# WATER-RESOURCES ACTIVITIES IN LOUISIANA,

# FISCAL YEARS 1990-92

*Compiled by Darlene M. Smothers and William C. Martin*

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**U.S. GEOLOGICAL SURVEY**

**Open-File Report 92-492**


**Baton Rouge, Louisiana**

**1992**

**U.S. DEPARTMENT OF THE INTERIOR**
**MANUEL LUJAN, Jr., Secretary**

**U.S. GEOLOGICAL SURVEY**
**Dallas L. Peck, Director**


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# WATER-RESOURCES ACTIVITIES IN LOUISIANA, FISCAL YEARS 1990-92

*Compiled by*
*Darlene M. Smothers and William C. Martin*

## ABSTRACT

During fiscal years 1990-92, the water-resources activities of the U.S. Geological Survey in Louisiana consisted of hydrologic data collection and interpretive investigations and research. Data collection activities involved the operation of statewide stream gaging, ground-water, and quality-of-water long-term monitoring networks. Interpretive investigations and research addressed specific hydrologic concerns such as potential organic chemical contamination in the lower Calcasieu River, water quality of the Barataria basin and Mermentau River basin, water quality and flood characteristics of streams, quality and quantity of freshwater in aquifers, and evaluation of ground-water resources.

This report briefly describes the problem, objective, approach, progress, and plans for each project. It also includes a description of the District's organization and a list of cooperators.

## INTRODUCTION

The mission of the U.S. Geological Survey (USGS), Water Resources Division, is to provide the hydrologic information and understanding needed for the optimum utilization and management of the Nation's water resources for the overall benefit of the people of the United States.

This is accomplished, in large part, through cooperation with other Federal, State, and local agencies by:

- Collecting data, on a systematic basis, needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.
- Conducting analytical and interpretive water-resources appraisals describing the occurrence, availability, and physical, chemical, and biological characteristics of surface and ground water.
- Conducting supportive basic and problem-oriented research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurement techniques and to understand hydrologic systems sufficiently well to quantitatively predict their response to stress, either natural or manmade.
- Disseminating the water data and the results of investigations and research through reports, maps, computerized information services, and other forms of public releases.
- Coordinating the activities of Federal agencies in the acquisition of water for streams, lakes, reservoirs, estuaries, and ground waters.

- Providing scientific and technical assistance in hydrologic fields to other Federal, State, and local agencies, to licensees of the Federal Power Commission, and to international agencies on behalf of the Department of State.

In Louisiana, the USGS, Water Resources Division, conducts water-resources activities to provide hydrologic information and understanding to manage the State's water resources. These activities are accomplished through cooperative programs with other Federal, State, and local agencies or USGS national programs. These activities consist of two broad categories: hydrologic data collection and hydrologic investigations and research.

Hydrologic data collection activities in Louisiana involve the operation of statewide stream gaging, ground-water, and quality-of-water long-term monitoring networks. These extensive networks are maintained with state-of-the-art equipment such as real-time satellite telemetry instrumentation. The data from these networks are essential for assessment and management of Louisiana's water resources. In addition to the above stated activities, the Louisiana District provides sediment laboratory services to other District offices of the USGS.

Interpretive investigations and research address hydrologic concerns such as potential organic chemical contamination in the Calcasieu River estuary, water quality of the Mermentau River basin, water quality and flood characteristics of streams, quality and quantity of freshwater in aquifers, and evaluation of ground-water resources. Also, the District participates in water-resources related workshops, seminars, and training activities at the international, national, State, and local levels, and the District frequently provides hydrologic information about Louisiana's water resources to national, State and local organizations. Currently (1992), the Louisiana District is providing assistance to the Federal Emergency Management Agency (FEMA), by collecting data and documenting the areal extent and magnitude of flooding related to Hurricane Andrew and the effects of the hurricane on surface-water resources of the State.

This report summarizes the Louisiana District's water-resources activities during fiscal years 1990 through 1992. The report includes brief descriptions of the problem, objective, approach, progress, and plans for each project. It also includes a description of the District organization and a list of cooperators. Special thanks is due to D.L. Collier who revised many of the project discussions for fiscal year 1991.

## DISTRICT ORGANIZATION

The Louisiana District of the Water Resources Division, USGS, conducts data collection activities and interpretive water-resources investigations and research under the leadership of Darwin Knochenmus, District Chief. The District office is located in Baton Rouge, and field offices are located in Baton Rouge and Ruston (fig. 1). The District organization includes the following sections: Hydrologic Investigations Section, Hydrologic Surveillance Section, Administrative Services Section, Computer Services and Data Management Section, and Report Preparation Section, as shown in figure 2. The names and titles of key personnel in various organizational units are listed below:

**Darwin Knochenmus**
**District Chief**
**U.S. Geological Survey**
**Water Resources Division**
**P.O. Box 66492**
**Baton Rouge, Louisiana 70896**
**(504) 389-0281**

**Edward H. Martin**
**Assistant District Chief**
**Hydrologic Investigations Section**

**Michael J. Kraemer**
**Administrative Officer**
**Administrative Services Section**

**Scott H. Beddingfield**
**Chief, Computer Services and**
**Data Management Section**

**Geraldine R. Stallworth**
**Chief, Report Preparation Section**

**George J. Arcement, Jr.**
**Assistant District Chief**
**Hydrologic Surveillance Section**

**Anthony H. Devillier**
**Chief, Baton Rouge Field Office**

**Alton J. Dupuy**
**Chief, Water-Quality Services Unit**

**Robert O. Walsworth**
**Chief, Ruston Field Office**
**U.S. Geological Survey**
**Water Resources Division**
**P.O. Box 1629**
**Ruston, Louisiana 71273**
**(318) 251-9630**

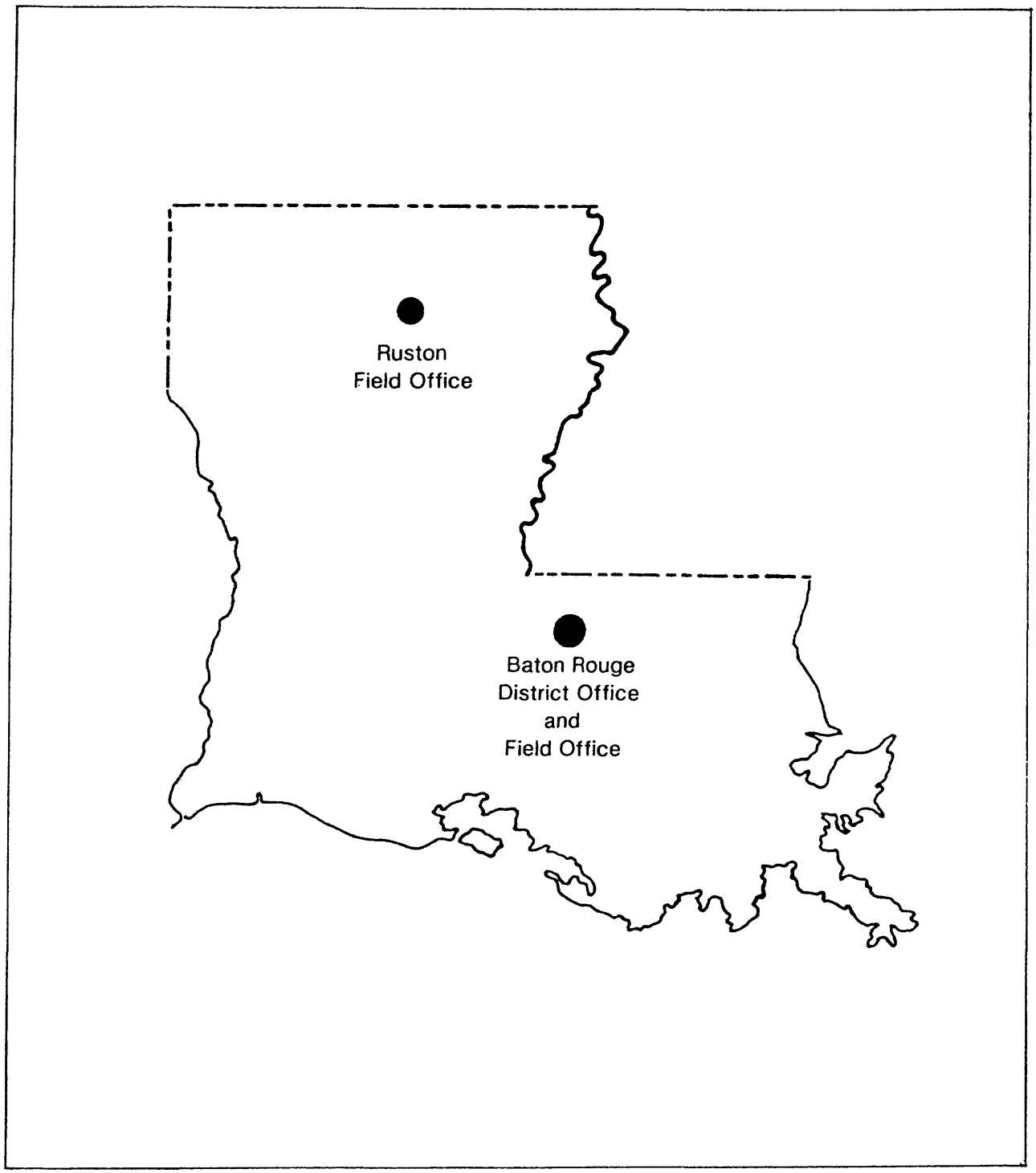



**Figure 1.--U.S. Geological Survey offices in Louisiana.**

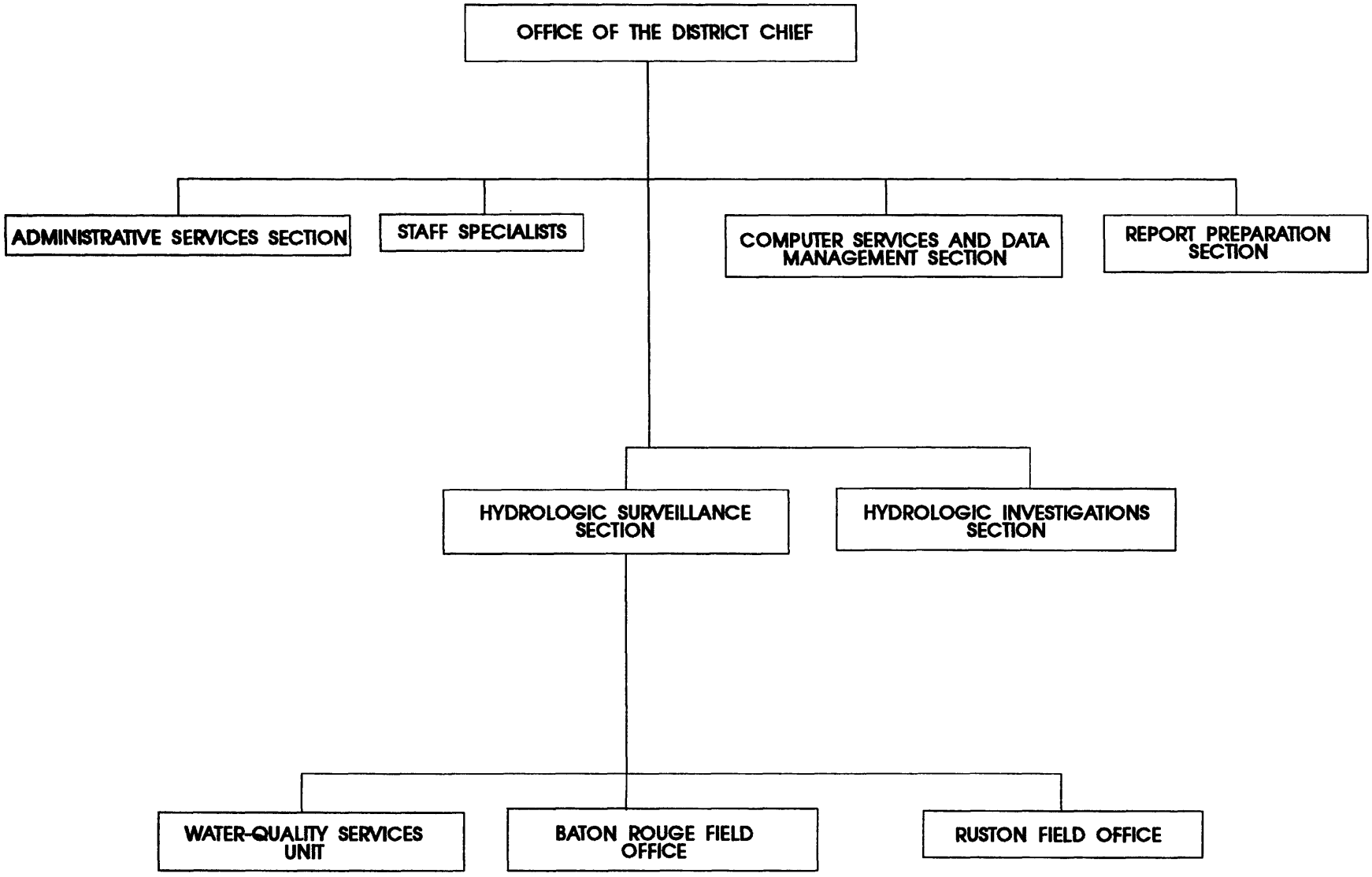



**Figure 2.--Louisiana District organization.**

## COOPERATIVE PROGRAM

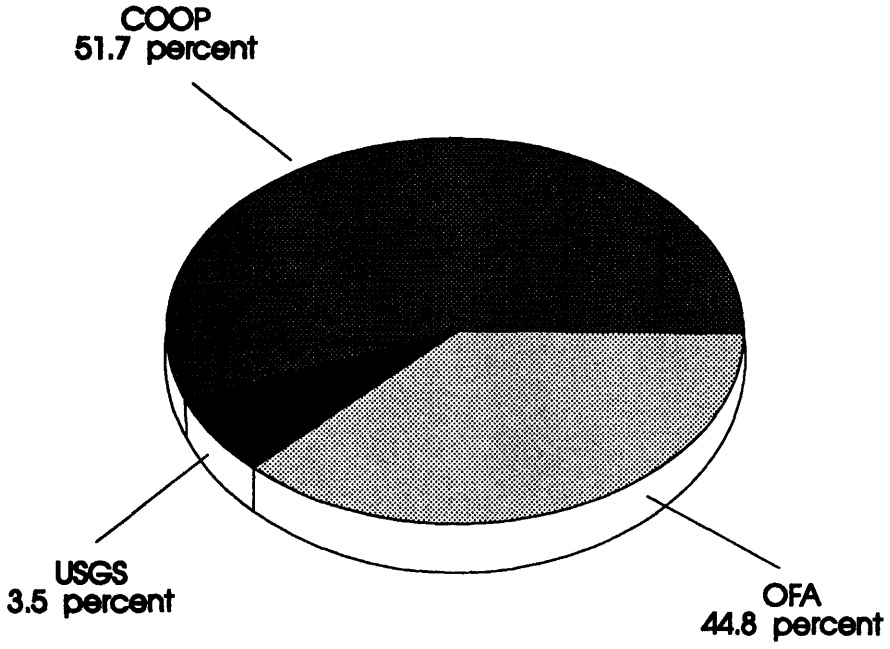
Hydrologic activities are conducted, in large part, through cooperation with Federal, State, and local agencies who share in the planning and financial support of the program. The sources of funding for the water-resources activities in Louisiana and the types of funded programs are shown in figure 3. The cooperators listed below have given support, both financially and professionally, to the projects and programs of the Louisiana District:

### State and Local Agencies

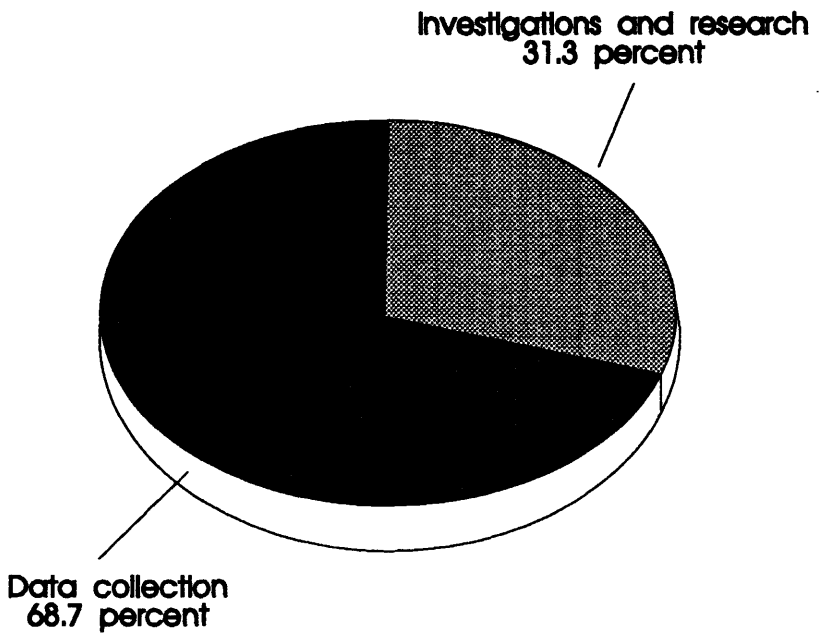
Caddo Parish
Capital Area Ground Water Conservation Commission (CAGWCC)
City of Alexandria
City of Minden
City of West Monroe
East Baton Rouge Parish
Jefferson Parish
    Department of Water
    Department of Public Works
Plaquemines Parish
St. John the Baptist Parish
Terrebonne Parish
State of Louisiana
    Department of Environmental Quality (DEQ)
    Department of Justice
    Department of Natural Resources (DNR)
    Department of Transportation and Development (DOTD)
    Department of Wildlife and Fisheries (DWF)
    Louisiana Office of Emergency Preparedness
Sabine River Compact Administration

### Federal Agencies

Federal Emergency Management Agency (FEMA)
Langley Air Force Base (AFB)
National Park Service (NPS)
U.S. Army Corps of Engineers (COE), Fort Worth, Texas
U.S. Army Corps of Engineers, New Orleans District
U.S. Army Corps of Engineers, Vicksburg District
U.S. Army, Fort Polk, Louisiana
U.S. Forest Service




SOURCES OF FUNDING




TYPES OF PROGRAMS

(p. 6 follows)

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**EXPLANATION**

USGS - Research
COOP - USGS-State and local agencies Cooperative Program
OFA - Other Federal agencies

**Figure 3.--Sources of funding and types of programs in the Louisiana District, fiscal year 1992.**

# WATER-RESOURCES DATA COLLECTION ACTIVITIES

## Types of Water-Resources Data

Some of the types of water-resources data that the Louisiana District routinely collects and makes available to users are described below:

1. Ground-water data.

    a. Water levels in selected wells.
    b. Results of pumping tests of selected wells, from which hydraulic characteristics of aquifers can be determined.
    c. Logs of wells (driller's, electric, or gamma-ray), indicating subsurface information.
    d. Water use

2. Surface-water data.

    a. Volume of flow in streams.
    b. Water elevations or stages of streams, both continuous and annual peaks.
    c. Characteristics of drainage basins that affect streamflow (drainage area, length, width, slope, stream cross sections, and in some instances, stream bottom and bank roughness).
    d. Delineation of areas inundated by historical floods and floods of estimated probability.
    e. Time-of-travel (velocity) data for streams.
    f. Water use.

3. Water-quality data such as determinations of chemical constituents, physical properties, and biological and microbiological substances in water; suspended sediment; and bottom material.

    a Water-quality data collected monthly or less frequently at selected well, stream, or lake sites include selected inorganic constituents, specific conductance, pH, temperature, color, hardness as calcium carbonate, dissolved solids, trace metals, selected insecticides and herbicides, and polychlorinated biphenyls and napthalenes. In addition, data are collected on dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, turbidity, nutrients, indicator bacteria (total coliform, fecal coliform, and fecal streptococci), chlorophyll, organic carbon, cyanide, phenols, oil and grease, sediment, and trace metals and insecticides in bottom material.
    b. Water-quality related data collected at selected surface-water sites on a daily basis include temperature, rainfall, velocity, water depth, dissolved oxygen, turbidity, and salinity.

Current data-collection activities are described in the remainder of this section. Water-use data are collected and published on a 5-year basis; this project is discussed on page 23 of this report.

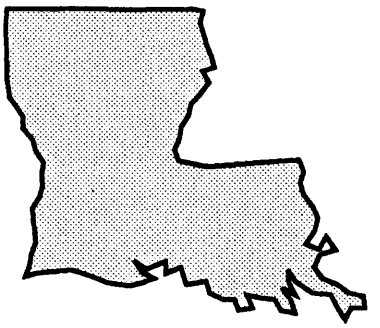
**PROJECT TITLE:** Surface-Water Stations

**PROJECT NUMBER:** LA00-001

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** George J. Arcement, Jr.

**PROJECT DURATION:** Continuous



**COOPERATING AGENCIES:** City of West Monroe; East Baton Rouge Parish; Jefferson Parish Department of Public Works; Plaquemines Parish; Terrebonne Parish; Louisiana Departments of Environmental Quality, Natural Resources, Transportation and Development, and Wildlife and Fisheries; Louisiana Office of Emergency Preparedness; Sabine River Compact Administration; and U.S. Army Corps of Engineers (New Orleans and Vicksburg Districts)

**PROBLEM:** Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in water-related fields such as water supply, hydroelectric power generation, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water-resources development.

**OBJECTIVE:** Collect surface-water data sufficient to satisfy needs for current uses such as assessment of water resources, operation of reservoirs or industries, forecasting, assimilation of wastes and implementation of pollution controls, calculation of water-quality load, meeting river compact and legal requirements, and research or special studies. Collect data necessary for analytical studies to define hydrologic characteristics of streams, lakes, estuaries, and other water bodies for use in planning and design.

**APPROACH:** Maintain a network of continuous and partial-record gaging stations throughout the State (fig. 4) using standard streamflow measurement techniques as described in the USGS publication series Techniques of Water-Resources Investigations.

**PROGRESS:** Hydrologic data have been collected for 202 continuous-record and partial-record surface-water stations in Louisiana (fig. 4). The number of surface-water stations and type data collected at these stations included the following: 19 crest-stage records, 60 discharge records, 26 stage (lake) records, and 97 flood-profile records. Surface-water data were compiled for the 1989 and 1990 water years and published in annual data reports. A one-dimensional flow model is being used for determining daily discharges at a number of slope-affected stations. A number of electromagnetic flowmeters have been installed at stations in the coastal areas where flow velocities are low.

**PLANS FOR 1992:** Publish data for 1991 water year. Continue operation of the surface-water data network. The data network will be evaluated and the cooperators will be consulted regarding potential changes. Continue using the one-dimensional flow model for computing daily discharges at backwater and tide-affected stations. Install satellite telemetry data collection platforms at a number of stations where electromagnetic flowmeters are operating and at selected locations to collect stage and rainfall data. Install satellite telemetry data collection platforms for operation of a coastal network to monitor coastal restoration projects.

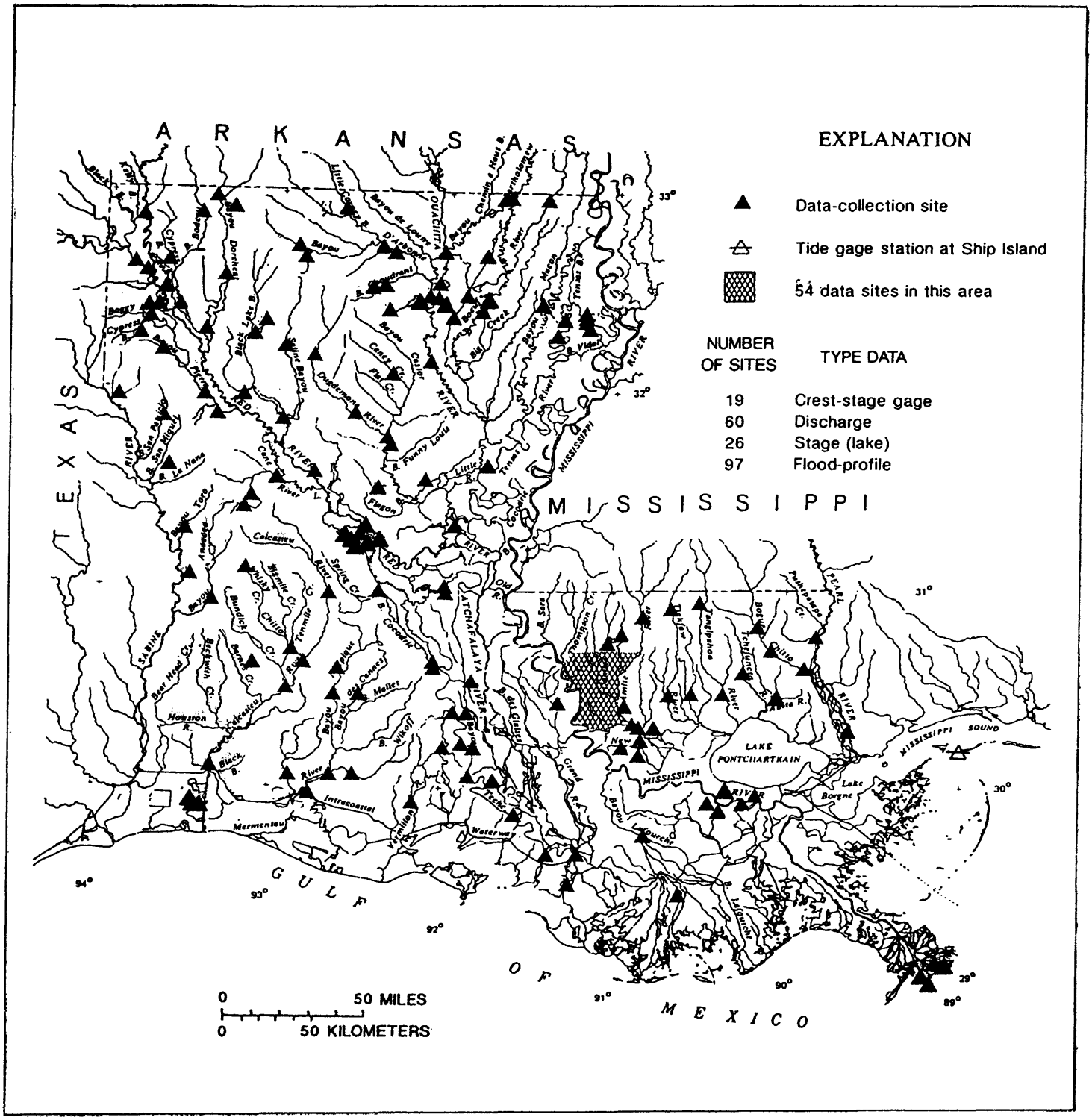



**Figure 4.--U.S. Geological Survey surface-water gaging stations in Louisiana.**

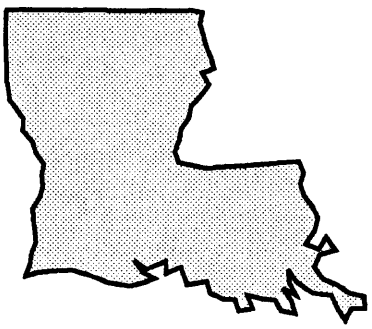
**PROJECT TITLE:** Ground-Water Sites

**PROJECT NUMBER:** LA00-002

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** George J. Arcement, Jr.

**PROJECT DURATION:** Continuous



**COOPERATING AGENCIES:** Capital Area Ground Water Conservation Commission; City of Alexandria; St. John the Baptist Parish; Louisiana Departments of Environmental Quality and Transportation and Development; U.S. Army Corps of Engineers (New Orleans and Vicksburg Districts), and U.S. Army, Fort Polk

**PROBLEM:** Long-term water-level records and other ground-water data are needed to evaluate the effects of climatic variations on recharge to and discharge from ground-water systems, provide a data base from which to measure the effects of development, assist in the prediction of future supplies, and provide data for management of the resource.

**OBJECTIVE:** Collect water-level data sufficient to provide a minimum long-term data base that can be used to describe the general response of the hydrologic system to natural climatic variations and induced stresses so that potential problems can be identified early enough to permit proper planning and management. Provide a data base against which the short-term records acquired in areal studies can be analyzed. Data typically are needed to (a) provide an assessment of the ground-water resources, (b) allow prediction of future conditions, (c) detect and define pollution and supply problems, and (d) provide the basis for management decisions.

**APPROACH:** Maintain a ground-water network consisting of 374 water-level observation wells (fig. 5) and the Ground Water Site Inventory file. The network is reviewed at regular intervals, and quality control of collected data is achieved on a regular basis. The network provides broad coverage of hydrologic conditions in the geologic provinces of the State and data for all major aquifers. Special emphasis is given to problem areas where serious water-level declines and encroachment of saltwater are occurring.

**PROGRESS:** Water-level data for observation wells were compiled and published for the 1989 and 1990 water years in annual data reports. Areal and special projects were supported by furnishing data in a variety of computer output formats. Two reports were published: "Organic chemical analyses of ground water in Louisiana, water years 1984-88" and "Louisiana ground-water map no. 3: Potentiometric surface, 1989, and water-level changes, 1980-89, of the Sparta aquifer in north-central Louisiana."

**PLANS FOR 1992:** Publish data for 1991 water year. Continue operation of the ground-water data network. Consult cooperators on any relevant changes in the data network and make revisions. Continue to maintain the Ground-Water Site Inventory file by entering water levels and well schedules for wells registered with the State. Obtain Director's approval and publish Louisiana ground-water maps nos. 4 and 5 for the Jasper aquifer system and the Evangeline equivalent/southeast Louisiana aquifer system.

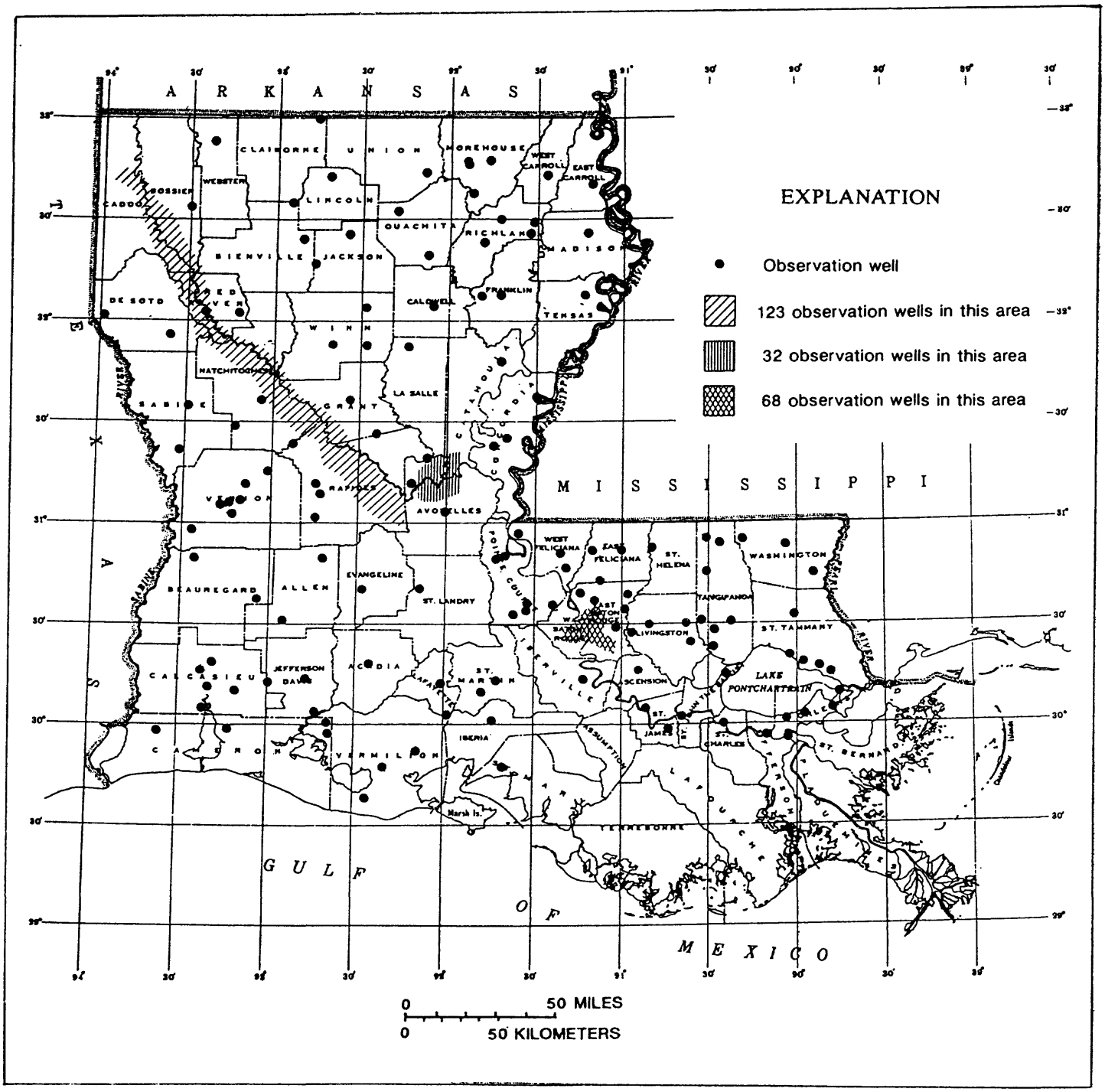



**Figure 5.--U.S. Geological Survey ground-water-level observation wells in Louisiana.**

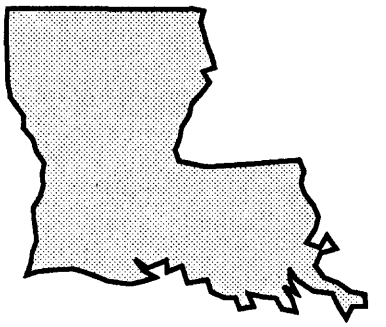
**PROJECT TITLE:** Quality-of-Water Wells and Stations

**PROJECT NUMBER:** LA00-003

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** George J. Arcement, Jr.

**PROJECT DURATION:** Continuous



**COOPERATING AGENCIES:** Capital Area Ground Water Conservation Commission; St. John the Baptist Parish; Louisiana Departments of Environmental Quality, Natural Resources, and Transportation and Development; Sabine River Compact Administration; National Park Service; and U.S. Army Corps of Engineers (New Orleans and Vicksburg Districts)

**PROBLEM:** Water-resources planning and water-quality assessment requires that the chemical, physical, and biological quality of the rivers, streams, lakes, and aquifers in the State be monitored.

**OBJECTIVE:** Provide a statewide, water-quality data base sufficient to satisfy current needs for the assessment of water resources, operation of reservoirs or industries, assimilation of wastes and implementation of pollution control techniques, calculation of water-quality loads, meeting river compact and legal requirements, and research or special studies.

**APPROACH:** Operate a water-quality network consisting of 203 wells and 38 surface-water stations (figs. 6 and 7). Water-quality data will be collected to provide chemical concentrations, loads, and time trends as required by planning and management agencies.

**PROGRESS:** Water-quality data for rivers, streams, lakes, and aquifers were compiled and published for the 1989 and 1990 water years in the annual data reports. The water-quality network was evaluated and adjusted as needed.

**PLANS FOR 1992:** Publish data for 1991 water year. Continue operation of network, review station requirements, and make any necessary adjustments to the network.

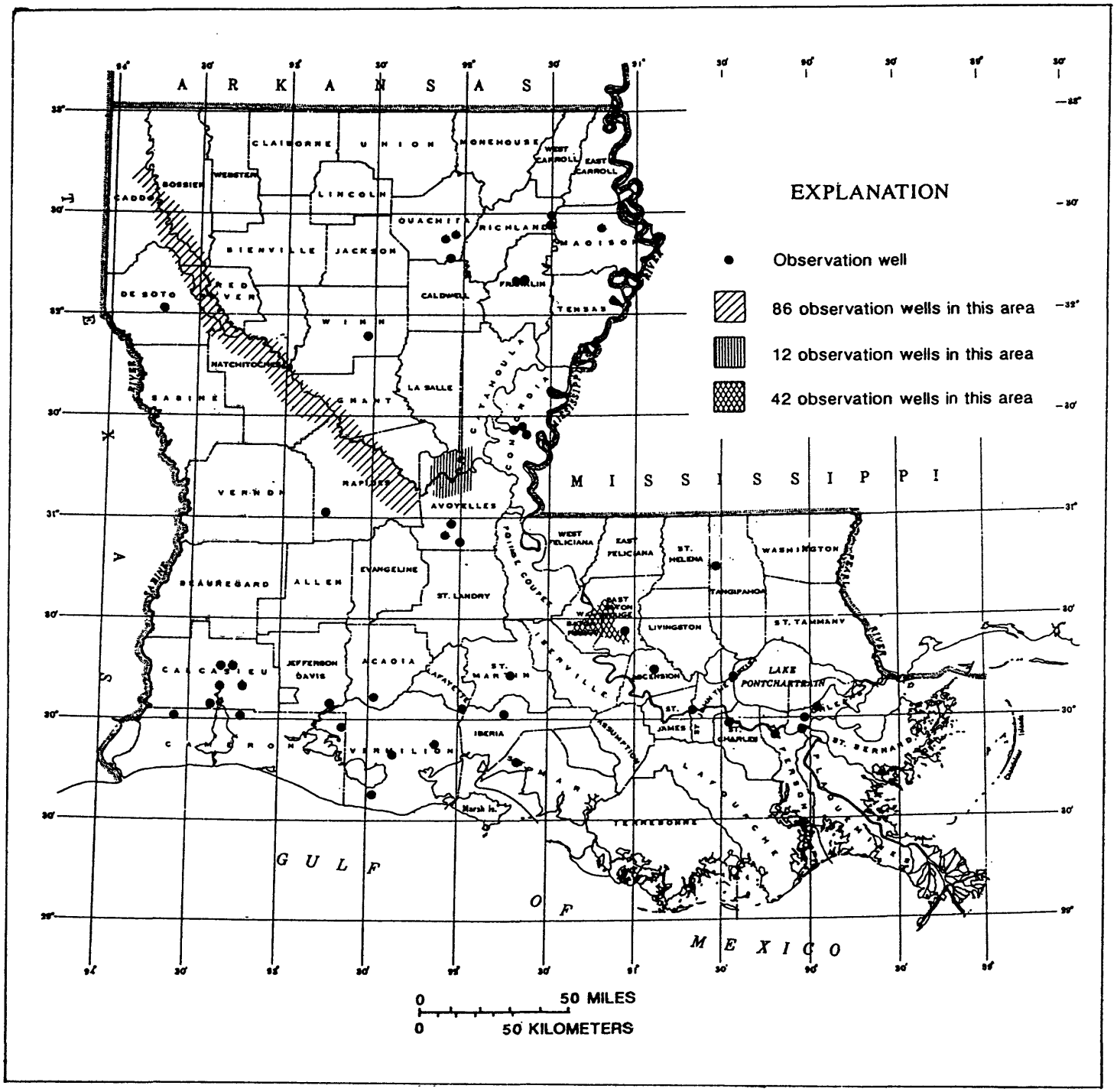



**Figure 6.--U.S. Geological Survey ground-water-quality observation wells in Louisiana.**


**Figure 7.--U.S. Geological Survey surface-water-quality stations in Louisiana.**

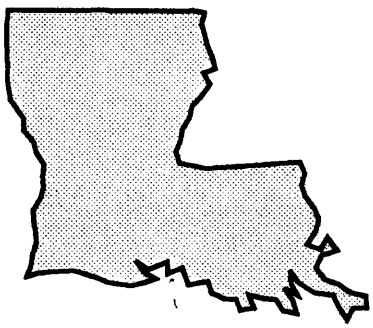
**PROJECT TITLE:** Sediment Stations

**PROJECT NUMBER:** LA00-004

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** George J. Arcement, Jr.

**PROJECT DURATION:** Continuous



**COOPERATING AGENCY:** U.S. Army Corps of Engineers (New Orleans District)

**PROBLEM:** Water-resources planning and water-quality assessment requires that the transport of suspended sediment in rivers and streams be monitored.

**OBJECTIVE:** Provide a statewide sediment data base to provide resource managers with the data needed for management of the State's water, and provide the data needed for water-quality assessment studies.

**APPROACH:** Establish and maintain a network of sediment stations to evaluate spatial and temporal variations in sediment concentrations and yields, determine trends of sediment concentrations and loads, and define the particle size of sediment being transported by rivers and streams. The locations of sediment stations operated by the USGS in Louisiana are shown in figure 8.

**PROGRESS:** Sediment samples were analyzed from 18 sites, including one site on the Mississippi River near St. Francisville. Sediment data were compiled and published for the 1989 and 1990 water years in the annual data reports. Samples were collected at 12 additional sites by the Army Corps of Engineers and analyzed by the USGS.

**PLANS FOR 1992:** Publish data for 1991 water year. Continue operation of the network, review station requirements and adjust the network as necessary. Continue operation of the District sediment laboratory.


**Figure 8.--U.S. Geological Survey sediment stations in Louisiana.**



(p. 21 follows)

# WATER-RESOURCES INTERPRETIVE INVESTIGATIONS AND RESEARCH ACTIVITIES

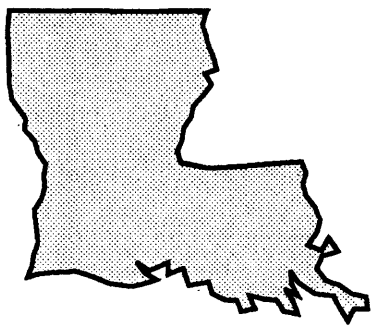
**PROJECT TITLE:** Flood Investigations

**PROJECT NUMBER:** LA75-006

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** Paul Ensminger

**PROJECT DURATION:** Continuous



**COOPERATING AGENCY:** Federal Emergency Management Agency

**PROBLEM:** The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 provide for the operation of a flood insurance program. The Federal Emergency Management Agency (FEMA) needs flood studies in selected areas to determine applicable flood insurance premium rates.

**OBJECTIVE:** Conduct the necessary hydrologic and hydraulic evaluations and studies of areas assigned by FEMA and present the results in an appropriate format.

**APPROACH:** Conduct the necessary evaluations or conduct surveys by ground or photogrammetric methods. Determine flood-discharge frequency relations using local historical information, gaging-station records, or other applicable information. Determine water-surface profiles using step-backwater models or other acceptable methods. Furnish the results in reports prepared to specifications of FEMA.

**PROGRESS:** A Limited Map Maintenance Program (LMMP) study for DeRidder, Louisiana, and Blackwater Bayou in East Baton Rouge Parish and tributaries 1 and 2 in Farmerville, Louisiana, were completed and sent to FEMA. Performed a field reconnaissance survey in the area of Leesville, Louisiana.

**PLANS FOR 1992:** Computerize cross-section data and begin step-backwater computer program estimation of 100-year flood plains for the Leesville area.

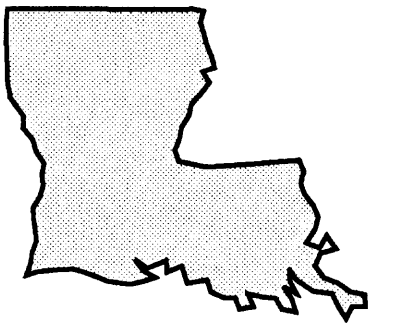
**PROJECT TITLE:** Water Use in Louisiana

**PROJECT NUMBER:** LA79-007

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** John K. Lovelace

**PROJECT DURATION:** Continuous



**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** Information on water use is essential for planners and managers to resolve problems involving resource allocations, environmental effects, energy development, and water quality. A reliable data base is needed to provide historical water-use information to enable scientists to project hydrologic effects of future water demands.

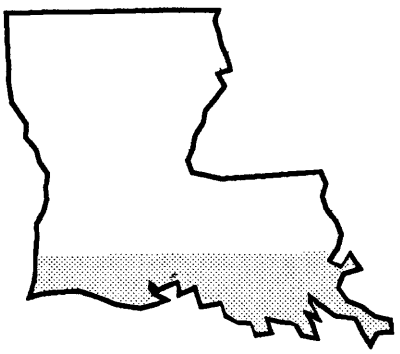
**OBJECTIVE:** Collect water-use data in a thorough, precise, and timely manner. Analyze and interpret the data for use by State officials and planners. The information collected includes the amounts of water used, the source of the water, and the amounts and locations of water returned to the hydrologic system.

**APPROACH:** A complete inventory of water withdrawals in Louisiana will be created for publication in a 5-year water-use report. Data will be collected from individual public-supply, commercial, industrial, and power generation facilities. Data for irrigation will be collected from a sample survey of farmers. Data for rural domestic, livestock, and aquaculture will be collected from county agents and appropriate local organizations. All data will be entered into the District's water-use data base.

**PROGRESS:** Water-withdrawal data were collected from about 1,600 public-supply, industrial, and power generation facilities, more than 2,000 farmers, and many Federal and local organizations and individuals throughout the State. All data have been entered into the water-use data base. The data have been organized and output both tabularly and graphically for reporting purposes. Published reports include the 1990 water-use report entitled "Water use in Louisiana, 1990" and a conference paper entitled "Water use trends for withdrawals from the lower Mississippi River in southeastern Louisiana, 1990," in the proceedings of the American Water Resources Association's 27th annual conference in 1991.

**PLANS FOR 1992:** The data collected during 1990 will be reformatted and entered into a national data base for publication in a national 5-year water-use report. Methods used to collect 1990 water-use data will be documented and specific water-use information from crawfish farmers will be collected.

**PROJECT TITLE:** Flood Characteristics of Coastal Streams in Louisiana



**PROJECT NUMBER:** LA85-088

**STUDY LOCATION:** South Louisiana, area south of Latitude $30^{o}$ $30'$

**PROJECT CHIEF:** Paul A. Ensminger and J. Josh Gilbert

**PROJECT DURATION:** October 1984 to September 1986 and October 1987 to September 1990

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** The Louisiana Department of Transportation and Development uses peak flow and stage information when designing a bridge. At ungaged sites, a bridge's hydraulic design is based upon the USGS's regional regression equations. For small watershed designs, the Soil Conservation Service discharge equations are used. These existing regression equations correlate both stage and discharge. However, at flood conditions, the USGS and Soil Conservation Service regression equations are not applicable to streams in Louisiana's coastal areas. In these areas, stage and discharge commonly are either minimally dependent or totally independent variables. Therefore, an accurate method to estimate peak stage and discharge in these areas is needed to eliminate current regression equation uncertainties.

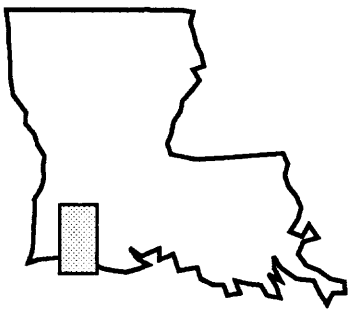
**OBJECTIVE:** Develop a method for describing flood characteristics of Louisiana's coastal streams, using gaging station records.

**APPROACH:** Develop a stage estimation technique based on stage records for the past 20 years. Statistically analyze Louisiana's coastal stage data, and generate stage frequency curves. Prepare a report summarizing findings and documenting the data used in the analysis.

**PROGRESS:** Report is being prepared for regional review.

**PLANS FOR 1992:** Obtain Director's approval.

**PROJECT TITLE:** Analysis of the Occurrence, Movement, and Fate of Selected Hazardous Substances in the Lower Calcasieu River, Louisiana



**PROJECT NUMBER:** LA85-093

**STUDY LOCATION:** Lower Calcasieu River, southwestern Louisiana

**PROJECT CHIEF:** Charles R. Demas

**PROJECT DURATION:** March 1985 to September 1992

**FUNDING SOURCE:** U.S. Geological Survey

**PROBLEM:** Information from Federal, State, and local government agencies documents the occurrence of toxic substances in the highly industrialized lower Calcasieu River. However, the processes which determine the movement and fate of these potentially hazardous substances in relation to the hydraulics of this tidal stream are not understood.

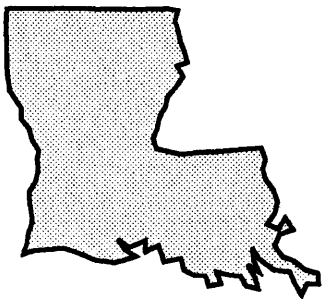
**OBJECTIVE:** Define the flow characteristics in the lower Calcasieu River such as rate and direction of movement, routing through loops within the system, and circulation patterns within the lakes bordering the channel. Determine the biological and chemical fates of selected organic compounds, nutrients, and trace metals in the industrial reach and in the transition zones between brackish and freshwater areas and the processes involved. Identify the physical characteristics such as specific conductance, temperature, and dissolved oxygen that affect the chemical and biologic processes in the lower Calcasieu River.

**APPROACH:** Document quantitatively the presence of toxic substances dissolved and suspended in water, in bottom material, and in biologic matter from the lower Calcasieu River using data from previous studies and results from reconnaissance sample collections. Determine the hydraulic and transport characteristics of the riverine system using flow and transport modeling results. Define processes that are important in determining the movement and fate of selected toxic substances in the lower Calcasieu River by: (1) sampling water, bottom material, and biologic matter over several tidal cycles, (2) determining settling and resuspension rates, (3) determining sediment-chemical size fraction relations, and (4) analyzing tissue of selected aquatic organisms. A Water-Supply Paper summarizing project work is planned.

**PROGRESS:** Report is being prepared for regional review.

**PLANS FOR 1992:** Obtain Director's approval.

**PROJECT TITLE:** Statistical Analysis of the Quality of Surface Water in Louisiana



**PROJECT NUMBER:** LA88-100

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** Kenneth J. Covay and Charles R. Garrison

**PROJECT DURATION:** October 1987 to September 1990

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** The Louisiana District has operated water-quality stations on streams and lakes since 1943. Results of the analyses are stored in the USGS computerized water-quality files and are often used to answer data requests and provide information for the management of Louisiana water resources. The data in these files constitute a large source of information on the quality of surface water in Louisiana; descriptive statistics need to be developed for these data. The development of descriptive statistics will make the data more usable for water managers, allow more complete answers to be given for data requests from the public, show the need and frequency for additional water-quality data at existing or new sites, and define problem areas where interpretive studies are needed.

**OBJECTIVE:** Statistically summarize water-quality data from about 200 quality of surface-water stations in Louisiana and present the data in such a manner that trends, overall quality, and basin-wide changes in water quality can be evaluated.

**APPROACH:** Obtain the analytical results to be compiled for this project from the USGS Water Data Storage and Retrieval System. Summarize and reduce existing records to a manageable and useful form. Use statistical programs to generate frequency tables for sites with sufficient data. Determine the maximum, minimum, mean, median, and selected percentiles for each constituent on a basin-by-basin approach, using the basins outlined in the State Water Plan of Louisiana[1]. Prepare maps and box plots to give the reader an overview of the distribution and relative abundance of selected constituents. Publish these statistical results, along with State and U.S. Environmental Protection Agency water-quality criteria, in a report. The report will contain maps, graphs, data, and tables for the nine major drainage basins.

**PROGRESS:** Report is being prepared for regional review.

**PLANS FOR 1992:** Obtain Director's approval.

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[1] Louisiana Department of Transportation and Development, Office of Public Works, 1984, The Louisiana Water Resources Study Commission's Report to the 1984 Legislature: Louisiana Department of Transportation and Development, Office of Public Works, draft, April 1984, 438 p.

**PROJECT TITLE:** High Chloride Ground Water in Selected Areas of the Mississippi River Alluvial Aquifer

**PROJECT NUMBER:** LA88-101

**STUDY LOCATION:** Franklin, Morehouse, and adjacent parishes

**PROJECT CHIEF:** Glen F. Huff

**PROJECT DURATION:** January 1988 to December 1990

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** The Mississippi River valley in northern Louisiana is one of the State's major agricultural areas for the production of cotton, soybeans, and rice. The Mississippi River alluvial aquifer supplies virtually all of the ground water used for agricultural irrigation within the valley. Recent abnormally low rainfall and an increase in withdrawals for irrigation in the valley have caused increased demands for usable water in the Mississippi River alluvial aquifer. These conditions also have been coincident with the occurrence of elevated chloride concentrations in water in previously freshwater areas within the Mississippi River alluvial aquifer.

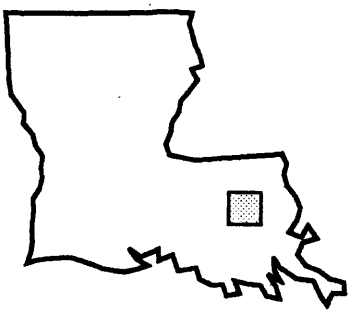
**OBJECTIVE:** Determine the areal extent of elevated chloride concentrations in water in two or three selected areas of the Mississippi River alluvial aquifer in northern Louisiana. Differentiate between possible natural and anthropogenic sources for elevated chloride concentrations in water in these areas.

**APPROACH:** Sample wells screened at or near the base of the Mississippi River alluvial aquifer (primarily irrigation wells) for a suite of inorganic constituents. Construct electrical-resistivity maps of the subsurface in selected areas to delineate the areal extent of elevated chloride concentrations in ground water. Prepare a report documenting all major findings of the study.

**PROGRESS:** Report is being prepared for regional review.

**PLANS FOR 1992:** Obtain Director's approval.

**PROJECT TITLE:** Alternative Water Supply for Jefferson Parish, Louisiana



**PROJECT NUMBER:** LA89-102

**STUDY LOCATION:** Lake Pontchartrain and surrounding parishes

**PROJECT CHIEF:** Timothy R. Rapp

**PROJECT DURATION:** October 1989 to September 1991

**COOPERATING AGENCY:** Jefferson Parish, Department of Water

**PROBLEM:** Jefferson Parish needs an alternative source of water supply besides its current supply source, the Mississippi River. Although treated Mississippi River water is, at present, suitable for domestic use, there is mounting concern about the quality of water in the river over a long term. Potential water-quality problems include chemical spills from industries along the river and from barges on the river, introduction of pesticides and herbicides into the river from agricultural runoff, and saltwater intrusion up the river from the Gulf of Mexico.

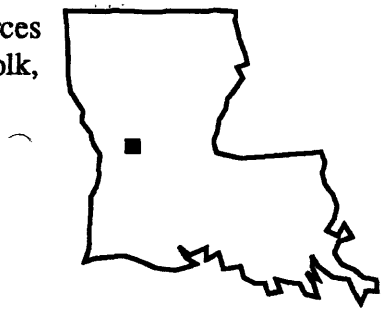
**OBJECTIVE:** Delineate the areal extent and quality of freshwater and the hydrogeology of the aquifer system adjacent to Lake Pontchartrain in St. John the Baptist and Tangipahoa Parishes. Determine the location of the east-west trending fault and the freshwater-saltwater interface and their relations. Estimate the effects of withdrawals on aquifers, such as decreased water levels, saltwater encroachment, and vertical leakage from aquifers containing brackish to salty water.

**APPROACH:** Conduct a library search and review all available data in or adjacent to the study area including seismic reflection data. Design a test hole program and drill three to five test holes to collect data on the hydrogeology of the aquifers adjacent to western Lake Pontchartrain, particularly in Tangipahoa and St. John the Baptist Parishes, to determine the number and thickness of freshwater sands in the area. Determine the location of the freshwater-saltwater interface, and sample aquifers for water quality. The report will focus on the test wells drilled in St. John the Baptist and Tangipahoa Parishes, the wells drilled, the data acquired on the aquifers, and the effect of the fault on ground-water movement.

**PROGRESS:** Report is being prepared for regional review.

**PLANS FOR 1992:** Obtain Director's approval.

**PROJECT TITLE:** Investigation of Ground-Water Resources and Potential Contamination at Fort Polk, Louisiana



**PROJECT NUMBER:** LA88-103

**STUDY LOCATION:** Fort Polk, Louisiana

**PROJECT CHIEF:** Robert B. Fendick, Jr.

**PROJECT DURATION:** October 1988 to September 1991

**COOPERATING AGENCY:** U.S. Army, Fort Polk, Louisiana

**PROBLEM:** Fort Polk, Louisiana, is the headquarters for the U.S. Army's 5th Infantry Division (mechanized). Water supply for the fort is from ground water with approximately 15 wells supplying needs at the installation. To run the division's tanks, jeeps, and other vehicles, many petroleum tanks that are above and below ground are located throughout the base. There is concern about the water levels and quality of water in the aquifers beneath the fort and the potential contamination from the petroleum storage tanks. A study is needed to monitor water levels and water quality in the aquifers at Fort Polk, Louisiana, and to determine the extent of any contamination of the surficial aquifer. To help the Army at Fort Polk better manage the ground-water resources, a data base also is needed.

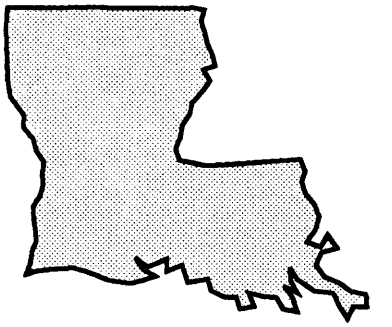
**OBJECTIVE:** Monitor water-levels in aquifers used for water supply at Fort Polk. Determine the background chemical quality of the ground water at Fort Polk. Monitor possible contamination from leaking underground storage tanks. Develop a data base for the ground-water resources at Fort Polk.

**APPROACH:** Collect, on a quarterly basis, water-level data from selected wells along with pumping data for wells supplying Fort Polk. Collect water-quality samples from selected wells and install monitor wells needed to conduct site investigations at the underground storage tank sites. Develop a computerized ground-water data file that is compatible with Fort Polk's computer system. Prepare a Water-Resources Investigations Report describing the data collection, analysis, and interpretation.

**PROGRESS:** Quarterly collection of water-level data at selected wells and pumping data from Fort Polk's wells are up to date. Installation of monitor wells at 13 underground storage sites and at one above ground site was completed. Twenty-five soil samples were collected and analyzed to determine if contamination has occurred. Data for all installed monitor wells were entered into the Ground-Water Site Inventory file as part of the data base for Fort Polk.

**PLANS FOR 1992:** Continue quarterly collection of water-level measurements at selected wells and pumping data from Fort Polk's public supply wells. Continue the installation and monitoring of wells at selected underground storage tank sites. Complete preliminary site investigations at four motor pools located at south Fort Polk and one fuel dispensing location. Install automated pumping systems at locations where free-product has been observed and begin ground-water remediation. Update and digitize monitor well information and locations.

**PROJECT TITLE:** Guide to Louisiana's Ground-Water Resources



**PROJECT NUMBER:** LA90-104

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** Benton D. McGee

**PROJECT DURATION:** October 1988 to March 1991

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** A simple, illustrative, and easy-to-read introduction to Louisiana's ground-water resources is needed to provide officials and the general public with a basic understanding of ground water in Louisiana. This publication will help the officials and citizens of Louisiana make decisions about the development and protection of ground water in the State.

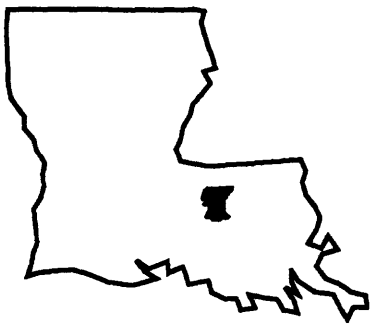
**OBJECTIVE:** Provide a layman's introduction to general ground-water hydrology. Describe Louisiana's major aquifers and aquifer systems by providing an overview of each aquifer and aquifer system, a description of the water quality, and typical use of ground water in the State. Describe potential ground-water problems, including excessive drawdowns, saltwater encroachment, and contamination.

**APPROACH:** Review existing reports and texts on general ground-water hydrology and Louisiana's ground-water resources. Contact State and other Federal agencies for additional information on ground water in the State. Use existing ground-water site-inventory, ground-water quality, and water-use computer data bases of the USGS as sources of pertinent information. Present schematics, figures, and photographs concerning hydrology and Louisiana's ground-water resources, and provide a list of other agencies involved in ground-water activities around the State.

**PROGRESS:** Report is being prepared for regional review.

**PLANS FOR 1992:** Obtain Director's approval.

**PROJECT TITLE:** Water Levels and Saltwater Movement in the Principal Aquifers of the Baton Rouge Area, Louisiana



**PROJECT NUMBER:** LA90-105

**STUDY LOCATION:** East Baton Rouge Parish

**PROJECT CHIEF:** Dan J. Tomaszewski

**PROJECT DURATION:** January 1990 to December 1992

**COOPERATING AGENCIES:** Capital Area Ground Water Conservation Commission and Louisiana Department of Transportation and Development

**PROBLEM:** Saltwater encroachment has occurred in the "600-foot" and "1,500-foot" aquifers and probably is occurring in the "2,000-foot" and "2,800-foot" aquifers of the Baton Rouge, Louisiana area. The rate and direction of saltwater movement are of concern to State and local officials and to officials of industries and public supplies that are dependent on ground water. More than 10 years have elapsed since the last evaluation of data obtained from a network of water-level and water-quality monitor wells. A new evaluation is needed to determine whether projections made in 1978 are still valid and to determine whether changes are needed in the monitoring network.

**OBJECTIVE:** Evaluate the present monitor-well network in the Baton Rouge area and assess the validity of data collected since 1978. Prepare maps showing water levels and the location of saltwater in each major aquifer. Estimate the rate and direction of saltwater movement in each aquifer and compare the results to previous estimates.

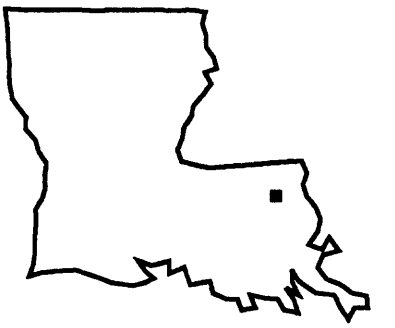
**APPROACH:** Evaluate water-level and water-quality data collected since 1978 to detect anomalies and to identify problem wells. Analyze logs of wells drilled since 1978 to aid in determining the geometry of the aquifer system and location of saltwater, and in mapping the saltwater interface in the "2,800-foot" aquifer. Measure water levels to map the potentiometric surface of each major aquifer. Evaluate the present (1990) monitoring network and perform minor maintenance work on the network wells.

Use the present (1990) position of saltwater in each aquifer, water-level gradients between the saltwater and pumping centers, and available information on the geometry of the aquifer to estimate the present rate and direction of saltwater movement. Compare these estimates to estimates made in 1978 and determine possible reasons for any discrepancies. Write a report describing findings and results.

**PROGRESS:** Analysis of data has continued and additional water-quality data have been collected. The additional data were collected in an area where preliminary sampling results indicate the direction of saltwater encroachment. Parts of the draft report have been written and many figures and tables have been completed.

**PLANS FOR 1992:** Obtain Director's approval.

**PROJECT TITLE:** Movement and Fate of Fecal Coliform Bacteria through a Shallow Ground-Water System



**PROJECT NUMBER:** LA90-106

**STUDY LOCATION:** Tangipahoa River basin, Louisiana

**PROJECT CHIEF:** Keith J. Halford

**PROJECT DURATION:** January 1990 to September 1992

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** The contribution of fecal-coliform bacteria contamination by ground-water recharge to the Tangipahoa River is not well defined. The physical processes involved in the movement of fecal-coliform bacteria through shallow ground water to a surface-water system are poorly understood.

**OBJECTIVES:** Describe the physical processes involved in the movement of fecal-coliform bacteria through a shallow ground-water system into a surface-water system. Specifically, the objectives include the following:

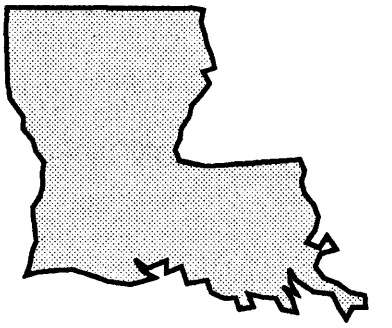
1. Determine, during the spring and fall seasons, the nature of fecal-coliform bacteria movement, including rate of travel and maximum residence time, through a shallow aquifer system typical of the Tangipahoa River basin.
2. Verify that fecal-coliform bacteria can move from the shallow ground-water system into the Tangipahoa River.
3. Determine the maximum distance that fecal-coliform bacteria could reasonably migrate through the subsurface from land surface to the river.
4. Adapt or develop equations which utilize the fecal-coliform bacteria and microsphere travel-time measurements, aquifer grain-size distributions, degree of soil saturation, and gradient to predict the nature of fecal-coliform bacteria movement in the shallow aquifer system.

**APPROACH:** Under controlled conditions, a small amount of fecal bacteria will be injected into a shallow aquifer. The movement of the bacteria and other tracers in the shallow ground-water system will be closely monitored. The physical, chemical, and bacterial environment of the shallow ground-water system will be defined prior to seeding with fecal-coliform bacteria. A report which describes, in detail, the duration of viable fecal-coliform bacteria in the shallow ground-water system for each of the seasons will be prepared.

**PROGRESS:** The report is being prepared for regional review.

**PLANS FOR 1992:** Obtain Director's approval.

**PROJECT TITLE:** Annual Water-Quality Survey of Louisiana's River Basins



**PROJECT NUMBER:** LA90-107

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** Dennis K. Demcheck

**PROJECT DURATION:** October 1989 to September 1991

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** Monitoring surface-water quality in Louisiana usually has been conducted on a fixed-site network basis. Increasingly, investigators are using a river basin approach for monitoring water quality. In this approach to water-quality monitoring, a large number of sites are located in a single basin to provide a comprehensive view of the water-quality conditions present during sampling throughout the basin. This approach has the potential to answer more water-quality questions than the fixed-site network. By examining an entire basin, one can often determine the magnitude and areal extent of a problem, rather than the presence or absence of harmful constituents at one site. This enables State and local personnel to develop an effective plan for management or mitigation of a problem.

**OBJECTIVE:** Gather water-quality information to determine the occurrence, areal extent, and magnitude of water-quality constituents in a basin.

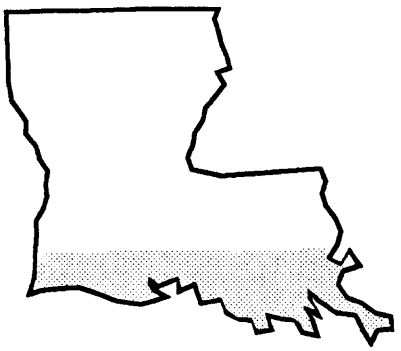
**APPROACH:** Project design will stress the importance of sample collection, analysis, and publication on a timely basis. One basin will be intensively sampled for physical, chemical, and biological constituents for a week during adverse conditions. This would be during an extended period of low-flow and high-water temperatures, usually July through September for most basins. In a few basins, the adverse conditions may occur during the spring, when a combination of agricultural pesticides application and storm run-off from fields may worsen the water quality. For some studies, additional sampling and analysis may be required to verify significant findings.

Physical properties and chemical constituents will be determined. Temperature, pH, dissolved oxygen, and specific conductance will be measured at least 1 week before, during, and 1 week after the sampling period. This will be done by portable in situ water-quality monitors. Discharge measurements will be made to provide information for flow conditions during sampling and for load calculations. Water, suspended sediment, and bottom-material samples will be analyzed for major inorganic ions, nutrients, minor elements, pesticides, and synthetic organic compounds. Water samples will be tested for the presence of fecal and pathogenic bacteria. Biota such as fish or shellfish will be tested for concentrations of minor elements and synthetic organic compounds.

**PROGRESS:** The report for the Barataria basin study was published. The report for the Mermentau River basin is being prepared for regional review.

**PLANS FOR 1992:** Obtain the Director's approval.

**PROJECT TITLE:** Assessment of Potential Trace Elements in Coastal Louisiana Streams



**PROJECT NUMBER:** LA91-109

**STUDY LOCATION:** Coastal Louisiana

**PROJECT CHIEF:** Benton D. McGee

**PROJECT DURATION:** January 1991 to March 1993

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** Current trace-element data for bottom material, needed for assessment of coastal Louisiana streams, are not available. The data that are available lack key physical and chemical analyses that are crucial in identifying anthropogenic origins of these elements in the aquatic environment. Based on the results from a previous study, accurate data on the physical properties and chemical composition of bed sediments from this region, used in conjunction with sediment-trace element predictive models, can be used to identify sites with elevated concentrations of trace elements. The State needs to locate these sites for further evaluation and for potential remediation.

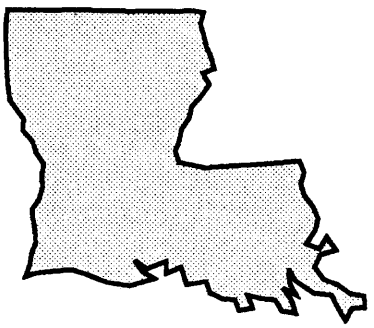
**OBJECTIVE:** Identify trace-element concentrations in bottom material from several organic-rich coastal Louisiana streams. Identify the physical and chemical factors that affect the distribution of these trace elements in the aquatic environment. Evaluate current nationwide or local (Mermentau River basin models) sediment-trace element predictive models to identify potentially impacted sites and (or) sites with elevated trace elements concentrations for further evaluation.

**APPROACH:** Bottom-material samples will be collected from six coastal Louisiana streams at several sites within each river basin. Multiple sites sampled within a basin will provide the necessary data to establish baseline trace element concentrations. Samples will be shipped frozen to Atlanta, Georgia, for analysis of trace elements, physical descriptors (such as grain-size distribution, loss-on-ignition, total organic carbon, and surface area), and chemical factors (such as iron and manganese oxides), characterization of clay particles, and generation of the multiple linear regression models. Predicted trace-element concentrations (generated by the models) will be compared to actual trace-element concentrations by locations within each basin. Land use within the basin will be described. Data also will be compared to and used to supplement the national data base.

**PROGRESS:** Phase I river sediment samples have been collected and have been sent for analysis.

**PLANS FOR 1992:** Collect remaining sediment samples and perform analysis. Receive analyses and interpret results.

**PROJECT TITLE:** Geographic Information System for Louisiana's Ground-Water Information



**PROJECT NUMBER:** LA91-110

**STUDY LOCATION:** State of Louisiana

**PROJECT CHIEF:** J. Josh Gilbert

**PROJECT DURATION:** January 1991 to September 1993

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** Increased number of wells, increased amounts of information on each well, and more extensive requests for information contained within the ground-water data bases, especially the geographic orientation and position of various points of information, have contributed to difficulties in accessing information. An improved and more comprehensive geographic data base is needed to aid the Louisiana Department of Transportation and Development (DOTD) in meeting its mission of developing and managing Louisiana's ground-water resources.

**OBJECTIVE:** Create easy-to-use ground-water data bases that also can be used for graphically viewing results in map form. Investigate the inclusion of other related data such as land use, soil type, and waste-site locations in the data bases. Explore and incorporate visual representations of well-log data.

**APPROACH:** An interface for accessing Geographic Information System (GIS) coverages will be created using ARC/INFO[1]. Basic digital cartographic data will be obtained from the National Mapping Division. Additional coverages will be created from specific DOTD and USGS data bases. The digitizing of map products to create coverages is not a planned activity. Data bases from other agencies will be used to build coverages if the information is available in an appropriate machine-readable format.

**PROGRESS:** 1:100,000 scale coverages of transportation, hydrography, political boundaries and limited hypsography have been translated for statewide coverage in ARC/INFO. Point coverages of hazardous-waste sites and public-supply wells have been completed with basic query options in the main menu. Main menu for cover selection and query is complete and sub-menus for detailed query are being developed. Water-use coverage by parish is being developed. Routines for hydrograph display from within the menu environment are being developed.

**PLANS FOR 1992:** Refine query, mapping, and error trapping routines in the menu shell. Attempt to incorporate digital well-log information. Add digital cartographic data for use as background coverages.

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[1]Any use of product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

**PROJECT TITLE:** Bridge Scour Analysis of Louisiana Department of Transportation and Development Bridges on the Red River in Louisiana

**PROJECT NUMBER:** LA91-112

**STUDY LOCATION:** Northwestern Louisiana

**PROJECT CHIEF:** Paul A. Ensminger

**PROJECT DURATION:** April 1991 to March 1992

**COOPERATING AGENCY:** Louisiana Department of Transportation and Development

**PROBLEM:** The Federal Highway Administration has established a requirement that all State highway agencies evaluate the bridges of the Federal aid system for scour susceptibility.

**OBJECTIVES:** Evaluate scour at bridges of the Louisiana Department of Transportation and Development on the Red River in Louisiana. Collect, analyze, and present associated hydrologic data for the Red River.

**APPROACH:** Hydrologic and geomorphological data for the Red River in Louisiana will be assembled using existing publications. Hydrologic characteristics will be determined using available data from the USGS and U.S. Army Corps of Engineers. Discharge relations and corresponding flood stages will be computed. Water-surface profiles for the 100- and 500-year discharge ($Q_{100}$ and $Q_{500}$) will be developed. Determine potential scour at various sites as described in Hydraulic Engineering Circular nos. 18 and 20.

**PROGRESS:** All available data were formatted and entered into computer files for statistical analysis. Geographic Information System (GIS) coverage showing plan and profile views of the Red River, major tributaries, bridge study sites, gaging stations and major cities were prepared. A discharge frequency analysis was performed for each site to determine the $Q_{10}$, $Q_{50}$, $Q_{100}$, $Q_{500}$. The discharge-skew relation was investigated. The $Q_{100}$ and $Q_{500}$ profiles for reaches of the river between major tributaries were plotted. Blue prints of the bridge which contain coring information of the bed material were obtained. Each site was visited and a bridge cross-section photograph obtained.

**PLANS FOR 1992:** Evaluate existing hydrologic data and determine $Q_{100}$ and $Q_{500}$ at each bridge site. Begin scour analysis for each site.

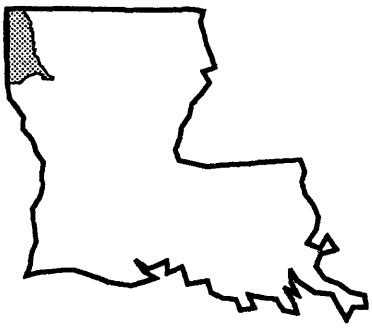
**PROJECT TITLE:** Ground-Water Resources of Caddo Parish

**PROJECT NUMBER:** LA91-113

**STUDY LOCATION:** Caddo Parish

**PROJECT CHIEF:** Timothy R. Rapp

**PROJECT DURATION:** October 1991 to March 1994



**COOPERATING AGENCIES:** Caddo Parish and Louisiana Department of Transportation and Development

**PROBLEM:** Fresh ground water is available throughout most of Caddo Parish, but supply from the Carrizo-Wilcox aquifer is limited. As Caddo Parish has become more urbanized in recent years, increased pumping from the Carrizo-Wilcox aquifer has resulted in increased management of the parish water supply system to offset the effects of water-level declines. The other two aquifers (Red River alluvial and terrace aquifers) that underlie the parish have limited development potential for public supply due to the insufficient thickness of these aquifers, limited areal extent, and variable water quality.

**OBJECTIVE:** Define the hydrology and water quality of the principal freshwater aquifers of Caddo Parish.

**APPROACH:** All existing data pertaining to the ground-water resources of Caddo Parish, particularly the Carrizo-Wilcox aquifer because of the areal extent and heavy usage of the aquifer in Caddo Parish, will be researched. A reconnaissance study of the area to aid in locating and scheduling wells in areas where water-level and water-quality data are needed will be conducted. The aquifer throughout the parish will be correlated, and will show correlation in hydrogeologic column and sections. The areal extent and thickness of the water-bearing sand in the aquifer will be mapped. Water-level data to construct potentiometric surface maps of the Carrizo-Wilcox and Red River alluvial aquifers will be used. Present and historical water-level data will be compared to determine trends. Aquifer-test data to estimate aquifer properties such as transmissivity and hydraulic conductivity will be evaluated, and these estimates will be used to help predict aquifer response to water withdrawals from wells. The water-quality data to determine water types and chemical characteristics of the ground water will be analyzed.

**PROGRESS:** Permission was obtained from land owners and municipal water suppliers to sample for water quality and measure water levels. Water-quality and water-level data were collected. District Chief's approval of report outline was obtained.

**PLANS FOR 1992:** Analyze water-quality and water-level data. Begin writing parts of the report.

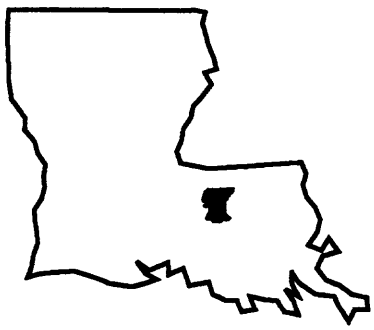
**PROJECT TITLE:** Urban Hydrology, East Baton Rouge Parish

**PROJECT NUMBER:** LA91-114

**STUDY LOCATION:** East Baton Rouge Parish

**PROJECT CHIEF:** Kurt Johnson

**PROJECT DURATION:** January 1992 to May 1994



**COOPERATING AGENCY:** East Baton Rouge Parish

**PROBLEM:** Baton Rouge is a large urban center and, as in any metropolitan area, municipal storm-sewer systems have been installed to provide drainage for developed areas. Although discharges from storm sewers often have lower concentrations of many pollutants than discharges of industrial and municipal point sources, they still have significant effects on water quality.

**OBJECTIVE:** Determine water quality of urban runoff in East Baton Rouge Parish.

**APPROACH:** The characterization of storm-water runoff will be accomplished by monitoring the quantity of precipitation and the quantity and quality of runoff at five selected sites with representative land use throughout Baton Rouge, for a period of 1 year (six storm events, occurring in different seasons of the year). These data will be required by Part II of the Environmental Protection Agency storm-water permit application (U.S. Environmental Protection Agency, 1990, p. 48045-48058). Use discharge and chemical data to compute storm-runoff volumes, constituent loads, and constituent mean concentrations for each sampled storm from each site.

**PROGRESS:** New project.

**PLANS FOR 1992:** Dry-weather data will be collected. Shelters for data-collection equipment will be constructed. Regional approval of proposal to collect wet-weather data will be obtained.

# SOURCES OF U.S. GEOLOGICAL SURVEY PUBLICATIONS

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Other water-resources publications prepared by the U.S. Geological Survey and published by cooperators are listed below:

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U.S. Geological Survey Public Inquiries Office (PIO) provides general information about the Geological Survey's programs and publications, and sells maps of local and general interest. For additional information, write to:

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# PUBLICATIONS OF THE LOUISIANA DISTRICT

## Reports

Most publications of the Louisiana District are listed in the following reference:

**Adams, P.A., 1989, Water resources publications of the Louisiana District of the U.S. Geological Survey, 1904-89: Louisiana Department of Transportation and Development Water Resources Special Report no. 5, 104 p.**

The publications are cross referenced by parishes and multiparishes (geographic area), discipline (ground water, surface water, quality of water, or multidiscipline), publication series, and author. Reports published later than the above reference are listed in this report alphabetically by author. Abstracts are included for the most recently published reports. The following reports were published recently in a U.S. Geological Survey series or a Louisiana Department of Transportation and Development series:

Arcement, G.J., Dantin, L.J., Garrison, C.R., and Lovelace, W.M., 1991, Water Resources Data-Louisiana, water year 1990: U.S. Geological Survey Water-Data Report LA-90-1, 419 p.

Arcement, G.J., Dantin, L.J., Garrison, C.R., and Stuart, C.G., 1990, Water Resources Data-Louisiana, water year 1989: U.S. Geological Survey Water-Data Report LA-89-1, 395 p.

Covay, K.J., Sturrock, A.M., Jr., and Sasser, D.C., 1992, Water requirements for growing rice in southwestern Louisiana, 1985-86: U.S. Geological Survey Technical Report no. 52, 14 p.

Demcheck, D.K., 1991, Louisiana hydrologic atlas map no. 6: Water-quality survey of the Barataria basin, 1988: U.S. Geological Survey Water-Resources Investigations Report 90-4170, 2 map sheets.

Demcheck, D.K., Demas, C.R., and Curwick, P.B., 1990, Plan of study for selected toxic substances in the Calcasieu River, Louisiana: U.S. Geological Survey Open-File Report 90-148, 29 p.

Demcheck, D.K., Demas, C.R., and Garrison, C.R., 1990, Chemical, tissue, and physical data from water and bottom material in the lower Calcasieu River, Louisiana, 1985-88: U.S. Geological Survey Open-File Report 89-420, 281 p.

Farrar, L.F., compiler, 1991, Water-resources activities of the Louisiana District, 1988-89: U.S. Geological Survey Open-File Report 91-201, 38 p.

Kuniansky, E.L., 1989, Geohydrology and simulation of ground-water flow in the "400-foot," "600-foot," and adjacent aquifers, Baton Rouge area, Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 49, 90 p.

Kuniansky, E.L., Dial, D.C., and Trudeau, D.A., 1989, Maps of the "400-foot," "600-foot," and adjacent aquifers and confining beds, Baton Rouge area, Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 48, 16 p.

Lovelace, J.K., 1991, Water use in Louisiana, 1990: Louisiana Department of Transportation and Development Water Resources Special Report no. 6, 131 p.

Martin, Angel, Jr., and Whiteman, C.D., Jr., 1990, Calibration and sensitivity analysis of a ground-water flow model of the coastal lowlands aquifer system in parts of Louisiana, Mississippi, Alabama, and Florida: U.S. Geological Survey Water-Resources Investigations Report 89-4189, 54 p.

----- 1991, Hydrology of the coastal lowlands aquifer system in parts of Alabama, Florida, Louisiana, and Mississippi: U.S. Geological Survey Open-File Report 91-72, 115 p.

McWreath, H.C., III, Nelson, J.D., and Fitzpatrick, D.J., 1991, Simulated response to pumping stresses in the Sparta aquifer, northern Louisiana and southern Arkansas: Louisiana Department of Transportation and Development Water Resources Technical Report no. 51, 51 p.

Nyman, D.J., Halford, K.J., and Martin, Angel, Jr., 1990, Geohydrology and simulation of flow in the Chicot aquifer system of southwestern Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 50, 58 p.

Smoot, C.W., and Martin, Angel, Jr., 1991, Generalized potentiometric surfaces of the Red River alluvial aquifer, pool 1, Red River waterway area, central Louisiana: U.S. Geological Survey Water-Resources Investigations Report 91-4109, 7 map sheets.

Smoot, C.W., and Seanor, R.C., 1991, Louisiana ground-water map no. 3: Potentiometric surface, 1989, and water-level changes, 1980-89, of the Sparta aquifer in north-central Louisiana: U.S. Geological Survey Water-Resources Investigations Report 90-4183, 2 map sheets.

----- 1992 [in press], Louisiana ground-water map no. 4: Potentiometric surface, 1989, and water-level changes, 1984-89, of the Jasper aquifer system in west-central Louisiana: U.S. Geological Survey Water-Resources Investigations Report 91-4137, 2 map sheets.

Stuart, C.G., and Demas, C.R., 1990, Organic chemical analyses of ground water in Louisiana, water years 1984-88: Louisiana Department of Transportation and Development Water Resources Basic Records Report no. 18, 80 p.

Walters, D.J., 1992 [in press], Louisiana ground-water map no. 5: Potentiometric surface, 1990, and water-level changes, 1974-90, of the Evangeline equivalent/southeast Louisiana aquifer system: U.S. Geological Survey Water-Resources Investigations Report 92-4112, 2 map sheets.

## Symposium Proceedings

The following symposium proceeding was published recently:

Lovelace, J.K., 1991, Water use trends for withdrawals from the lower Mississippi River in southeastern Louisiana, 1990, *in* Dhamotharan, Dhamo, McWreath, H.C., and Johnson, A.I., eds., 27th Annual Conference, *in* "Water Management of River Systems" and Symposium "Resource Development of the Lower Mississippi River," New Orleans, Louisiana, September 8-13, 1991: American Water Resources Association Technical Publication series TPS-91-3, p. 205-213.



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# SELECTED ABSTRACTS OF RECENT PUBLICATIONS OF THE LOUISIANA DISTRICT

# LOUISIANA HYDROLOGIC ATLAS MAP NO. 6: WATER-QUALITY SURVEY OF THE BARATARIA BASIN, 1988

*By Dennis K. Demcheck*

## ABSTRACT

An intensive survey of the Barataria basin, Louisiana, was conducted from August 26 to September 2, 1988. The survey documented the concentrations of selected water-quality constituents at 16 sites in the basin during a period of high temperatures and low freshwater inflow.

Nutrients data indicate that organic enrichment in the northwestern parts of the study area is occurring. With the exception of the Harvey Canal, in which detectable concentrations of mercury were detected in bottom material, trace element contamination is not a problem in the study area.

Comparisons with historical data indicate that, with regard to pesticides, the water quality in the basin has improved in the last 10 years. Although DDT and its breakdown products were routinely detected in bottom material in this area in the late 1970's, they were not detected during this survey.

Twelve synthetic organic compounds were detected in the study area, but concentrations of these compounds were near the lowest level of detection. Analyses of oyster tissue from the north end of Barataria Bay indicated no contamination by either trace elements such as lead, chromium, and mercury or synthetic organic compounds.

The fecal-coliform bacteria concentrations indicate that human sewage inputs may be adversely affecting the water quality in the northern part of the study area. Test for enteric pathogenic bacteria at nine sites did not indicate widespread hazardous pathogens.

# PLAN OF STUDY FOR SELECTED TOXIC SUBSTANCES IN THE CALCASIEU RIVER, LOUISIANA

*By Dennis K. Demcheck, Charles R. Demas, and Phillip B. Curwick*

## ABSTRACT

In 1984 the U.S. Geological Survey established the Toxic Substances Hydrology, Surface-Water Contamination Program. As part of this program, an investigation of the lower Calcasieu River began in 1985 to define the magnitude, distribution, and fate of selected toxic substances in the Calcasieu River.

This report documents the plan of study used to design and implement the investigation of the Calcasieu River. The principal steps were: (1) Developing a preliminary plan of study; (2) modifying the plan of study based on the reconnaissance results; and (3) determining the methods to be used to communicate the results.

The preliminary plan of study was developed by: (1) Formulating the overall objectives and approach; (2) reviewing literature on studies of the basin and pertinent toxic substances; (3) documenting the hydrologic setting of the basin; (4) designing and conducting a preliminary reconnaissance sampling program that would provide a basis for modification of the work plan; and (5) determining appropriate dissemination of results of the study.

Preliminary results were used to select for intensive study the following substances in water, bottom material, and biota: ammonia, nitrite plus nitrate, chromium, iron, mercury, bromoform, chloroform, 1,2-dichloroethane, hexachlorobenzene, hexachlorobutadiene, naphthalene, octachloronaphthalene, benzopyrene, and benzoperylene.

# CHEMICAL, TISSUE, AND PHYSICAL DATA FROM WATER AND BOTTOM MATERIAL IN THE LOWER CALCASIEU RIVER, LOUISIANA

*By Dennis K. Demcheck, Charles R. Demas, and Charles R. Garrison*

## ABSTRACT

Field and laboratory methodologies used by the U.S. Geological Survey, Louisiana District, during studies to determine the movement and fate of selected chemicals in the lower Calcasieu River are described. All data collected during the studies from 1985 to 1988 are presented. Data presented include: daily velocities, temperatures, and specific conductances; suspended-sediment concentrations and bottom-material grain-size distributions; concentrations of major inorganic chemical constituents and physical properties in water; trace metal concentrations in water and bottom material; concentrations of volatile organic and methylene chloride-extractable organic compounds in water, bottom material, and tissue; concentrations of insecticides in bottom material; radioactivity levels of lead-210 and cesium-137 in bottom material; and radioactivity levels of radon-222 in water and bottom material.

# WATER USE IN LOUISIANA, 1990

*By John K. Lovelace*

## ABSTRACT

In 1990, approximately 9,100 Mgal/d (million gallons per day) of water was withdrawn from ground- and surface-water sources in Louisiana. Total ground-water withdrawals were 1,300 Mgal/d, and total surface-water withdrawals were 7,800 Mgal/d. From 1985 to 1990, ground-water withdrawals in Louisiana decreased by 6.9 percent, and surface-water withdrawals decreased by 13 percent. Total water withdrawals in Louisiana decreased by 12 percent from 1985 to 1990.

Total water withdrawals for categories of use were as follows: public supply, 630 Mgal/d; industry, 2,400 Mgal/d; power generation, 4,700 Mgal/d; rural domestic, 50 Mgal/d; livestock, 8.9 Mgal/d; rice irrigation, 650 Mgal/d; general irrigation, 62 Mgal/d; and aquaculture, 540 Mgal/d.

Forty-five percent (610 Mgal/d) of all ground water withdrawn was from the Chicot aquifer system. Another 21 percent (280 Mgal/d) was withdrawn from the Mississippi River alluvial aquifer. Seventy-two percent (5,600 Mgal/d) of all surface water withdrawn was from the Mississippi River.

# CALIBRATION AND SENSITIVITY ANALYSIS OF A GROUND-WATER FLOW MODEL OF THE COASTAL LOWLANDS AQUIFER SYSTEM IN PARTS OF LOUISIANA, MISSISSIPPI, ALABAMA, AND FLORIDA

*By Angel Martin, Jr., and Charles D. Whiteman, Jr.*

## ABSTRACT

A six-layer, finite-difference, ground-water flow model was developed to quantify flow in the coastal lowlands aquifer system of Louisiana, Mississippi, Alabama, and Florida. The model was calibrated under steady-state and transient conditions by trial-and-error and a statistical optimization program by varying values of transmissivity of the aquifers, vertical leakances between the aquifers, and storage coefficients of the aquifer system. Calibration was quantitatively evaluated by calculation of the residuals between simulated and measured water levels. Results show that the model is best calibrated in the upper model layer representing the youngest section of the aquifer system. Analyses show that the model is generally more sensitive to reductions of transmissivity and vertical leakance than to increases in these parameters. The model was relatively insensitive to changes in storage coefficient over a wide range of values.

# HYDROLOGY OF THE COASTAL LOWLANDS AQUIFER SYSTEM IN PARTS OF ALABAMA, FLORIDA, LOUISIANA, AND MISSISSIPPI

*By Angel Martin, Jr., and Charles D. Whiteman, Jr.*

## ABSTRACT

Regional ground-water flow in the coastal lowlands aquifer system has been quantitatively investigated and described with the use of a finite-difference ground-water flow model. The coastal lowlands aquifer system comprises aquifers of Oligocene age and younger in the coastal plain and Mississippi embayment parts of Louisiana, Mississippi, Alabama, and Florida. The aquifer system consists of alternating discontinuous beds of gravel, sand, silt, and clay. Regional ground-water flow under predevelopment conditions was primarily from recharge areas in southwestern Mississippi and central and southeastern Louisiana to discharge areas in lowlands along the coast and in the major river valleys.

Pumpage has increased recharge to the aquifer system, decreased natural discharge, and distorted flow patterns in the vicinity of pumping centers. Simulations of ground-water flow indicate that the aquifer system was near steady state in 1987, so pumpage could be continued indefinitely at the 1983-87 rate of about 1,600 million gallons per day. Increasing the pumping rate by 50 percent would increase drawdown by as much as 80 feet at major pumping centers but would have little adverse effect over most of the area. The upper part of the aquifer system generally is more favorable than the lower part for future development.

# SIMULATED RESPONSE TO PUMPING STRESSES IN THE SPARTA AQUIFER, NORTHERN LOUISIANA AND SOUTHERN ARKANSAS

*By Harry C. McWreath, III, James D. Nelson, and Daniel J. Fitzpatrick*

## ABSTRACT

A ground-water flow model was developed to evaluate the flow characteristics of recharge, discharge, and leakage, and the effects of pumping stresses on water levels in the Sparta aquifer in northern Louisiana and southern Arkansas. Both steady state and transient (1898 to 1970 and 1970 to 1985) simulations were performed to calibrate the model. Model results indicated that the total amount of water flowing through the Sparta aquifer has increased from 20.4 to 38.6 $Mft^3/d$ (million cubic feet per day) since predevelopment. Effective recharge into the Sparta aquifer has increased by about four times. The direction of flow of water from the Sparta aquifer to overlying aquifers has reversed from a net rate of 7.2 to -14.4 $Mft^3/d$. Withdrawals from the aquifer have resulted in drawdowns in potentiometric levels of more than 280 feet at several large pumping centers.

Three pumping conditions were selected to simulate the effects of pumping stresses from 1985 to 2005. In the first simulation, in which pumping rates were held constant at the 1985 rate, water levels remained virtually unchanged. Results from two other simulations indicate that pumping rates between 25 and 50 percent greater than 1985 pumping rates may cause water levels to drop below the tops of the producing sand beds in El Dorado and Magnolia, Arkansas.

# GEOHYDROLOGY AND SIMULATION OF FLOW IN THE CHICOT AQUIFER SYSTEM OF SOUTHWESTERN LOUISIANA

*By Dale J. Nyman, Keith J. Halford, and Angel Martin, Jr.*

## ABSTRACT

The Chicot aquifer system is the principal source of ground water for southwestern Louisiana and contains the most heavily pumped aquifers in the State. The aquifer system consists of a complex of alternating beds of unconsolidated sand, gravel, silt, and clay.

Under predevelopment conditions, ground-water flow was primarily from recharge areas where the aquifers outcrop in southern Vernon and Rapides Parishes and in northern Beauregard, Allen, and Evangeline Parishes to discharge areas southward along the coast and eastward toward the Atchafalaya River. Development has reversed the direction of flow in aquifers near Lake Charles and the rice-growing area.

A five-layer, finite-difference, digital ground-water flow model was developed to simulate flow in the Chicot aquifer system under predevelopment and current conditions and to estimate the effects of future pumping. The model was calibrated by matching 1980 conditions treated as steady state and by matching transient conditions from the start of development to 1981. In the calibrated model, water levels generally compared closely with observed levels. The model is least sensitive to changes in aquifer storage and most sensitive to changes in the transmissivity of the aquifers.

The model simulations indicate that vertical leakage is the largest component of recharge to the aquifer system under 1981 conditions and that pumpage rates of about 2 billion gallons per day, twice the 1980 rate, can be maintained indefinitely with the recharge available to the aquifer system. Although the aquifer system can support higher pumping rates, saltwater encroachment may occur in the aquifers along the coast. Dewatering of the upper part of the Chicot aquifer system in certain areas is possible if pumpage rates increase by more than 50 percent of the 1980 rate.

# GENERALIZED POTENTIOMETRIC SURFACES OF THE RED RIVER ALLUVIAL AQUIFER, POOL 1, RED RIVER WATERWAY AREA, CENTRAL LOUISIANA

*By Charles W. Smoot and Angel Martin, Jr.*

## ABSTRACT

Lock and Dam 1, completed in November 1984, on the Red River near Vick, Louisiana, has had the greatest effect on river stages and on water levels in the Red River alluvial aquifer under low-flow conditions. Postconstruction water levels in the alluvial aquifer are as much as 15 feet higher near the structure than under similar flow conditions before construction. The effects of the structure on water levels decrease upstream and with increasing distance from the river but are still detectable as much as 31 miles upstream near Poland, Louisiana. Throughout most of the area ground-water gradients and flow directions have been affected only slightly by the structure, but just upstream from the structure gradients have been reversed and water now moves out of the river to the aquifer, flows in the aquifer (downstream past the structure), and then discharges back to the river.

The effects of the structure on water levels in the Red River alluvial aquifer are relatively slight under high-flow conditions. Water levels in the alluvial aquifer range from almost unchanged near the structure to about 3 feet higher after construction near Echo, Louisiana, almost 23 miles up river. Comparison of average measured postconstruction water levels with water levels predicted by a digital ground-water model shows less than 4 feet of difference over most of the area near the structure with a maximum difference of about 10 feet in a small area west of the structure.

# LOUISIANA GROUND-WATER MAP NO. 3: POTENTIOMETRIC SURFACE, 1989, AND WATER-LEVEL CHANGES, 1980-89, OF THE SPARTA AQUIFER IN NORTH-CENTRAL LOUISIANA

*By Charles W. Smoot and Ronald C. Seanor*

## ABSTRACT

Generalized contours of the altitude of water levels and changes of water levels in the Sparta aquifer in north-central Louisiana are shown on two maps. During May through June 1989, the altitudes of water levels in the Sparta aquifer ranged from about 160 feet below sea level in an industrial area in West Monroe, Ouachita Parish, to more than 200 feet above sea level in the recharge area. Water-level changes ranged from a 20-foot decline to a 40-foot recovery, 1980-89.

Over 60 million gallons per day of water were pumped from the Sparta aquifer in 1985. Ground-water flow generally is easterly toward the Mississippi River alluvial valley. However, heavy pumpage at West Monroe in Ouachita Parish and in southern Arkansas north of the study area has altered the direction of flow. Pumpage is less in Jackson and Bienville Parishes near Hodge, in Lincoln Parish at Ruston, in Winn Parish at Winnfield, and in Webster Parish at Minden has caused minor changes in the direction of flow.

Wells at Bastrop show that for the period 1922-65 the water level in the aquifer declined 190 feet, and for the period 1965-82 no decline occurred. During the period 1982-90, the water level has risen 40 feet, as a result of reduced pumpage.

# ORGANIC CHEMICAL ANALYSES OF GROUND WATER IN LOUISIANA, WATER YEARS 1984-88

*By Christie G. Stuart and Charles R. Demas*

## ABSTRACT

This report presents, in tables, synthetic organic chemical data collected by the U.S. Geological Survey, in cooperation with the Louisiana Department of Transportation and Development and the Louisiana Department of Environmental Quality, during water years 1984-88. The report describes the frequency of data collection, lists water well descriptions and locations, and identifies the aquifers sampled. A table containing the names of the synthetic organic compounds that were analyzed in the ground-water samples, as well as the U.S. Environmental Protection Agency's drinking water maximum contaminant levels for pesticides and other synthetic organic compounds, also is included.

Eleven aquifers and aquifer systems were sampled for the presence of organic compounds in water. Ninety-three water samples from 65 wells throughout the State were collected and analyzed during water years 1984-88.

In general, water quality is good in the aquifers sampled, as indicated by the lack of detection of pesticides, arochlors (PCBs), semivolatile organic compounds, and volatile organic compounds at most of the wells sampled. Only 39 of the approximately 8,900 individual analyses were at or above detection limits. The 20 organic compounds identified from the 39 analyses that were at or above detection limits were in the following classes: 7 pesticides, 3 semivolatile organic compounds, and 10 volatile organic compounds. No arochlors were detected in ground-water samples during water years 1984-88. The organic compounds were detected in 15 of the 65 water wells sampled and were below drinking water maximum contaminant levels listed by the U.S. Environmental Protection Agency.



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