U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
PUBLIC WORKS AND FLOOD CONTROL DIRECTORATE
WATER RESOURCES SECTION

WATER-RESOURCES INVESTIGATIONS
REPORT 99-4193

BATHYMETRIC SURVEY AND PHYSICAL AND CHEMICAL-RELATED PROPERTIES OF FALSE RIVER

INTRODUCTION

False River, an oxbow lake formed from an abandoned meander loop of the Mississippi River in southeastern 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 lake to Baton Rouge and its continued year-to-year fishing productivity make it one of the most used lakes in southern Louisiana. An understanding of current hydrologic conditions of False River 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 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 False River.

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. 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 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

False River (fig. 1) is located in southeastern Pointe Coupee Parish near New Roads, Louisiana, and about 25 miles northwest of Baton Rouge, Louisiana. A recent census (1998) estimates a population of 23,316 for Pointe Coupee Parish, 5,510 for New Roads, and 232,637 for Baton Rouge (Northeast Louisiana University, Uniform Resource Locator accessed May 19, 1999). This area 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).

False River has a drainage area of 62 square miles and primarily receives inflow from Patin Duke Slough and False Bayou, which enter at the northern end of the lake, and The Chenal and Discharge Bayou, which flow into the southern end of the lake. The lake level is controlled by a spillway structure on Lighthouse Canal. The original spillway was completed in 1948 and modified in 1991. The spillway is 24 feet in length at a crest elevation of 17.00 feet above sea level. The maximum design discharge for the spillway structure is 1,400 cubic feet per second (Ray Elifami, Louisiana Department of Transportation and Development, written commun., 1998). Boat ramps are available at four locations on the lake (fig. 1).

Acknowledgments

The author extends appreciation to Zahir "Bo" Bolourchi, Chief, Water Resources Section, Louisiana Department of Transportation and Development, for direction and assistance provided for this study.

BATHYMETRY

Bathymetric data for False River were collected during June 4-5 and July 23-28, 1998. Accurate position and depth data were obtained to comprehensively describe the lake bathymetry; 119,474 data points of latitude, longitude, and depth were recorded. The bathymetry of the lake is shown in figure 1; water depths are referenced to the water-surface elevation of 15.56 feet above sea level, which existed June 4-5, 1998. The lake has a bathymetry typical of Mississippi River oxbow lakes with a steep outer bank and a gradually sloping inner bank. The normal pool elevation of False River is 17.00 feet above sea level.

Equipment used during the bathymetric survey included a Starlink DNAV-212 DGPS, an Odom 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 drawing lines of equal depth of water and subsequent reviewing and editing of the results.

Surface area and volume spatial analyses also were performed within ARC/INFO. The water-surface area of False River was 3,060 acres, and the water volume was 67,300 acre-feet (fig. 2). The depth-surface area and depth-volume relations are shown in figure 2. The average depth of False River was 22.0 feet, with a depth of 20.3 feet or greater over more than 50 percent of the lake-surface area. Greatest depths are located in the southwestern part of the lake near the spillway and Lighthouse Canal.

PHYSICAL AND CHEMICAL-RELATED PROPERTIES

Data on physical and chemical-related properties were collected on July 29, 1998, at three selected sites in False River. 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 from approximately 31 feet to 1.6 feet below the water surface, with additional sampling points within the stratification zone. Water temperature decreased slightly with depth from approximately 87°F at the surface to a depth of 17 to 19 feet, then decreased rapidly to the lowest measurement of 69.1°F at 31.1 feet (fig. 3).

Chemical-related properties indicated a distinct stratification of the lake existed on July 29, 1998. Shallow-water DO ranged from 6.30 to 9.60 mg/L, then decreased substantially at a depth from 16 to 19 feet below the water surface. Concentrations of DO below 20 feet ranged from 0.10 to 0.14 mg/L. Concentrations of DO vary considerably with depth, location, and season (Demas, 1985). The criterion for DO 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 varied slightly from the surface to approximately 17 feet; shallow-water concentrations ranged from 220 to 231 µS/cm (microsiemens per centimeter at 25 degrees Celsius). Below 17 feet, the specific conductance increased with depth; deepest measurements ranged from 285 to 304 µS/cm. The pH was about 8.4 (standard units) near the surface and generally decreased with depth.

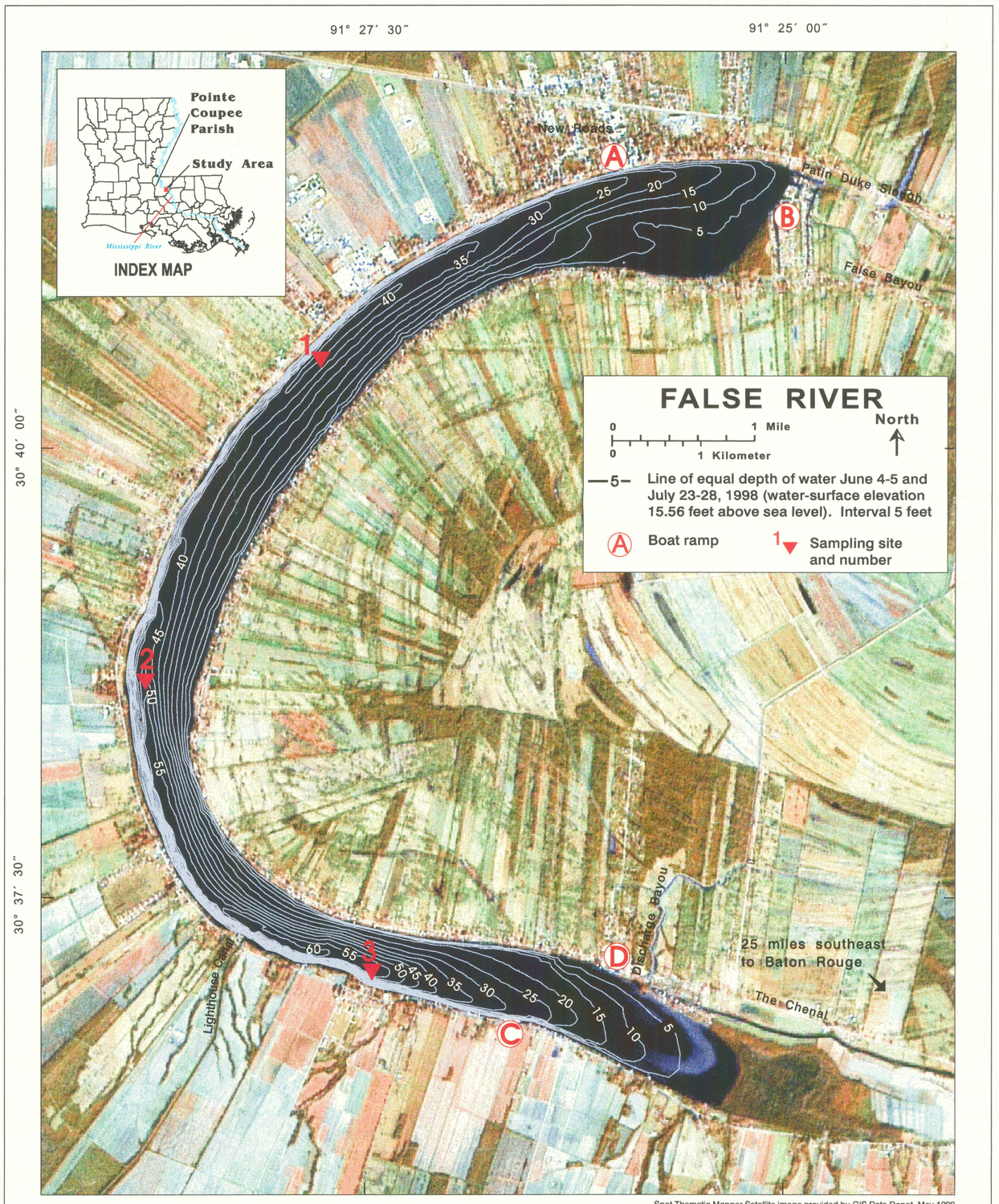

Figure 1. Bathymetry of False River, June 4-5 and July 23-28, 1998.

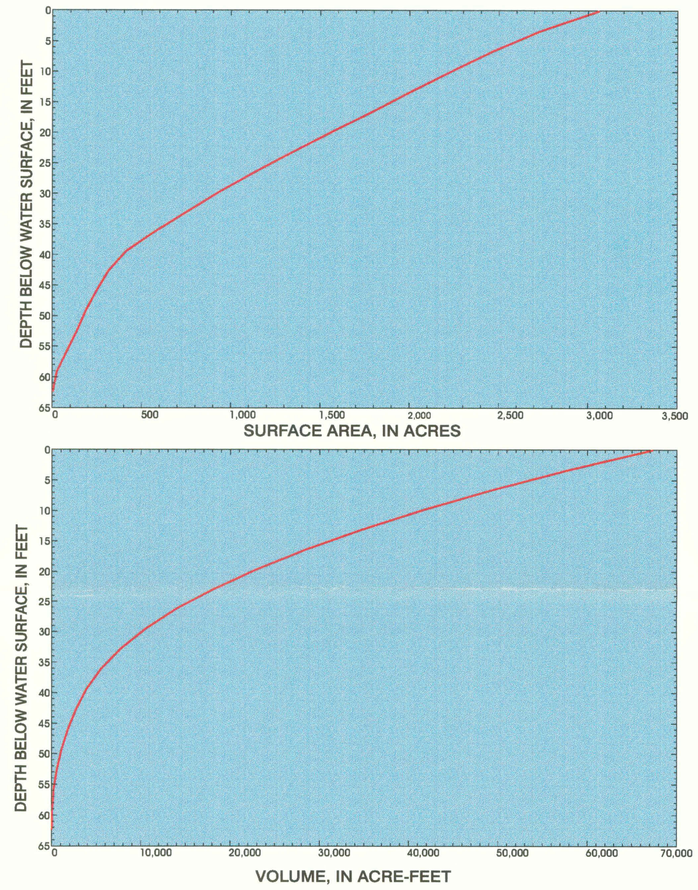

Figure 2. Depth-surface area and depth-volume relations for False River. Water-surface elevation was 15.56 feet above sea level during the bathymetric survey of June 4-5 and July 23-28, 1998.

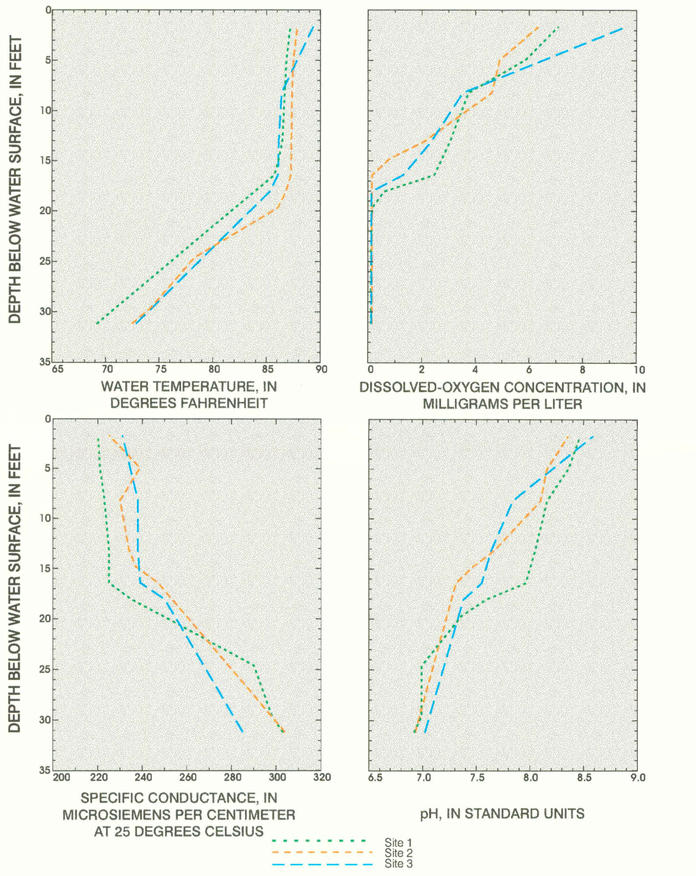

Figure 3. Variation of water temperature, dissolved-oxygen concentration, specific conductance, and pH in False River, July 29, 1998.

REFERENCES

Demas, C.R., 1985, A limnological study of Lake Bruin, Louisiana: Louisiana Department of Transportation and Development, Office of Public Works Water Resources Technical Report no. 38, 96 p.

Louisiana Department of Environmental Quality, 1998, Water quality regulations *in* Environmental Regulatory Code: Baton Rouge, Louisiana, Louisiana Administrative Code, title 33, part IX, p. 128.

Northeast Louisiana University, Center for Business and Economic Research, Louisiana parishes and municipalities July 1, 1998, population estimates published in January 1999: accessed May 19, 1999, at URL http://leap.nlu.edu/POPHS/pop1998.txt

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.

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Louisiana Department of Transportation and Development - U.S. Geological Survey Water Resources Cooperative Program

Bathymetric Survey and Physical and Chemical-Related Properties of False River, Louisiana, June and July 1998

By Paul A. Ensminger

For additional information contact:

District Chief
U.S. Geological Survey
3535 S. Sherwood Forest Blvd., Suite 120
Baton Rouge, Louisiana 70816
E-mail: dc_la@usgs.gov
Telephone: (225) 389-0281
Fax: (225) 389-0706

Copies of this report can be purchased from:

U.S. Geological Survey
Branch of Information Services
Box 25286
Denver, Colorado 80225
Telephone (toll free): 1-888-ASK-USGS