Amelia Lake

VLAWMO
EST 1983
Vadnais Lake Area
Water Management Organization

Macrophyte, Contour, Biovolume and Bottom Hardness Survey 7/29/2021

This document contains two reports of data collected on Amelia 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.

Aquatic Macrophyte Point-Intercept Survey

July 29, 2021

Methods:

The point-intercept method incorporating aerial photography and a Lowrance Elite-7 Ti2 Global Positioning System (GPS) were used to assess the aquatic macrophyte community on Amelia Lake (Figure 1) on July 29, 2021. Samples were taken at 90 evenly spaced (40 m) 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 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 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 88 of 90 points surveyed (Figure 2). The two most common species observed included flat-stem pondweed (*Potamogeton zosteriformis*) and N. Mucronata (*Nitella mucronata*).[1] Other species observed included Canada waterweed (*Elodea canadensis*), coontail (*Ceratophyllum demersum*), Eurasian watermilfoil (*Myriophyllum* spicatum), filamentous algae (Spirogyra/Cladophora spp.), muskgrass (*Chara spp.*), sago pondweed (*Stuckenia pectinata*), and slender naiad (*Najas flexilis*).

Although not collected on the rake, field staff observed northern watermilfoil in the northern and southern extents of the lake. The Secchi disk reading was 2.5m (8.5 ft).
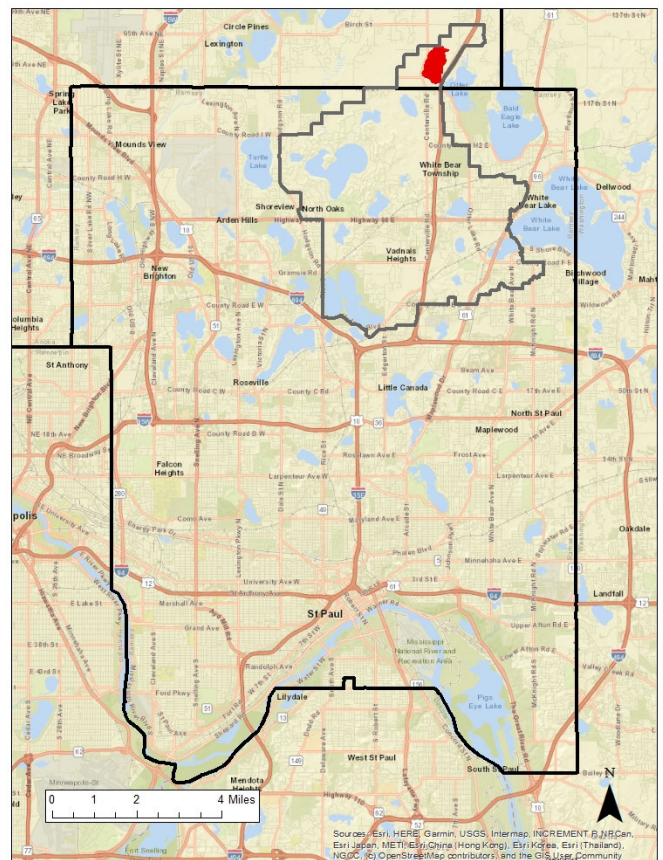

Figure 1. Location of Amelia Lake shown in red within Vadnais Lake Area Water Management Organization and Anoka County Boundaries.

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[1] Field staff identified N. mucronata using Skawinski, P.M. *Aquatic Plants of the Upper Midwest,* (4th Ed.). Nitellas can be difficult to differentiate, and classifications can change.

Since this is the first survey of this type on Amelia 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 Eurasian watermilfoil and hybrid watermilfoil. Hybrid watermilfoil was identified based on having characteristics of both northern watermilfoil and Eurasian watermilfoil. For absolute identification, a genetic analysis is advised. There is also a known presence of flowering rush (*Butomus umbellatus*) at Amelia Lake.[2] Checking the status of flowering rush and delineating extent was planned as part of this survey. Reports of flowering rush are quite old (decades). Flowering rush was not detected on this survey. Follow-up will be conducted during the next couple of consecutive years to verify if flowering rush is still present or not on Amelia Lake.

Table 2. *Percent occurrence and average abundance of aquatic plant taxa present during Amelia Lake point-intercept surveys.*

Species	Common Name	Scientific Name	Average Abundance	Percent Occurrence
1	Canada Waterweed	*Elodea canadensis*	1.44	28%
2	Coontail	*Ceratophyllum demersum*	2.43	16%
3	Eurasian Watermilfoil	*Myriophyllum spicatum*	1.50	2%
4	Filamentous Algae	*Spirogyra/Cladophora spp.*	2.00	7%
5	Flat-stem Pondweed	Potamogeton zosteriformis	1.39	64%
6	Muskgrass	*Chara spp.*	2.83	40%
7	N. Mucronata	*Nitella mucronata*	2.35	61%
8	Sago Pondweed	*Stuckenia pectinata*	1.00	3%
9	Slender Naiad	*Najas flexilis*	1.00	2%

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.

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[2] *Minnesota Department of Natural Resources Infested Waters List.* Minnesota Department of Natural Resources. Retrieved December 27, 2021, from https://www.eddmaps.org/midwest/tools/infestedwaters/

Table 3. Depth, Secchi disk, water temperature, and vegetation abundance point survey results on July 29, 2021

Point	Depth (m)	Canada waterweed	Coontail	Eurasian Watermilfoil	Filamentous Algae	Flat-stem Pondweed	Muskgrass	N. Mucronata	Sago Pondweed	Slender Naiad
1	0.4		3		2	1				
2	0.3	2	3		2	2		2		
3	0.2	1	3		2					
4	0.5	1			2	1		3		
5	0.7	1	3		2	2		1		
6	0.1	2		2	2	1		2		
7	0.5					1		3		
8	0.8	1	2			1		3		
9	0.7	3				1		3		1
10	0.1									
11	0.6	3	2					3		
12	0.7						3		1	
13	0.7	1	2			3			1	
14	0.7					1		3		
15	0.3					2		2		
16	0.4					1		1		1
17	0.7	1					3	2		
18	0.8			1		3	2	1		
19	0.7					2	3			
20	0.7		3			1		2		
21	0.7						3	2		
22	0.7					1	3	2		
23	0.8	1				3				
24	0.7					1	3			
25	0.6							3		
26	0.7							3		
27	0.8						2			
28	0.8					1	3			
29	0.7						3			
30	0.7							2		
31	0.6					1		3		
32	0.8							2		
33	0.8					1	3			

Point	Depth (m)	Canada waterweed	Coontail	Eurasian Watermilfoil	Filamentous Algae	Flat-stem Pondweed	Muskgrass	N. Mucronata	Sago Pondweed	Slender Naiad
34	0.7					1	3			
35	0.8						3			
36	0.6					1		2		
37	0.1					3		2		
38	0.8							3		
39	0.8					1		3		
40	0.8						3			
41	0.7					2	1			
42	0.7	1				1		1	1	
43	0.3	2					3	1		
44	0.8					1		3		
45	0.9							3		
46	0.8					2	2	3		
47	0.7					1		3		
48	0.1	1				2		3		
49	0.8							3		
50	0.9					2		3		
51	0.9						3			
52	0.7		2				3			
53	0.7						3			
54	0.9		2			1				
55	0.9	1					3			
56	0.6	2				1		2		
57	0.4					2		2		
58	0.7	1	1			1		1		
59	0.8					1		3		
60	1.0					2		2		
61	0.9					1		3		
62	5.7									
63	0.7						3			
64	0.8						3			
65	0.9						3			
66	0.8							3		
67	0.7					1	3	1		

Point	Depth (m)	Canada waterweed	Coontail	Eurasian Watermilfoil	Filamentous Algae	Flat-stem Pondweed	Muskgrass	N. Mucronata	Sago Pondweed	Slender Naiad
68	0.9						3			
69	0.9					1	3			
70	0.8							3		
71	0.5					2		1		
72	0.2	2	2			1				
73	0.7	1				1		3		
74	0.9						3			
75	0.8						3			
76	0.8					1		3		
77	0.3	1	3			1		2		
78	0.7					2		2		
79	0.7						3			
80	0.9					1		3		
81	0.5					1	3			
82	0.6					2	3			
83	0.7					1	3			
84	0.7					1		2		
85	0.6	1				1		3		
86	0.7					2	2			
87	0.5	1						3		
88	0.4	2	3			1		2		
89	0.5	1				1	3			
90	0.5	2						2		
Total Abundance		36	34	3	12	78	99	127	3	2
Count		25	14	2	6	56	35	54	3	2
Avg. Abundance		1.44	2.43	1.50	2.00	1.39	2.83	2.35	1.00	1.00
% Occurrence		28%	16%	2%	7%	64%	40%	61%	3%	2%

Secchi Depth (m):	2.5
Water Temperature (C):	26.2

Figure 2. Amelia Lake vegetation point intercept survey locations. N = 90.

Biovolume, Contour, and Bottom Hardness Survey

7/29/2021

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 Amelia Lake on July 29, 2021. The lake was transected at a maximum distance of 15 meters between transects at a speed of no more than five 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 one-meter intervals as well as bottom hardness (composition) maps. The maximum depth measured in Lake Amelia was 6.3m (20.7 ft) and the average was 0.7m (2.3 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. 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

Amelia Lake, Anoka Minnesota

Report Time Stamp: 2021 August 26 - 18:15 (UTC) ... REPORT LINK

Survey Metadata

Data Collector:	Justin Townsend
Survey Time Stamp (UTC):	2021 July 29 - 13:03
Starting Location:	45.131901, -93.056626
Ending Location:	45.132035, -93.056653

Survey Statistics

Average Water Temperature:	26.6 °C
Survey Area:	60.182 ha
Survey Volume:	431238.710 cu. m
Percent of Waterbody Surveyed:	90.4%
Waterbody Area:	66.593 ha
Estimated Waterbody Volume))	477180.955 cu. m

Survey Settings

Includes Edited Data:	No
Track Buffer:	25 m
BV Grid Cell Size:	5 m
BV Minimum Detection - Percent:	5.0%
BV Minimum Detection - Depth:	0.732 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	Distance	No. Depth Records
Point	88.8%	66.9%	± 42.1%	59.4%	± 41.2%	0.40 - 6.34 m	0.881 m	19.101 km	9230
Grid	99.1%	71.7%	± 25.0%	71.1%	± 25.8%	0.04 - 6.05 m	0.717 m	NA	48043

Biovolume Analysis by Quintiles

Type ?	0 - 20%	20 - 40%	40 - 60%	60 - 80%	80 - 100%
Point	28.7%	14.3%	6.9%	0.4%	49.8%
Grid	4.1%	12.2%	15.2%	19.1%	49.4%

Biovolume Analysis by Depth

Type ?	Depth	Count	PAC ?	Avg BVp ?	SD BVp ?	Avg BVw ?	SD BVw ?
Point	0 - 1 m	4054	92.9%	68.3%	± 41.6%	63.5%	± 41.3%
	1 - 2 m	38	95.0%	37.0%	± 23.0%	35.2%	± 23.0%
	2 - 3 m	33	100%	42.5%	± 11.3%	42.5%	± 11.3%
	3 - 4 m	83	90.2%	38.2%	± 17.9%	34.4%	± 17.5%
	4 - 5 m	29	20.3%	20.1%	± 18.7%	4.1%	± 9.5%
	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	47077	99.8%	72.3%	± 24.6%	72.2%	± 24.8%
	1 - 2 m	216	73.7%	29.2%	± 13.2%	21.5%	± 17.1%
	2 - 3 m	166	64.1%	29.2%	± 13.1%	18.7%	± 17.5%
	3 - 4 m	170	64.7%	23.6%	± 11.2%	15.3%	± 14.4%
	4 - 5 m	219	60.4%	14.7%	± 7.6%	8.9%	± 9.3%
	5 - 6 m	109	33.2%	8.2%	± 2.6%	2.7%	± 4.1%
	6 - 7 m	3	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.

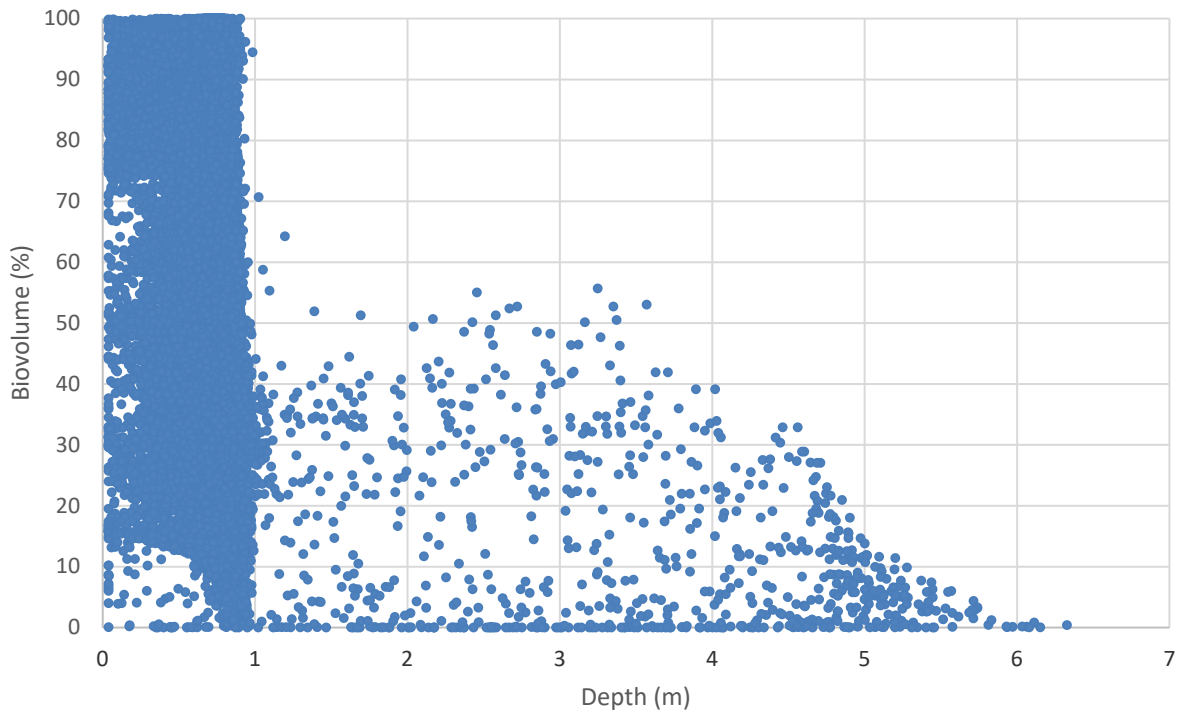Figure 3. Amelia Lake CiBioBase survey summary statistics.

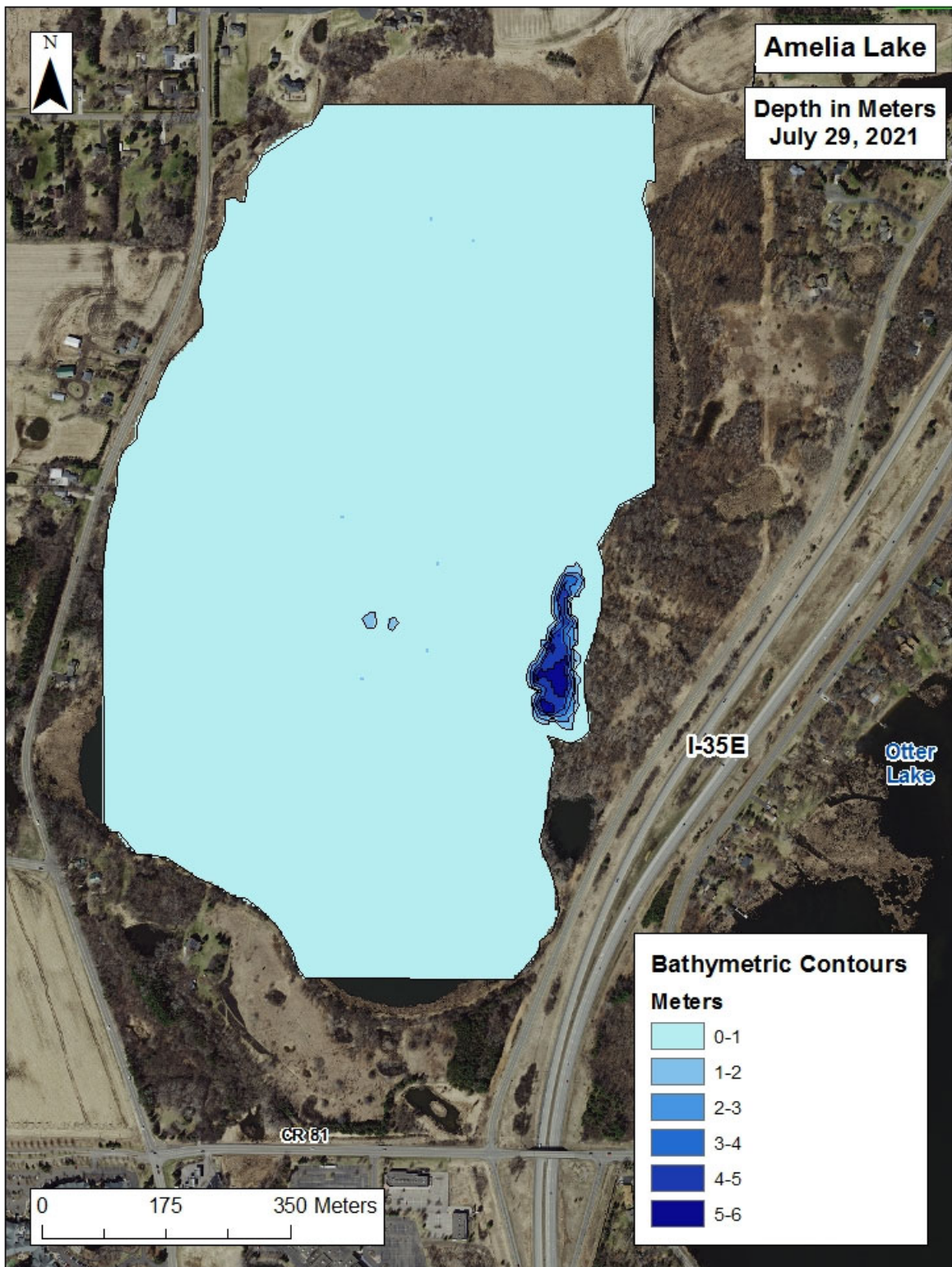Figure 4. Amelia Lake biovolume distribution scatter chart.

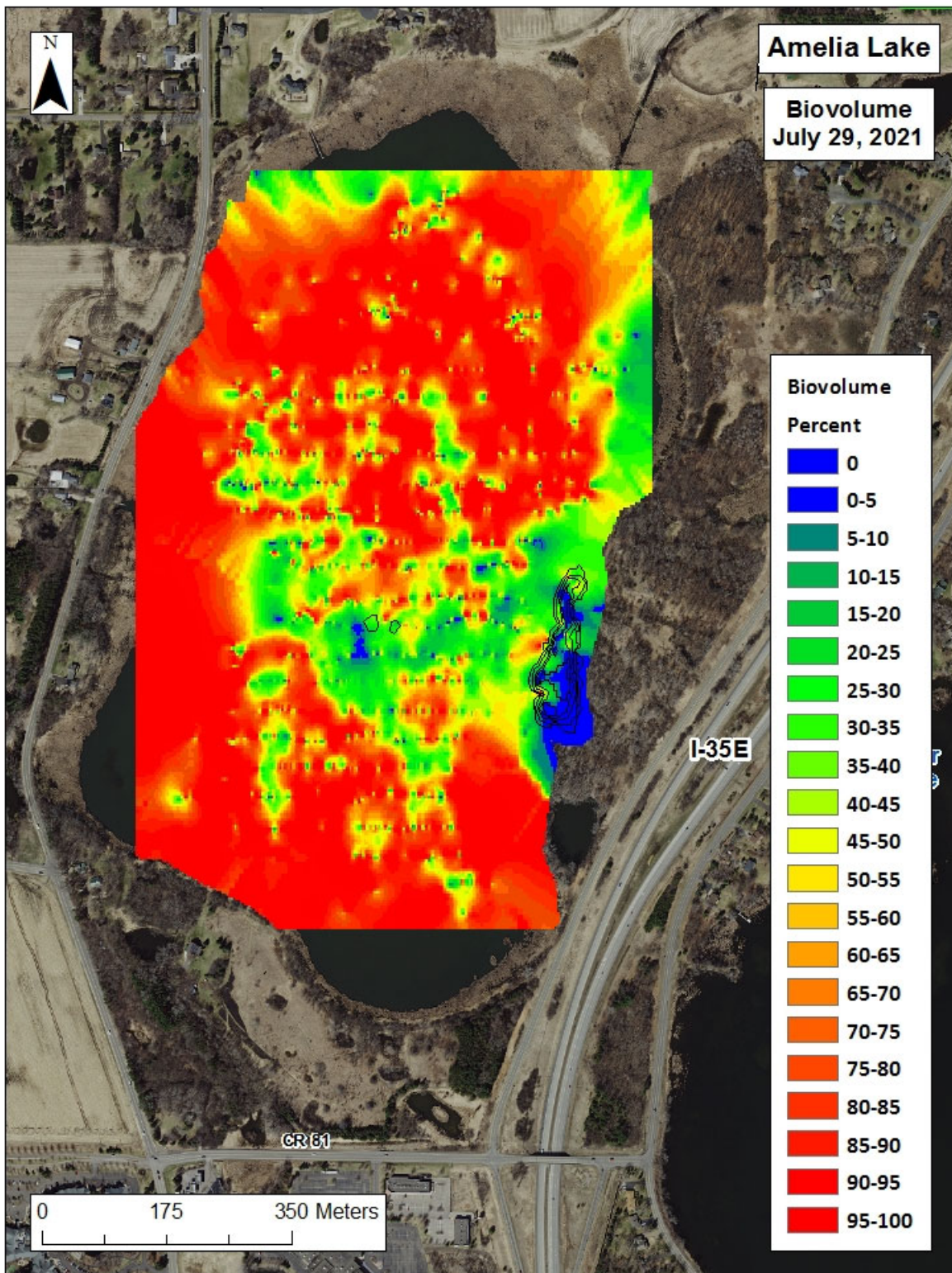Figure 5. Amelia Lake depth with one-meter contours.

Figure 6. Amelia Lake vegetation biovolume with one-meter contours. Percent values range from zero to one hundred; Blue = 0%, Yellow = 50% and Red = 100%.
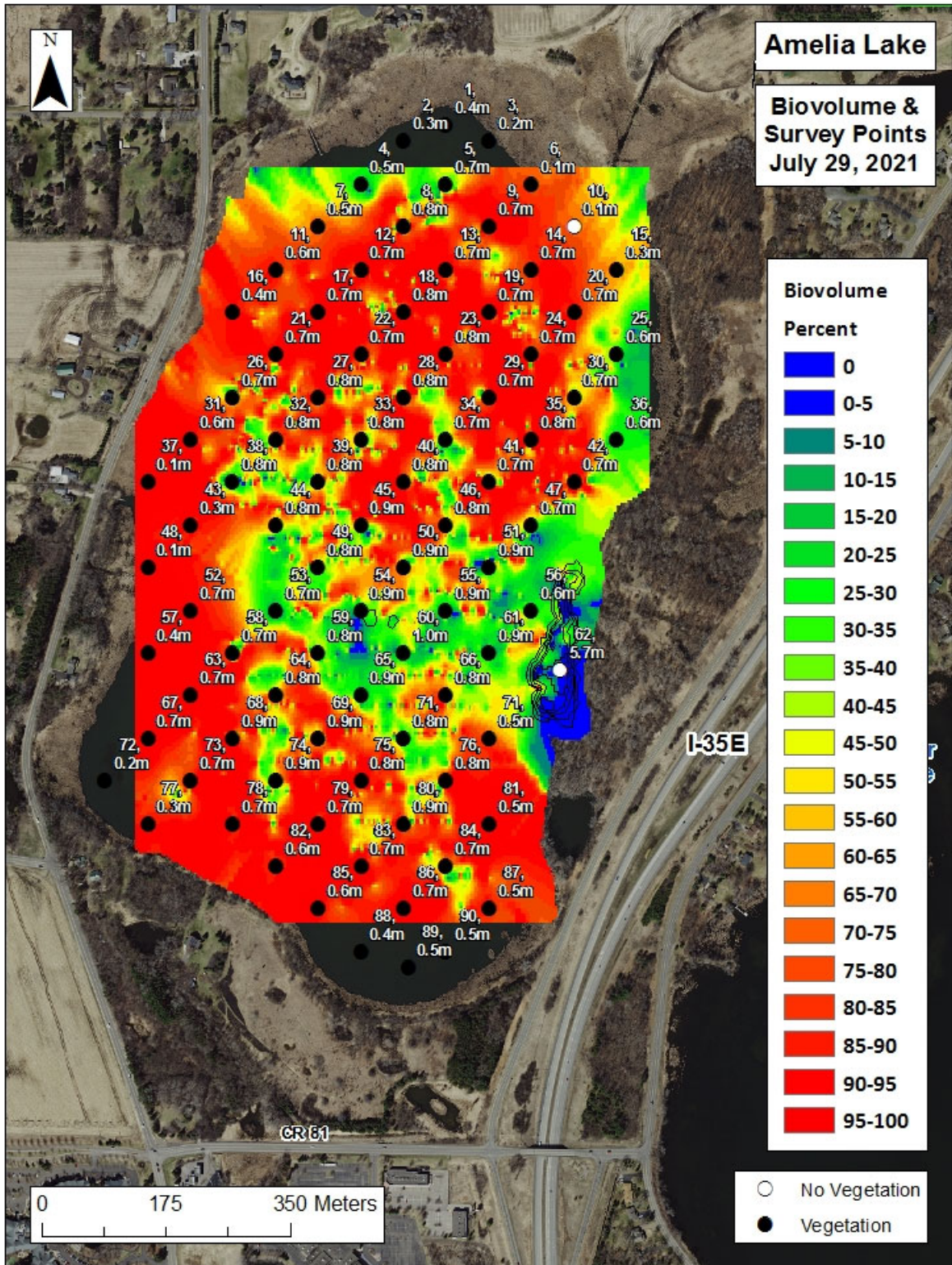
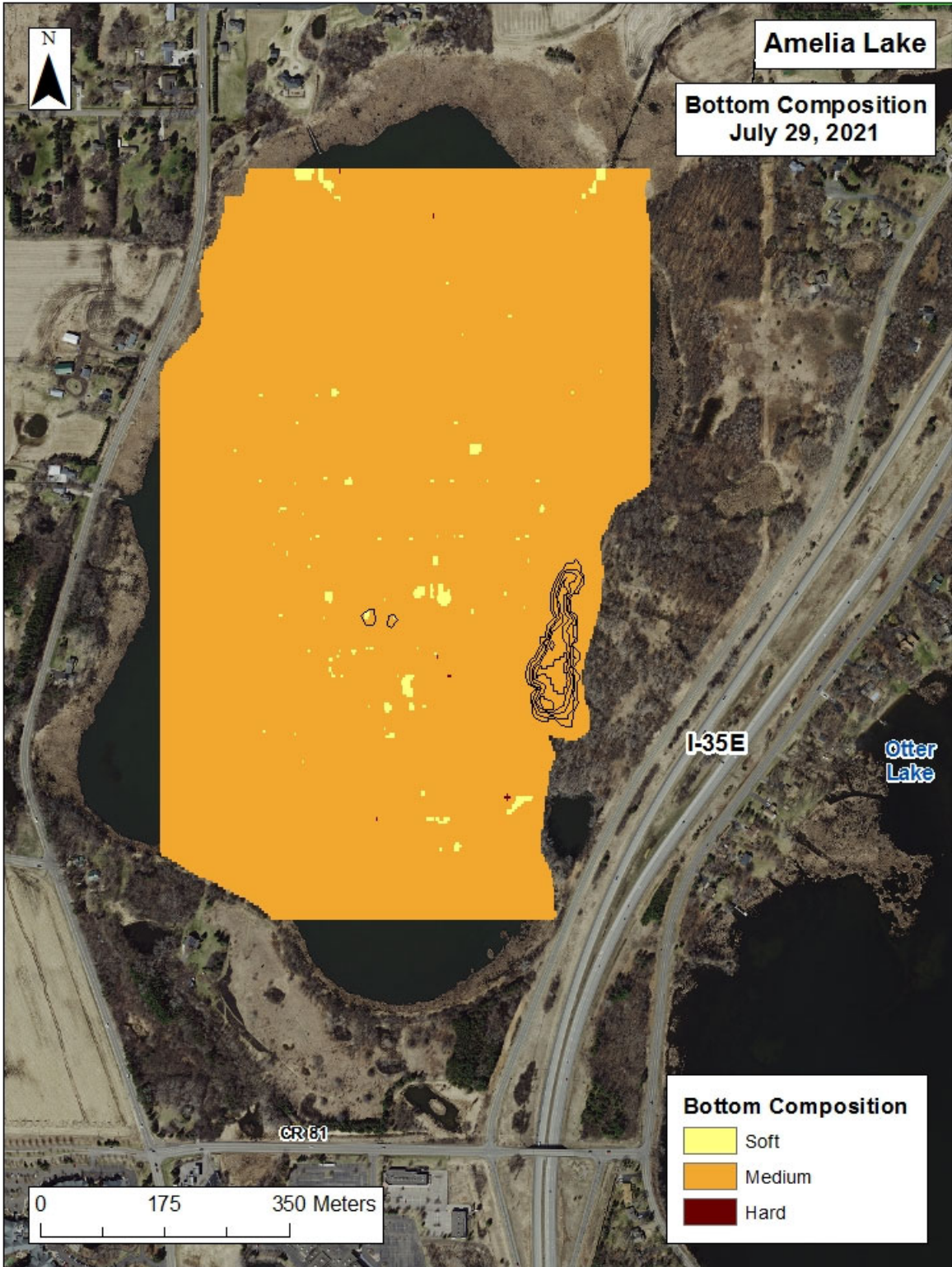Figure 7. Amelia Lake vegetation biovolume and locations of survey points.

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