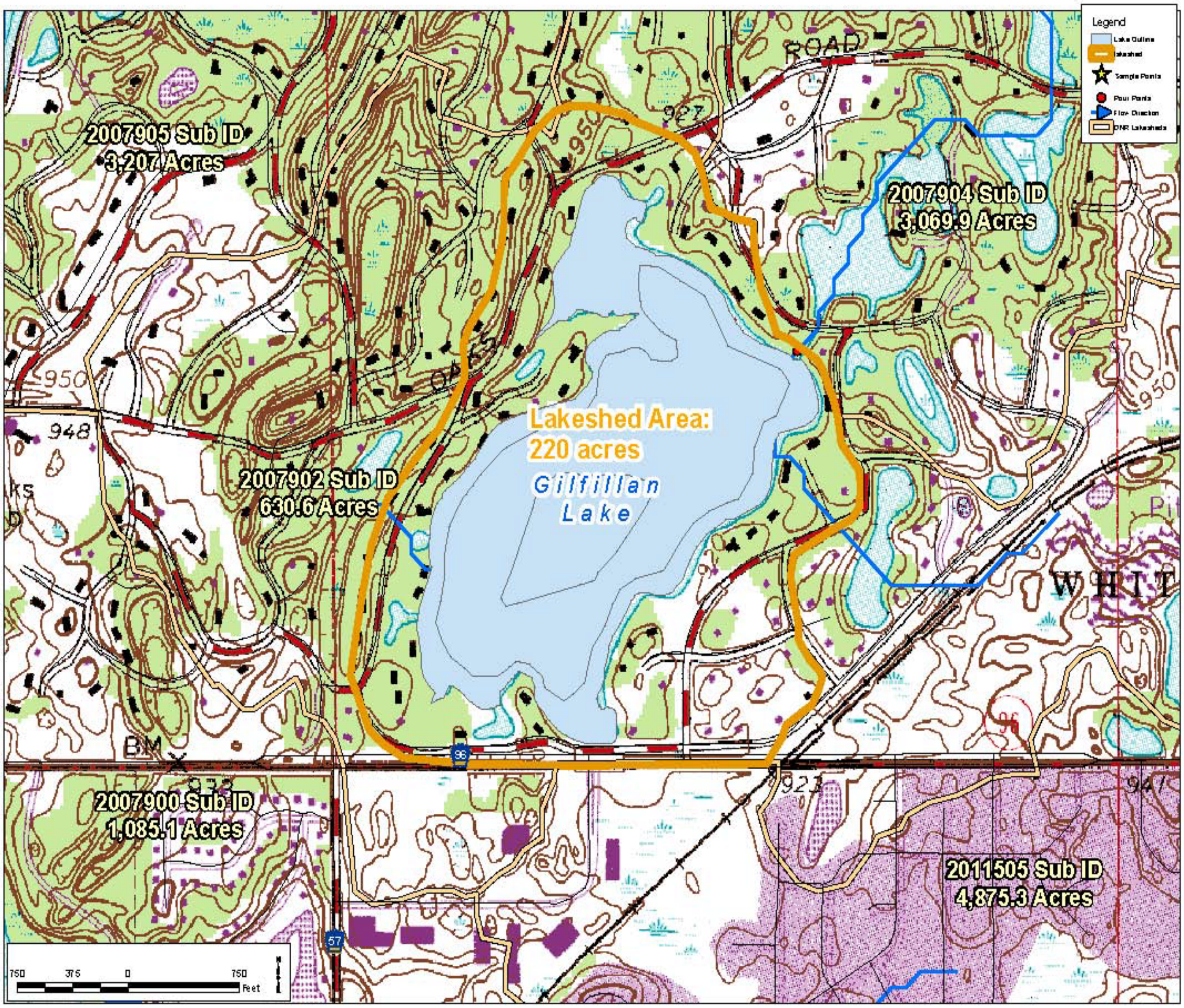
Figure 14: Wetlands in and around Gilfillan Lake



Wetland Types

1 – Seasonally Flooded
2 – Wet Meadow
3 – Shallow Marsh
4 – Deep marsh
5 – Shallow Open Water

2 WATERSHED FEATURES



3 LAKE FEATURES

LAKE FEATURES

3.1 LAKE DEPTH, BOTTOM HARDNESS, AND SEDIMENT ANALYSIS

A bathymetry survey was completed by RCSWCD on July 28, 2023 to develop a map of the bottom and determine lake depths. The deepest location detected by sonar was 2.3 m (7.5 ft), and the average was 1.6 m (5.2 ft). Bottom hardness is represented as soft, medium, or hard; with soft bottoms characterized as muck, loose silt or sand, and medium to harder bottoms characterized as compacted sand, gravel, or rock. Gilfillan Lake has a primarily medium lake bottom with variability.

Figure 15: Gilfillan Lake depths with 0.3-meter contours

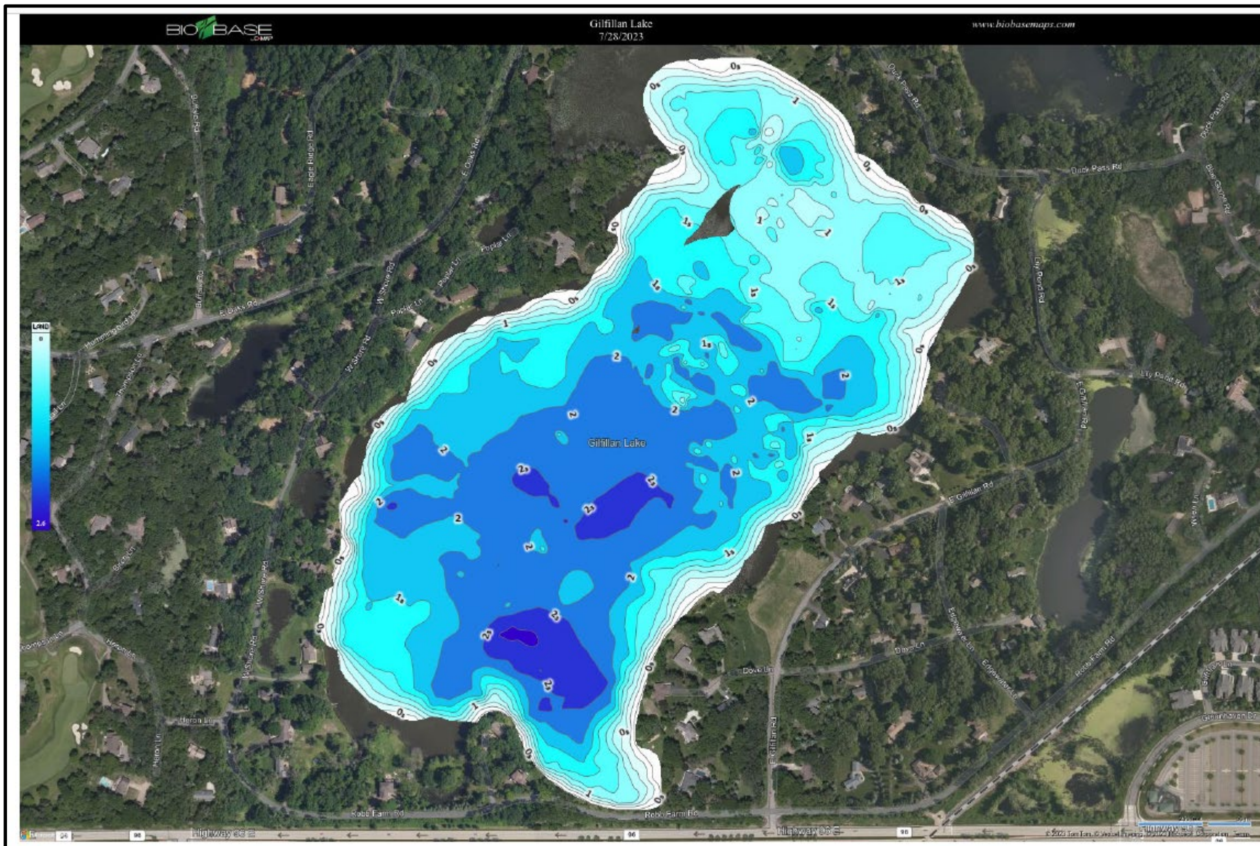


Figure 5. Gilfillan Lake 0.3-m contours with depth in meters taken on July 28, 2023.

Macrophyte, Contour, Biovolume and Bottom Composition Survey 5

Figure 16: Gilfillan Lake bottom hardness

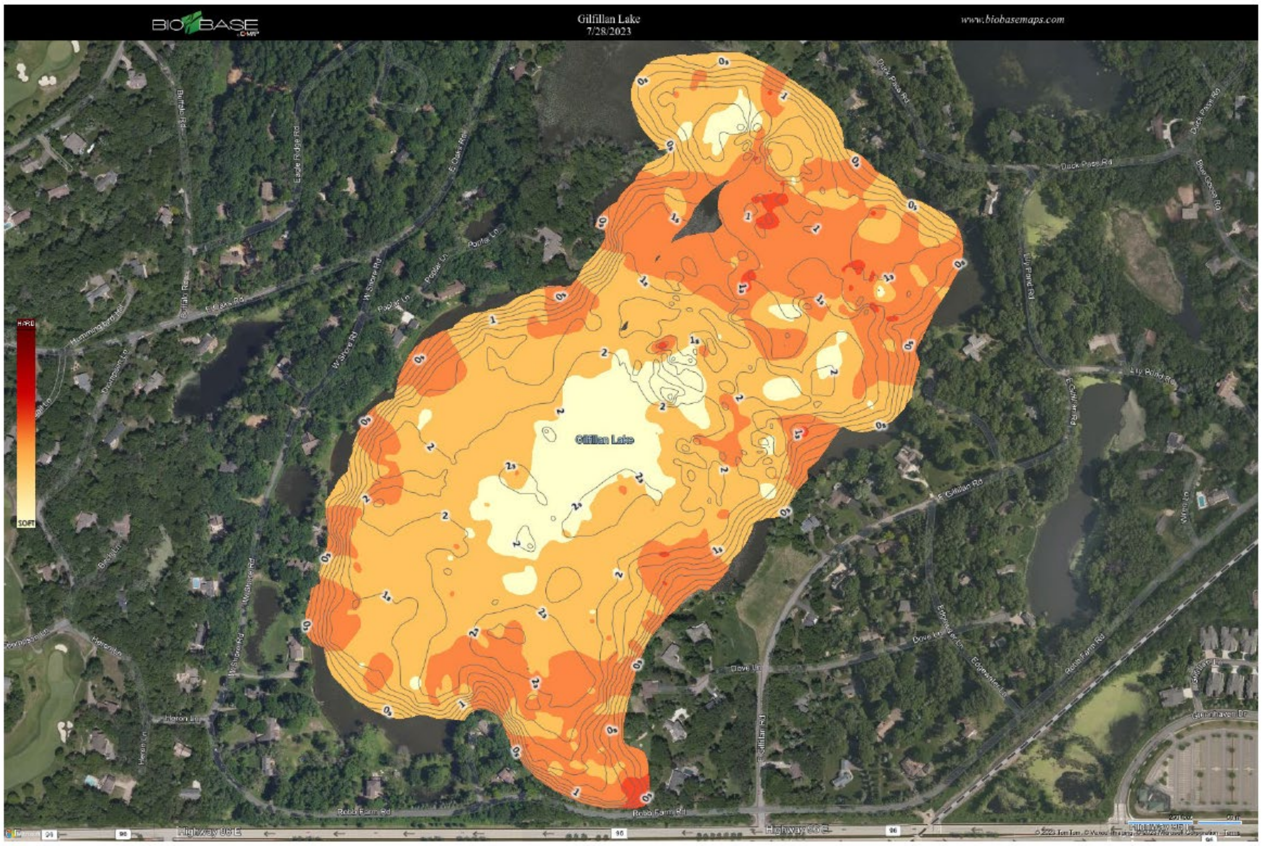


Figure 7. Gilfillan Lake bottom composition values with 0.3-m contours taken on July 28, 2023.

Sediment Analysis

A study of Gilfillan Lake sediment was conducted on February 3, 2009, by VLAWMO staff: Brian Corcoran and Kristine Lampert. Results were analyzed by the University of Minnesota. Gilfillan Lake sediments have a high organic matter which is consistent with a soft mucky bottom. In addition, one site contained high sand content. Lake sediment phosphorus concentrations are relatively high. Below is a summary of the results and a map showing the sites where the samples were collected.

Figure 17: Map showing sediment survey sampling locations (2009)

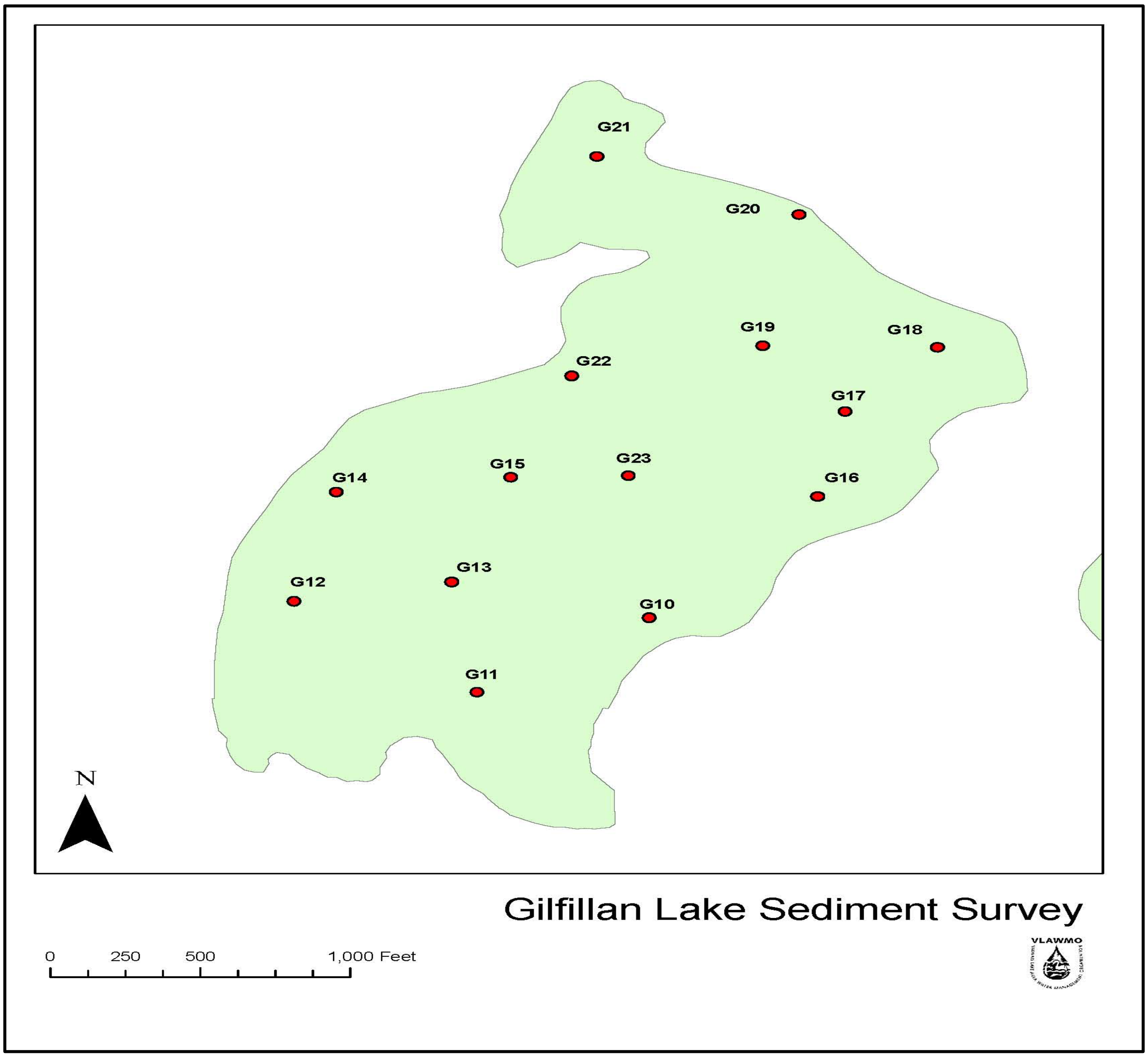
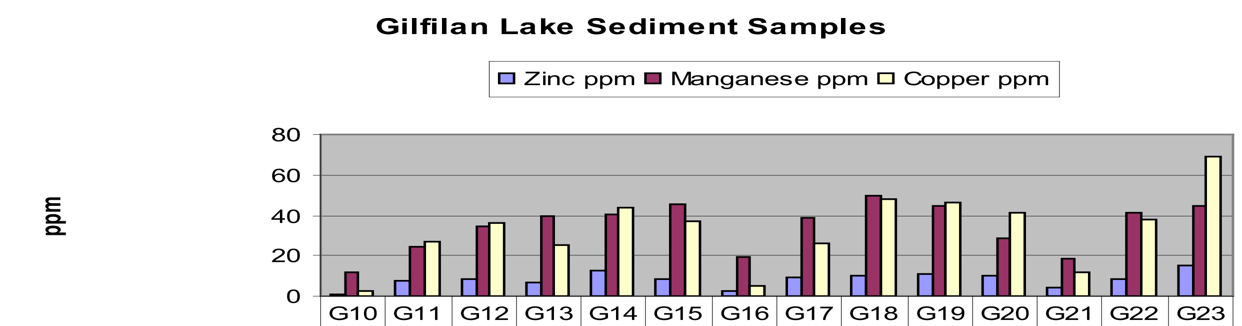


Figure 18: Gilfillan Lake Sediment Samples: Summary for Zinc, Manganese, and Copper (2009)



	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20	G21	G22	G23
Zinc ppm	1.2	7.3	8.8	6.5	12.8	8.6	2.5	9.2	9.9	10.9	9.7	4.1	8.2	14.9
Manganese ppm	11.9	24.8	34.8	39.7	40.2	45.8	19.6	39	49.7	44.8	28.3	18.3	41.6	44.8
Copper ppm	2.8	27	36.3	25	43.5	36.7	4.9	26	48.3	45.9	41.2	11.4	37.5	69

Table 1: Gilfillan Soil Sample Results (2009)

Gilfillan Soil Sample Results									
location	soil texture	Organic Matter %	soluable salts mmhos/cm	pH	Nitrate ppm	Phosphorus ppm	Potassium ppm	Sulfur ppm	Zinc ppm
G10	coarse	4.4	0.5	6.5	1.1	14	81	28	1.2
G11	muck	28.8	1.4	6.4	1	25	150	40+	7.3
G12	muck	34	1.7	6.4	1.6	8	220	40+	8.8
G13	muck	32.6	1.7	6.3	1.2	13	161	40+	6.5
G14	muck	32.7	3.3	6.3	3	12	250	40+	12.8
G15	muck	37.7	2.1	6.5	1.7	8	204	40+	8.6
G16	muck	46.3	1	6.4	2.1	14	86	40+	2.5
G17	muck	34.4	1.6	6.2	1.4	8	172	40+	9.2
G18	muck	26.1	1.9	6.5	1.6	7	214	40+	9.9
G19	muck	28.5	1.6	6.5	1.4	7	206	40+	10.9
G20	muck	27.3	3.1	6.3	1.8	9	220	40+	9.7
G21	muck	27.8	1.2	6.4	1.1	9	139	40+	4.1
G22	muck	27.5	1.3	6.4	1.3	9	177	40+	8.2
G23	muck	26	2.7	6.4	2.1	7	216	40+	14.9
location	soil texture	Iron ppm	Manganese ppm	Copper ppm	Boron ppm	Calcium ppm	Magnesium ppm		
G10	coarse	99.9+	11.9	2.8	0.6	1211	220		
G11	muck	99.9+	24.8	27	1.4	2829	596		
G12	muck	99.9+	34.8	36.3	2.6	3965	799		
G13	muck	99.9+	39.7	25	2.6	3362	658		
G14	muck	99.9+	40.2	43.5	3.9	3708	829		
G15	muck	99.9+	45.8	36.7	2.7	4088	830		
G16	muck	99.9+	19.6	4.9	1.3	2237	396		
G17	muck	99.9+	39	26	1.9	3853	768		
G18	muck	99.9+	49.7	48.3	1.9	3592	788		
G19	muck	99.9+	44.8	45.9	1.9	3683	799		
G20	muck	99.9+	28.3	41.2	2.9	3597	801		
G21	muck	99.9+	18.3	11.4	1.9	3077	640		
G22	muck	99.9+	41.6	37.5	1.6	3347	704		
G23	muck	99.9+	44.8	69	2.1	3735	831		
	interpretation								
	Phosphorus	<-->							
		5	10	15	20	25			
		low	**medium**		**high**	**very high**			
	Potassium	<-->							
		25	75	125	175	225			
		low	**medium**		**high**	**very high**			
	pH	<-->							
		3	5	6	7	9			
		Acid		**optimum**		**Alkaline**			
	soluble salts	<-->							
		0	2	5	8	10			

		satisfactory		possible problem		excessive salts			
Summary									
Magnesium: Metro lake are between 100ppm – 1000ppm									
Zinc: Adequate range 1ppm – 15ppm									
pH: Soil pH was at optimum levels for all samples (6.0-7.0)									
Soluble salts: For most of the samples, soluble salts were at satisfactory levels (1.0-2.0). A few samples were approaching the possible problem level, suggesting contamination. This could be coming from salted streets and sidewalks.									
Nitrate: This is an essential plant nutrient, most northern lakes have concentrations of less than 4ppm, excessive concentration could contribute to high aquatic vegetation growth, Gilfillan (1-3 ppm)									
Potassium: Since natural levels of sodium and potassium ions in soil and water are very low, their presence may indicate lake pollution caused by human activities. Sodium is often associated with chloride. It finds its way into lakes from road salt and fertilizers. Soils retain sodium and potassium to a greater degree than chloride or nitrate; therefore, these compounds strongly indicate possible contamination from more damaging compounds. Gilfillan ranges from 80-250 ppm, which corresponds to medium to very high levels of potassium.									
Phosphorus: Phosphorus is the key nutrient effecting algae and weed growth. Phosphorus originates from a variety of sources. Major sources include human and animal wastes, soil erosion, detergents, internal loading, septic systems and runoff from farmland or lawns. Gilfillan ranges between 7-25ppm, medium to very high									
Copper: Copper is a relatively common metal in the environment. Average copper concentrations in lakes is 15-30ppm. Copper is applied on many lakes to control algae and weeds and over time can accumulate in lake sediment to levels that can become toxic to fish and other organisms. Gilfillan ranges from 3-69ppm.									

3.2 Biovolume, Aquatic Vegetation, and follow-up Curly-leaf Pondweed Delineation

Biovolume and Aquatic Vegetation

RCSWCD and VLAWMO staff conducted a biovolume and aquatic vegetation survey on July 28, 2023. Biovolume measures the density of plant life within the lake. Blue signifies 0% plant life, and red signifies 100% plant life. At depths greater than 4-6 feet, there is commonly no plant life in Minnesota lakes. Plant growth is limited because the sun does not penetrate into the water column below those depths enough to allow photosynthesis to occur.

The point-intercept method incorporating aerial photography and a Lowrance Elite-7 TI2 Global Positioning System (GPS) was used to assess the aquatic macrophyte community. Samples were taken at 30 unevenly spaced geo-referenced points (Figure 2). Unevenness is due to these points being created during a previous study in 2009 by a different organization and the desire to reuse these for comparison purposes.

Due to Gilfillan's depth, plant life is abundant throughout the lake and was only absent at 3 deeper points that were sampled.

Six species sampled via rake toss on Gilfillan Lake were Canada waterweed (*Elodea canadensis*), Northern watermilfoil (*Myriophyllum sibiricum*), White water lily (*Nymphaea odorata*), Curly-leaf pondweed (*Potamogeton crispus*), Flat-stem pondweed (*Potamogeton zosteriformis*), and Sago pondweed (*Stuckenia pectinata*). Filamentous algae (*Spyrogyra* spp.) were also noted but not included in macrophyte calculations.

Additional macrophytes confirmed visually but not at a point or on the rake included Water stargrass (*Heteranthera dubia*), Naiads (*Najas* spp.), and Slender pondweed (*Potamogeton pusillus*), The secchi disk reading was 0.9m (2.95ft).

A previous macrophyte survey of Gilfillan Lake was conducted in 2009. Due to differences in methodology comparative data are limited. Comparative data between those sampling events is included in the full report from RCSWCD.

Although Curly-leaf pondweed was present in the aquatic vegetation survey, the system was dominated by Flat-stem pondweed (*Potamogeton zosteriformis*). Flat-stem pondweed tends to be present in high-quality lakes. This result seemed inconsistent with the impairment status, so the aquatic plant survey was followed up with a Curly-leaf pondweed delineation on April 30, 2024.

Figure 19: Macrophyte sampling with RCSWCD and VLAWMO staff

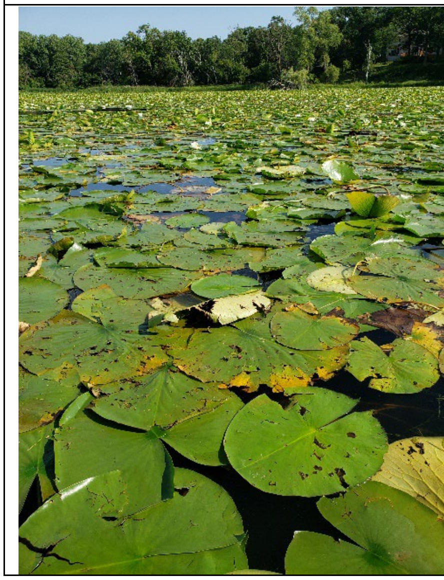
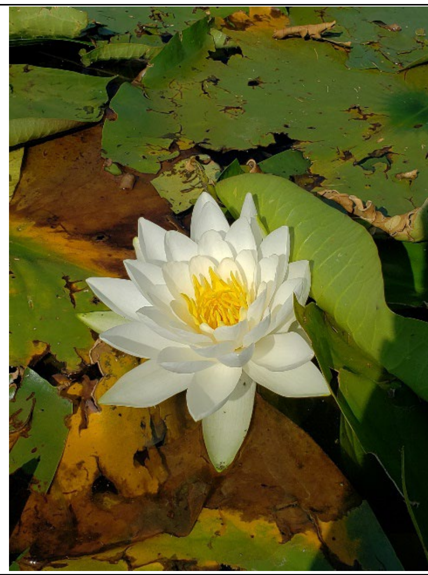
Gilfillan Lake had a high-density of surface coverage by native White water lilies	Close-up of a native White water lily
	

Figure 20: Gilfillan Lake survey points with depths

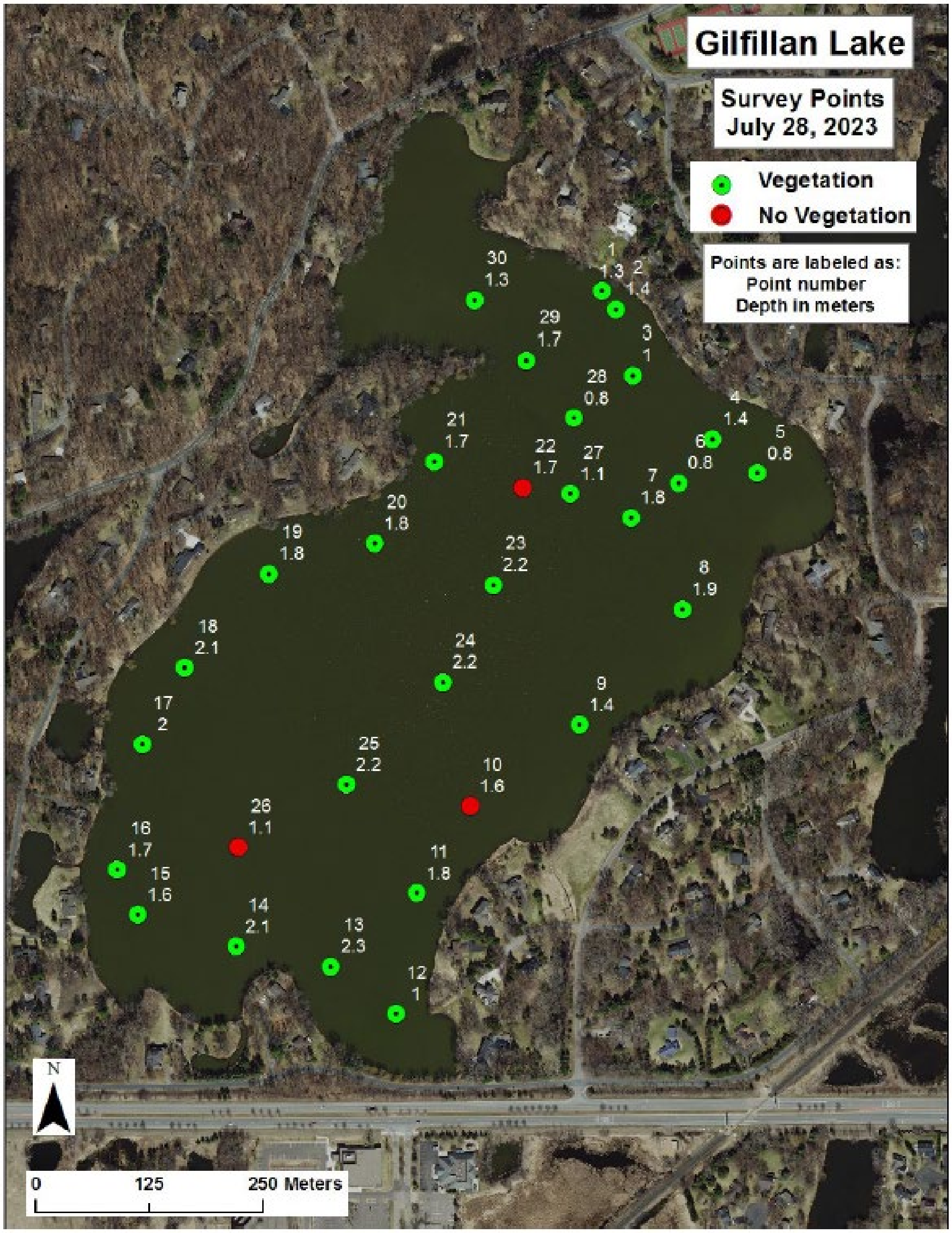


Figure 2. Gilfillan Lake vegetation point intercept survey locations. N=30.

Macrophyte, Contour, Biovolume and Bottom Composition Survey 3

Figure 21: Gilfillan Lake biovolume

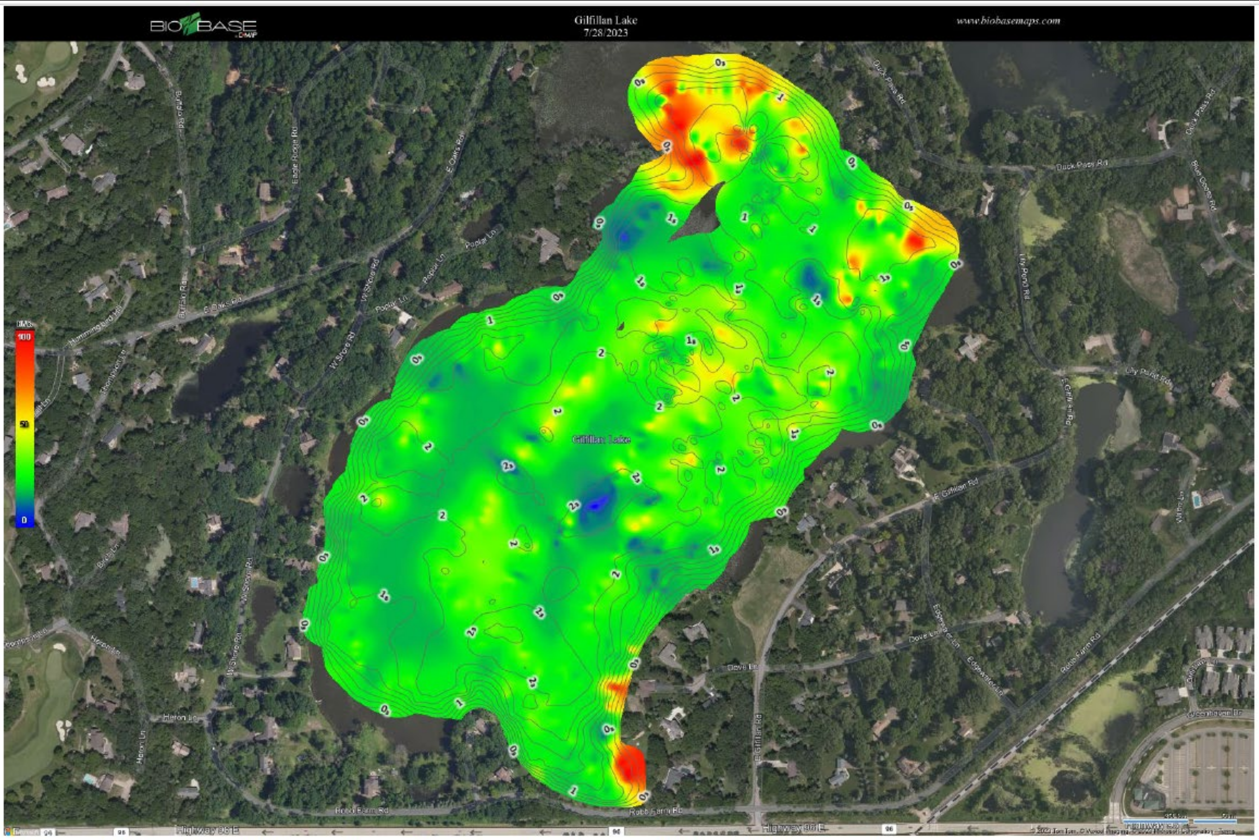
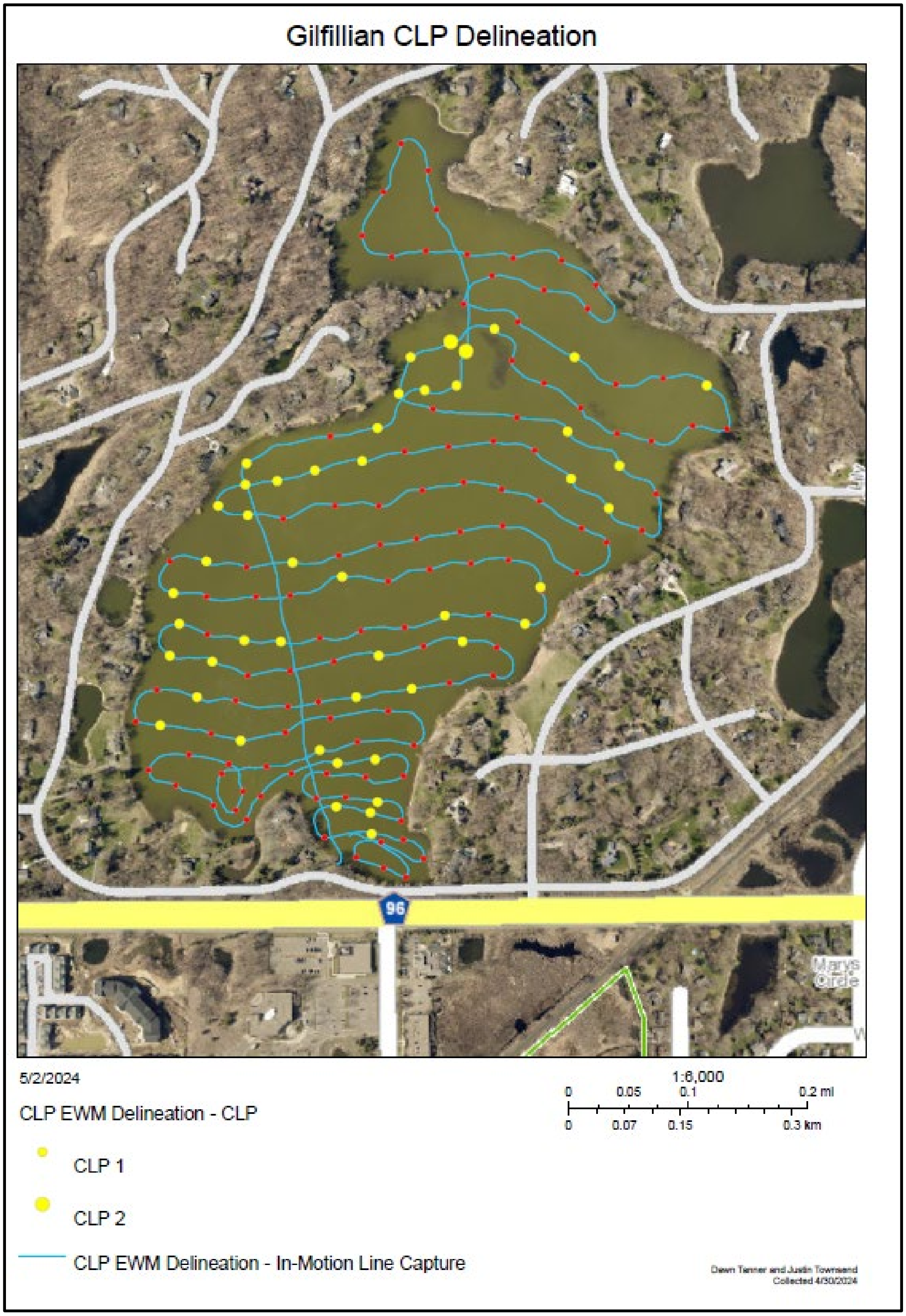


Figure 6. Gilfillan Lake vegetation biovolume with 0.3-m contours taken on July 28, 2023. Percent values range from zero to one hundred; Blue = 0%, Yellow = 50% and Red = 100%.

Figure 22: Gilfillan Lake follow-up Curly-leaf pondweed delineation from April 30, 2024. CLP was present but did not seem to be forming large single-stand patches in any locations. Overall, it was present with a high-density of native aquatic plants, especially Flat-stem pondweed (as previously noted).



3.3 Fish Survey

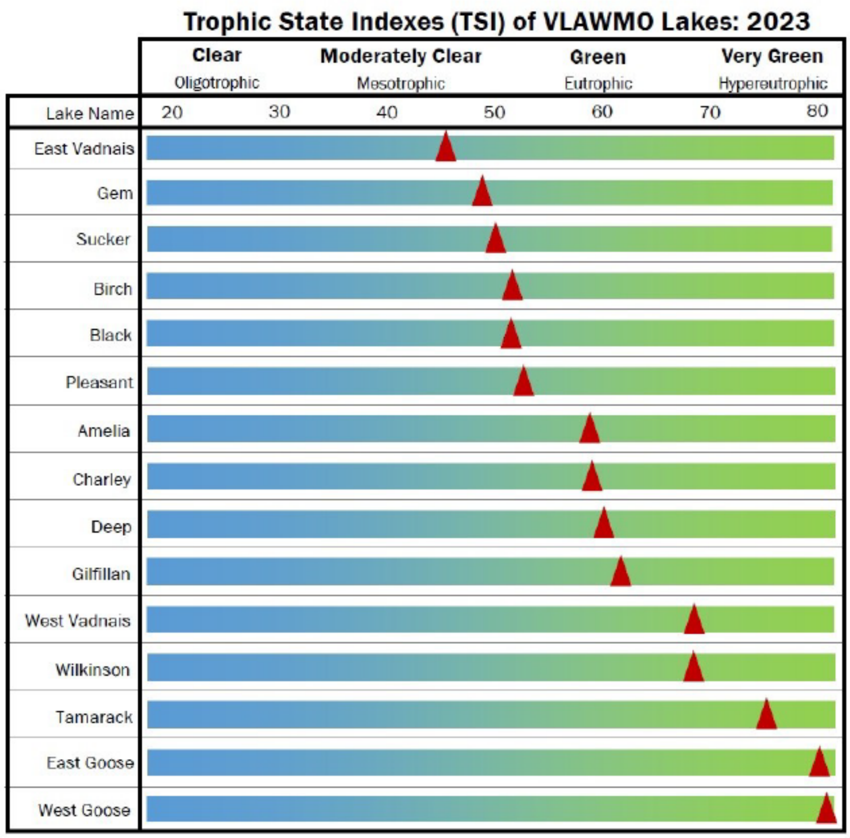
The only fish survey on record is from 1961. Qualitative data from residents in 2009/2010 indicated a mix of walleye and goldfish/koi in Gilfillan Lake. There apparently were also crappie, sunfish, and bullhead according to the 1961 survey. As of 2002, those fish are probably gone due to a fish kill the DNR did to clear the lake of predators for their walleye stocking program.

Synopsis from 2010: The water was murky. This could be due to rough fish, which stir up bottom sediment while foraging for food, releasing phosphorus and other nutrients stored in the sediment and causing high algae growth. A stated "dirty" appearance of Gilfillan could be due to the addition of the goldfish/koi, combined with the drop in water levels. Gilfillan was used as a walleye nursery by the DNR in 2002, and it was quite productive. There is little documented on why they stopped the program, but the otters chewing up their nets have been mentioned as one reason.

3.4 WATER QUALITY SUMMARY

Gilfillan Lake is shallow and falls in the green/eutrophic on the Trophic State Index (TSI) (shown below using the Carlson scale, MPCA). Gilfillan Lake had a score of 62 in 2022 and 2023.

Figure 23: TSI scores for VLAWMO lakes



VLAWMO has collected water quality (WQ) data on Gilfillan Lake since 1997. 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: Gilfillan Lake monitoring data 1997-2023 (Check zeros)

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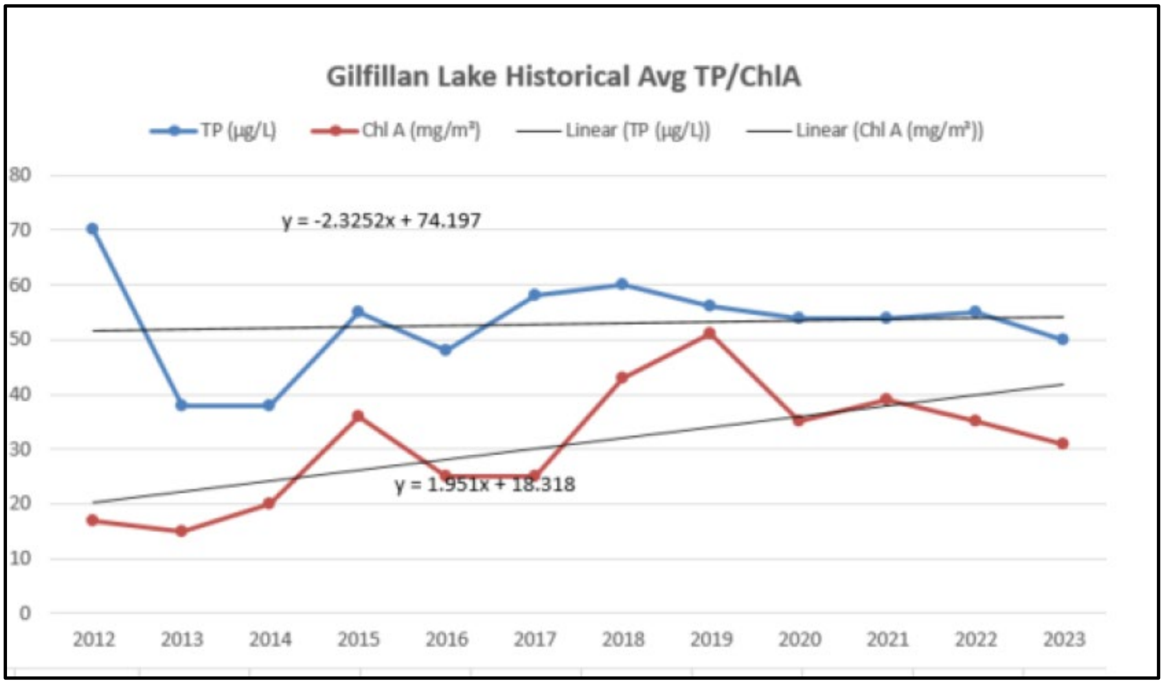
Gilfillan Lake Historical Avg TP/Chl A/ SDT			
Year	**TP (µg/L)**	**Chl A (µg/L)**	**Secchi (m)**
1997	96	32	0.5
1998	47	44	0.5
1999	72	23	0
2000	35	47	0
2001	84	20	0
2002	81	43	0.4
2003	44	25	1.4
2004	58	0	0
2005	52	8	0
2006	91	19	0
2007	100	33	0.7
2008	96	31	0.5
2009	152	44	0.4
2010	192	44	0.4
2011	123	25	0.4
2012	70	17	0.8
2013	38	15	1
2014	38	20	0.8
2015	55	36	0.6
2016	48	25	0.7
2017	58	25	0.7
2018	60	43	0.7
2019	56	51	0.6
2020	54	35	0.8
2021	54	39	0.9
2022	55	35	1
2023	50	31	1

Figure 24: Water quality trends in Gilfillan Lake



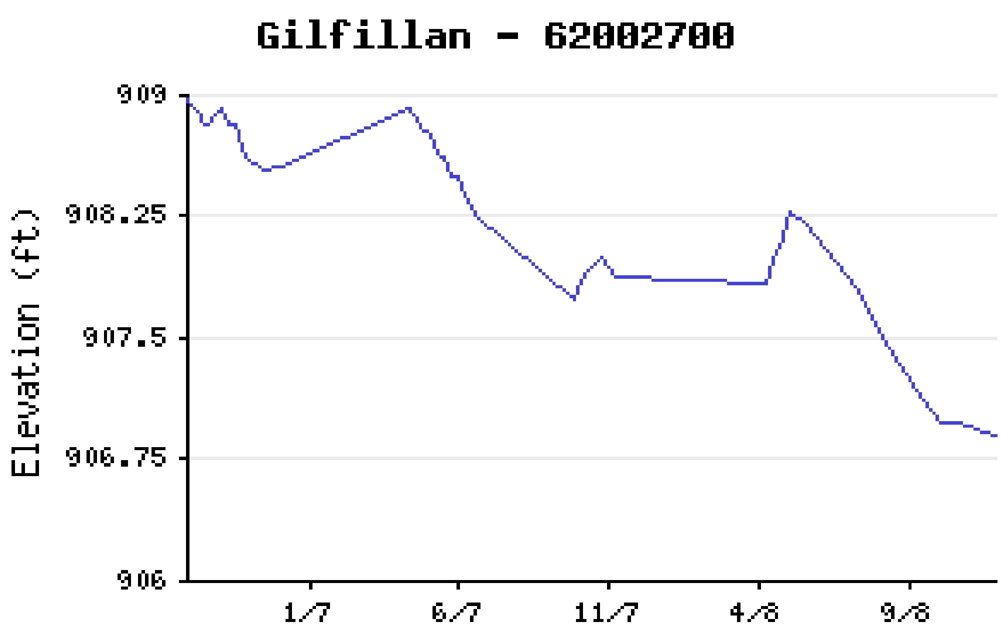
4.1 APPROPRIATION PERMITS

Water levels in Gilfillan Lake as described in the historical/aerial photos section of this review due to 1) Gilfillan's Lake history as a wetland that was dredged and converted to a lake and 2) some augmentation management that has been periodically active.

From 2010: A high water level of 910. 87ft was reported in June of 1994. The lake low was reported at 906.72 ft in July 2009. Water levels from 2007 through 2008 are shown below. Gilfillan Lake was approximately 3-4 feet below its historical augmented average of 908-910ft. There is no official ordinary high water level (OHW) set for Gilfillan by the DNR. Water level was of concern on Gilfillan Lake since augmentation stopped in 1990. It is unlikely the water level will drop much below its current level due to the perched aquifer Gilfillan Lake is on. Since the stop of augmentation Gilfillan Lake has gradually dropped to its current water level, the levels of the perched aquifers water table. It is suggested that Gilfillan will likely stay at this level and may bounce a little one direction or the other based on the aquifer recharge, but it is likely this is the "new" normal for the lake. The DNR would be able to provide more information on setting an OHW if it is in the interest of the homeowners. Reports by Wenck, Conestoga-Rovers & Associates report (august 1992), and Ramsey Conservation District go into great detail on the current water level, perched aquifers, and wells surrounding Gilfillan Lake.

Gilfillan is a meandered lake. The State has jurisdiction waterward from the ordinary high water level (OWH) The State would hold in trust the bed of the lake for riparian owners and the DNR has permitting authority.

Figure 25: Water quality levels in Gilfillan Lake (2007-2008)



Appropriation Permit

The Vadnais Lake Area Water Management Organization (VLAWMO) granted a General Permit to the City of North Oaks allowing the use of small or under 10,000 gallons per day amounts of surface water for non-essential uses. Homeowners must register with the City to be eligible for this permit authorization. Non-registered use of surface water is considered illegal under Minnesota Statute Chapter 103B.211, Subdivision 4. Non-essential uses include, but are not limited, to lawn watering, ornamental pond filling, and car washing. Please contact the City of North Oaks for registration information.

The General Permit may be found on the VLAWMO website www.vlawmo.org as Appendix E of the VLAMWO Water Management Plan. Highlights of permit are located in appendix F of this report.

In the fall of 2009, the Lake Gilfillan Watershed Association raised private funds to install an aeration system on the lake. The hope was that the aeration would keep the shallow lake well enough oxygenated and partially open through the winter to help limit the severity of potential fish kills. Also, the aeration will help with the mixing of the water table and may eventually help reduce the high chlorophyll levels in the lake by limiting the amount of time the chlorophyll is exposed to the sunlight. Below is a map showing the location of the unit.

Figure 26: Aerator Location

Homeowner Survey Summary

VLAWMO conducted a survey of homeowners on Gilfillan Lake in 2009. A little more than 75% of the residents responded. A summary of the results are shown below. Water level was the major concern of many of the residents who responded along with the poor quality of the lake.

Questions and summary of responses:

How important to you are the following concerns? (1 not important, 5 very important)

Lake Level	Healthy Fish Community	Waterfowl and Wildlife Presence	Boating Ability	Access to Lake	Aquatic Veg. Levels	Swimming	Lake Monitoring	Exotic Plant Control
5	4	4	3	3	4	3	4	4

What is your primary activity on the lake?

Viewing	Fishing	Boating	Swimming	Other
32	4	13	2	2

Over the last 5 years would you say the overall quality of Gilfillan was;

About the same	Getting better	Getting worse
2	2	29

How do you feel about the following aspects of your lake in its present state? (1 poor, 5 excellent)

Water Quality	Fishing	Boating	Swimming	Wildlife viewing	Other
2	2	2	1	4	n/a

Would you be interested in being part of a Gilfillan Lake Homeowners Association?

Yes	No	Maybe
19	3	2

Over the last five years how would you say the overall quality of Gilfillan was?

Water to low, drying up, too many weeds and rough fish (goldfish), liked DNR stocking program

What is your highest priority regarding the management of Gilfillan Lake?

Water level back to normal, clear water, good water quality, keep shore looking natural, not letting it turn into a swamp, find ways to get water

What does "good water quality" mean to you?

Safe, no toxins, high water and clean, no freeze outs, low vegetation, no smell, safe for swimming

What are your goals for Gilfillan Lake? What do you want your lake to look like in 20 years?

Full lake, abundant and diverse wildlife, 3 feet higher and ability to use for human enjoyment, keep lake clean and non-motorized like it was 20 years ago and clear

List any other questions or concerns:

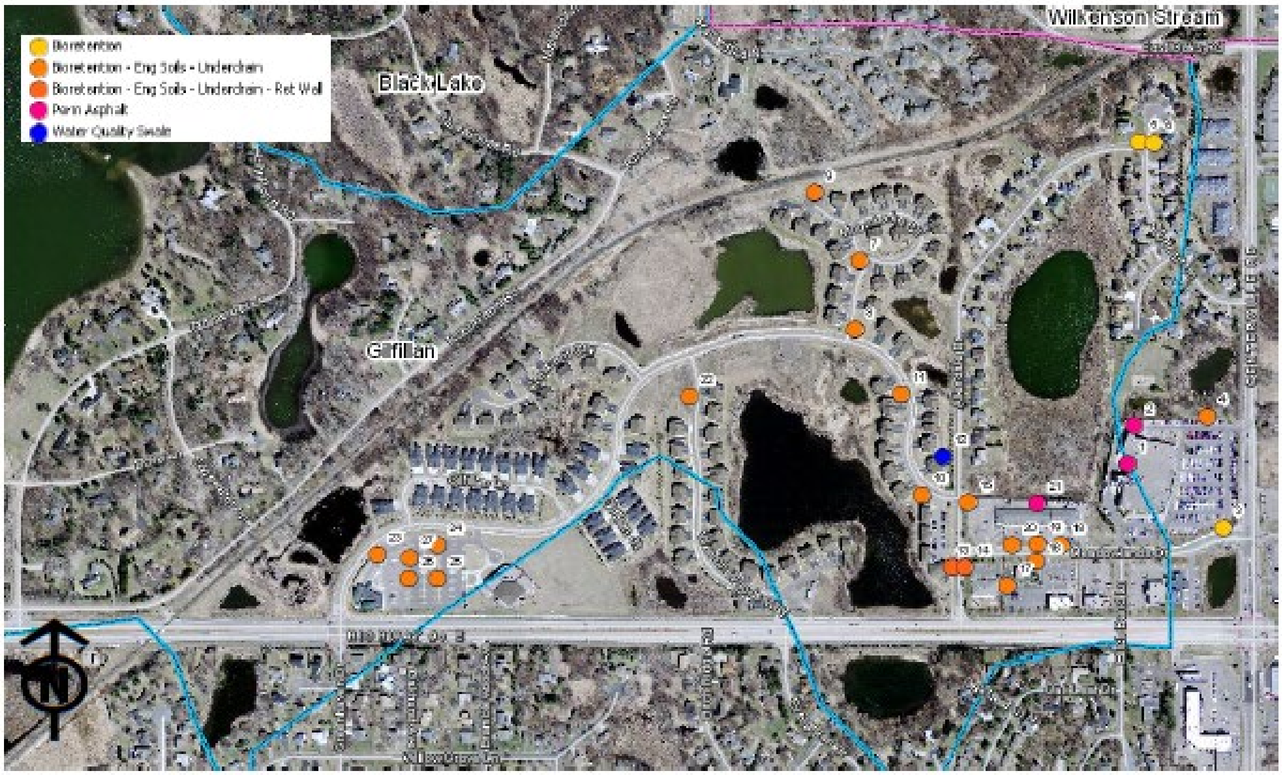
If an increase in water level is not possible/sustainable, lets improve the lake view and attract wildlife. The lake is currently an eyesore, movement was ever present from big lake to small, not using the lake for watering and pond filling, thank you for your efforts, governments should stay out of the problem and stop making it worse.

4.2 RETROFIT REPORT (2012)

In 2012, the Ramsey Conservation District (RCD), now RCSWCD, completed a Retrofit Report for Gilfillan Tamarack and Wilkinson Lakes. This was part of a larger effort to assess the full watershed and subwatershed scales and identify optimal locations for BMPs.

All of the retrofit locations were identified on the east side of the Gilfillan catchment, within the more urban area consisting of residential duplexes and commercial complexes, and include bioretention, dry swale and permeable asphalt. Sites identified were all on private land so cooperation of landowners will be required during the planning and installation of projects. As assumed bioretention basins capturing runoff more from roads combined with larger drainage areas were at the top of the list for installation. Twelve individual bioretention cells and 4 sites with multiple bioretention cell clusters were identified. The potential to install a water quality swale (dry swale) to capture runoff from a large grassy area and roof tops of several duplexes was identified in a current swale consisting of eroding turf grass. Options for permeable asphalt were identified in paved parking lot locations consisting of larger drainage areas with limited space for bioretention. If removing parking space/pavement to replace with bioretention is an option at these locations the bioretention would be a more efficient cost-effective retrofit alternative than the permeable asphalt. Site ID location 1,2,3,4 was a combination of the permeable asphalt and bioretention sites that were identified on the Cub Foods complex. These clusters were also modeled individually to compare options. It is suggested that retrofits proposed be considered from the top of the list down also taking in to account overall ease of installation. If all retrofit opportunities are installed 8.88 lbs of TP would be removed from the catchment resulting in a 2.5% decrease from the base load.

Figure 27: Gilfillan Lake Subwatershed: Locations recommended for retrofits with description in table below.



Catchment	Site ID	TP (lb/yr)	TSS (lb/yr)	Volume (cubic-feet/yr)	Size (sq ft)	BMP Type	Materials/Labor/Design	Unit Promotion & Admin Costs*	Total Project Cost**	Annual O&M	Term Cost/lb/yr (30 yr)
GF	7	0.80	338.97	5042.80	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$498.95
GF	8	0.79	298.40	8339.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$504.08
GF	5 & 6	0.90	324.90	21747.00	500	Simple Bioretention	$6,210.00	$564.81	$9,034.06	$375.00	$754.03
GF	22	0.44	230.50	10098.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$893.89
GF	3 & 4	1.28	732.00	61736.00	1000	Simple Bioretention	$12,210.00	$340.76	$15,617.64	$750.00	$990.33
GF	13	0.39	267.02	7842.00	250	Complex Bioretnetion	$4,710.00	$936.17	$7,050.43	$187.50	$1,074.42
GF	14	0.39	272.58	6367.00	250	Complex Bioretnetion	$4,710.00	$936.17	$7,050.43	$187.50	$1,077.43
GF	10	0.34	129.40	10093.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$1,183.78
GF	9	0.33	132.39	8497.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$1,204.59
GF	11	0.32	125.50	9684.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$1,236.82
GF	1,2,3,4	1.90	1408.10	96812.00	2000	Permeable and Bioretention	$26,420.00	$205.59	$30,531.80	$1,500.00	$1,327.91
GF	24-27	0.78	508.00	42797.00	1000	Moderately Complex Bioretention	$15,210.00	$340.76	$18,617.64	$750.00	$1,763.95
GF	17	0.19	120.80	10479.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$2,097.70
GF	15	0.19	120.10	10450.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$2,125.74
GF	1 & 2	0.61	676.10	35076.00	1000	Permeable Asphalt	$14,210.00	$340.76	$17,617.64	$750.00	$2,181.49
GF	18, 19, 20	0.43	283.10	24443.00	750	Moderately Complex Bioretention	$11,460.00	$420.27	$14,612.06	$562.50	$2,439.16
GF	16	0.13	93.37	8188.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$3,043.75
GF	21	0.22	210.50	13547.00	500	Permeable Asphalt	$7,210.00	$564.81	$10,034.06	$375.00	$3,232.20
GF	12	0.25	71.98	9192.00	800	Dry Swale	$5,490.00	$400.96	$8,697.68	$600.00	$3,559.69
GF	23	0.11	73.18	7037.00	250	Moderately Complex Bioretention	$3,960.00	$936.17	$6,300.43	$187.50	$3,767.19

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 Gem Lake included major efforts incorporated with road reconstruction in 2010 and 2011 that led to delisting Gem Lake in 2018:

2010: Scheuneman Road upgrades

Scheuneman Road (north and west of Hwy 61) sanitary sewer lining; East of Gem Lake

- Lined sanitary sewer lines, potentially ceasing shallow groundwater nutrient loading from leaking lines into Gem Lake

Scheuneman Road (south and east of Hwy 61) reconstruction

- Re-grading of the west ditch, including re-seeding and the addition of rip-rap at the end of the ditch
- Stormwater from ditch flows underground and over to the east ditch of the NB lane of Highway 61

2011: Highway 61 reconstruction (MnDOT Project 622-161)

- Improved grading and removed sediment
- Replaced and improved storm sewer infrastructure
- Ditch block installed in ditches to slow stormwater and increase infiltration prior to Gem Lake
- Established vegetation (MNDoT seed mix 250) where erosion was once and issue, slowing discharge rates and increasing infiltration in the NB ditches and swales before they flow west to the SB ditch wetland and then into Gem Lake

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 Gen Lake subwatershed, 1 VLAWMO grant project was implemented in 2021.

Figure 25: Gem Lake subwatershed implemented projects and BMPs.