West Vadnais Lake

VLAWMO
Vadnais Lake Area
Water Management Organization

Macrophyte, Biovolume, and Contour Survey 6/18/19

This document contains data collected on West Vadnais Lake in Vadnais Heights, MN. The report details the methods and findings of a point intercept survey of macrophyte vegetation, a vegetation bio-volume survey, and a contour bathymetry survey.

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

Vadnais Lake Area Water Management Organization
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http://www.vlawmo.org/
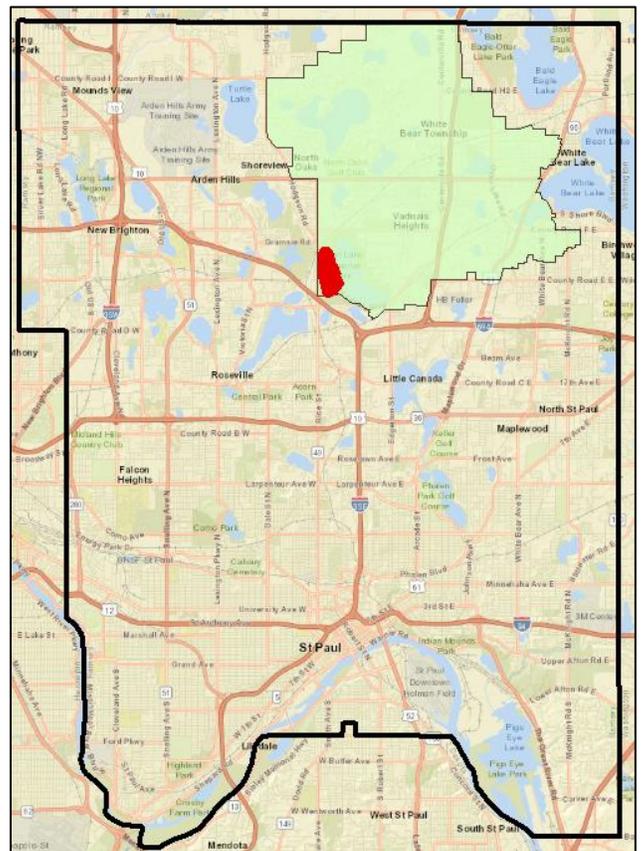
Figure 1. Location of West Vadnais Lake (red) in Ramsey County within VLAWMO borders

West Vadnais Lake

June 18, 2019

1. Macrophyte Survey Methods:

The point intercept method incorporating aerial photography and a Lowrance HDS-5™ Global Positioning System (GPS) was used to assess the aquatic macrophyte community on West Vadnais Lake on June 18, 2019. Samples were taken at 137 geo-referenced points 80 meters apart. Data on plant species and abundance rank was recorded and displayed in Table 2 of this report. A secchi disk measurement was also taken in the deepest part of the lake on the shady side of the boat.

A double-tined metal rake attached to an 11-meter rope was used to collect specimens. At each point, the device was thrown out approximately 1 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 at the collection points 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

Results:

Aquatic macrophytes were found at 37 of 137 points surveyed (Figure 2). The most prevalent species was Muskgrass (*Chara*)*,* which had 51% occurrence*.* Coontail *(Ceratophyllum demersum)*, Leafy Pondweed (*Potamogeton foliosus),* Sago Pondweed (*Stuckenia pectinata*), White Water Lily (*Nymphea odorata*), Yellow Water Lily (*Nuphar lutea*), Curly Leaf Pondweed (*Potamogeton crispus*), and Filamentous Algae (*Spirogyra sp./Cladophora*) were the next most common species, with percent occurrence ranging from 16%-35%. Found at only 1 point and 2 points respectively were the remaining surveyed species: Northern Watermilfoil (*Myriophyllum exalbescens)*, and Flat Stem Pondweed (*Potamogeton zosteriformis*)*.* Common bladderwort (*Utricularia vulgaris*) was also observed in the lake. The secchi disk reading was 4.25 ft (1.3m). Water temperature was 73 degrees, and the deepest point in the lake was 11.13 ft according to the sonar record.

Table 2

Percent occurrence and average abundance of aquatic plant taxa present during West Vadnais Lake point-intercept survey

Species	Common Name	Scientific Name	Average Abundance 6/18/19	Percent Occurrence 6/18/19
1	Muskgrass	*Chara spp .*	1.1	51
2	Filamentous Algae	*Spirogyra/Cladophora sp*	1.3	35
3	Curly Leaf Pondweed	*Potamogeton crispus*	1.2	35
4	Leafy Pondweed	*Potamogeton foliosus*	1.4	30
5	Sago Pondweed	*Stuckenia pectinata*	1	22
6	Coontail	*Ceratophyllum demersum*	1.4	19
7	White Water Lily	*Nymphaea odorata*	1	19
8	Yellow Water Lily	*Nuphar lutea*	1.5	16
9	Flat-Stem Pondweed	*Potamogeton zosteriformis*	1	5
10	Northern Watermilfoil	*Myriophyllum exalbescens*	1	3

Note. Percent occurrence represents the number of times a plant species was observed divided by the number of total sample sites where vegetation was observed. Average abundance is calculated as the average of the abundance ranking for an individual species present.

Figure 2. Yellow Water Lilies at the north shore of West Vadnais Lake

The following map (Figure 3) shows the locations where vegetation was found, with Table 3 providing details on the types and abundance of macrophyte species present per point, as corresponding to the numbered points on the map.

Figure 3. West Vadnais Lake vegetation point intercept survey locations. N=137.

Table 3. West Vadnais Lake point intercept survey results. June 18, 2019

Point	Muskgrass	CurlyLeaf Pondweed	Filamentous Algae	Yellow Water Lily	White Water Lily	Sago Pondweed	Coontail	Flat-Stem Pondweed	Leafy Pondweed	Northern Watermilfoil
1		1	1			1				
2		1	1	2						
3		1	2	2			1			
4		2								
5		1								
6	1									
7			1		1		3			
8		2	1	1	1	1	1			
9	1									
10		1								
11										
12	1									
13			2	1	1	1	2			
14	1					1	1	1		1
17										
18	1									
19				2						
24										
25	1		1						2	
30										
31									1	
38										
39	1								1	
54	1									
61										
62	1					1				
71	1								1	
80	1	1	1						2	
81										
82			1							
87										
88			1							
97	1									
106	1		1			1			2	
115	3		3			1			2	
116			1					1		
121		2					1			
122	1									
123	1	1							1	
128										
129		1			1				1	
130										
131		1			1					
134				1	1	1	1			
135	1	1								
136	1								1	
137	1				1				1	
Total Abundance	21	16	17	9	7	8	10	2	15	1
Count	19	13	13	6	7	8	7	2	11	1
% Occurrence	51%	35%	35%	16%	19%	22%	19%	5%	30%	3%
Avg. Abundance	1.1	1.2	1.3	1.5	1.0	1.0	1.4	1.0	1.4	1.0
Secchi Depth	4.25 ft									

2. Biovolume Survey Methods:

A Lowrance HDS-5TM Global Positioning System (GPS)-enabled transducer was used to collect submerged aquatic vegetation biovolume data on West Vadnais Lake on June 18, 2019. The lake was transected at a maximum distance of 40 meters between transects at a speed of no more than 6 miles per hour. Transducer log data was processed using Contour Innovations, LLC, BioBase software, downloaded, and interpolated in ArcMap to create a biovolume map.

Results:

Results include a map as well as statistics of biovolume distribution represented as total percent of water column occupied by plant matter ranging from zero to one hundred. More robust interactive contour and vegetation map data, including sonar log trip replays, can be viewed on the ciBioBase website:www.cibiobase.com.

BIO BASE   VEGETATION ANALYSIS REPORT

Vadnais Lake, Ramsey Minnesota   Generated: 6/21/2019 9:02:57 PM (UTC)

Waterbody Size: 218.34 acres   report link
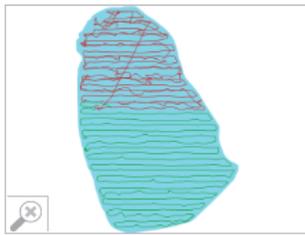
Data Collector		**Survey Size**		**Offset Information**
Andrea Prichard		Area: 215.20 acres		See Below
		Percent: 98.56% of waterbody		
Data Collection Date		Volume: 1697.23 acre ft		
6/19/2019 5:28:15 PM (UTC)				
		Est.Waterbody Volume ?		
Average Water Temperature		2124045.22 cu. m		
73.18° F		(1721.99 acre ft)		
Location		**Settings**		
Start: 45.05858895, -93.10365416		Track Buffer: 25 m		
End: 45.04665614, -93.09874188		Grid Cell Size: 5.0 m		
		Min.BV Detect: 5%		
		Min.Veg Depth Detect: 0.73 m		

▲ Survey Summary

	Type ?	PAC ?	Avg BVp ?	SD BVp ?	Avg BVw ?	SD BVw ?	Depth Range	Avg Depth	Distance	No.Points
Full Survey	Point	44.8%	28.5%	±23.5%	12.7%	±18.9%	2.14 - 11.33 ft	7.74 ft	18.13 miles	9560
	Grid	44.9%	22.4%	±17.4%	10.0%	±16.1%	0.21 - 11.13 ft	7.89 ft	-	31110

▲ Biovolume Analysis by Quantity

AOI ?	0-5%	5-20%	20-40%	40-60%	60-80%	>80%
1	55.23%	24.11%	7.33%	6.05%	6.49%	0.79%

Biovolume Analysis by Depth

Full Survey	Depth	Type ?	Count	PAC ?	Avg BVp ?	SD BVp ?	Avg BVw ?	SD BVw ?
	0-1m	Point	1247	100.0%	60.8%	±13.1%	13.1%	±0.0%
	1-2m		2031	70.0%	21.3%	±11.5%	11.0%	±0.0%
	2-3m		5193	31.0%	9.7%	±4.0%	4.4%	±0.0%
	3-4m		1089	0.0%	0.0%	±0.0%	0.0%	±0.0%
	4-5m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	5-6m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	6-7m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	7-8m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	8-9m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	9-10m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	0-1m	Grid	2908	85.8%	38.5%	±19.5%	33.0%	±22.5%
	1-2m		11003	88.9%	34.0%	±17.6%	30.2%	±19.7%
	2-3m		17199	40.0%	12.2%	±7.2%	4.9%	±7.5%
	3-4m		0	0.0%	5.1%	±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 irregularily spaced dataset that may have overlaps and/or gaps in the data resulting in a increased potential for error.
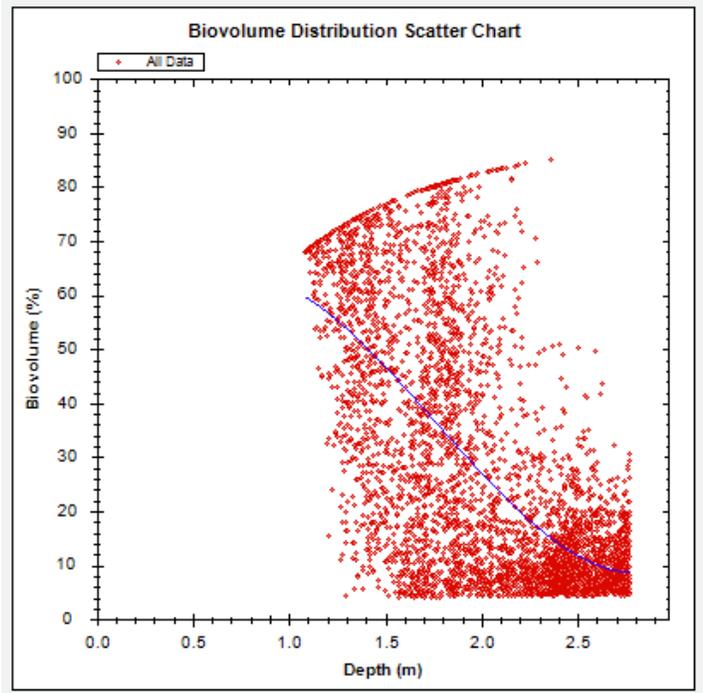
Figure 4. West Vadnais Lake BioBase survey summary statistics and chart
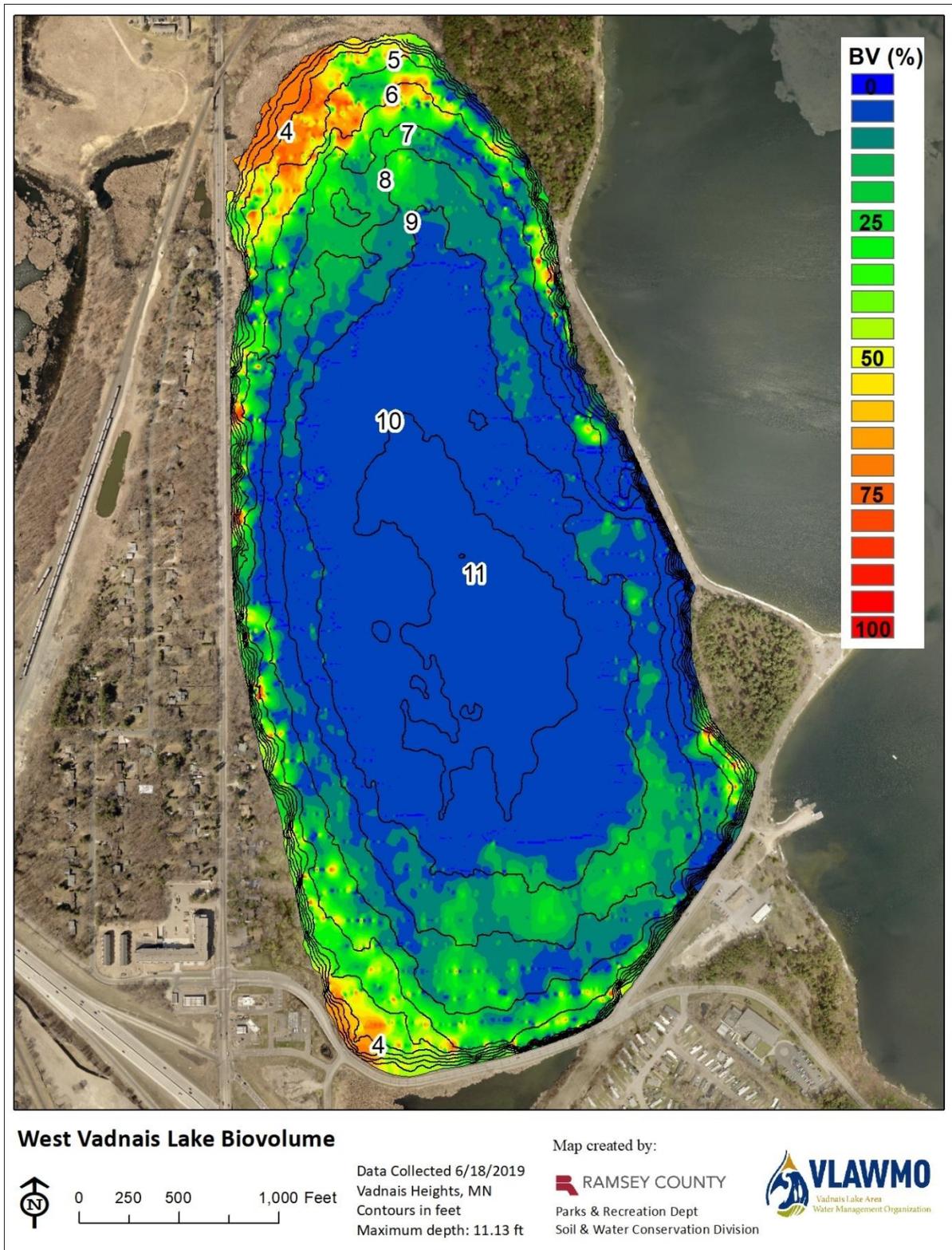
Figure 5. West Vadnais Lake biovolume map with 1-ft contours. Biovolume represented in %.

3. Contour Survey Methods:

A Lowrance HDS-5 Insight Global Positioning System (GPS)-enabled depth finder was used to collect bathymetry data on West Vadnais Lake on June 18, 2019 while following pre-determined transect lines at 40m intervals throughout the lake. A measuring rod was used to spot check depth accuracy in twenty locations (Figure 6). In all cases, the transducer value was lower than the actual measured depth. The average difference was 1.14 ft, due in large part to the depth of the transducer in the water. Sonar log data was adjusted accordingly and re-processed using Contour Innovations, LLC, BioBase software. Depth data was then downloaded and interpolated in ArcGIS to create a depth raster map and 1-ft contours.
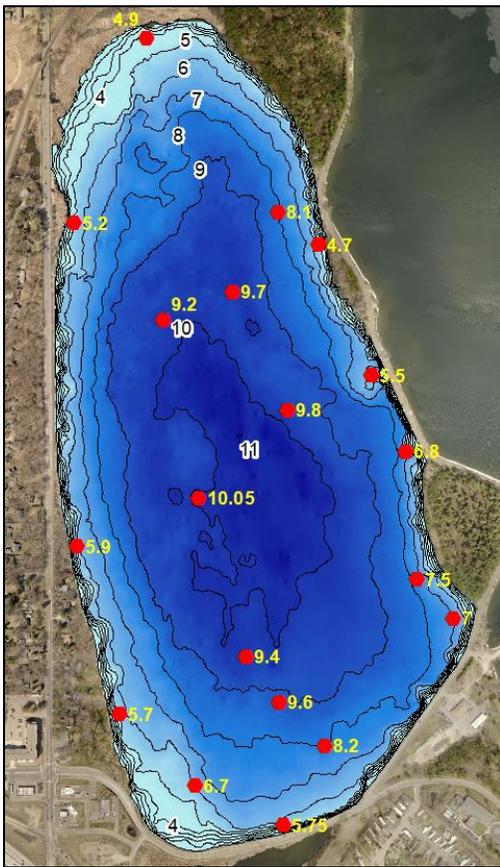
Results:

Results include a bathymetric map featuring depth in one-foot intervals and a contour shapefile. The deepest point measured with the rod was 10.05 ft (not at the deepest location in the lake). The deepest location detected by sonar was 11.13 feet, with the average lake depth between 7 and 8 feet.

Figure 6. Locations of twenty points in West Vadnais Lake where depth was recorded using a measuring rod for comparison with transducer depth data. Actual field depths are labeled and were used to refine transducer data for the generation of a more accurate depth map and contours.
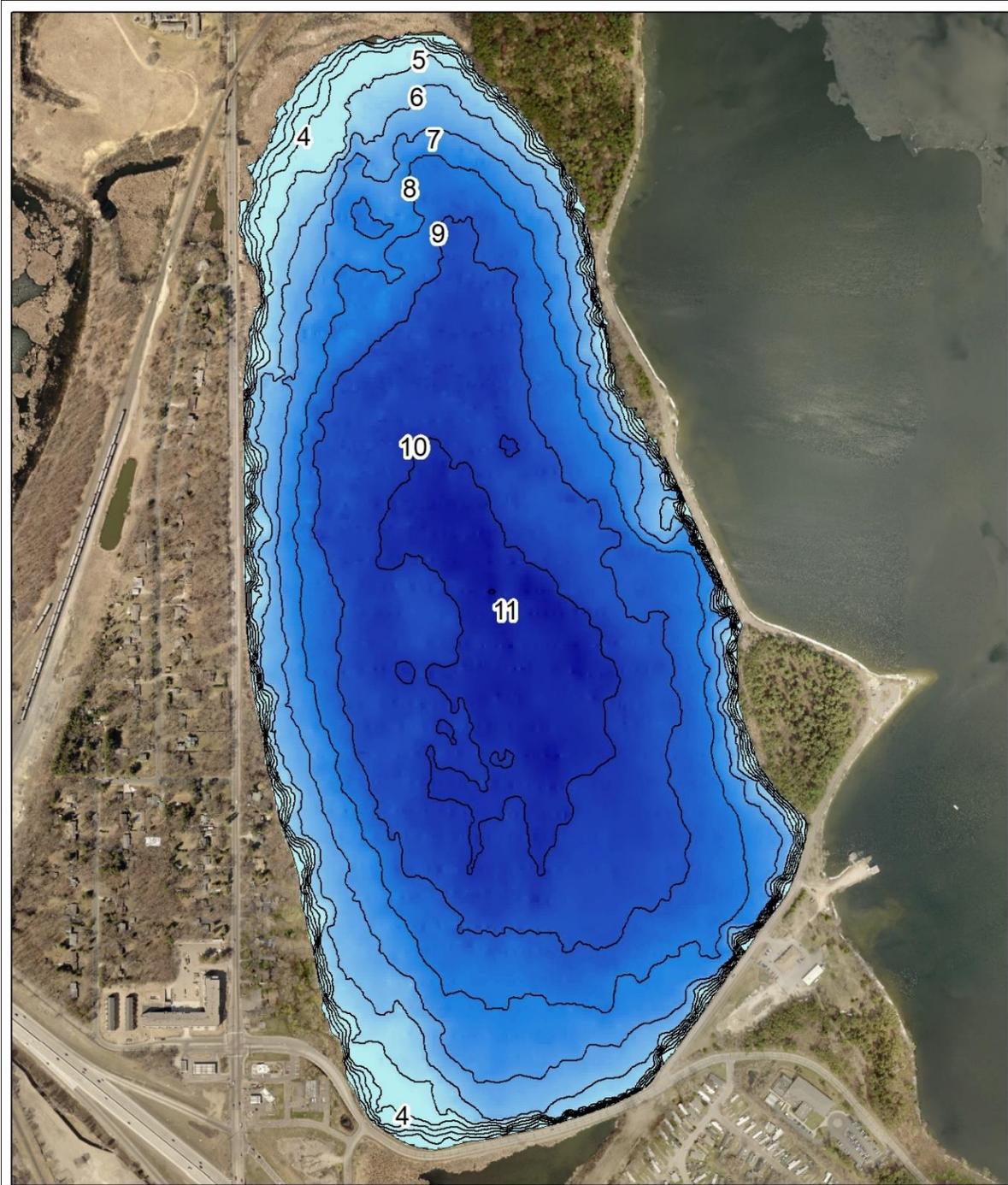
Bathymetry of West Vadnais Lake (ft)

0   250   500   1,000 Feet

Data Collected 6/18/2019
Vadnais Heights, MN
Contours in feet
Maximum depth: 11.13 ft

Map created by:

RAMSEY COUNTY
Parks & Recreation Dept
Soil & Water Conservation Division

VLAWMO
Vadnais Lake Area
Water Management Organization

Figure 7. Bathymetry of West Vadnais Lake with 1-ft contours