

INTRODUCTION

Cypress Bayou Reservoir, formed from an earthen dam built in 1975 on Cypress Bayou in northwestern Louisiana, is used for water-based activities such as water skiing, fishing, boating, and swimming. An understanding of current hydrologic conditions of this reservoir and other reservoirs and lakes 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 reservoirs and 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 Cypress Bayou Reservoir.

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 reservoir. 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 reservoir. 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 reservoirs and lakes in Louisiana.

Description of Study Area

Cypress Bayou Reservoir (fig. 1) is located in Bossier Parish, about 8 miles north of Shreveport, Louisiana, and 3 miles east of Benton, Louisiana. A 1997 census estimated a population of 93,752 for Bossier Parish, 200,827 for Shreveport, and 2,038 for Benton (University of Louisiana at Monroe, Uniform Resource Locator accessed December 1, 1998). This area has a subtropical transitional climate with a mean annual rainfall of 46.1 inches and a mean annual temperature of 54.2°F (degrees Fahrenheit) (Jay Grymes, Louisiana Office of State Climatology, written commun., 1998).

Cypress Bayou Reservoir has a drainage area of 155 square miles, and receives inflow from Cypress Bayou, Little Caney Bayou, and White Oak Bayou. The earthen dam is 6,100 feet in length. The reservoir level is controlled by a 300-foot spillway with a crest elevation of 180 feet above sea level. The maximum design discharge for the spillway is 45,400 cubic feet per second (Ray Elifami, Louisiana Department of Transportation, written and oral commun., 1998). The bathymetry of Cypress Bayou Reservoir still contains evidence of the once meandering channels of Cypress Bayou and Little Caney Bayou in the northern part of the reservoir.

Acknowledgments

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BATHYMETRY

Bathymetric data for Cypress Bayou Reservoir were collected during October 7, 1997, and September 3, 1998. Accurate position and depth data were obtained to comprehensively describe the reservoir bathymetry; 83,206 data points of latitude, longitude, and depth were recorded. The bathymetry of the reservoir is shown in figure 1; water depths are referenced to the water-surface elevation of 178.6 feet above sea level.

Equipment used for 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 results. Lines of equal depth of water were dashed in areas where the bathymetric data were sparse.

Surface area and volume spatial analyses also were performed within ARC/INFO. The water-surface area of Cypress

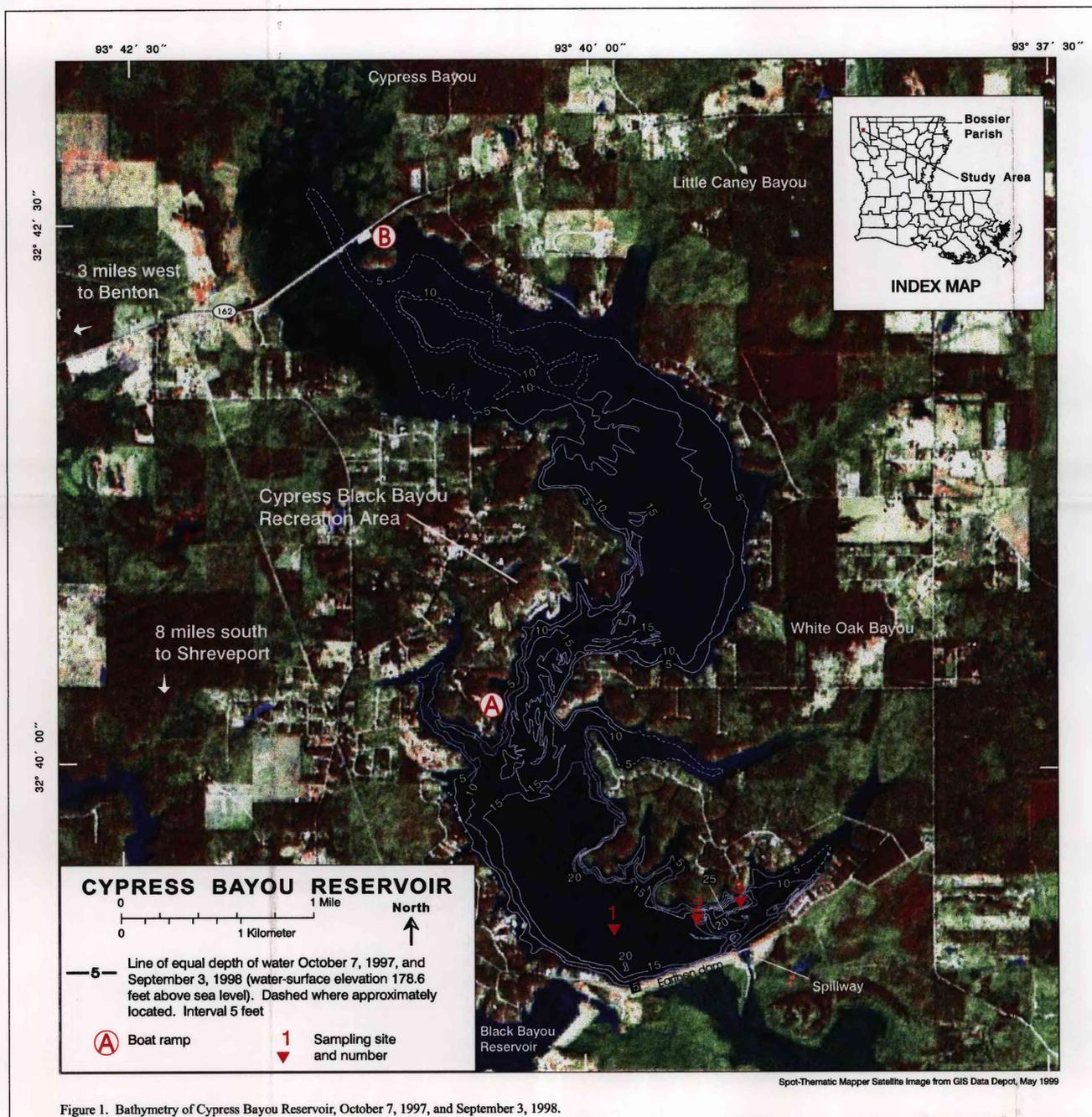


Figure 1. Bathymetry of Cypress Bayou Reservoir, October 7, 1997, and September 3, 1998.

Bayou Reservoir was 3,400 acres, and the water volume was 22,700 acre-feet. The depth-surface area and depth-volume relations are shown in figure 2. The average depth of the reservoir was 6.7 feet, with a depth of 6.2 feet or greater over more than 50 percent of the reservoir surface area. The greatest depths are located in the southeastern part of the reservoir.

PHYSICAL AND CHEMICAL-RELATED PROPERTIES

Data on physical and chemical-related properties were collected August 12, 1998, at selected sites in Cypress Bayou Reservoir. 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 above the reservoir bed to 1.6 feet below the water surface, with additional sampling points within the stratification zone. The deepest measurements at the three sampling sites were as follows: 13.8 feet at site 1, 17.4 feet at site 2, and 20.0 feet at site 3. Water temperature remained constant at approximately 85°F from the surface to approximately 18 feet in depth, then decreased more rapidly with depth, with the deepest measurement of 76°F at 20 feet (fig. 3).

The DO concentration profiles showed stratification occurring at a depth between 12 and 18 feet. Concentrations of DO decreased more rapidly within this range, with shallow-water DO concentrations varying between 4.9 and 5.3 mg/L (milligrams per liter), and bottom-water DO concentrations of approximately 0.24 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 2.4 feet.

The specific conductance remained constant at 63 μ S/cm (microsiemens per centimeter at 25 degrees Celsius) from the surface to about 18 feet, then increased with depth with the highest measurement of 157 μ S/cm at 20 feet. The pH was about 6.3 (standard units) near the surface to a depth of about 16 feet, then pH increased with depth with the highest measurement of 6.8 recorded at 20 feet.

SELECTED REFERENCES

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University of Louisiana at Monroe, Center for Business and Economic Research, Louisiana parishes and municipalities July 1, 1997, population estimates published in January 1996: accessed December 1, 1998, at URL <http://leap.nlu.edu/POPHS/pop1997.txt>

U.S. Geological Survey, 1975, Benton quadrangle, Louisiana, 7.5-minute series, (topographic), scale 1:62,500.

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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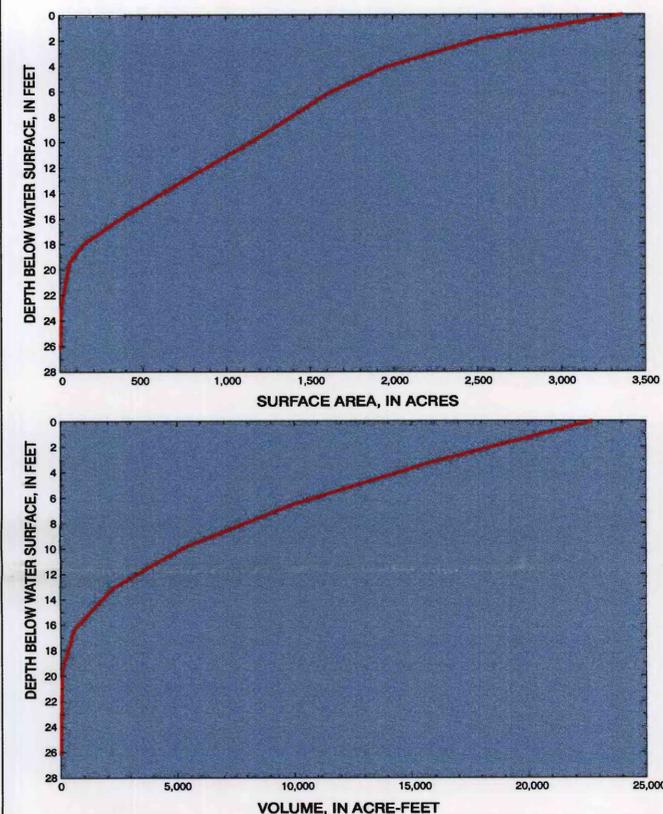


Figure 2. Depth-surface area and depth-volume relations for Cypress Bayou Reservoir. Water-surface elevation was 178.6 feet above sea level during the bathymetric surveys, October 7, 1997, and September 3, 1998.

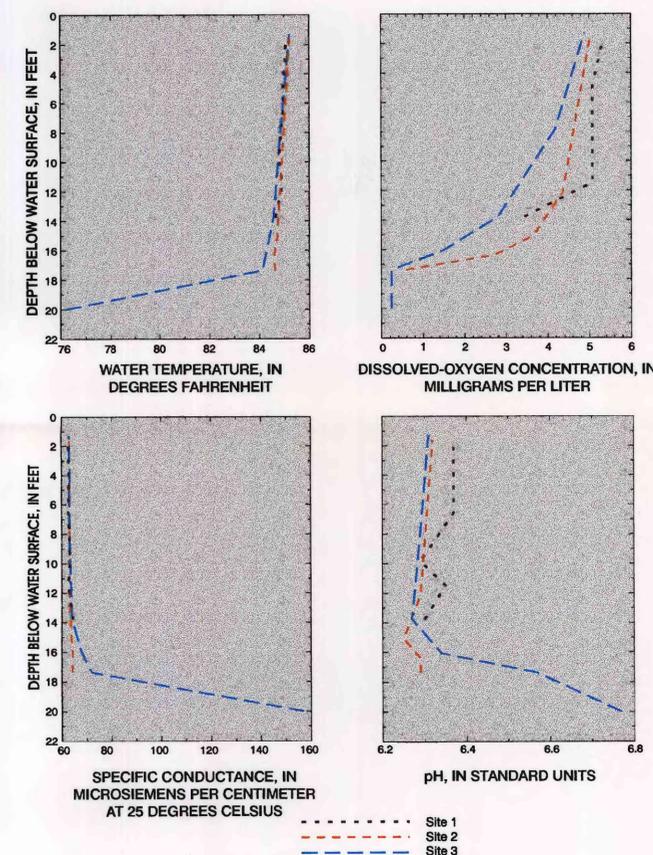


Figure 3. Variation of water temperature, dissolved-oxygen concentration, specific conductance, and pH in Cypress Bayou Reservoir, August 12, 1998.

