Gilfillan Lake

VLAWMO
Vadnais Lake Area
Water Management Organization

Macrophyte, Contour, Biovolume and Bottom Composition Survey
7/28/23

Gilfillan Lake is located in the City of North Oaks and is surrounded by light residential land cover. Historically, the lake was converted from a wetland to an open surface water lake around the time that residential development began in the late 1940s and early 1950s. The lake level began to drop between 2009 and 2010, and the lake owners around the lake pursued the path towards augmenting 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.

This document contains two reports of data collected on Gilfillan Lake. The first report details the methods and findings of a point intercept survey of macrophyte vegetation. The second report details the methods and results of a contour, vegetation bio-volume and bottom hardness (composition) survey.

Data collected and prepared by **Ramsey County** – **Parks & Recreation, Soil and Water Conservation Division** for

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Aquatic Macrophyte Point-Intercept Survey

7/28/2023

Methods:

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 on Gilfillan Lake on July 28, 2023. 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. Data on depth, plant species, and abundance rank were recorded as displayed in Tables 2 and 3 and in the maps of this report. A secchi disk measurement was also taken in a deeper part of the lake on the shady side of the boat, as displayed in Table 3.

A double-tined metal rake attached to a 11-meter rope was used to collect specimens. At each point the device was thrown out approximately one meter and then dragged across the substrate for approximately one meter. Species were identified and given a ranking based on cover of rake tines (Table 1). Plant species that were floating in the water within one square meter of each collection point were also counted.

Table 1

Abundance rankings for percent cover of rake tines

Percent Cover of Tines	Abundance Ranking
41-100	3
21-40	2
1-20	1

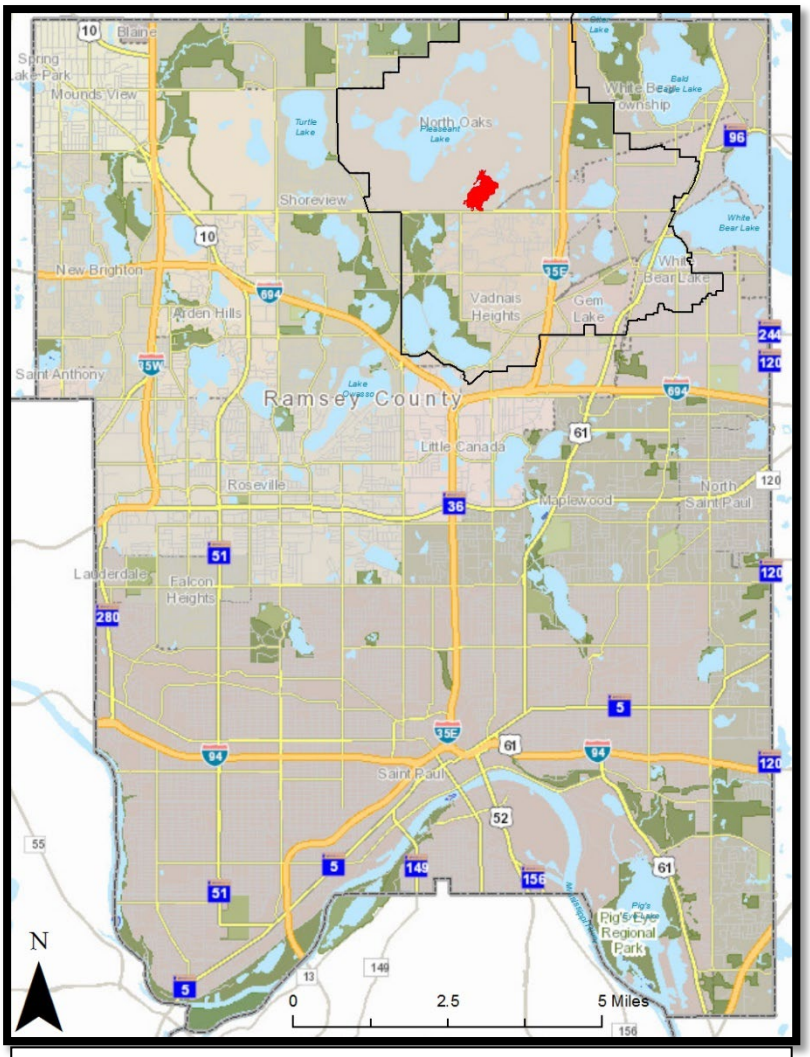

Figure 1. Location of Gilfillan Lake shown in red within Vadnais Lakes Watershed Management Organization and Ramsey County Boundaries.

Results:

Aquatic macrophytes were found at 27 of 30 points surveyed (Figure 2). The six species found 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).* Frequency of occurrence and average abundance of each species can be found in table 2. 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 include 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. The 2009 study used a 1-5 rake scale and put both bushy pondweeds and naiads together. Plants found in 2009 include naiads (*Najas spp*.), Canada waterweed (*Elodea canadensis*), and white water lily (*Nymphaea odorata)*. Comparative data is available in table 2.

Table 2. Frequency of occurrence & average abundance of aquatic plant taxa present during Gilfillan Lake point-intercept survey.

Species	Common Name	Scientific Name	Average Abundance 2009	Frequency of Occurrence 2009	Average Abundance 2023	Frequency of Occurrence 2023
1	Canada waterweed	*Elodea canadensis*	2	70%	1	3%
2	Northern watermilfoil	*Myriophyllum sibiricum*	-	-	1	3%
3	White water lily	*Nymphaea odorata*	2	37%	3	27%
4	Curly-leaf pondweed	*Potamogeton crispus*	-	-	1	3%
5	Flat-stem Pondweed	*Potamogeton zosteriformis*	-	-	2	77%
6	Naiad	*Najas spp.*	2	87%	-	-
7	Sago pondweed	*Stuckenia pectinata*	-	-	1	10%
*8	Filamentous algae	*Spyrogyra spp.*	-	-	1	17%

Table 3. Depth, Secchi disk, water temperature, and vegetation abundance point survey results on July 28, 2023

Sample ID	Depth (m)	*Potamogeton crispus*	*Elodea canadensis*	*Myriophyllum sibiricum*	*Potamogeton zosteriformis*	*Stuckenia pectinata*	*Nymphaea odorata*	Spyrogyra spp.*
1	1.3						3	
2	1.4				1			1
3	1.0				1			
4	1.3						3	
5	0.8				1	v	3	
6	0.8				2		3	
7	1.8				2			
8	1.9				1			
9	1.4				2	1		
10	1.6							
11	1.8				2			
12	1.0			1				
13	2.3				1			
14	2.1				1			
15	1.6			v	2	v	2	
16	1.7		1		1	1	3	
17	2.0	1			1			1
18	2.1				2			
19	1.8	turion			2	1		1
20	1.8				1			
21	1.7							1
22	1.7							
23	2.2				1			
24	2.2				3			
25	2.2				1			
26	2.1							
27	1.1				3			
28	0.8				2		v	
29	1.7				1		1	1
30	1.3				1		3	
Total Abundance		1	1	1	23	3	8	5
Count in Littoral Zone		4	7	8	9	10	11	12
Avg. Abundance		1	1	1	2	1	3	1
Frequency of Occurrence		3	3	3	77	10	27	17
Secchi Depth (m)	0.9	Water Temperature C (F)	28.5 (83.3)					

- Note: A “v” noted in a cell indicates a species was visually confirmed near the area but was not confirmed on the rake
- Note: A turion of curly leaf pondweed was found near point 19 and was noted

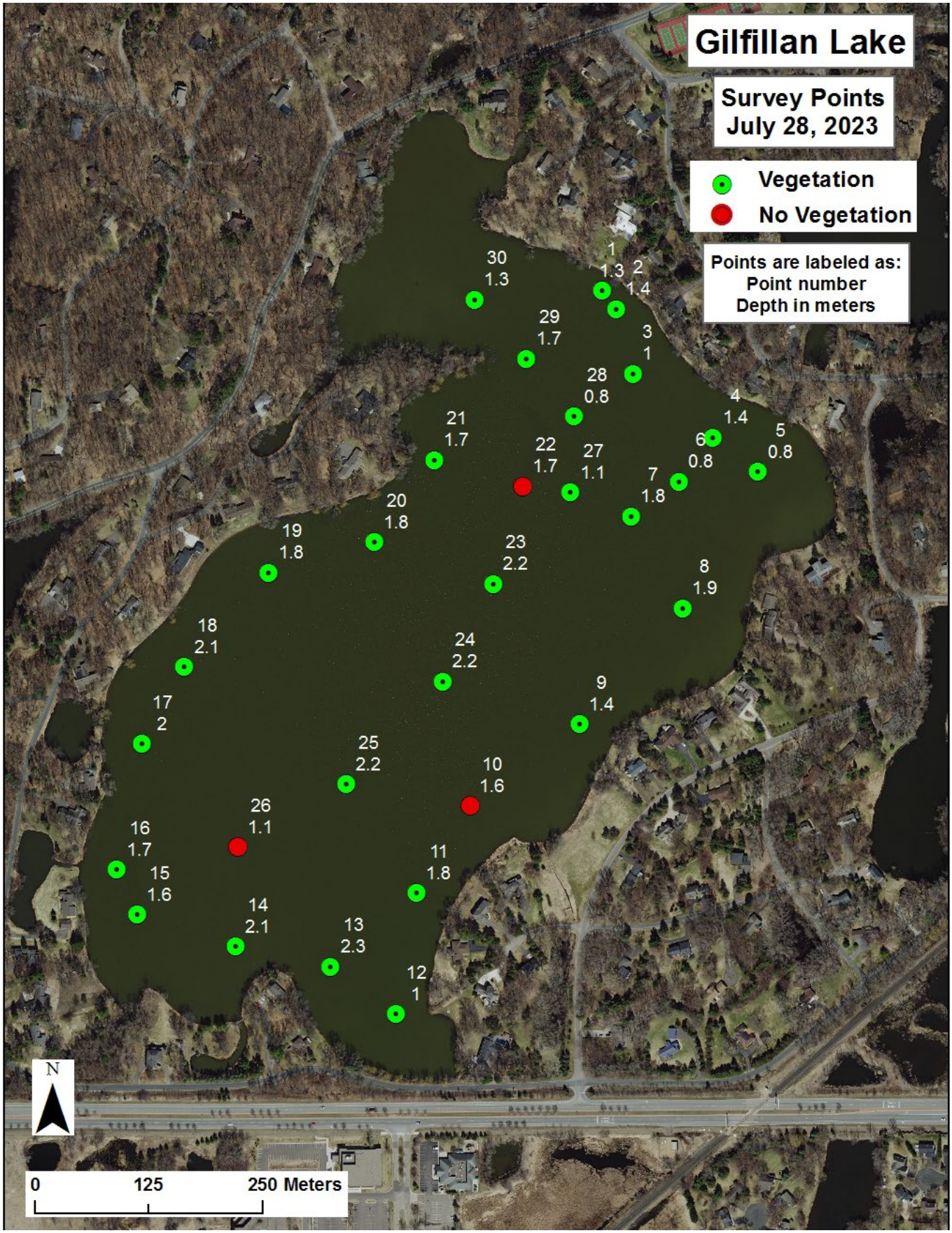

Figure 2. Gilfillan Lake vegetation point intercept survey locations. N=30.

Macrophyte, Contour, Biovolume and Bottom Composition Survey 3

Contour, Biovolume and Bottom Composition Survey

7/28/23

Methods:

A Lowrance Elite-7 Ti2 Global Positioning System (GPS)-enabled depth finder was used to collect submerged aquatic vegetation biovolume, lake depth (bathymetry), and bottom hardness (composition) data on Gilfillan Lake on July 28, 2023. The lake was transected at varying distances between transects due to the historical points at a speed of no more than 5 miles per hour. Sonar log data were recorded using the Lowrance Elite-7 Ti2 Global Positioning System (GPS)-enabled depth finder. Transducer data were processed using Contour Innovations, LLC, BioBase software.

Results:

The results below were produced by exporting the processed data from the BioBase system and interpolating spatial data using ArcGIS software. Results include maps as well as statistics of biovolume distribution represented as total percent of water column occupied by plant matter ranging from zero to one hundred. Additional results include contour depth maps at 0.3-meter intervals as well as bottom hardness (composition) maps. 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. More robust interactive contour and vegetation map data, including sonar log trip replays, can be viewed on the BioBase website: www.biobasemaps.com.

BIOBASE

VEGETATION ANALYSIS REPORT

Gilfillan Lake, Ramsey Minnesota

Report Time Stamp: 2023 October 25 - 15:26 (UTC) ... REPORT LINK

Survey Metadata	
Data Collector:	Justin Townsend
Survey Time Stamp (UTC):	2023 July 28 - 13:59
Starting Location:	45.080002, -93.080916
Ending Location:	45.083883, -93.082221
Distance	6.181 km

Survey Statistics	
Average Water Temperature:	28.0 °C
Survey Area:	36.945 ha
Survey Volume:	587085.940 cu. m
Percent of Waterbody Surveyed:	85.0%
Waterbody Area:	43.455 ha
Estimated Waterbody Volume ?	690537.785 cu. m

Survey Settings	
Includes Edited Data:	Yes
Track Buffer:	40 m
BV Grid Cell Size:	8 m
BV Minimum Detection - Percent:	5.0%
BV Minimum Detection - Depth:	0.701 m
BV Maximum Detection - Depth:	6.096 m
BV Sonar Channel:	NA

Survey Summary

Type ?	PAC ?	Avg BVp ?	SD BVp ?	Avg BVw ?	SD BVw ?	Depth Range	Depth Avg	No. Depth Records
Point	90.8%	33.0%	± 22.8%	30.0%	± 22.6%	0.51 - 2.66 m	1.668 m	4932
Grid	99.7%	30.4%	± 12.6%	30.3%	± 12.7%	0.05 - 2.58 m	1.589 m	11502

Biovolume Analysis by Quintiles

Type ?	0 - 20%	20 - 40%	40 - 60%	60 - 80%	80 - 100%
Point	34.8%	42.3%	15.6%	2.0%	5.3%
Grid	19.1%	64.9%	12.8%	2.5%	0.7%

Biovolume Analysis by Depth

Type ?	Depth	Count	PAC ?	Avg BVp ?	SD BVp ?	Avg BVw ?	SD BVw ?
Point	0 - 1 m	332	94.3%	38.4%	± 32.5%	36.2%	± 32.5%
	1 - 2 m	2699	92.3%	31.1%	± 22.9%	28.7%	± 22.8%
	2 - 3 m	1287	87.0%	35.4%	± 19.1%	30.8%	± 18.5%
	3 - 4 m	0	0%	0%	± 0%	0%	± 0%
	4 - 5 m	0	0%	0%	± 0%	0%	± 0%
	5 - 6 m	0	0%	0%	± 0%	0%	± 0%
	6 - 7 m	0	0%	0%	± 0%	0%	± 0%
	7 - 8 m	0	0%	0%	± 0%	0%	± 0%
	8 - 9 m	0	0%	0%	± 0%	0%	± 0%
	9 m +	0	0%	0%	± 0%	0%	± 0%
Grid	0 - 1 m	1759	100%	34.9%	± 16.8%	34.9%	± 16.8%
	1 - 2 m	6420	99.9%	30.3%	± 12.4%	30.3%	± 12.5%
	2 - 3 m	3322	99.3%	28.0%	± 9.1%	27.9%	± 9.3%
	3 - 4 m	0	0%	0%	± 0%	0%	± 0%
	4 - 5 m	0	0%	0%	± 0%	0%	± 0%
	5 - 6 m	0	0%	0%	± 0%	0%	± 0%
	6 - 7 m	0	0%	0%	± 0%	0%	± 0%
	7 - 8 m	0	0%	0%	± 0%	0%	± 0%
	8 - 9 m	0	0%	0%	± 0%	0%	± 0%
	9 m +	0	0%	0%	± 0%	0%	± 0%

Glossary

AOI

Area of Interest: Defines the individual transects or contiguous data samples as depicted by the color coding of each trip line. Seperate areas of interest can be generated through merging of multiple trips, appending data to a single sonar log or lapses in time (greater than five minutes) within a sonar log.

BVp

Biovolume (Plant): Refers to the percentage of the water column taken up by vegetation when vegetation exists. Areas that do not have any vegetation are not taken into consideration for this calculation.

BVw

Biovolume (All water): Refers to the average percentage of the water column taken up by vegetation regardless of whether vegetation exists. In areas where no vegetation exists, a zero value is entered into the calculation, thus reducing the overall biovolume of the entire area covered by the survey.

PAC

Percent Area Covered: Refers to the overall surface area that has vegetation growing.

Grid

Geostatistical Interpolated Grid: Interpolated and evenly spaced values representing kriged (smoothed) output of aggregated data points. The gridded data is most accurate summary of individual survey areas.

Point

Individual Coordinate Point: A single point represents a summary of sonar pings and the derived bottom and canopy depths. Individual point data create an irregularly spaced dataset that may have overlaps and/or gaps in the data resulting in a increased potential for error.

Figure 3. Gilfillan Lake BioBase survey summary statistics.

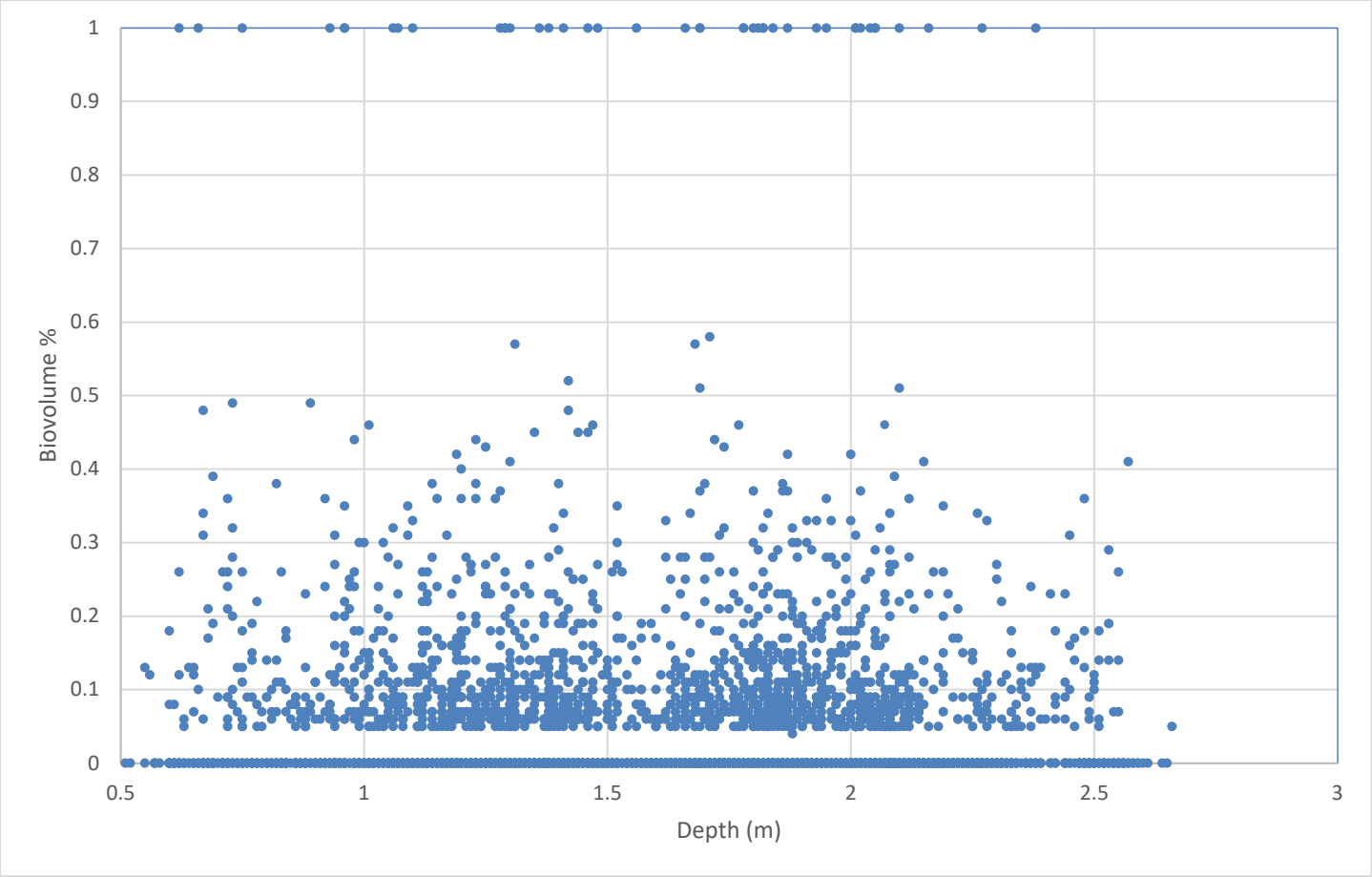

Figure 4. Gilfillan Lake biovolume distribution scatter chart.

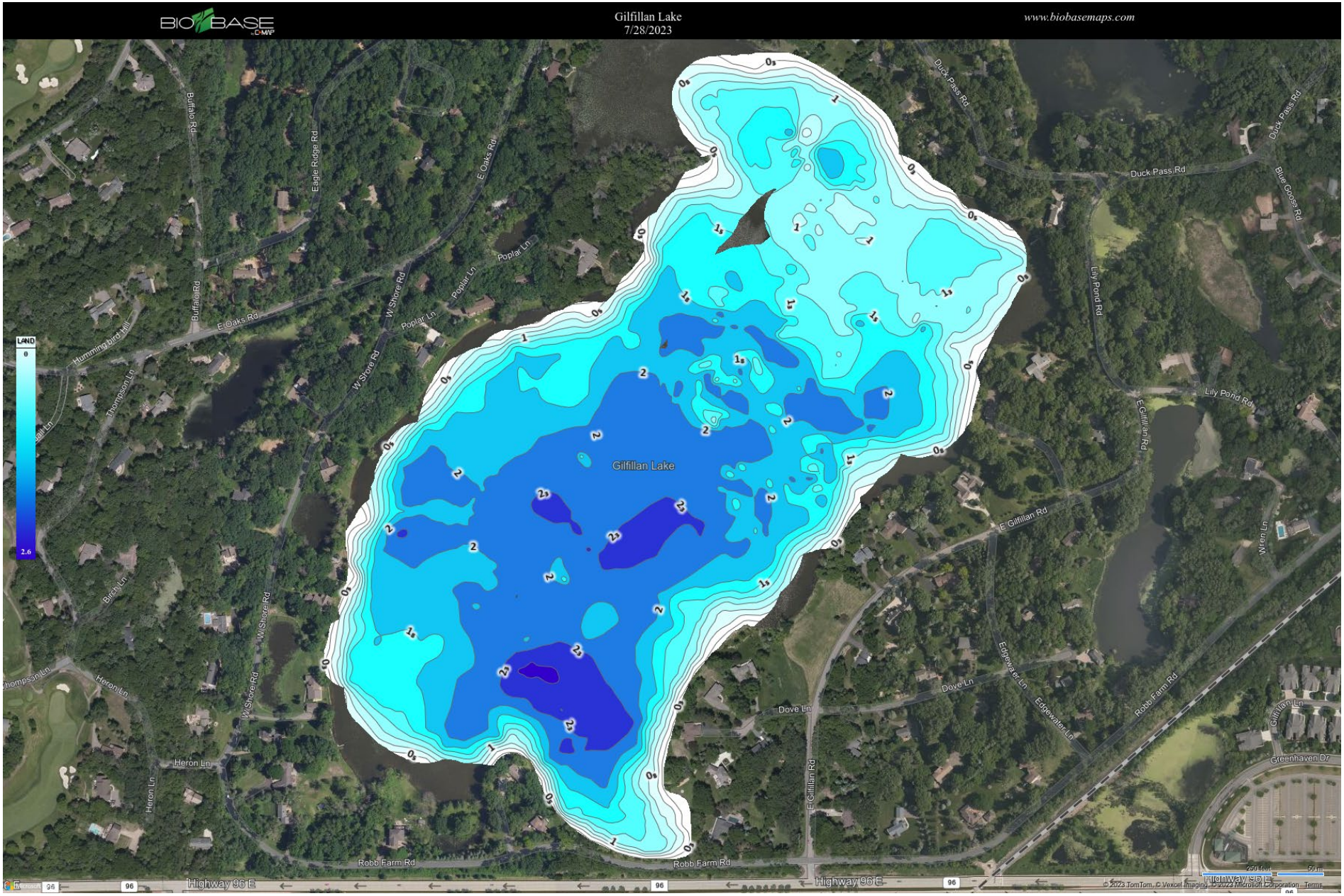

Figure 5. Gilfillan Lake 0.3-m contours with depth in meters taken on July 28, 2023.

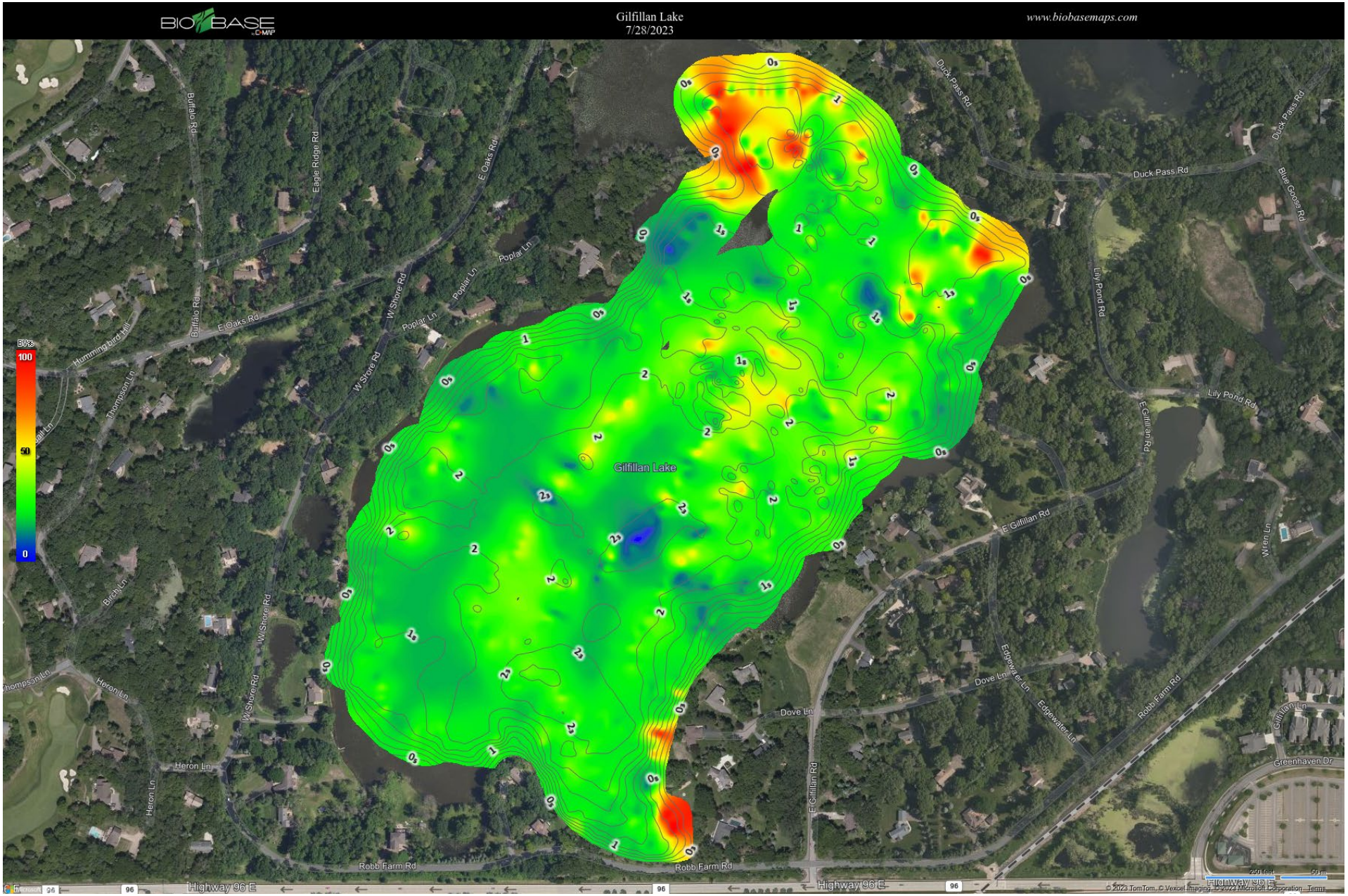

Figure 6. Gilfillan Lake vegetation biovolume with 0.3-m contours taken on July 28, 2023. Percent values range from zero to one hundred; Blue = 0%, Yellow = 50% and Red = 100%.

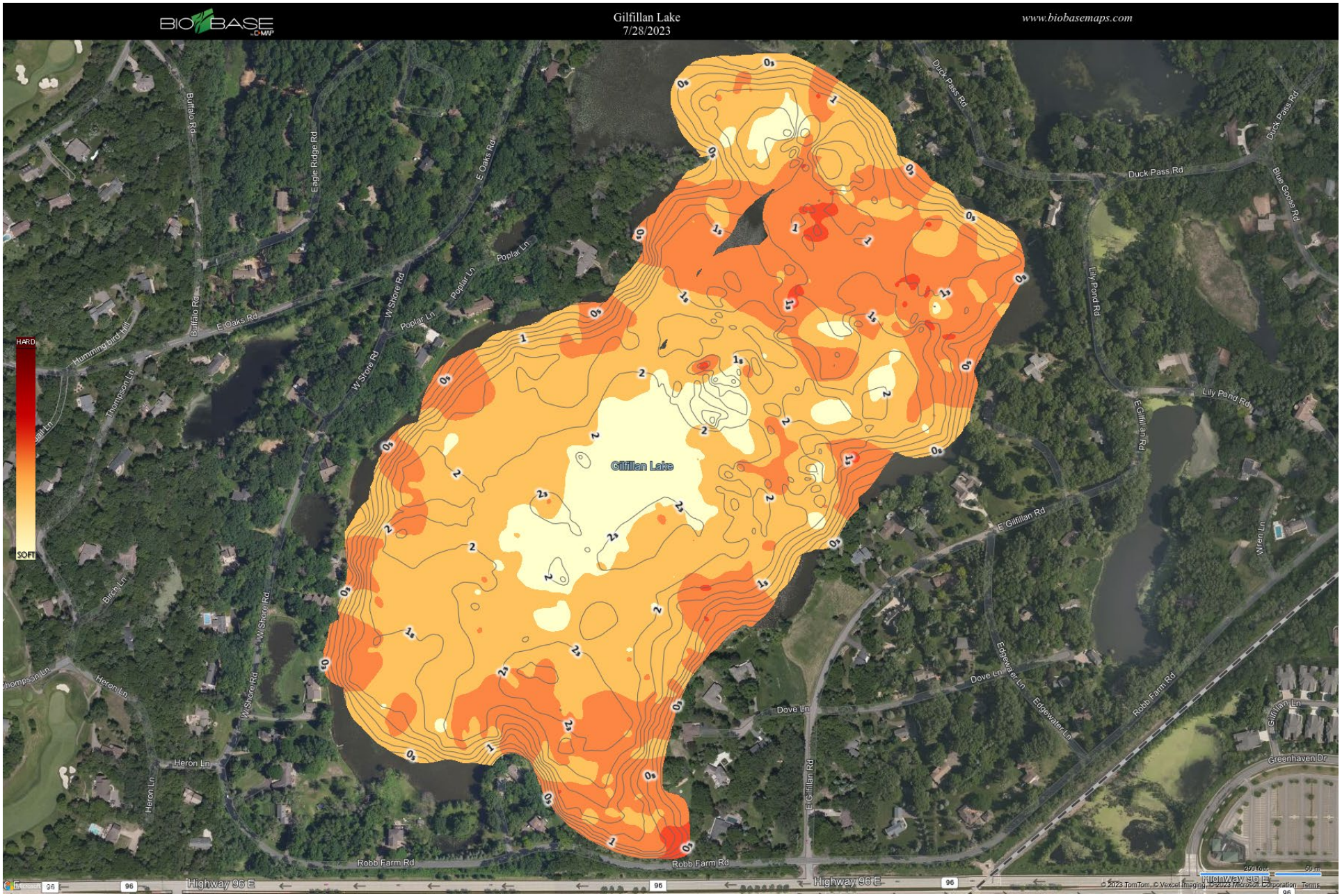

Figure 7. Gilfillan Lake bottom composition values with 0.3-m contours taken on July 28, 2023.