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The Morphometry of Lake West Okoboji

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duction will largely be restricted to those acres that cannot be managed profitably for a marketable crop, and the amount of habitat on farms is likely to remain at about present levels.

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The Morphometry of Lake West Okoboji[1]

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Abstract. A total of 2901 depth measurements were made in Lake West Okoboji, Dickinson Co., Iowa in the summer of 1962 using a non-recording echo sounder. These were used to construct a morphometric map of the bottom topography. The area of the lake was found to be 1540 Ha., the volume 184 x 10^6 m^3, maximum depth 42.7 m, mean depth 11.9 m and length of shoreline 30.0 km. No changes in the morphometry of the lake could be detected since it was last mapped in 1913.

As a part of the teaching and research programs of the Iowa Lakeside Laboratory, a series of depth soundings were made in Lake West Okoboji, Dickinson Co., Iowa during the summer of 1962. These have been incorporated into a new morphometric map for the purpose of providing basic data to be used in future studies of the lake.

This effort represents the second time within this century that the lake has been sounded. From 1905 to 1912 the Civil Engineering Department of Iowa State University conducted an annual two week Summer Surveying Camp at the lake and constructed topographic maps of the lake and surrounding terrain. The original map, containing 732 soundings, was published by Ford (1913). These data were used as the basis for the map which appeared in the Iowa Lake Beds Survey (Iowa Highway Commission, 1916). In the latter publication, only 257 of the soundings were indicated. It formed the basis for the morphometric calculations of Birge and Juday (1922).

Whereas a sounding lead and line were used in the original survey, we used a Transcentury, non-recording, echo sounder mounted on a motor launch. A total of 61 transects were run between known points on the shore with depths being read and

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recorded every 10 seconds. These were plotted on an outline map of the lake and contours were drawn at 2-meter intervals. Our base map was a tracing of the 1916 Highway Commission Map which we obtained from the Iowa Conservation Commission and had a scale of 1:12,000. Our map, based on 2901 individual soundings, has been reproduced in Fig. 1 at a reduced scale. The areas enclosed by the contour lines were determined with a planimeter, and the total volume of the lake was calculated from a planimetric integration of the area-depth curve. A map measurer was used to find the length of the shoreline.

The surface area was found to be 1540 Ha., the volume 184 $\times$ 10^6 m^3, maximum depth 42.7 m, mean depth 11.9 m and length of shoreline 30.0 km. The area-depth relationship is summarized in Table 1 along with the calculations of Birge and Juday (1922). In general, quite good agreement was obtained between these two independently derived estimates of the areas of the various contours and of the lake volume. For example, they obtained a total volume of 188 $\times$ 10^6 m^3, while we found 184 $\times$ 10^6 m^3, the difference being well within the range of any reasonable errors of measurement. The most notable difference was that we found a greater maximum depth of 42.7 m as opposed to 40.2 m in the earlier study. This is reasonable to expect when our greater number of soundings is taken into consideration. On the basis of this study there does not appear to be any de-

Table 1. Area Depth Relationship in Lake West Okoboji.

Depth (meters)	Area in hectares	
	This study	Birge and Juday (1922)
0	1540	1538
2	1410	
4	1210	
5		1205
6	1020	
8	837	
10	716	803
12	650	
14	574	
15		529
16	498	
18	418	
20	332	315
22	228	
24	161	
25		117
26	108	
28	85.7	
30	60.8	49.9
32	34.1	
34	13.7	
35		14.6
36	6.30	
38	3.34	
40	0.742	0
42	0.260	

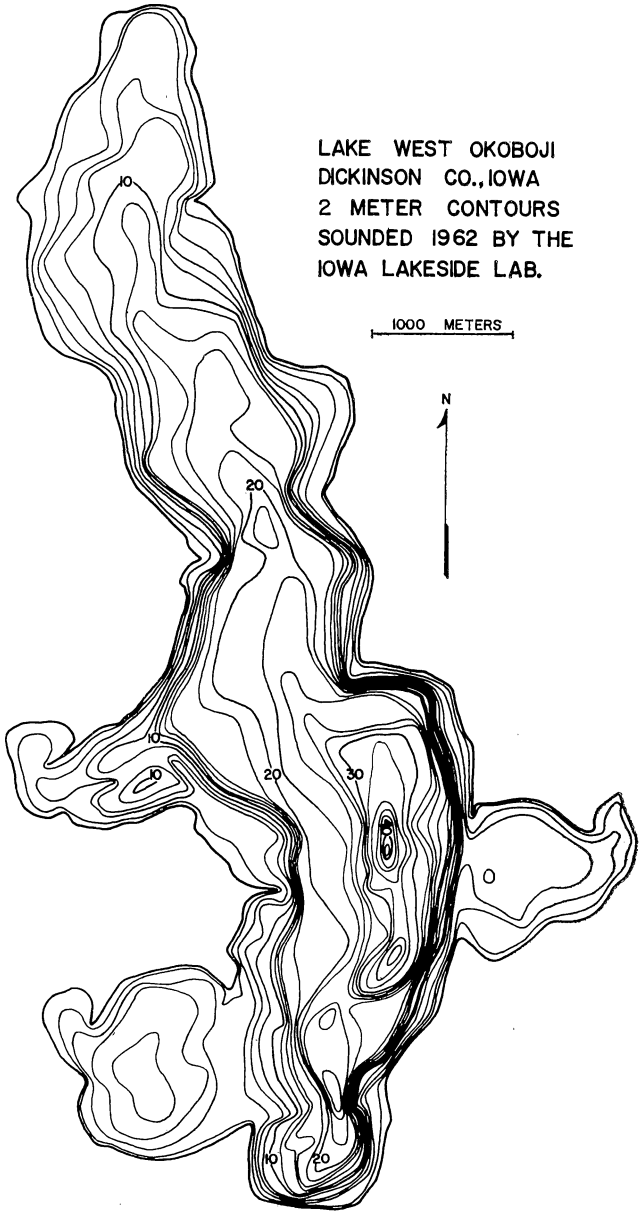

Figure 1. Morphometric map of Lake West Okoboji.

tectable change in the morphometry of the lake in the past 50 years, indicating that siltation has not been a serious problem.

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Macroscopic Invertebrates on the Higher Aquatic Plants at Clear Lake, Iowa[1]

ROGER J. MRACHEK

Abstract. Macroscopic invertebrates were removed and counted from 355 samples of higher aquatic vegetation collected between 23 June 1965 and 3 September 1965 at Clear Lake, Iowa. It was found that all species of higher aquatic plants do not harbor the same populations of animals and that the composition of the macroscopic invertebrate populations on the plants showed a successional variation throughout the summer. A direct linear relationship was found between the surface areas of aquatic plants and the numbers of animals found on their surfaces.

Baker (1918), Muttkowski (1918), Moore (1913, 1920), Rawson (1930), and Ball (1948) all stressed the importance of vegetation to the production of fish food organisms. Ridenhour (1958) observed that in the years when the aquatic vegetation at Clear Lake was abundant, the growth of that year class of yellow bass, *Roccus mississippiensis*, was usually better. Stube (1958) found that an increase in water level which eliminated rooted vegetation also eliminated Acarina, Amphipoda, Coletoptera, Ephemeroptera, Neuroptera, Plecoptera, and most of the Trichoptera. Hart (1895) studied relationships of certain aquatic insects to plants, and Welch (1914, 1916, 1924) investigated insects of the yellow water lilly. Kecker (1939) studied animal populations on certain submerged aquatic plants and Andrews and Hasler (1943) studied summer populations of macroscopic animals on the aquatic plants at Lake Mendota, Wisconsin. Berg (1949) studied insects on plants of the genus *Potamogeton* and Rosine (1955) found that a considerable variation existed in the density of animals on the different species of aquatic plants in Muskee Lake, Colorado. Still, there remains much to

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