

INTRODUCTION

Raccourci Lake (Old River), an oxbow lake formed from an incomplete cutoff of the Mississippi River in southeast Louisiana, is a popular recreational lake used for water-based activities such as water skiing, fishing, boating, and swimming. The nearness of this large oxbow to Baton Rouge and its continued fishing productivity make it one of the most used lakes in southern Louisiana. An understanding of current hydrologic conditions of Raccourci Lake and other lakes and reservoirs in Louisiana is essential to the management and protection of these valuable natural resources. Water quality and quantity are important concerns to those who use these bodies of water for municipal, recreational, agricultural, or industrial purposes. Current and accurate information regarding the physical and chemical-related properties and conditions of freshwater lakes and reservoirs in Louisiana is fundamental to planners and managers for evaluating these resources. In October 1996, the U.S. Geological Survey, in cooperation with the Louisiana Department of Transportation and Development, began a study to conduct a bathymetric survey and determine the physical and chemical-related properties of Raccourci Lake.

The purpose of this report is to present the results of the bathymetric survey and the results of vertical profiles of physical and chemical-related properties, including depth, water temperature, dissolved oxygen (DO), specific conductance, and pH, which were measured at three sites in the lake. Hydrographic surveying software was used for combining differential global positioning system (DGPS) information with digital survey fathometer data to accurately map the bathymetry of the lake. The bathymetric map was produced using geographic information systems (GIS), and lines of equal depth of water were reviewed and edited for accuracy and consistency. On-site physical and chemical-related properties were measured at the three selected locations using a water-quality monitor. This report is one in a series of planned map reports describing current bathymetry and physical and chemical-related properties of lakes and reservoirs in Louisiana.

Description of Study Area

Raccourci Lake (fig. 1) is located along the border between Pointe Coupee Parish and West Feliciana Parish about 25 miles northwest of Baton Rouge, Louisiana. A 1997 census estimated a population of 23,532 for Pointe Coupee Parish, 231,276 for Baton Rouge, and 13,505 for West Feliciana Parish (University of Louisiana at Monroe, Uniform Resource Locator accessed December 1, 1998). This area of southeastern Louisiana has a subtropical transitional climate with a mean annual rainfall of 61.0 inches and a mean annual temperature of 66.5°F (degrees Fahrenheit) (Jay Grymes, Louisiana Office of State Climatology, written commun., 1998).

Raccourci Lake receives inflow from the Mississippi River entering at the northeastern end of the lake and is hydraulically connected to the Mississippi River. Furthermore, Raccourci Lake is contained within the Mississippi River levee system, with levees bordering toward the west and the Mississippi River towards the east. The normal low water stage of 26 feet on the lake coincides with low water occurrences on the river during the summer and fall. The lake's water stage gradually increases during the winter until the spring flood peak. During the spring, Raccourci Lake typically reaches stages exceeding 40 feet (Lantz, 1971). High stages in the spring may make boat launches and camps inaccessible.

Acknowledgments

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BATHYMETRY

Bathymetric data for Raccourci Lake were collected during April 13-16, 1999. Accurate position and depth data were obtained to comprehensively describe bathymetry of the lake; 108,779 data points of latitude, longitude, and depth were recorded. The bathymetry of Raccourci Lake is shown in figure 1; water depths are referenced to the water-surface elevation of 24 feet above sea level.

Equipment used for the bathymetric survey included a Starlink DNAV-212 DGPS, an Odum digital survey fathometer, and HYPACK software. The DGPS measured spatial position in latitude and longitude with routine accuracy of 5 feet; horizontal control points were established at the beginning and rechecked at the end of each survey day to maintain that accuracy. The survey fathometer measured the depth with routine accuracy of 0.1 foot; the fathometer was calibrated at the start and verified at the end of each survey day to maintain that accuracy. The HYPACK software was used for survey planning, survey execution, and storage and editing of data. Data were exported to ARC/INFO for

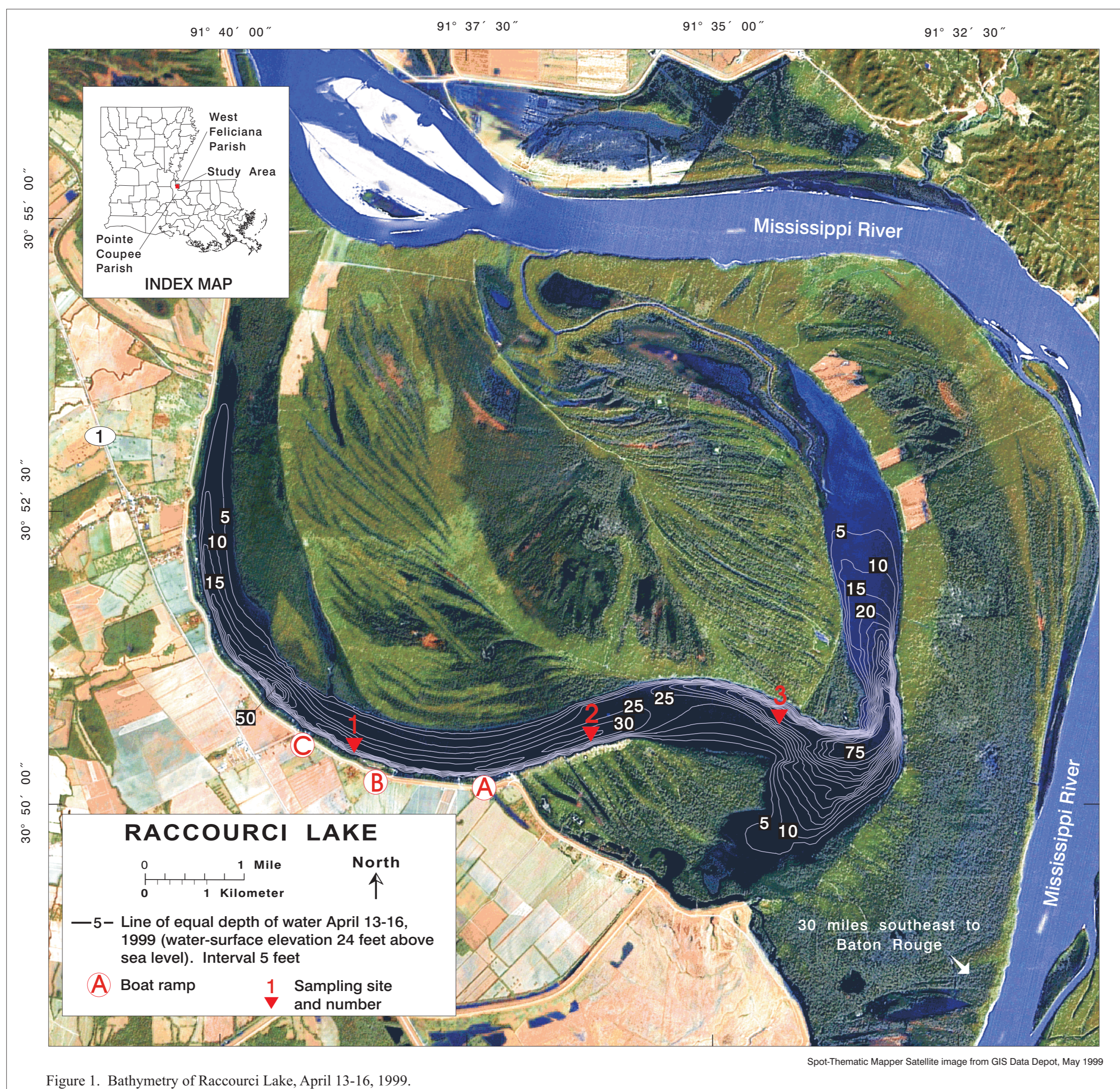


Figure 1. Bathymetry of Raccourci Lake, April 13-16, 1999.

drawing lines of equal depth of water and subsequent reviewing and editing of results.

Surface area and volume spatial analyses also were performed within ARC/INFO. The water-surface area of Raccourci Lake was 4,450 acres, and the water volume was 87,200 acre-feet. The depth-surface area and depth-volume relations are shown in figure 2. The average depth of Raccourci Lake was 19.6 feet, with a depth of 16.4 feet or greater over more than 50 percent of the lake-surface area. The greatest depths are located in the southeastern part of the lake, near site 3 (fig. 1).

PHYSICAL AND CHEMICAL-RELATED PROPERTIES

Data on physical and chemical-related properties were collected on July 29, 1998, at selected sites on Raccourci Lake. At these sites (1, 2, and 3 in fig. 1), multiple points along a vertical profile were sampled to establish the occurrence and depth of stratification. The HYDROLAB, a water-quality monitor, was calibrated at the beginning of the day prior to physical and chemical-related property data collection.

Data were collected along a vertical profile using a 10-meter cable to suspend the HYDROLAB; therefore, measurements ranged from approximately 1.6 to 31 feet below the water surface, with additional sampling points within the stratification zone. Water temperature decreased slightly with depth from approximately 88°F at the surface to a depth of 13 to 15 feet; then temperature decreased rapidly to the lowest measurement of 56.2°F at 31.2 feet (fig. 3).

The DO profiles showed a decrease in concentration occurring with depth from the surface to 13 to 15 feet. Surface DO concentrations were near 14.8 mg/L (milligrams per liter), then gradually decreased with depth from the surface to 13 to 15 feet. Concentrations below 15 feet ranged from 0.18 to 0.24 mg/L. DO concentrations vary considerably with depth, location, and season (Demas, 1985). The criterion for dissolved oxygen is 5 mg/L for freshwater aquatic life (Louisiana Department of Environmental Quality, 1998, p. 128; U.S. Environmental Protection Agency, 1976; 1986). Water visibility, measured with a Secchi disk, was 3.2 feet.

The specific conductance increased with depth from the surface to approximately 15 feet; surface concentrations ranged from 316 to 334 $\mu\text{S}/\text{cm}$ (microsiemens per centimeter at 25 degrees Celsius). Below 17 feet specific conductance increased slightly with depth; deepest measurements ranged from 376 to 384 $\mu\text{S}/\text{cm}$. The pH was about 8.8 (standard units) near the surface and generally decreased with depth, reaching a minimum pH of 7.1 to 7.5 at about 10 to 15 feet. Below 10 to 15 feet, pH increased with depth, ranging from 7.6 to 7.9.

SELECTED REFERENCES

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U.S. Environmental Protection Agency, 1976, Quality criteria for water: Washington, D.C., U.S. Environmental Protection Agency, 256 p.

-----1986, Quality criteria for water: Washington, D.C., U.S. Environmental Protection Agency [variously paged].

In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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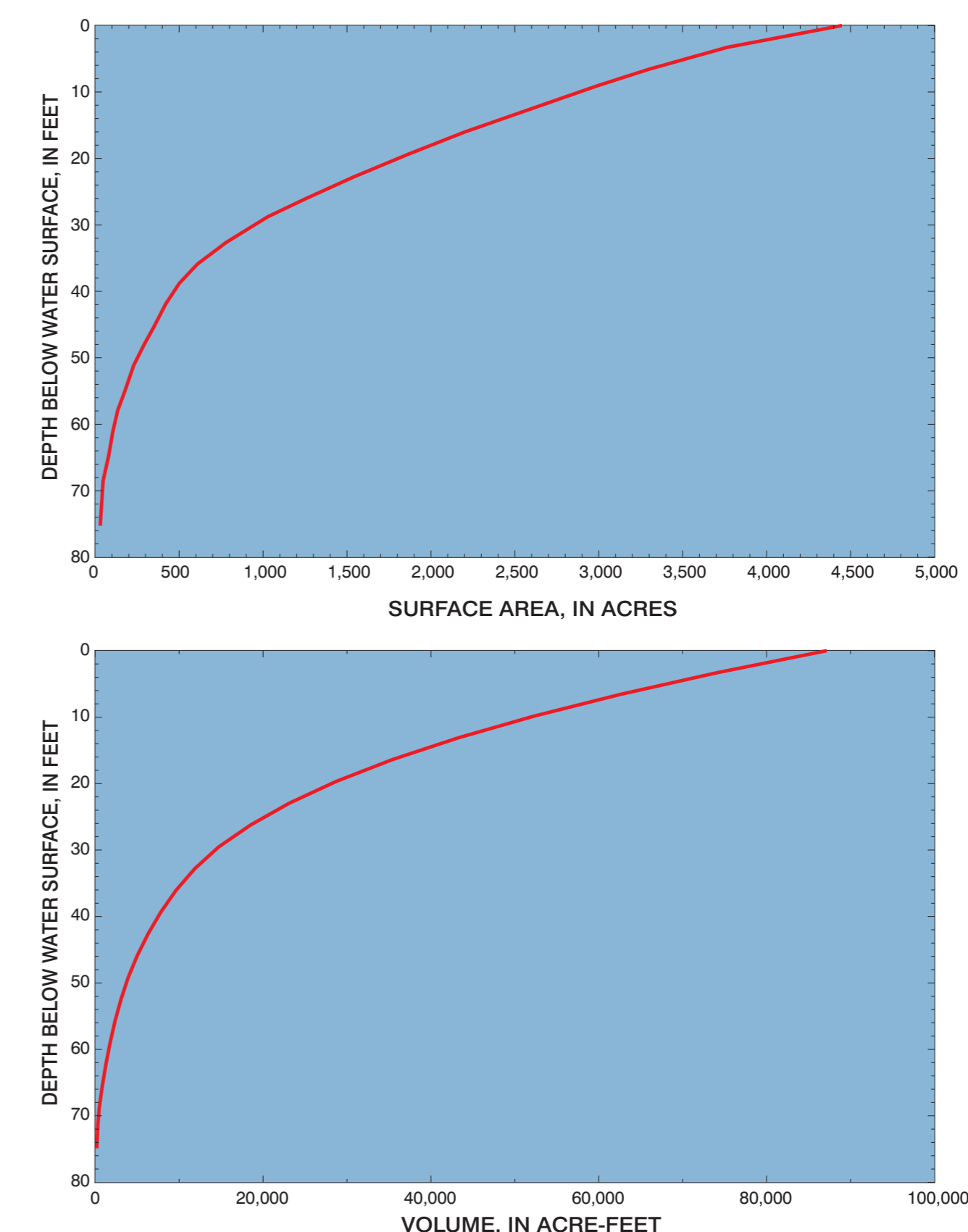


Figure 2. Depth-surface area and depth-volume relations for Raccourci Lake. Water-surface elevation was referenced to 24 feet above sea level during the bathymetric survey of April 13-16, 1999.

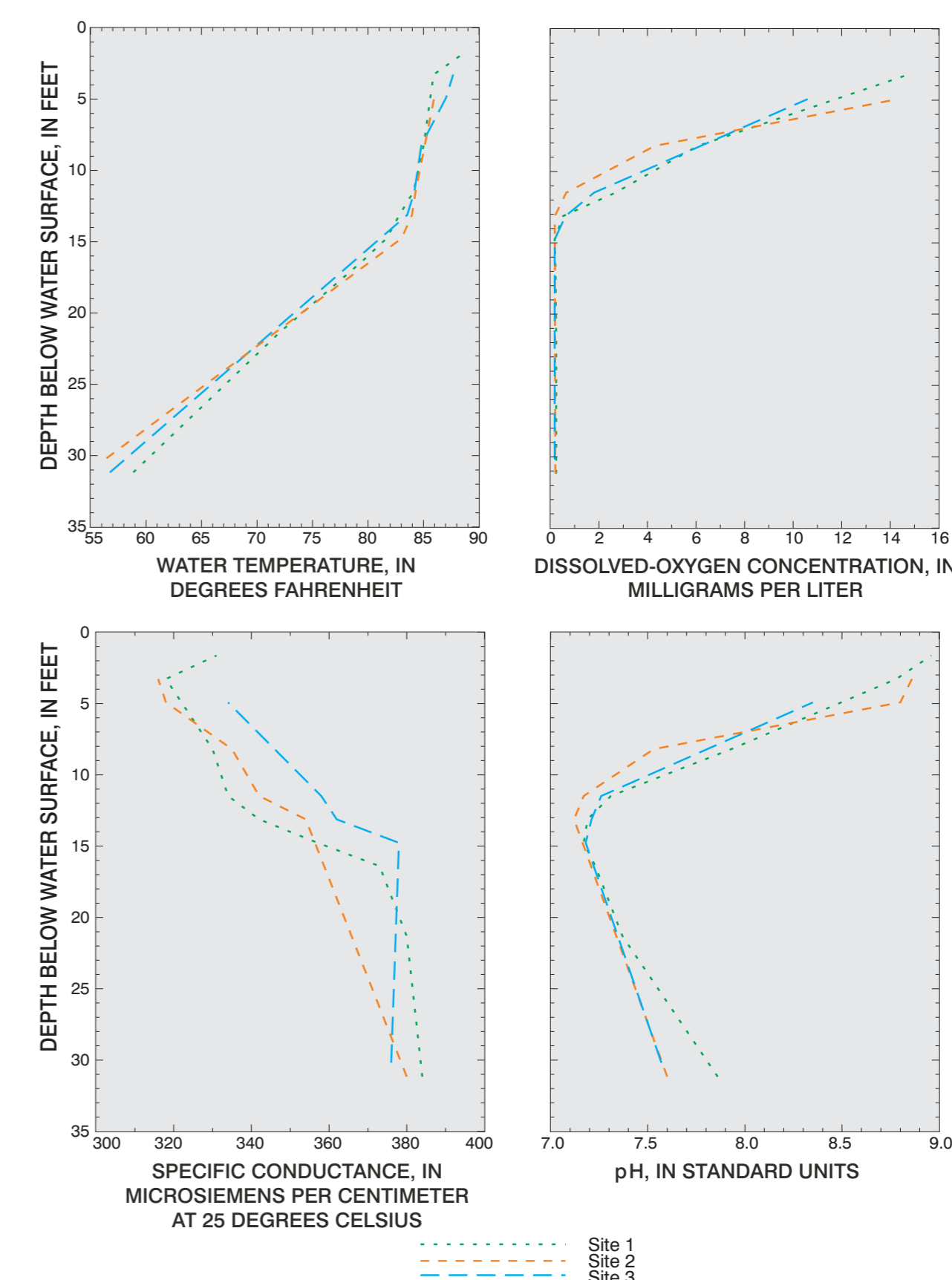


Figure 3. Variation of water temperature, dissolved-oxygen concentration, specific conductance, and pH at Raccourci Lake, July 29, 1998.