East Vadnais Lake

Aquatic Macrophyte, Contour, Biovolume and Bottom Composition Survey 6/23/2020

This document contains two reports of data collected on East Vadnais 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 biovolume, and bottom hardness (composition) survey.

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Aquatic Macrophyte Point-Intercept Survey

June 23, 2020

Methods:

The point-intercept method incorporating aerial photography and a Lowrance HDS-5™ Global Positioning System (GPS) were used to assess the aquatic macrophyte community on East Vadnais Lake (Figure 1) on June 23, 2020. Samples were taken at 120 evenly spaced (125m) georeferenced points (Figure 2). 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 the center of the lake on the shady side of the boat, as displayed in Table 3.

A double-tined metal rake attached to an 8.5-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 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

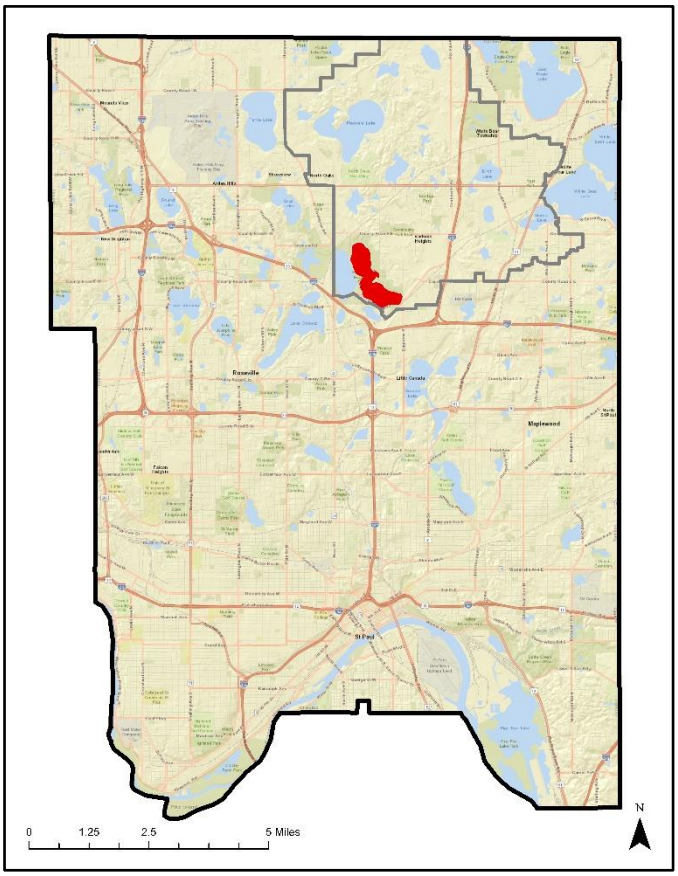


Figure 1. Location of East Vadnais Lake shown in red within Vadnais Lake Watershed Management Organization and Ramsey County Boundaries.

Results:

Aquatic macrophytes were found at 63 of 120 points surveyed (Figure 2). The most common species observed (62% occurrence) was Greater Duckweed (*Spirodela polyrhiza*). Other relatively common species observed included Coontail (*Ceratophyllum demersum*), Curly-leaf Pondweed (*Potamogeton crispus*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Flat-stem Pondweed (*Potamogeton zosteriformis*), and Star Duckweed (*Lemna trisulca*). The remainder of the species observed at lower occurrences included Filamentous Algae (*Spirogyra/Cladophora spp.*), Lesser Duckweed (*Lemna minor*), Northern Watermilfoil (*Myriophyllum sibiricum*), Watermeal (*Wolffia columbiana*), White Water Crowfoot (*Ranunculus aquatilis*), White Water-lily (*Nymphaea odorata*), White-stem Pondweed (*Potamogeton praelongus*), Wild Celery (*Vallisneria americana*), and possible Hybrid Watermilfoil (*Myriophyllum sibiricum x Myriophyllum spicatum*). Sago Pondweed (*Stuckenia pectinata*) was present near survey-point 9, but was not officially observed on the rake. Patches of Filamentous Algae were also seen throughout the lake. The Secchi disk reading was 3.9m (12ft, 9in).

Since this is the first survey of this type on East Vadnais Lake, data from surveys conducted in previous years are not available to determine changes in average abundance, percent occurrence, or species composition. Invasive species of concern observed in this survey included Curly-Leaf Pondweed, Eurasian Watermilfoil, Hybrid Watermilfoil, and Zebra Mussel (*Dreissena polymorpha*) (Minnesota DNR). Hybrid Watermilfoil was identified based on having characteristics of both Northern Watermilfoil and Eurasian Watermilfoil. For absolute identification, a genetic analysis is advised.

Table 2. *Percent occurrence and average abundance of aquatic plant taxa present during East Vadnais Lake point-intercept survey.*

Species	Common Name	Scientific Name	Average Abundance 6/23/2020	Percent Occurrence 6/23/2020
1	Coontail	*Ceratophyllum demersum*	2.19	43%
2	Curly-leaf Pondweed	*Potamogeton crispus*	1.45	46%
3	Eurasian Watermilfoil	*Myriophyllum spicatum*	1.10	32%
4	Filamentous Algae	*Spirogyra/Cladophora spp.*	1.17	19%
5	Flat-stem Pondweed	*Potamogeton zosteriformis*	1.92	38%
6	Greater Duckweed	*Spirodela polyrhiza*	1.00	62%
7	Lesser Duckweed	*Lemna minor*	1.00	10%
8	Northern Watermilfoil	*Myriophyllum sibiricum*	1.17	19%
9	Star Duckweed	*Lemna trisulca*	1.15	32%
10	Watermeal	*Wolffia columbiana*	1.00	13%
11	White Water Crowfoot	*Ranunculus aquatilis*	2.54	21%
12	White Water-lily	*Nyphaea odorata*	1.00	3%
13	White-stem Pondweed	*Potamogeton praelongus*	1.50	16%
14	Wild Celery	*Vallisneria americana*	1.00	3%
15	Hybrid Watermilfoil	*M. sibiricum x M. spicatum*	1.00	5%

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.

Table 3. *Depth, Secchi disk, water temperature, and vegetation abundance point survey results on June 23, 2020.*

Point	Depth (m)	Coontail	Curly-leaf Pondweed	Eurasian Watermilfoil	Filamentous Algae	Flat-stem Pondweed	Greater Duckweed	Lesser Duckweed	Northern Watermilfoil	Star Duckweed	Watermeal	White Water Crowfoot	White Water-lily	White-stem Pondweed	Wild Celery	Hybrid Watermilfoil
1	1.3						1			1				1		
2	0.6	1		1	2	1	1	1	1	1	1	3				
3	0.5	3				1	1				1					
4	3.2		1				1	1								
5	1.0	2		1		2	1		2	1						
6	0.4			1		1				1		3	1			
7	5.1						1			1	1					
8	3.2		2													
9	0.7			1	1	3						1				
10	0.6		2			3	1									
11	8.3						1			1						
12	6.8						1									
13	0.5	1		1		2	1	1	1	1	1	3				
14	0.2						1	1		1	1	3		1		
15	8.6						1									
16	9.4															
17	6.0							1								
18	4.7						1			1						
19	11.4						1			1						
20	9.7						1									
21	0.9	2	1	1		3	1			1						
22	0.6		1	2	1											
23	12.6						1				1					
24	12.5						1			1						
25	9.2						1				1					
26	9.0						1			1						
27	13.4						1									
28	12.1						1									
29	3.6		1				1									
30	0.7		1				1	1		1	1	3				
31	12.2						1									
32	13.9						1									
33	11.3															
34	0.8	1		1		2	1							2		
35	6.4															
36	13.3															
37	14.7															
38	7.8															
39	9.6															
40	14.1															
41	13.7															
42	0.5	1	1			3				1		1				
43	10.6															
44	15															
45	7.1															
46	2.1	3		1												
47	12.7															
48	14.2															
49	6.0															
50	1.4	3	2			1	1									

Point	Depth (m)	Coontail	Curly-leaf Pondweed	Eurasian Watermilfoil	Filamentous Algae	Flat-stem Pondweed	Greater Duckweed	Lesser Duckweed	Northern Watermilfoil	Star Duckweed	Watermeal	White Water Crowfoot	White Water-lily	White-stem Pondweed	Wild Celery	Hybrid Watermilfoil
51	11.8															
52	13															
53	1.1	3	1		1	1	1		1							
54	0.8						1					3				
55	13.2															
56	3.7	3														
57	0.7	2				2	1		1			3	1	1		
58	9.1						1									
59	12.1						1									
60	0.8	2	2	1		2			1	1		3		1		1
61	2.8															
62	13.1															
63	3.2	2	1				1									
64	10.7															
65	12.9															
66	1.3	2	1	1	1	2			1					2		
67	2.5		1		1	1										
68	2.2	3	2	2					1						1	1
69	12.3															
70	12.8															
71	13.1															
72	7.0															
73	2.4	3	1											2		
74	12.1															
75	13.2															
76	16.4															
77	2.6	3	2	1	2	1			1							
78	11.3															
79	12															
80	13.6															
81	12.4															
82	2.2	2	2		1											
83	3.1		1												1	
84	12.8															
85	11.9															
86	12															
87	10.5															
88	7.6															
89	5.8															
90	1.8	1	2	1	1	3			1			1		2		
91	8.6						1									
92	12.9															
93	11.5															
94	10.7															
95	10.1															
96	9.2															
97	8.7															
98	1.7	2	1	1	1											
99	3.6															
100	11.4															

Point	Depth (m)	Coontail	Curly-leaf Pondweed	Eurasian Watermilfoil	Filamentous Algae	Flat-stem Pondweed	Greater Duckweed	Lesser Duckweed	Northern Watermilfoil	Star Duckweed	Watermeal	White Water Crowfoot	White Water-lily	White-stem Pondweed	Wild Celery	Hybrid Watermilfoil
101	10.4															
102	10.4															
103	10															
104	9.4															
105	7.7															
106	7.3															
107	9.8															
108	8.8															
109	9.0															
110	8.6															
111	2.5	3	2	1												1
112	3.8						1			1						
113	3.0	3	3													
114	5.3	3	2	1		1										
115	3.4		1			1										
116	2.6	1	1	1		3										
117	0.8	1	2	1		1	1		2							
118	0.6	3	1	1	1	3				1				2		
119	0.4		1		1		1		1	3		3		1		
120	0.3					3	1			2		3				
Total Abundance		59	42	22	14	46	39	6	14	23	8	33	2	15	2	3
Count		27	29	20	12	24	39	6	12	20	8	13	2	10	2	3
Avg. Abundance		2.19	1.45	1.10	1.17	1.92	1.00	1.00	1.17	1.15	1.00	2.54	1.00	1.50	1.00	1.00
% Occurrence		43%	46%	32%	19%	38%	62%	10%	19%	32%	13%	21%	3%	16%	3%	5%
Secchi Depth (m):		3.9														
Water Temperature (C):		22.4														

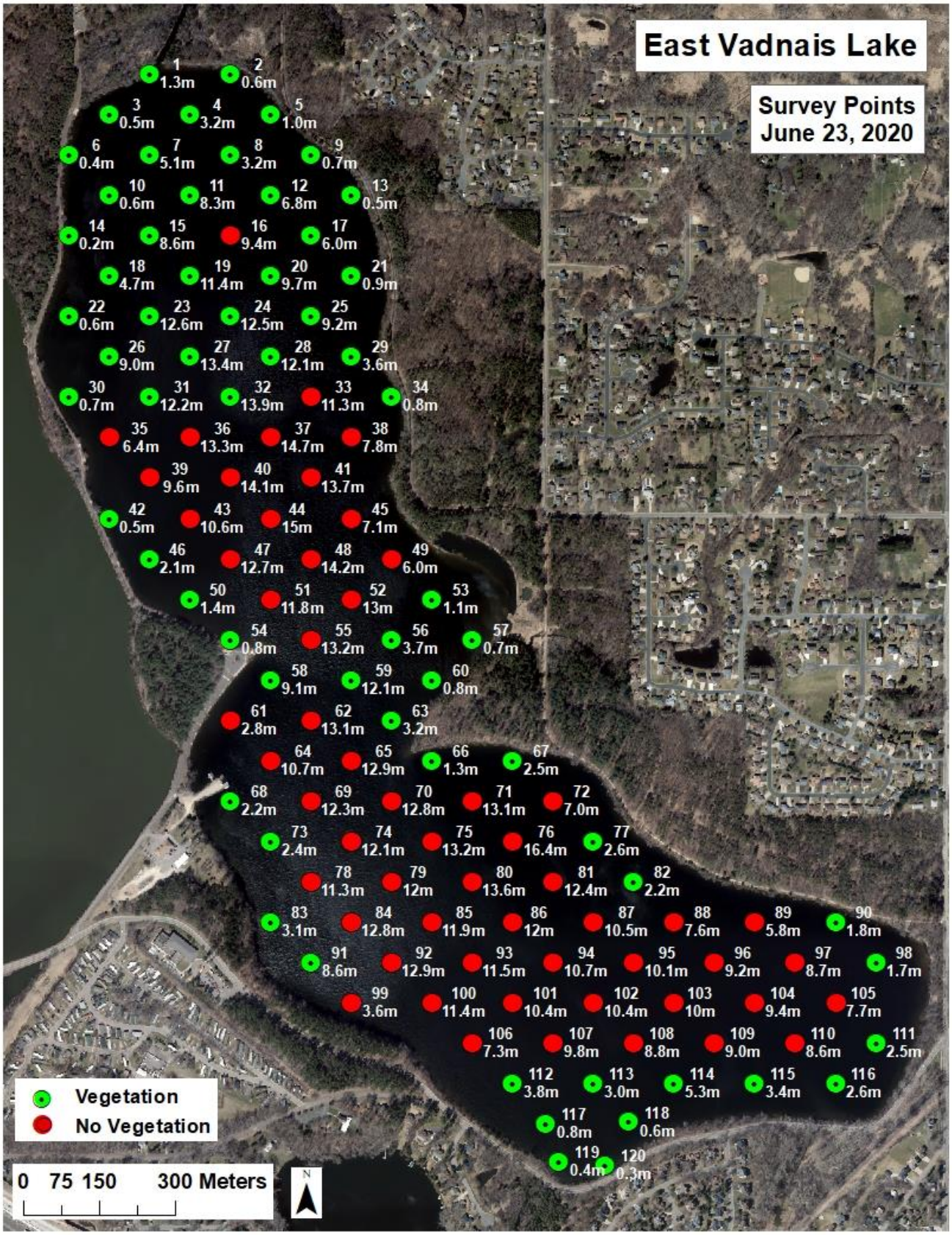


Figure 2. East Vadnais Lake vegetation point-intercept survey locations. N = 120.

Contour, Biovolume and Bottom Composition Survey

June 23, 2020

Methods:

A Lowrance HDS-5TM Global Positioning System (GPS)-enabled depth finder was used to collect submerged aquatic vegetation biovolume, lake depth (bathymetry), and bottom hardness (composition) data on East Vadnais Lake on June 23, 2020. The lake was transected at a maximum distance of 40 meters between transects at a speed of no more than 5 miles per hour. Sonar log data were recorded using the Lowrance HDS-5TM 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 one-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 ciBioBase website: www.cibiobase.com.

BIOBASE

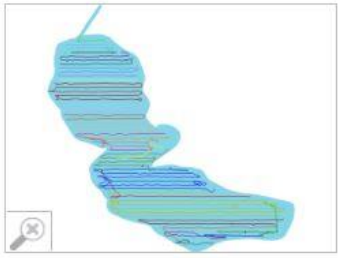
VEGETATION ANALYSIS REPORT

Vadnais Lake, Ramsey Minnesota

Generated: 6/25/2020 4:24:35 PM (UTC)

Waterbody Size: 164.91 ha

report link



Data Collector
Ramsey County Parks and Recreation Conservation Division

Data Collection Date
6/24/2020 10:37:07 PM (UTC)

Average Water Temperature
23.10° C

Location

Start:	45.04878309, -93.09422618
End:	45.06076639, -93.09397380

Survey Size

Area:	143.96 ha
Percent:	87.30% of waterbody
Volume:	11137578.67 cu. m

Est.Waterbody Volume ?
12757921.10 cu. m
(10343.01 acre ft)

Settings

Track Buffer:	25 m
Grid Cell Size:	5.0 m
Min.BV Detect:	5%
Min.Veg Depth Detect:	0.73 m

Offset Information
See Below

Survey Summary

	Type ?	PAC ?	Avg BVp ?	SD BVp ?	Avg BVw ?	SD BVw ?	Depth Range	Avg Depth	Distance	No.Points
Full Survey	Point	35.7%	72.2%	±31.7%	25.8%	±33.6%	0.35 - 17.22 m	6.15 m	35.44 km	10615
	Grid	34.6%	66.2%	±30.6%	22.9%	±36.3%	0.03 - 17.12 m	7.74 m	-	39596

Biovolume Analysis by Quantity

AOI	0-5%	5-20%	20-40%	40-60%	60-80%	>80%
1	64.26%	3.27%	4.93%	4.16%	3.40%	19.98%

Biovolume Analysis by Depth

Full Survey	Depth	Type	Count	PAC	Avg BVp	SD BVp	Avg BVw	SD BVw
	0-1m	Point	2590	99.7%	91.4%	±14.5%	14.5%	±0.0%
	1-2m		736	97.8%	39.3%	±13.3%	13.2%	±0.0%
	2-3m		503	78.1%	21.9%	±9.2%	9.2%	±0.0%
	3-4m		616	16.2%	11.1%	±4.2%	4.1%	±0.0%
	4-5m		534	0.0%	0.0%	±0.0%	0.0%	±0.0%
	5-6m		420	0.0%	0.0%	±0.0%	0.0%	±0.0%
	6-7m		374	0.0%	0.0%	±0.0%	0.0%	±0.0%
	7-8m		379	0.0%	0.0%	±0.0%	0.0%	±0.0%
	8-9m		655	0.0%	0.0%	±0.0%	0.0%	±0.0%
	9-10m		3808	0.0%	0.0%	±0.0%	0.0%	±0.0%
	0-1m	Grid	12751	100.0%	88.4%	±12.2%	88.4%	±12.2%
	1-2m		9957	100.0%	82.6%	±15.2%	82.6%	±15.2%
	2-3m		6720	99.8%	63.1%	±22.0%	63.0%	±22.1%
	3-4m		4482	92.4%	33.2%	±17.9%	30.7%	±19.3%
	4-5m		2447	63.6%	21.4%	±13.9%	13.6%	±15.1%
	5-6m		1480	40.2%	16.9%	±11.0%	6.8%	±10.9%
	6-7m		968	24.0%	13.6%	±8.8%	3.3%	±7.2%
	7-8m		499	10.2%	12.3%	±7.2%	1.3%	±4.4%
	8-9m		183	2.6%	11.6%	±6.0%	0.3%	±2.1%
	9+		109	0.2%	9.4%	±3.8%	0.0%	±0.4%

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. East Vadnais Lake CiBioBase survey summary statistics.

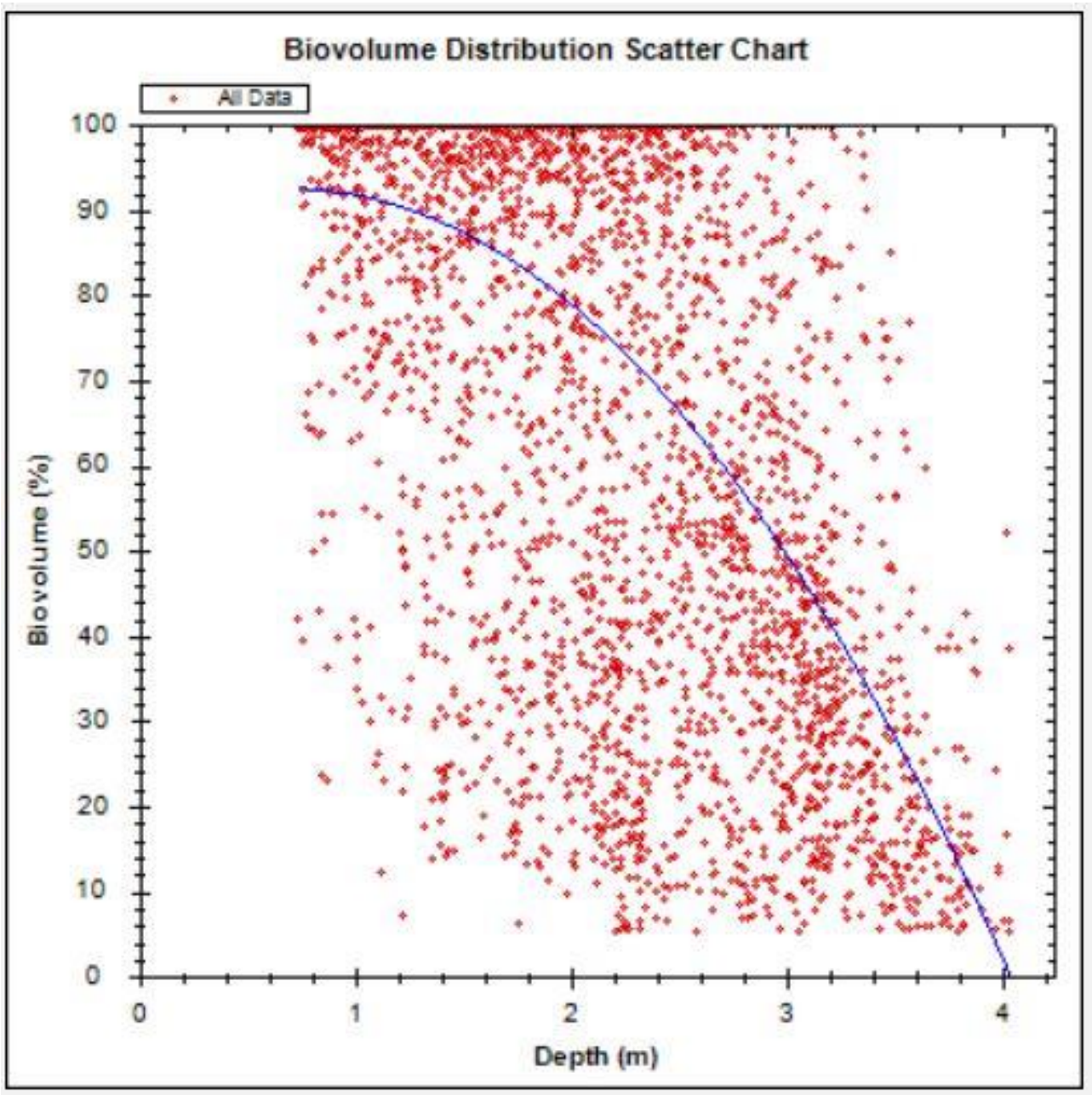


Figure 4. East Vadnais Lake biovolume distribution scatter chart.

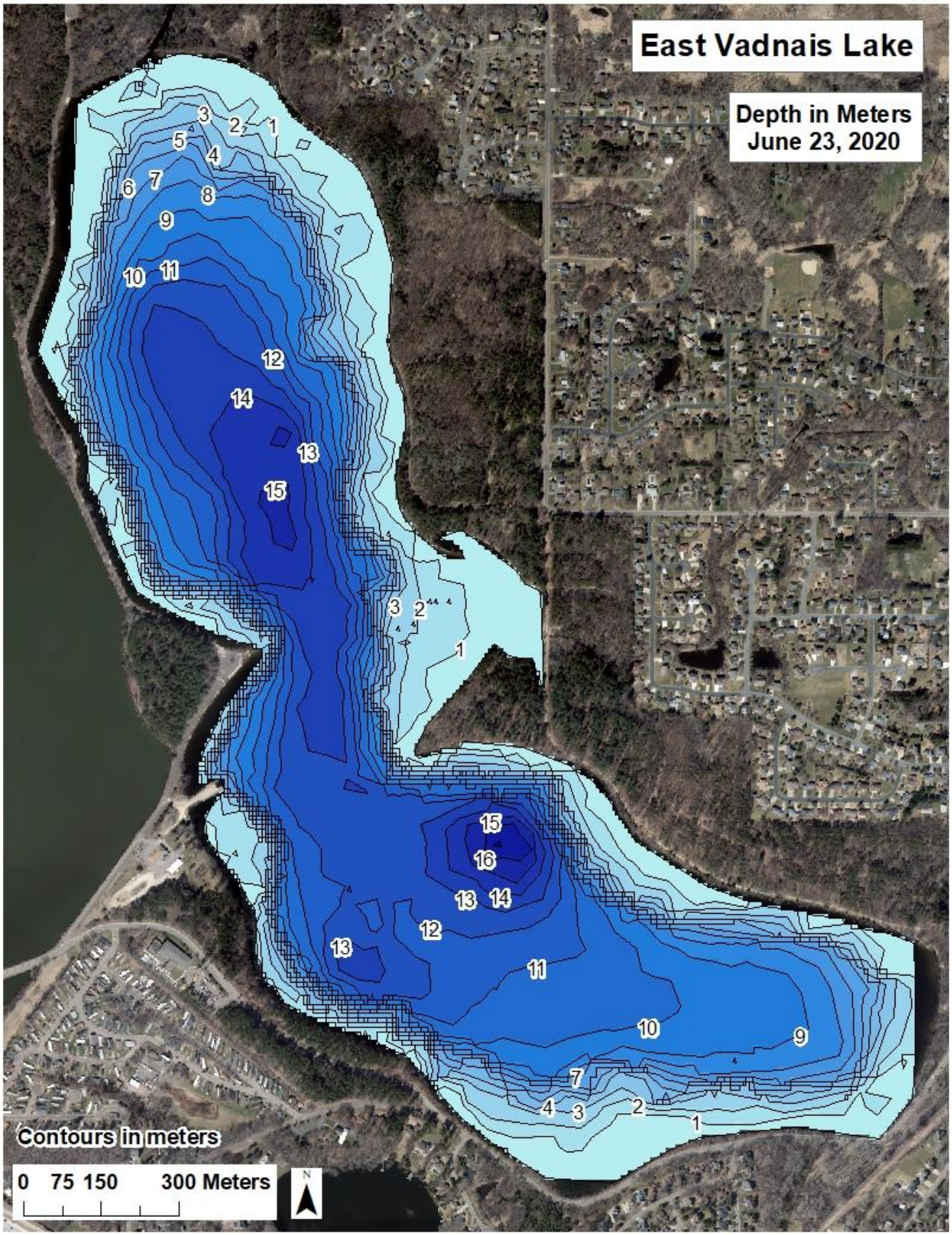


Figure 5. East Vadnais Lake depth with one-meter contours – June 2020 map used.

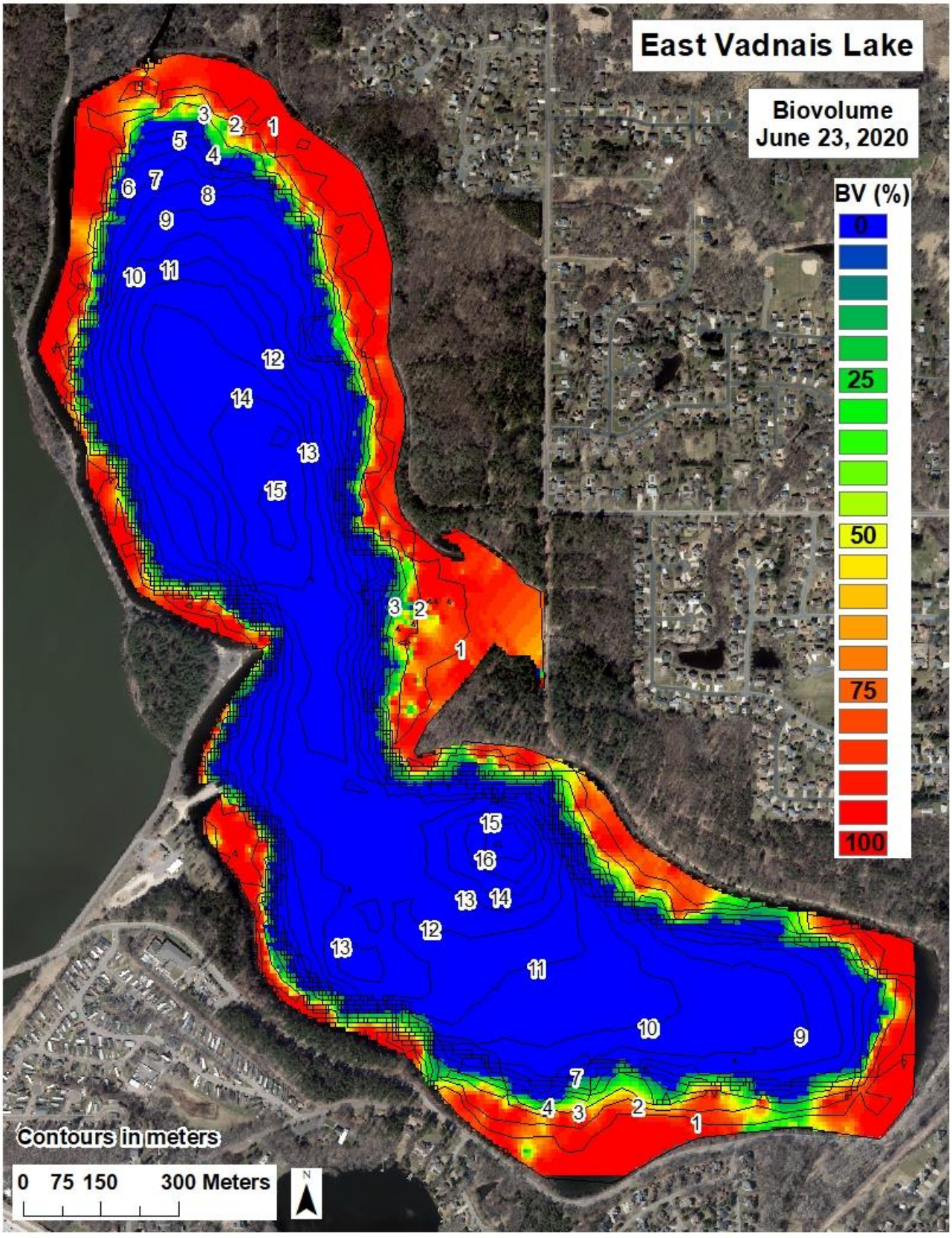


Figure 6. East Vadnais Lake vegetation biovolume with one-meter contours. Percent values range from zero to one hundred; Blue = 0%, Yellow = 50% and Red = 100%.

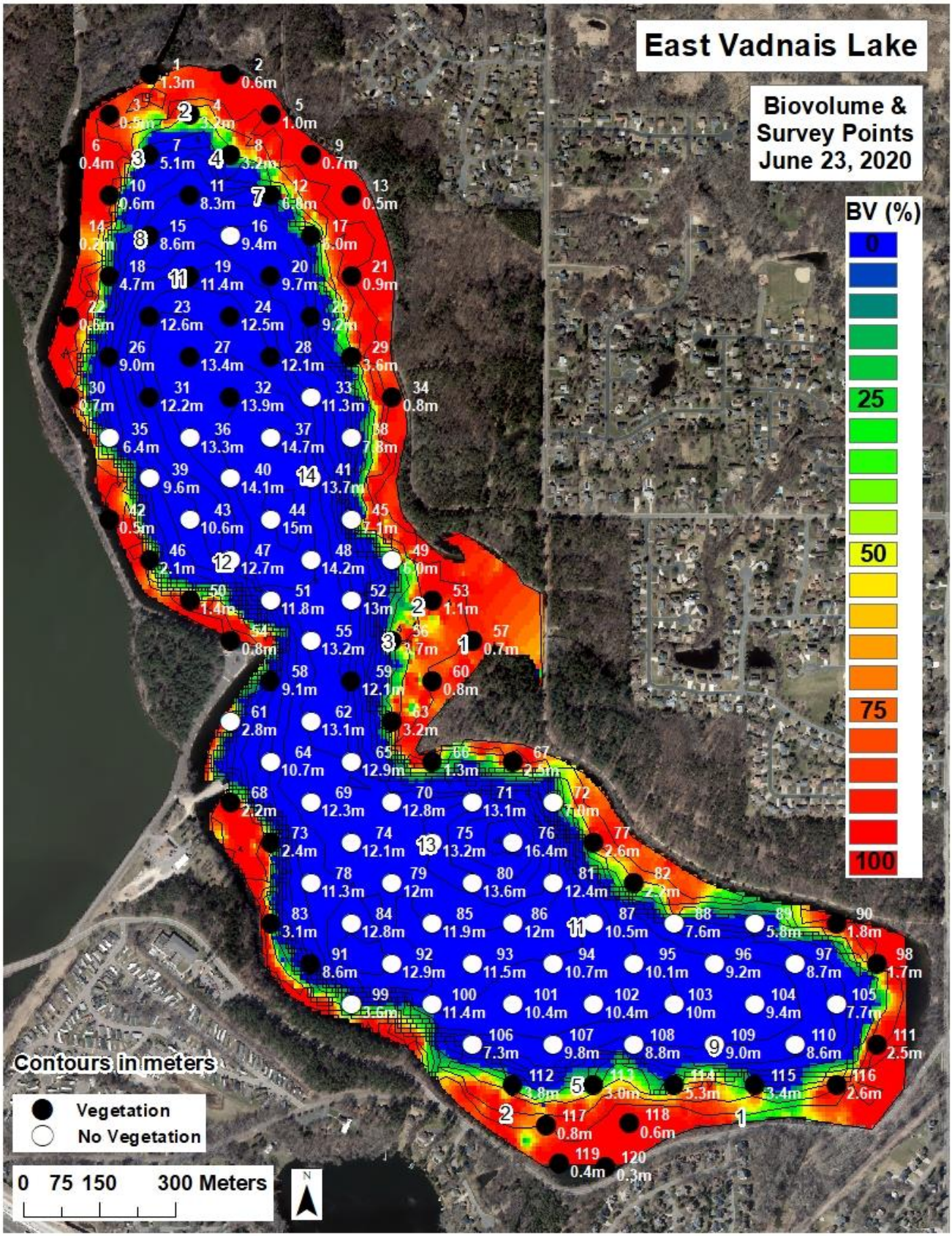


Figure 7. East Vadnais Lake vegetation biovolume and locations of survey points.

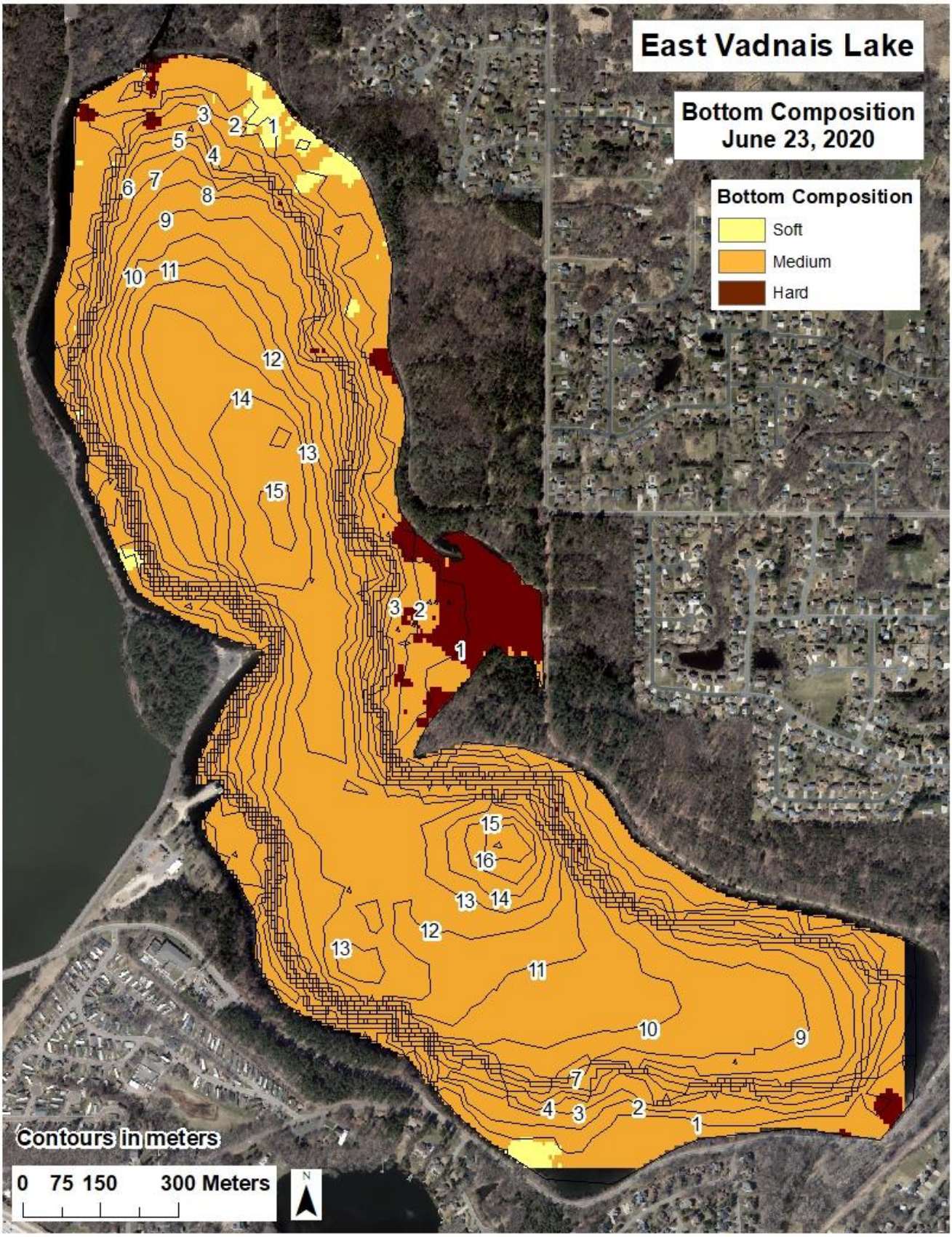


Figure 8. East Vadnais Lake bottom composition values with one-meter contours.