WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN ARKANSAS--Fiscal Years 1982 and 1983

Bobbie L. Louthian

U.S. GEOLOGICAL SURVEY

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UNITED STATES DEPARTMENT OF THE INTERIOR

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CONTENTS

ILLUSTRATIONS

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN ARKANSAS--Fiscal Years 1982 and 1983

Compiled by Bobbie L. Louthian

INTRODUCTION

Water-resources investigations of the U.S. Geological Survey in Arkansas consist of collecting water-resources data and conducting interpretive hydrologic investigations. The water-resources data and the results of the investigations are published or released by either the U.S. Geological Survey or by cooperating agencies. This report describes the water-resources investigations in Arkansas for the 1982 and 1983 fiscal years (October 1, 1981, through September 30, 1983).

The U.S. Geological Survey's investigations of the water resources of Arkansas are under the direction of the District Chief. The Arkansas District office is divided into three sections. They are (1) Administrative Services Section, (2) Hydrologic Investigations Section and, (3) Hydrologic Surveillance Section which includes the Field Service Unit which maintains a water-quality laboratory for the Arkanas District.

The Arkansas District office is in Room 2301 Federal Office Building, Little Rock, Arkansas. The Arkansas District has a Field Headquarters office in Fort Smith, Arkansas.

COOPERATING AGENCIES

In Arkansas, the collecting of some of the water-resources data and the conducting of some of the interpretive hydrologic investigations are done in cooperation with Federal, State, and local agencies. Those agencies cooperating with the U.S. Geological Survey during fiscal years 1982 and 1983 are:

ARKANSAS GEOLOGICAL COMMISSION
ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
ARKANSAS POWER AND LIGHT COMPANY
ARKANSAS SOIL AND WATER CONSERVATION COMMISSION
ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
U.S. DEPARTMENT OF AGRICULTURE
  Soil Conservation Service
U.S. DEPARTMENT OF THE ARMY
  Corps of Engineers
U.S. DEPARTMENT OF INTERIOR
  Bureau of Land Management
  National Park Service
U.S. ENVIRONMENTAL PROTECTION AGENCY
U.S. DEPARTMENT OF COMMERCE
  National Weather Service
U.S. DEPARTMENT OF TRANSPORTATION
  Federal Highway Administration

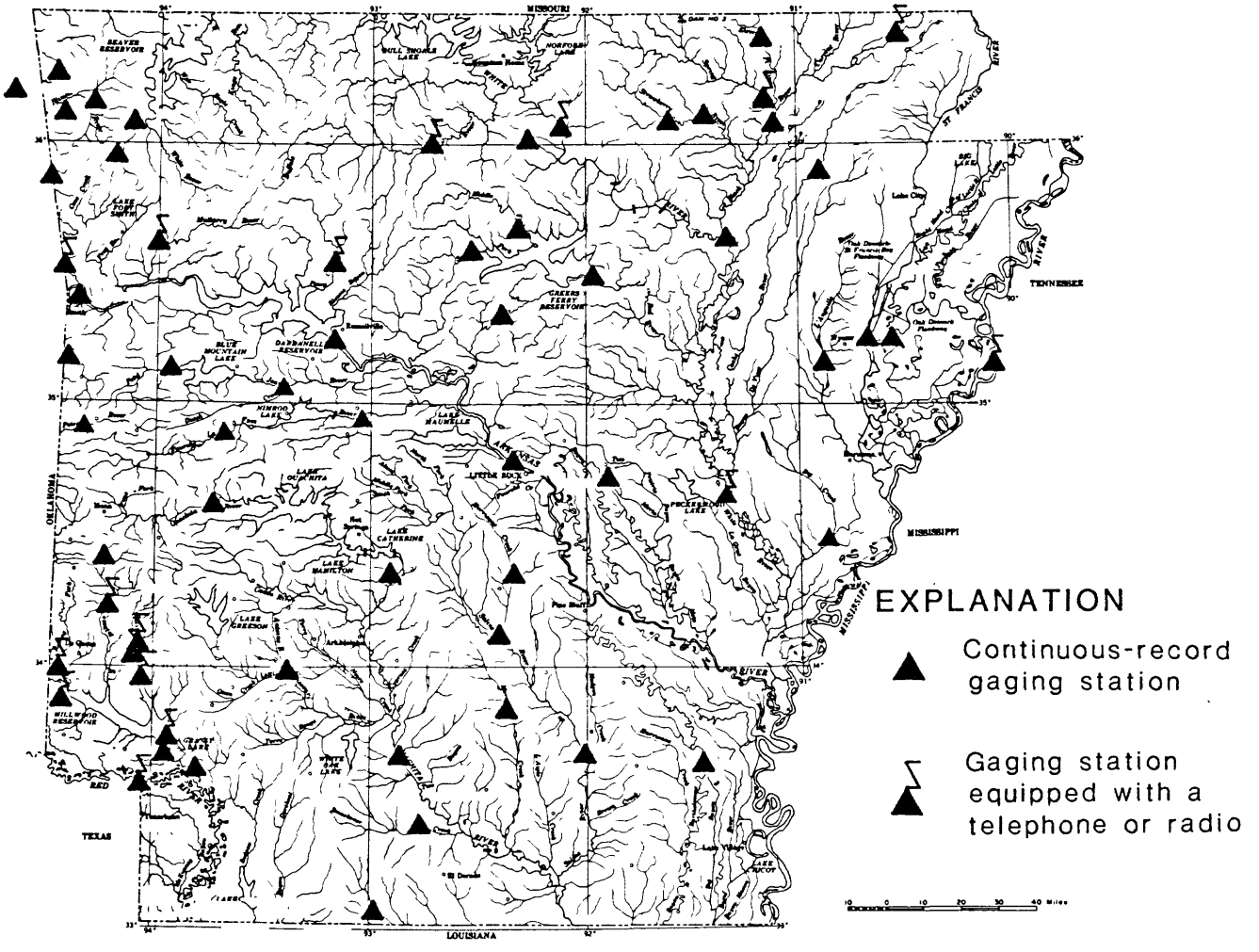


Figure 1.--Locations of continuous-record gaging stations in Arkansas.

PROJECTS

Collection of Surface-Water Data

COOPERATING AGENCIES: Arkansas Geological Commission, Arkansas Department of Pollution Control and Ecology, U.S. Army Corps of Engineers, Arkansas Power & Light Company, Arkansas Soil and Water Conservation Commission, National Park Service

PROJECT CHIEF: T. E. Lamb

PERIOD OF RECORD: Continuous since October 1927

Problem.--Surface-water information is needed for surveillance, planning, design, hazard warning, operation, and management in water-related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, water-resources development, and waste disposal. An appropriate data base is necessary to provide this information.

Objectives.--Collect surface-water data to satisfy needs for current-purpose uses, such as assessment of water resources, operation of reservoirs or industries, forecasting, disposal of wastes and pollution controls, discharge data to accompany water-quality measurements, compact and legal requirements, and research or special studies. Collect data necessary for analytical studies needed to understand cause-effect relations and define the trends and statistical properties of streamflow.

Approach.--Standard methods of data collection will be used as described in the publication series "Techniques of Water Resources Investigations of the United States Geological Survey." Partial-record gaging will be used instead of complete-record gaging where it serves the required purpose.

Progress.--The statewide network of streamflow stations was continued and records were published. The network consisted of 85 stream-gaging stations (fig. 1) and stage and content records were prepared for 10 lakes and reservoirs. Data necessary to provide flood profiles of 17 sites on the Buffalo River are being collected and analyzed.

Plans.--Continue present network of 85 stream-gaging stations and records for 4 lakes and reservoirs. Prepare report describing Buffalo River flood profiles.

Reports published or released during fiscal years 1982 and 1983.--See references 3, 9, 10, 19 and 20 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

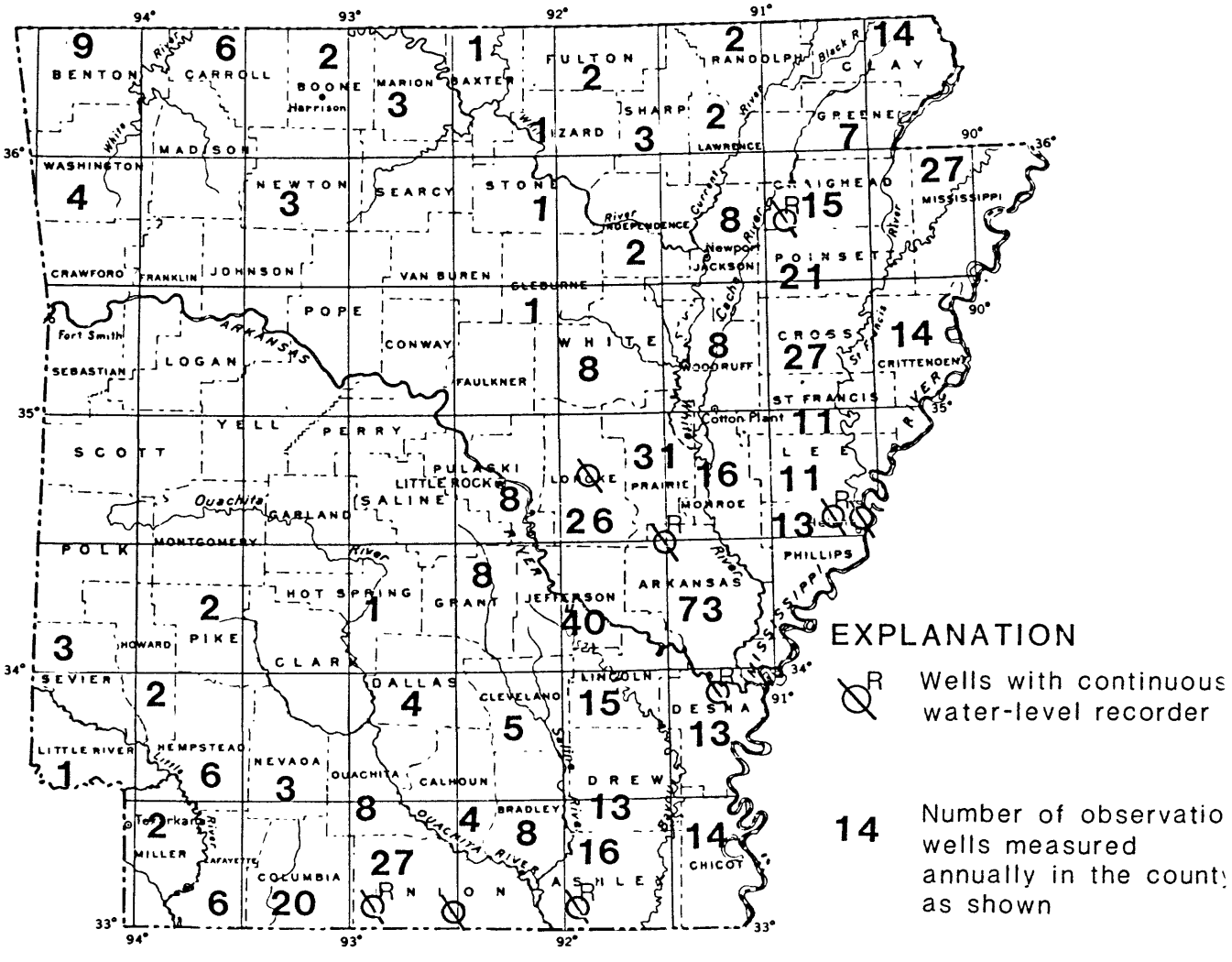


Figure 2.--Locations of wells with continuous water-level recorders and number of observation wells measured annually.

Collection of Ground-Water Data

COOPERATING AGENCY: Arkansas Geological Commission, National Park Service

PROJECT CHIEF: Joe Edds

PERIOD OF PROJECT: Continuous since July 1945

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

Objectives.--Collect water-level data to provide a minimum long-term data base so that the general response of the hydrologic system to natural climatic variations and induced stresses is known and potential problems can be defined early enough to allow proper planning and management. Provide a data base against which the short-term records acquired in areal studies can be analyzed. This analysis must provide an assessment of the ground-water resource, allow prediction of future conditions, detect and define pollution and supply problems, and provide the data base necessary for management of the resource.

Approach.--Evaluation of regional geology allows broad, general definition of aquifer systems and their boundary conditions. Within this framework, and with some knowledge of the stress on the system in time and space and the hydrologic properties of the aquifers, a subjective decision can be made on the most advantageous locations for observation of long-term system behavior. This subjective network will be refined as records become available and detailed areal studies of the ground-water system more closely define the aquifers, their properties, and the stresses to which they are subjected.

Progress.--Water levels were measured in 640 wells (fig. 2) throughout the State as part of the Federal-State ground-water data-collection program. Electric, gamma-ray, and caliper logs were made in approximately 15 newly drilled water wells in the State. The reports "Ground-Water Levels in Arkansas, Spring 1982" and "Ground-Water Levels in Arkansas, Spring 1983" were prepared. The ground-water section of the annual report "Water Resources Data for Arkansas, Water Year 1981" was completed.

Plans.--Continue water-level monitoring. Prepare the ground-water section of "Water Resouces Data for Arkansas, Water Year 1982."

Reports published or released during fiscal years 1982 and 1983.--see references 4, 5, 19, and 20 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

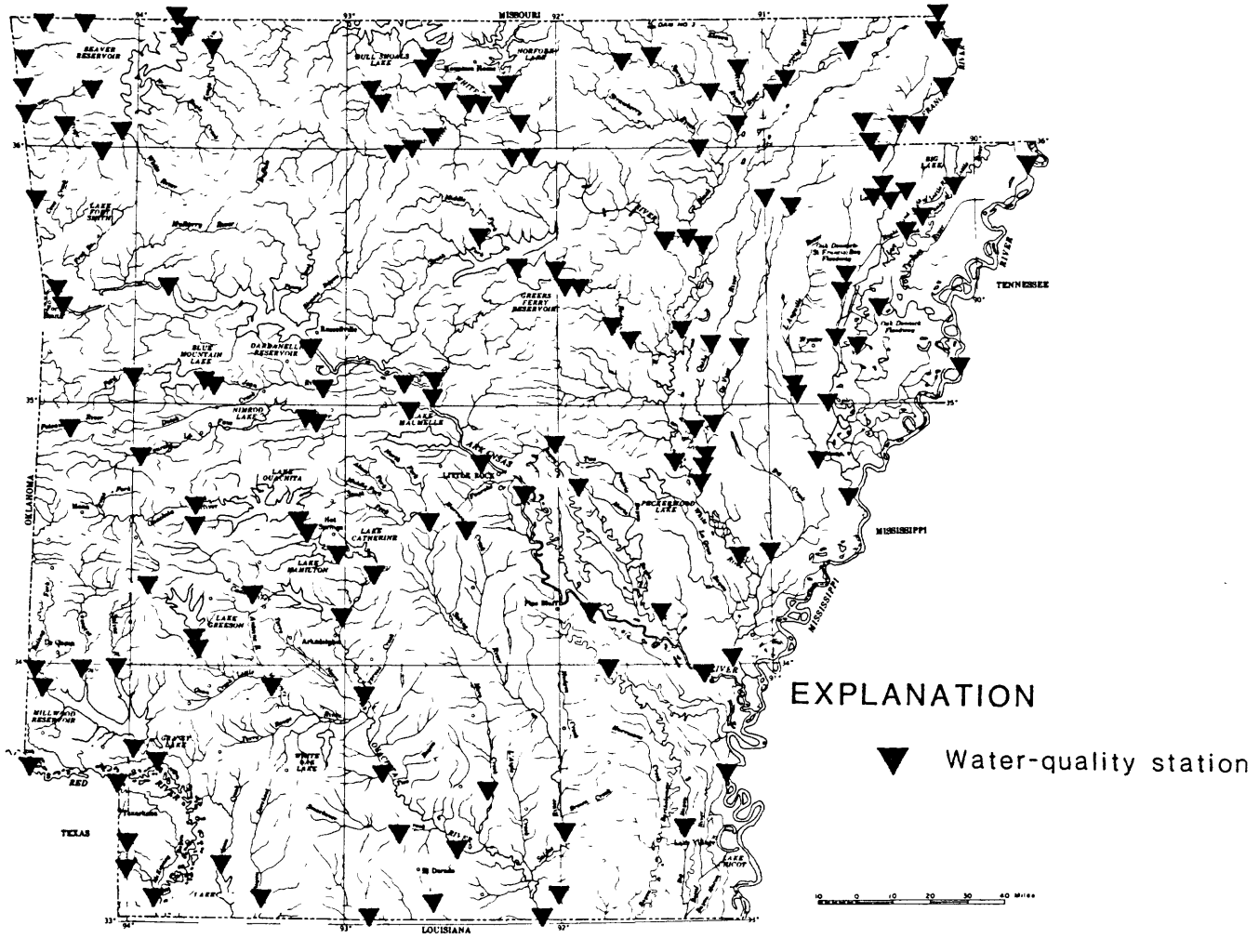


Figure 3.--Locations of water-quality stations in Arkansas.

Collection of Water-Quality Data

COOPERATING AGENCIES: Arkansas Geological Commission, Arkansas Department of Pollution Control and Ecology, U.S. Army Corps of Engineers, National Park Service, U.S. Environmental Protection Agency, U.S. Soil Conservation Service

PROJECT CHIEF: B. Frank Lambert

PERIOD OF PROJECT: Continuous since July 1945

Problem.--Water-resource planning and water-quality assessment require a statewide and nationwide base of relatively standardized information. For intelligent planning and realistic assessment of the water resources, the chemical and physical quality of the rivers and streams must be defined and monitored.

Objectives.--Provide a National and State bank of water-quality data for planning-and-action programs, and provide data for State and Federal management of intrastate and interstate waters.

Approach.--Operate a network of water-quality stations to measure concentrations, loads, and time trends, as required by planning and management agencies.

Progress.--Water-quality samples were collected and analyzed. These samples were collected at 13 National Stream Quality Accounting Network stations, 1 Benchmark Network station, 5 cooperative stations, and 73 sites on 13 lakes. From 5 to 131 parameters were determined for samples from each site. The Arkansas Department of Pollution Control and Ecology collects and analyzes water-quality samples at approximately 95 stations. These stations are also shown on figure 3. Data from Geological Survey and Arkansas Department of Pollution Control and Ecology stations are published annually by the Geological Survey.

Plans.--Continue to operate water-quality stations and continue to update stations and parameters needed to meet present and long-term needs.

Reports published or released during fiscal years 1982 and 1983.--See references 19 and 20 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

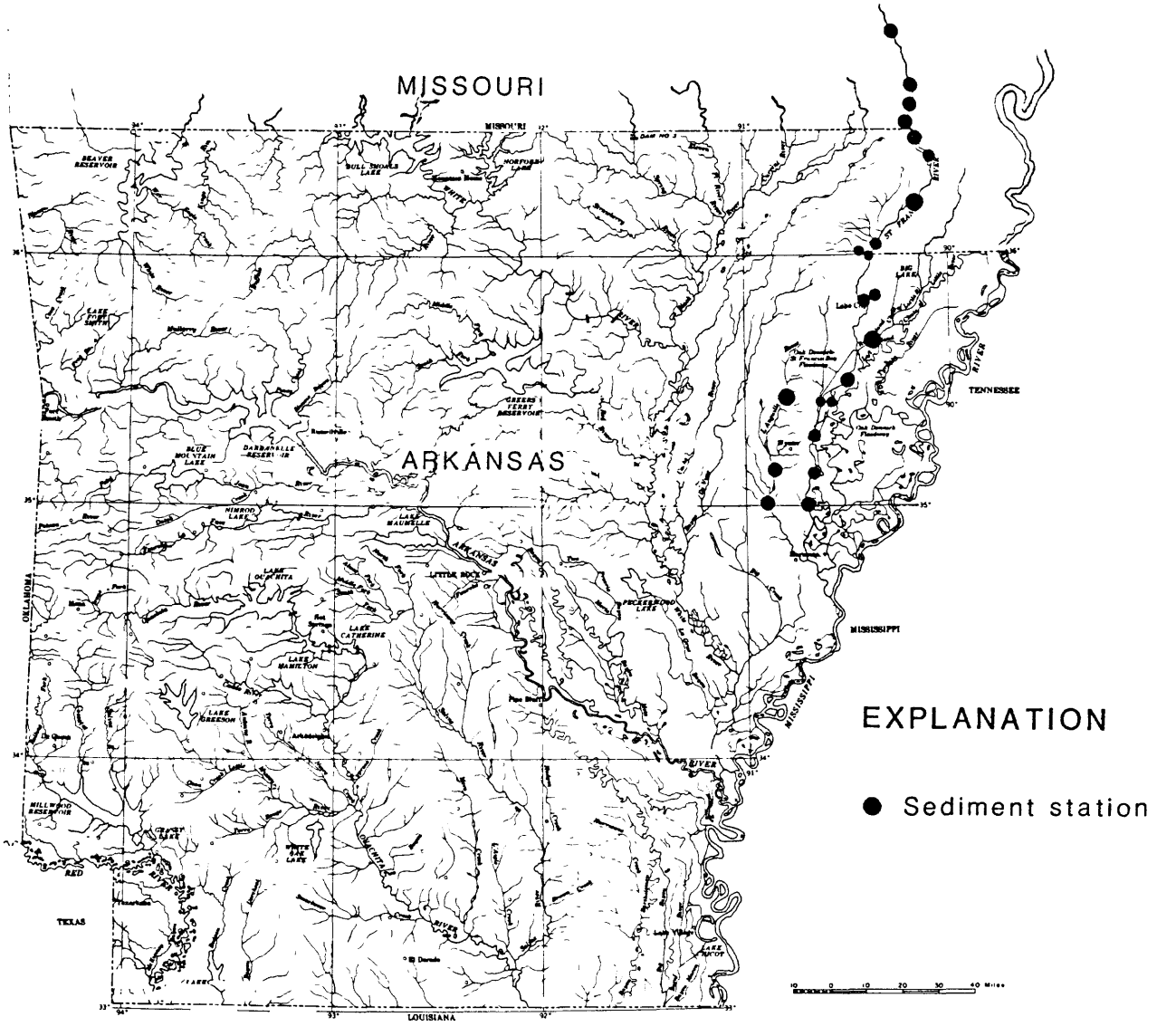


Figure 4.--Locations of monthly sediment stations Arkansas and Missouri

Sediment Stations

COOPERATING AGENCY: U.S. Army Corps of Engineers

PROJECT CHIEF: B. Frank Lambert

PERIOD OF PROJECT: Continuous since July 1976

Problem.--Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. Sediment concentrations and discharges in Arkansas rivers and streams must be defined and monitored.

Objectives.--Provide a national bank of sediment data for use in Federal and State planning-and-action programs, including State and Federal management of interstate and international waters.

Approach.--Establish and operate a network of sediment stations to estimate spatial and temporal averages and trends of sediment concentration, sediment discharge, and particle size of sediment being transported by rivers and streams.

Progress.--Sediment samples were collected at 11 selected stations and analyzed for concentration. Monthly sediment samples were collected at 22 stations in the St. Francis River basin and analyzed for concentration and also for particle size of particles greater than 62 microns in diameter. Records were prepared for publication in the annual water data report.

Plans.--Continue to collect and analyze sediment samples monthly at 22 stations in the St. Francis River basin in Arkansas (fig. 4). Sediment samples will be collected at eight selected stations and analyzed for concentration.

Reports published or released during fiscal years 1982 and 1983.--See references 19 and 20 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

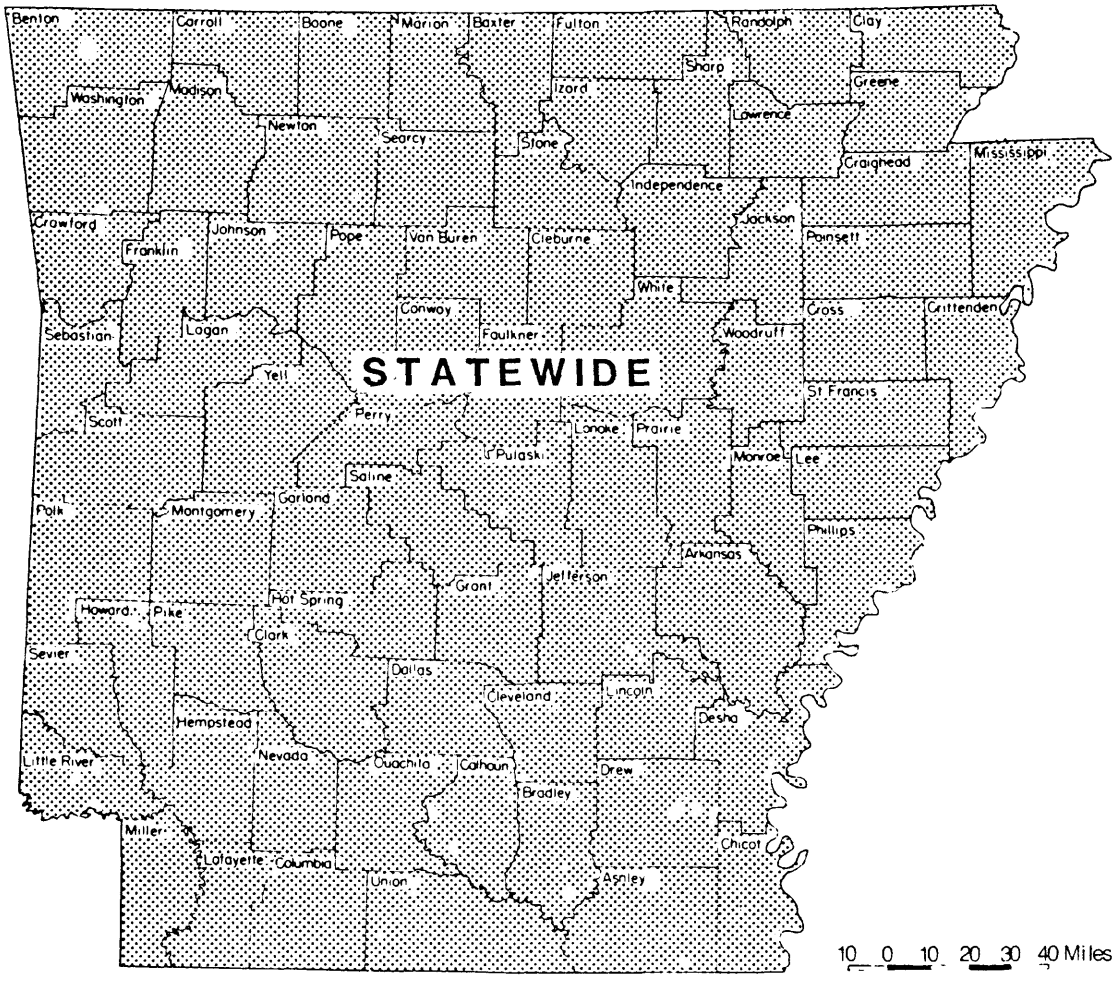


Figure 5.--Location of area included in water-use inventory.

Water-Use Data for Arkansas

COOPERATING AGENCY: Arkansas Soil and Water Conservation Commission and Arkansas Geological Commission

PROJECT CHIEF: Alan P. Hall

PERIOD OF PROJECT: Continuous since April 1979

Problem.--Because of the large increase (more than 500 percent since 1960) in the use of water in Arkansas in recent years, water-use data are needed as a management tool. Requests from State and municipal planners for water-use data are increasing. As competition increases among users, the need for water-use information becomes essential in determining the amount of water available.

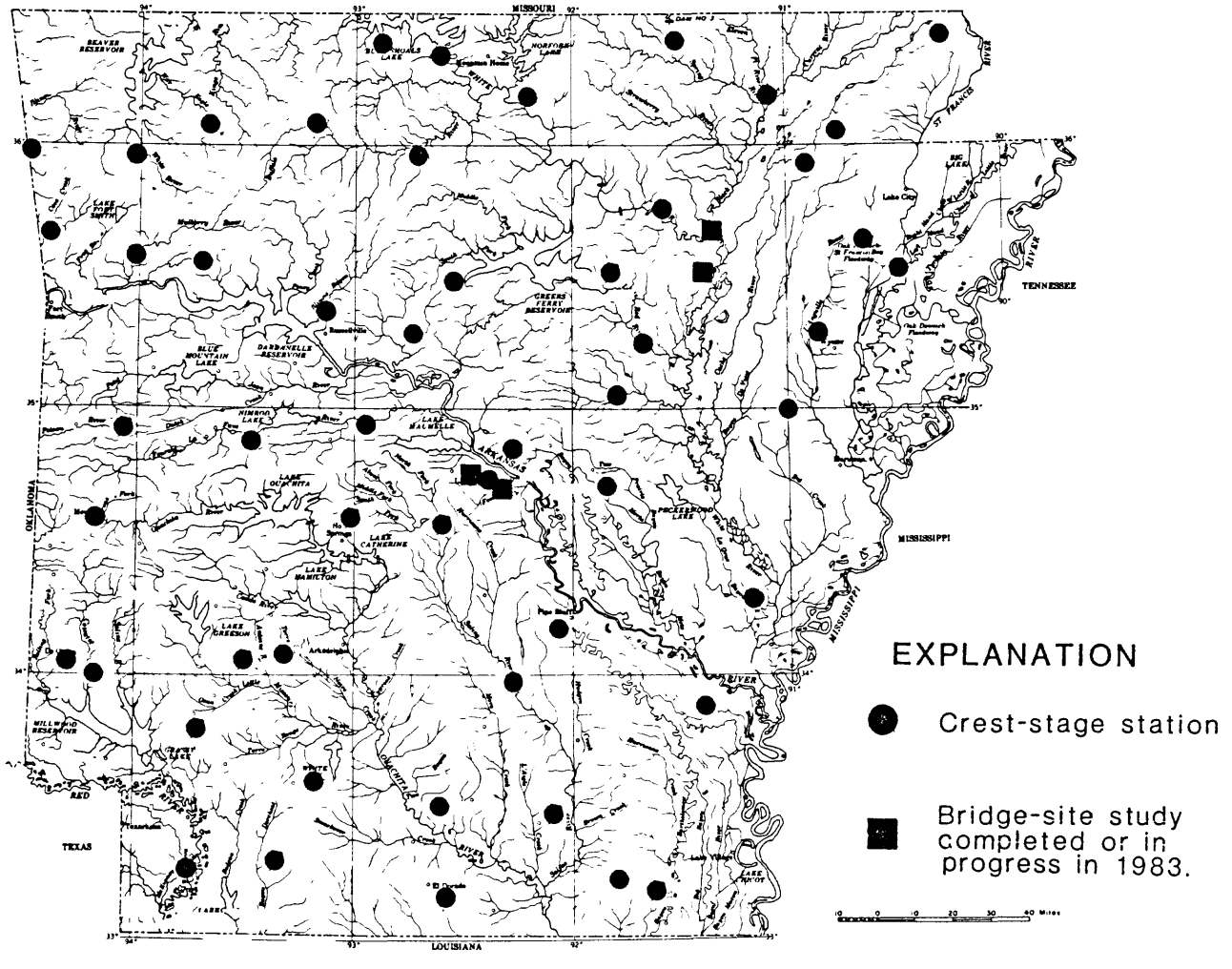
Objectives.--Maintain and upgrade a statewide continuing water-use data-collection system (fig. 5) that will document the amount of water used. Prepare summary map reports annually and full-scale reports at 5-year intervals.

Approach.--Water-use data will be collected statewide for storing and dissemination by the U.S. Geological Survey in cooperation with the Arkansas Soil and Water Conservation Commission and the Arkansas Geological Commission. Data will be made available by the implementation of the State Water Use Data System beginning this year. Data collection, report preparation and distribution will be handled by the U.S. Geological Survey with support from the Arkansas Soil and Water Commission as needed.

Progress.--Prepared methodology report outlining guidelines for implementation of the water-use program. Established data-collection network for obtaining application rates for rice, cotton, and soybean irrigation. A report on use of water in Arkansas for 1980 has been published. All of the 1980 water-use data has been entered into computer system. Prepared a map report on water use in Arkansas for 1981 (in review).

Plans.--Collect water-use data for municipal, industrial, and nonirrigation functional-use categories. Development of a benchmark program for estimating water used for rice irrigation will be proposed.

Reports published or released during fiscal years 1982 and 1983.--See reference 7 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.



igure 6.--Locations of bridge-site studies and crest-stage stations.

Flood Investigations

COOPERATING AGENCY: Arkansas State Highway and Transportation Department

PROJECT CHIEF: T. E. Lamb

PERIOD OF PROJECT: Continuous since July 1960

Problem.--About 25 percent of highway-construction funds in Arkansas are spent on bridges and culverts. The safe and economic design of these structures requires a knowledge of the magnitude and frequency of floods for all size drainage basins and an analysis of the hydrologic and hydraulic characteristics at specific bridge sites. Flood-frequency relations are not adequately defined for drainage areas of less than about 50 square miles. This project will permit better definition of flood-frequency relations for small streams and will supply the State Highway and Transportation Department data useful in economic and safe design of highway-drainage structures.

Objectives.--Define regional flood-frequency relations, with emphasis on areas of less than about 50 square miles. Make hydrologic and hydraulic analyses of floodflow characteristics at specific bridge sites. Compile and publish statewide drainage-area data.

Approach.--Collect annual peak-discharge data and rainfall data on small streams, and relate peak discharge to rainfall. Use peak-flow rainfall relations and historical rainfall data to synthesize long-term annual peak discharges at the gage sites. Define regional flood-frequency relations for small streams by multiple-regression analysis. Analyze floodflow characteristics at specifc bridge sites by use of standard methods of indirect computation of peak flow. Delineate and planimeter drainage areas.

Progress.--Operated and maintained a network of more than 65 crest-stage stations (fig. 6). Determined the annual maximum peak stage and discharge at all sites. Provided assistance to cooperator on several bridge sites.

Plans.--Operate and maintain crest-stage network. Make discharge measurements to verify stage-discharge relations in range of shifting controls. Document small-area floods. Perform bridge-site studies as requested. Continue work on flood-frequency report. Complete synthesis of flood frequency data for 26 rainfall-runoff stations and prepare a report of the results.

Figure 7.--Location of area included in flow-duration and low-flow frequency determinations of selected Arkansas streams.

Flow-Duration and Low-Flow Frequency Determinations of Selected Arkansas Streams

COOPERATING AGENCY: Arkansas Geological Copmmission

PROJECT CHIEF: Richard A. Hunrichs

PERIOD OF PROJECT: Continuous since July 1972

Problem.--Low-flow frequency and flow-duration data for strams are needed to assess water-supply potential and waste-carrying capacity. Low-flow data are useful for studies of ground-water and surface-water interactions.

Objectives.--Provide statewide data on flow duration and frequency of streams (fig. 7).

Approach.--Maintained up-to-date frequency and duration statistics for stations having continuous records. Expanded partial-record station data to include data from additional sites. Used regression analysis for frequency determination at partial-record stations. Inventoried perennial streams when weather conditions were suitable.

Progress.--Report has been completed and published.

Plans.--None.

Reports published or released during fiscal years 1982 and 1983.--See reference 8 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

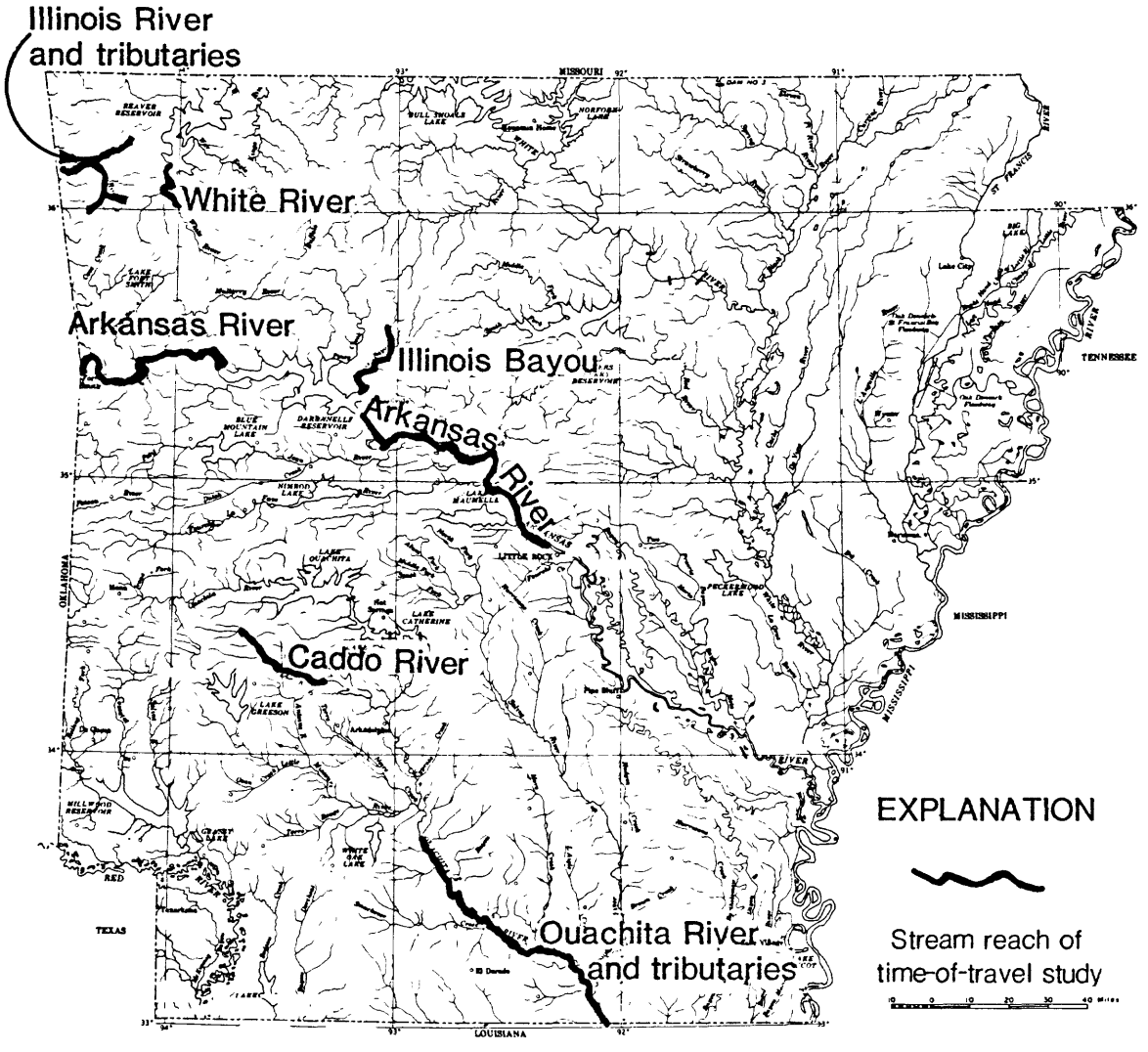


Figure 8.--Locations of time-of-travel studies in Arkansas.

Time of Travel of Selected Arkansas Streams

COOPERATING AGENCY: Arkansas Geological Commission

PROJECT CHIEF: T. E. Lamb

PERIOD OF PROJECT: July 1969 through May 1983

Problem.—Information about dispersion and rate of movement of dissolved and suspended material is needed for predictive modeling of water quality in Arkansas streams and reservoirs, and for predicting the time of travel, maximum concentrations, and time of passage of pollutants spilled in the streams.

Objectives.—Collect data that can be used to relate time of travel and dispersion of a conservative contaminant to one or more easily measured physical characteristics of each drainage basin.

Approach.—Fluorescent dye was injected in selected streams (fig. 8), and dye concentrations were sampled at downstream sites. An attempt was made to define relationships between time of travel and stream and basin characteristics for regional appraisals of time of travel.

Progress.—Report has been completed and published.

Plans.—None.

Reports published or released during fiscal years 1982 and 1983.—See reference 11 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

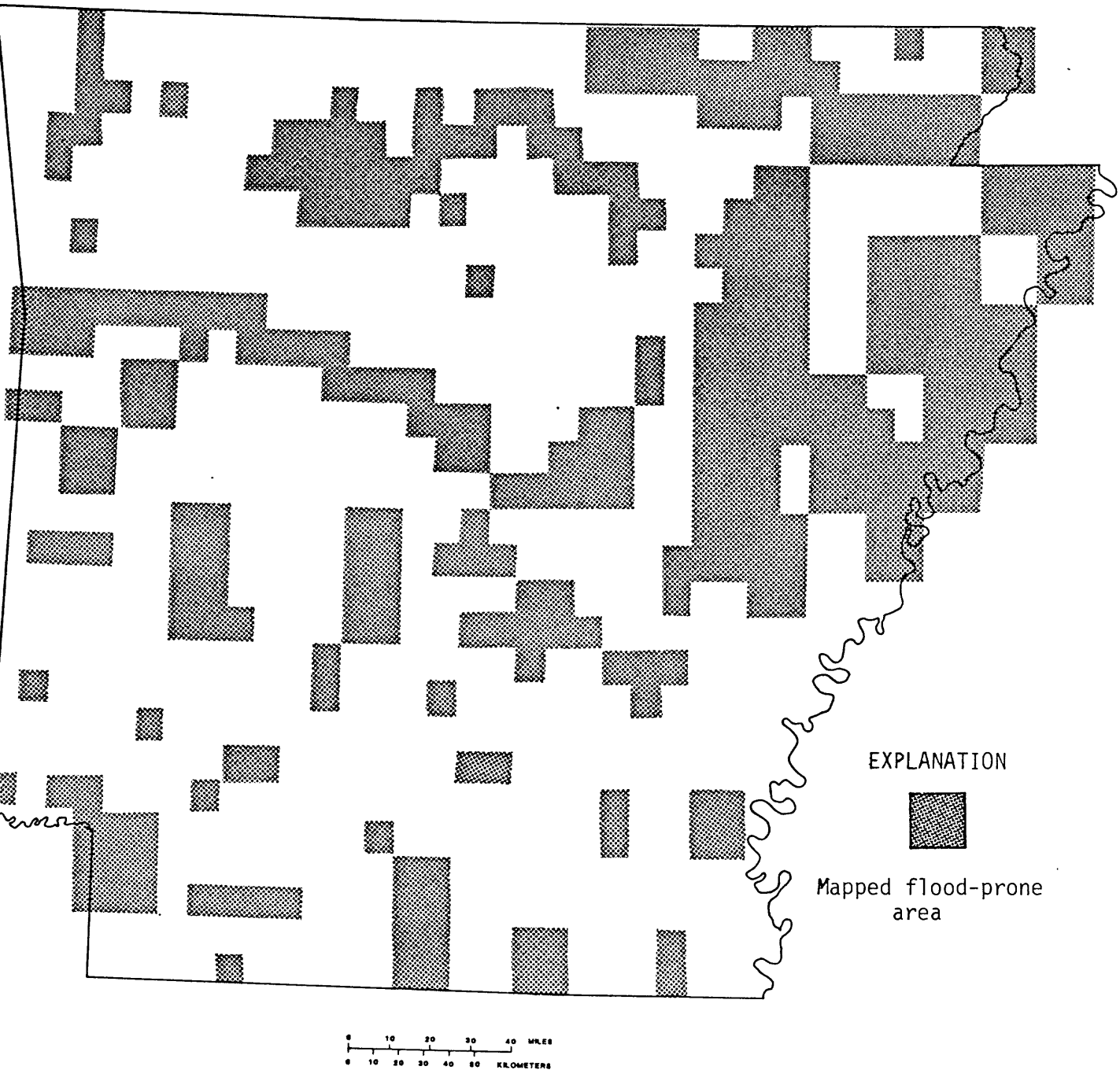


Figure 9.--Locations of flood prone areas mapped in Arkansas.

Flood-Hazard Information, House Document 465

COOPERATING AGENCY: None

PROJECT CHIEF: Roy C. Gilstrap

PERIOD OF PROJECT: Continuous since July 1972

Problem.—House Document 465 outlines a national program to provide flood-hazard information. The U.S. Geological Survey was assigned the responsibility to outline on existing Geological Survey topographic maps those flood-prone areas that can be identified from information on the maps and from previous flood-frequency studies.

Objectives.—Identify and label on Survey topographic quadrangle maps the flood-prone areas of cities and towns having a population of more than 2,500, and adjacent areas for which adequate maps are available and flood-frequency drainage-area relationships can be determined.

Approach.—Use relationships between flood depth, flood discharge, frequency of occurrence, and drainage area to define flood profiles and flood boundaries (100-year recurrence interval) along streams shown on topographic maps. If no actual flood information exists, will use regional flood-depth frequency relationships.

Progress.—No flood-prone area maps were prepared in 1982 or 1983. A total of 219 flood-prone area maps have been published for Arkansas (fig. 9). A list of flood-prone area maps is at the end of the report.

Plans.—None.

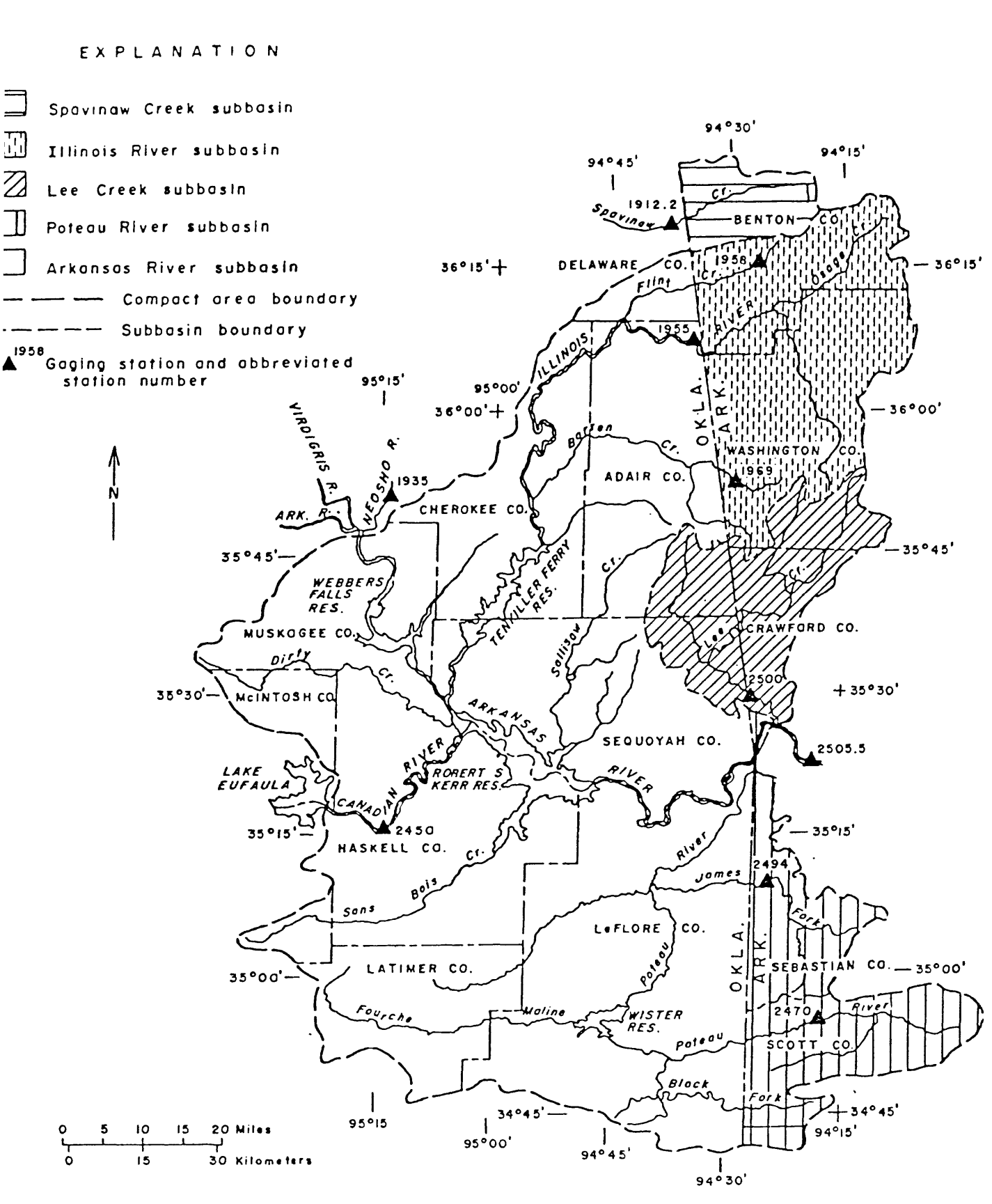


Figure 10.--Location of the Arkansas-Oklahoma Arkansas River compact area and subbasins.

Arkansas River Basin Annual Flows, Arkansas-Oklahoma

COOPERATING AGENCY: Arkansas Soil and Water Conservation Commission

PROJECT CHIEF: T. E. Lamb and Martha A. Moore

PERIOD OF PROJECT: Continuous since July 1977

Problem.--The Arkansas River Basin Compact between Arkansas and Oklahoma requires that annual yields be determined from the five specific subbasins shown in figure 10.

Objectives.--Determine annual streamflow yields from five subbasins, as defined in the Arkansas River Basin Compact.

Approach.--Data will be collected at five stream-gaging stations in three subbasins. Additional data will be furnished by the Oklahoma District of the Water Resources Division. Annual reports will give the annual yield of each subbasin and the data will be used to develop results.

Progress.--Streamflow measurements were made at five stream-gaging stations and daily discharges were computed.

Plans.--Data collection will continue at existing stream-gaging stations.

Reports published or released during fiscal years 1982 and 1983.--See references 3 and 12 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

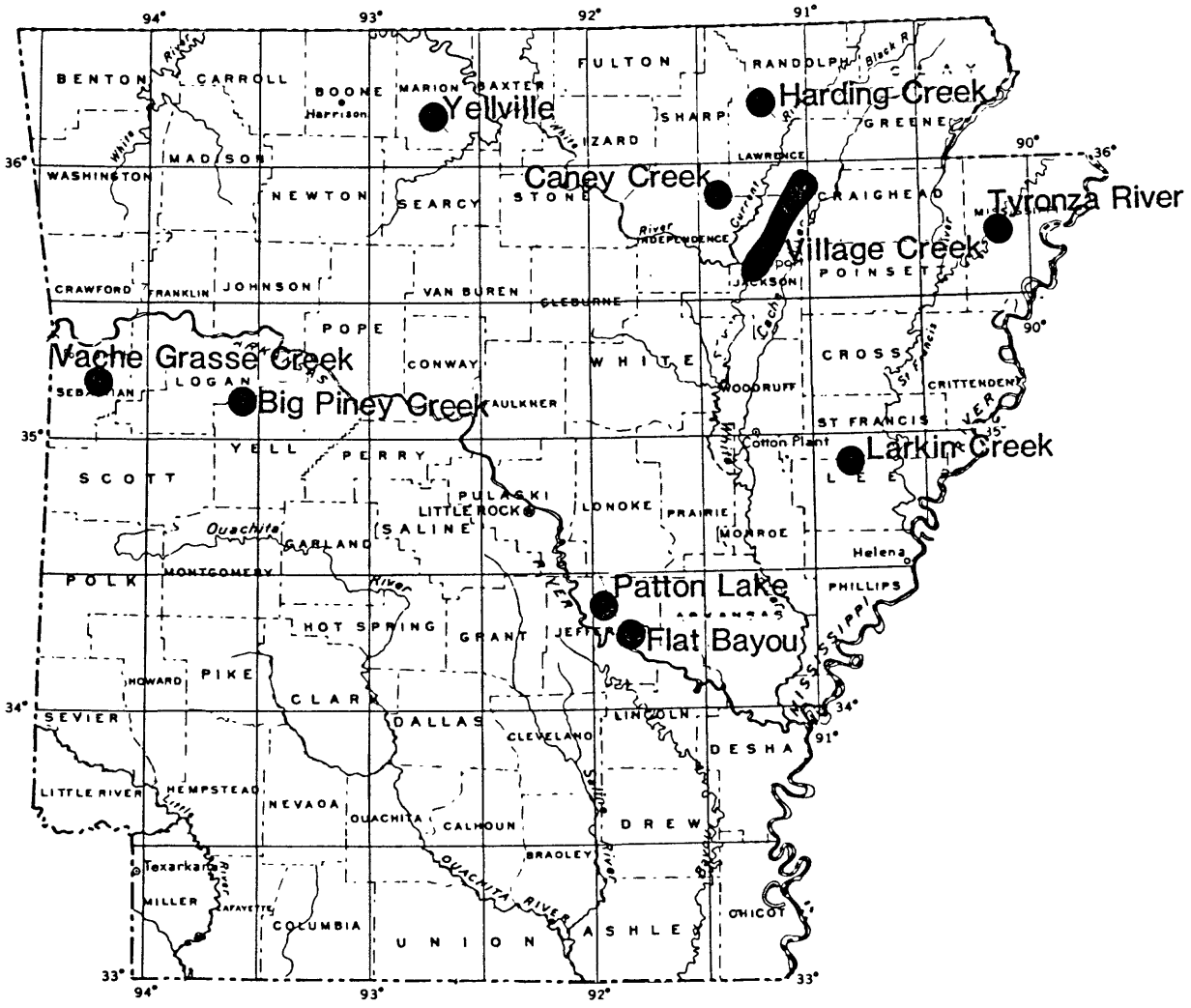


Figure 11.--Locations of U.S. Soil Conservation Service watershed projects.

Environmental Assessment of Impact of U.S. Soil Conservation Service Projects on Water Resources

COOPERATING AGENCY: U.S. Soil Conservation Service

PROJECT CHIEF: James C. Petersen

PERIOD OF PROJECT: Continuous since June 1976

Problem.—With the advent of the National Environmental Policy Act, the Federal Water Pollution Control Act Amendments of 1972, and the Water Resources Council's "Principles and Standards for Planning Water and Related Land Resources," documentation of various water-resources parameters is required before, during, and after implementation of watershed-improvement programs.

Objectives.—Document and interpret water quality and quantity prior to land- and watershed-improvement programs by the U.S. Soil Conservation Service.

Approach.—A team composed of State and Federal representatives, including a member of the U.S. Geological Survey, will make a field reconnaissance of each Soil Conservation Service project area as projects are authorized. The Geological Survey will review literature for pertinent water-resources data for each area and participate with the interdisciplinary team in establishing the water-quality parameters to be studied and the location and frequency of sampling. The Survey will use standard methods to operate a network of surface-water and quality-water stations to provide water quality and quantity information for each project area.

Progress.—Reports on Harding Creek, Patton Lake, Larkin Creek and Big Piney Creek watershed sites were completed.

Plans.—None.

Reports published or released during fiscal years 1982 and 1983.—See references 13, 14, 15, and 16 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

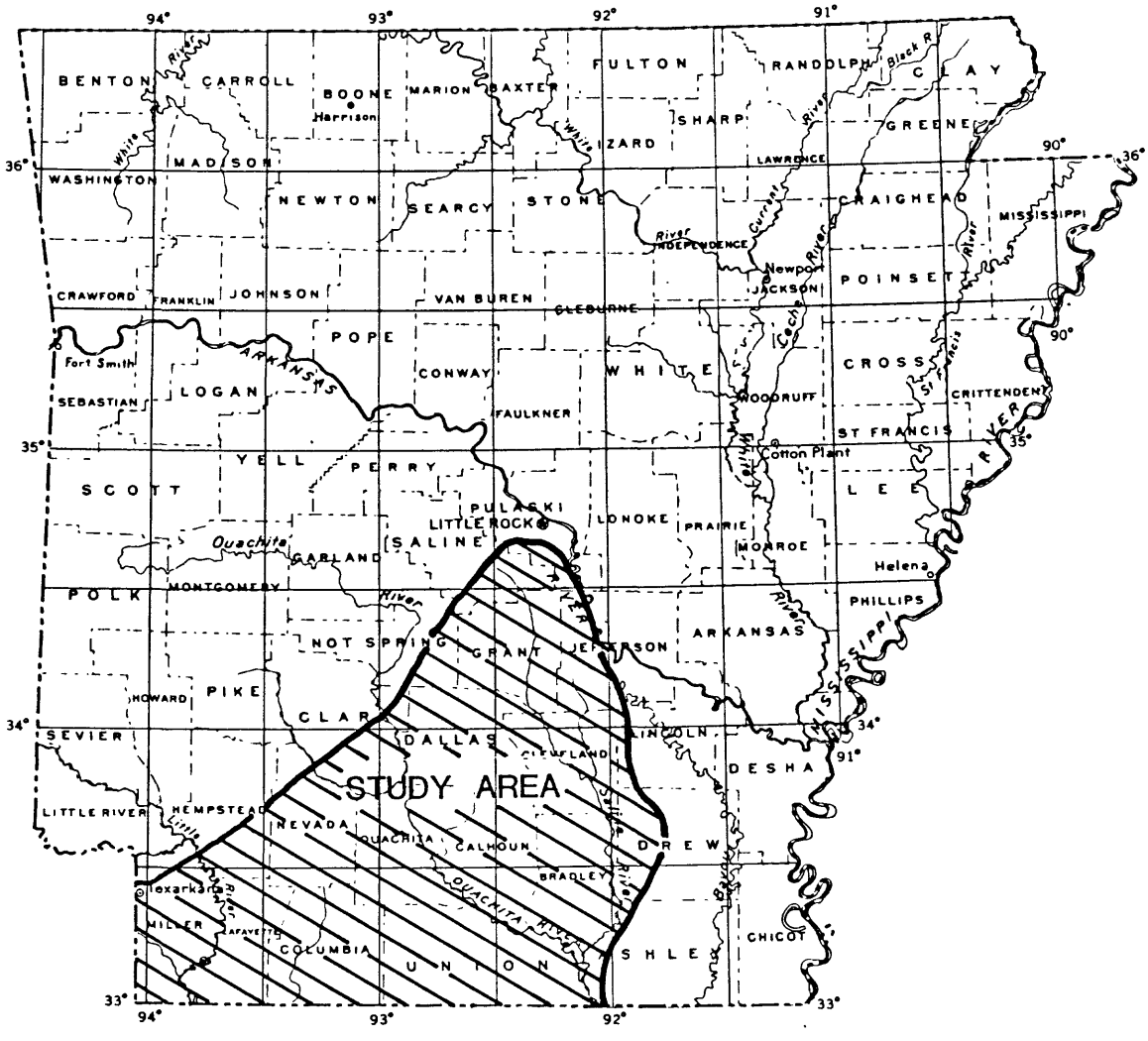


Figure 12.--Location of the south-central Arkansas lignite study area.

Lignite Water Resources in South-Central Arkansas

COOPERATING AGENCY: None

PROJECT CHIEF: John E. Terry

PERIOD OF PROJECT: February 1979 through September 1983

Problem.--Beds of lignite are present in the outcrop areas of aquifers that are essential for water supply. Surface mining of lignite could cause a disruption of flow to locations of ground-water use.

Objectives.--Through modeling techniques, project the effects of dewatering on water levels. Determine present water use in the area. Improve the understanding of ground water-surface water relations. Project changes in quantity of surface water and changes in ground-water levels during and after mining. The study area is shown in figure 12.

Approach.--Calibrate a ground-water model using historic data. Use the model to project effects of increased pumpage on ground water.

Progress.--Transmissivity and storage-coefficient maps were prepared. Initial leakance coefficients and recharge were estimated, coded, and key-punched. Necessary model modifications were made. Leakance and recharge coefficients were adjusted during calibration of the steady-state model. Calibration of the steady-state model is tentatively complete. Historical pumping information has been inventoried and the appropriate data prepared for input to the nonsteady-state model.

Plans.--Due to lack of funding this project will be suspended.

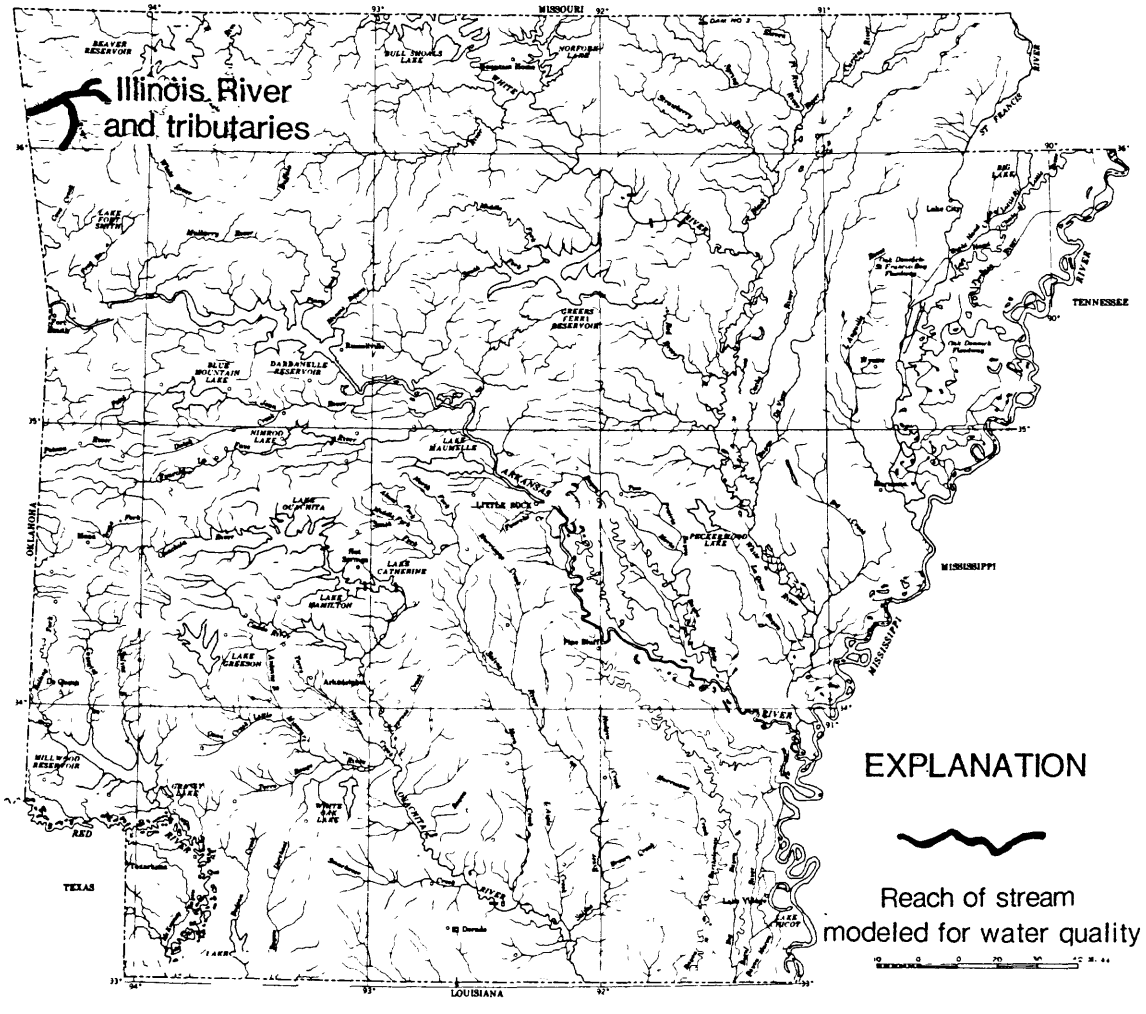


Figure 13.--Location of water-quality modeling study of the Illinois River and tributaries.

Water-Quality Model of the Illinois River Basin, Arkansas

COOPERATING AGENCY: Arkansas Department of Pollution Control and Ecology

PROJECT CHIEF: Edward E. Morris

PERIOD OF PROJECT: October 1978 through September 1979. Inactive October 1979 through March 1981. Reactivated April 1981 through September 1982.

Problem.—Segment 3J, in northwest Arkansas, which includes the Illinois River and its tributaries, as shown in figure 13, has been selected by the Arkansas Department of Pollution Control and Ecology (ADPC&E) as one of three basins for intensive study under Section 208 of Public Law 92-500. The Geological Survey was asked to train personnel of ADPC&E in water-quality modeling.

Objectives.—Calibrate and verify a steady-state water-quality model. Use the calibrated-verified model to predict water-quality conditions at 7-day 10-year low-flow conditions. Arkansas Department of Pollution Control and Ecology personnel will be trained in using water-quality models. Nutrient contribution to the basin from nonpoint sources will be assessed.

Approach.—Three synoptic data-collection runs will be made throughout the basin. Data will include time of travel, discharge, biochemical-oxygen demand, nutrients, dissolved oxygen, dissolved solids, chloride, sulfate, bacteria, pH, conductivity, and channel geometry. Additional data sets will be collected during storms to determine nonpoint contribution of pollutants to the basin.

Progress.—Report has been completed and published.

Plans.—None.

Reports published or released during fiscal years 1982 and 1983.—See reference 18 under "REPORTS PUBLISHED OR RELEASED DURING 1981-1983" at end of report.

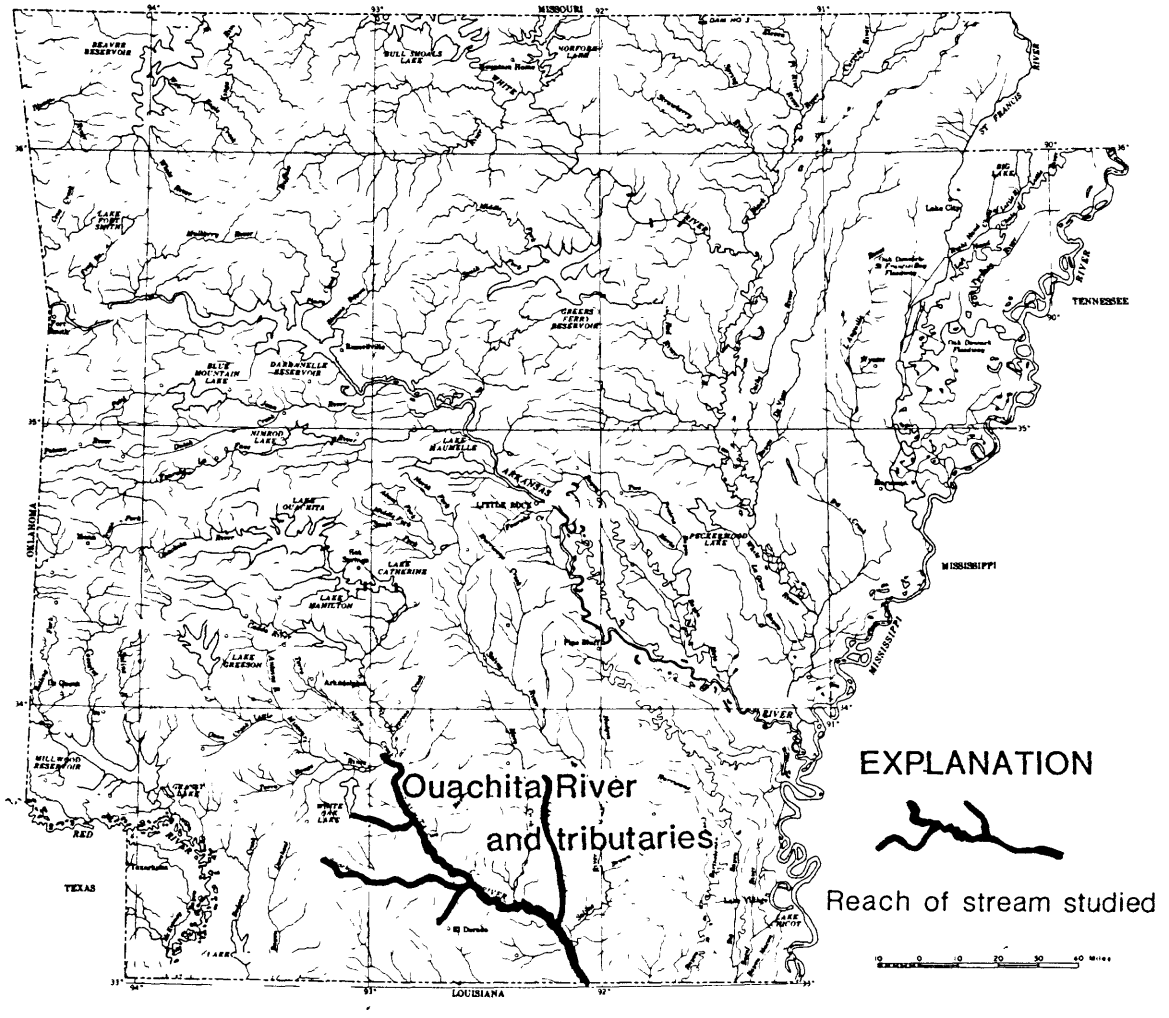


Figure 14.--Location of water-quality study of the lower Ouachita River and tributaries.

Water-Quality of the Lower Ouachita River and Selected Tributaries in Arkansas

COOPERATING AGENCY: Arkansas Department of Pollution Control and Ecology

PROJECT CHIEF: Edward E. Morris

PERIOD OF PROJECT: October 1979 through September 1984

Problem.--Significant levels of industrial wastes have been discharged into the lower Ouachita River and several of its tributaries. Because these waste discharges, along with municipal wastes, have had a serious impact on the river, the State of Arkansas selected this basin, as shown in figure 14, for intensive studies. The study is considered necessary by the State to meet the requirements of Section 208 of Public Law 92-500 (as revised).

Objectives.--The original objective was to provide the Arkansas Department of Pollution Control and Ecology with a calibrated, verified water-quality model as a management tool for allocating existing and future waste discharges into the Ouachita River. The current objective is to publish the data collected for the model in a data report but not to calibrate a model.

Approach.--Two data sets were required for the study. Data set were collected during low-flow conditions in the summers of 1980 and 1981. Data collected included dissolved oxygen concentrations, nutrient concentrations, phytoplankton and periphyton data, discharge, time of travel, stream geometry, and reaeration constants.

Progress.--Collected both data sets. Conducted time of travel and determined reaeration constants using ethylene gas. Project was inactive in 1983.

Plans.--Project has been reactivated in 1984. A report containing water-quality data, phytoplankton and periphyton data, and physical data will be published in 1984.

Figure 15.--Location of south-central Arkansas Sparta Sand saltwater study area.

A Reconnaissance Study of Saltwater Contamination in the Sparta Sand Aquifer, South-Central Arkansas

COOPERATING AGENCIES: Arkansas Geological Commission and Arkansas Department of Pollution Control and Ecology

PROJECT CHIEF: Matthew E. Broom

PERIOD OF PROJECT: March 1982 through January 1983

Problem.--A significant increase in the chloride concentration of water produced from the Sparta Sand has been observed during the last 10 years near El Dorado, in Union County. The study area is shown in figure 15. The increasing chloride has caused abandonment of some wells and curtailment of pumping from other wells. Potentially, the problem includes widespread contamination in the Sparta, a nearly sole-source aquifer for industrial and municipal water supplies in south-central Arkansas. The source of contamination is unknown.

Objectives.--Appraise the magnitude and extent of contamination. Define the sources and avenues of contamination. Formulate the scope, approach, and methods for any further study that may be needed.

Approach.--Assemble and reduce available data. Collect additional data as necessary for conceptualizing ground-water flow in the Sparta and associated units, and for defining chemical types and trends of water in the Sparta and associated units. Prepare report.

Progress.--Project data are being compiled and analyzed. The data includes water-level and water-quality records from 75 wells completed in the Sparta Sand. The data also includes water-level and water-quality records for hydrologic units overlying and underlying the Sparta Sand.

Plans.--A report will be completed during the current year for the problem in Union County (in review).

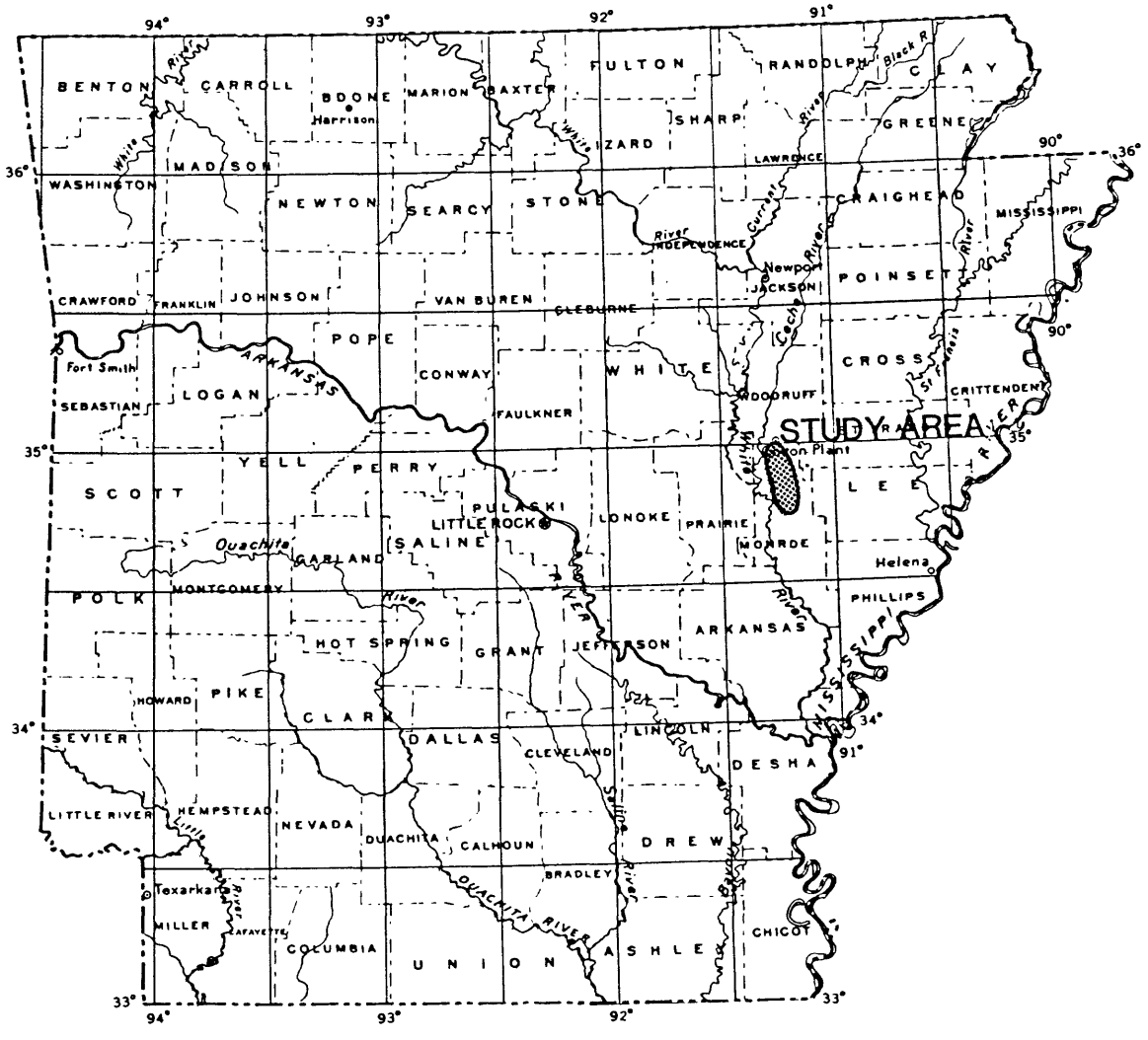


Figure 16.--Location of Brinkley area saltwater study.

A Reconnaissance Study of Saltwater Contamination in the Alluvial and Sparta Sand Aquifers, Brinkley Area, Arkansas

COOPERATING AGENCY: Arkansas Geological Commission

PROJECT CHIEF: Edward E. Morris

PERIOD OF PROJECT: October 1982 through September 1985

Problem.--A significant increase in the chloride concentration of water from the alluvial and Sparta Sand aquifers has been observed during the last 20 years in the vicinity of Brinkley, Arkansas. The increasing salt content has caused abandonment of some wells and curtailment of pumping from other wells. Potentially, the problem includes widespread contamination in the two aquifers which are major groundwater sources for irrigation, municipal and industrial supplies in the area. Possible sources include: 1) leakage from abandoned gas test wells, 2) vertical leakage from underlying units, and 3) naturally occurring saltwater pockets.

Objectives.--Appraise the magnitude and extent of contamination. Define the sources and avenues of contamination. Formulate the scope, approach, and methods for any further study that may be needed.

Approach.--Available data will be assembled and entered into computer storage. Additional data will then be collected as necessary to determine if contamination in the alluvial and Sparta Sand aquifers is the result of vertical movement of water from underlying saline units or from abandoned gas test-wells that tap saline formations.

Progress.--Available data is being assembled.

Plans.--Collect additional data as needed.

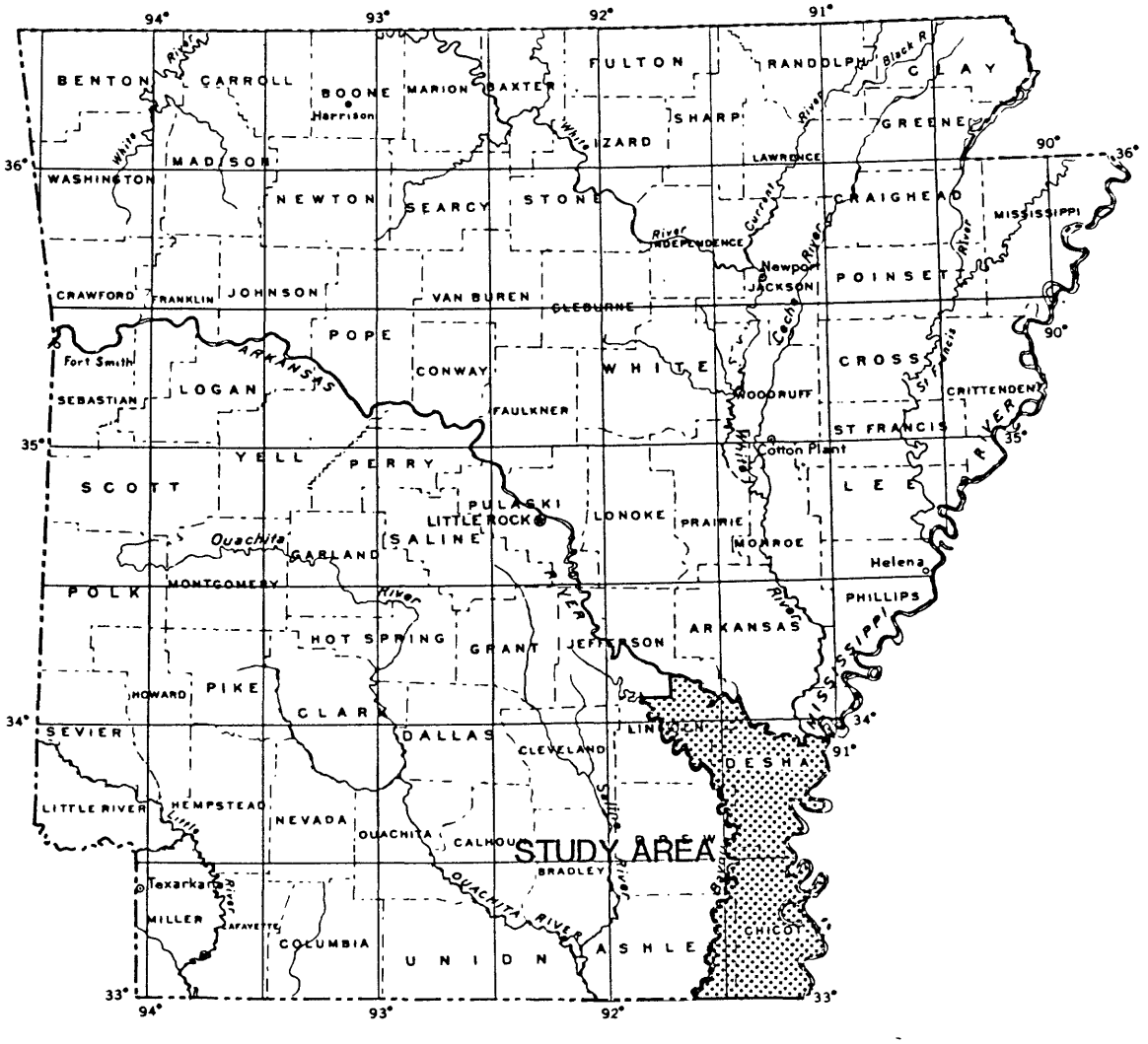


Figure 17.--Location of Mississippi River alluvial aquifer saltwater contamination study area.

A Reconnaissance Study of Saltwater Contamination in the Mississippi River Alluvial Aquifer in Chicot, Desha, and Lincoln Counties, Arkansas

COOPERATING AGENCY: U.S. Army Corps of Engineers, Vicksburg District

PROJECT CHIEF: Daniel J. Fitzpatrick

PERIOD OF PROJECT: June 1983 through September 1984

Problem.--The aquifer in a large part of the Boeuf River basin and a part of the upper half of the Bayou Macon basin yields water containing high (greater than 250 mg/L) concentrations of dissolved solids and chloride. Reports from farmers indicate that the quality of water has deteriorated to such a degree that residents are concerned about the suitability of the water for irrigation. The location of the study area is shown in figure 17.

Objectives.--To determine the magnitude and extent of saltwater contamination and define the source and avenue of contamination.

Approach.--Assemble and evaluate existing data. Collect additional data needed. Prepare report.

Progress.--Researched petroleum files to obtain locations of all oil-test drilling sites in the project area. Examined and updated Survey computer files to insure that all historic chemical analyses were correct and available for project use. Collected 80 ground-water samples from irrigation wells in Chicot and Desha Counties. The data collection phase of the project has been completed.

Plans.--Assemble and evaluate chemical data. Complete draft of report, "Quality of Water from the Mississippi River Alluvial Aquifer Beneath the Bayou Macon and Boeuf River Basins, Arkansas".

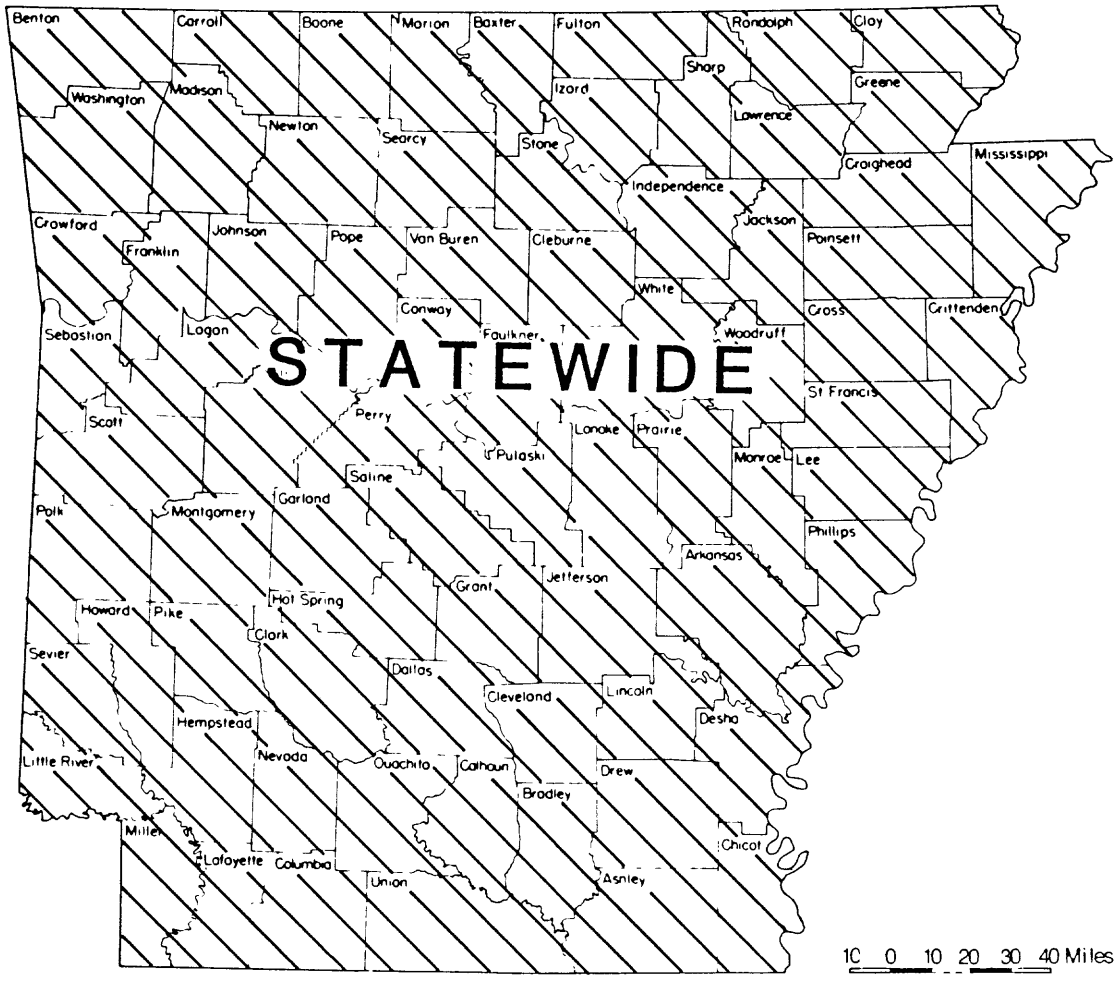


Figure 18.--Location of study area in ground-water problems in Arkansas.

A Reconnaissance Study of Ground-Water Problems in Arkansas

COOPERATING AGENCY: Arkansas Department of Pollution Control and Ecology

PROJECT CHIEF: Charles T. Bryant

PERIOD OF PROJECT: August 1983 through March 1984

Problem: Ground water is an important resource in Arkansas. Ground-water withdrawals averaged 4,056 million gallons per day in the state in 1980. Saltwater contamination is affecting the use of ground water for irrigation in several areas. Significant water-level declines are occurring in the principal aquifers in some areas. Aquifer contamination associated with waste disposal practices and mineral production activities is a potential problem. For proper development protection and management of the State's ground-water resources, identification and knowledge of existing and potential problem areas is essential. The location of the study area is shown in figure 18.

Objective: Define existing and potential ground-water problem areas in Arkansas.

Approach: Areas affected by saltwater contamination, water-level declines, and known or potential contamination from waste disposal practices and mineral production activities will be delineated on area maps with a brief text summarizing the problem in each area.

Progress: Information and data have been collected and partially analzed. Report is being written.

Plans: Complete draft of report "Ground-water problems in Arkansas" by April 30, 1984. Publish report by September 30, 1984.

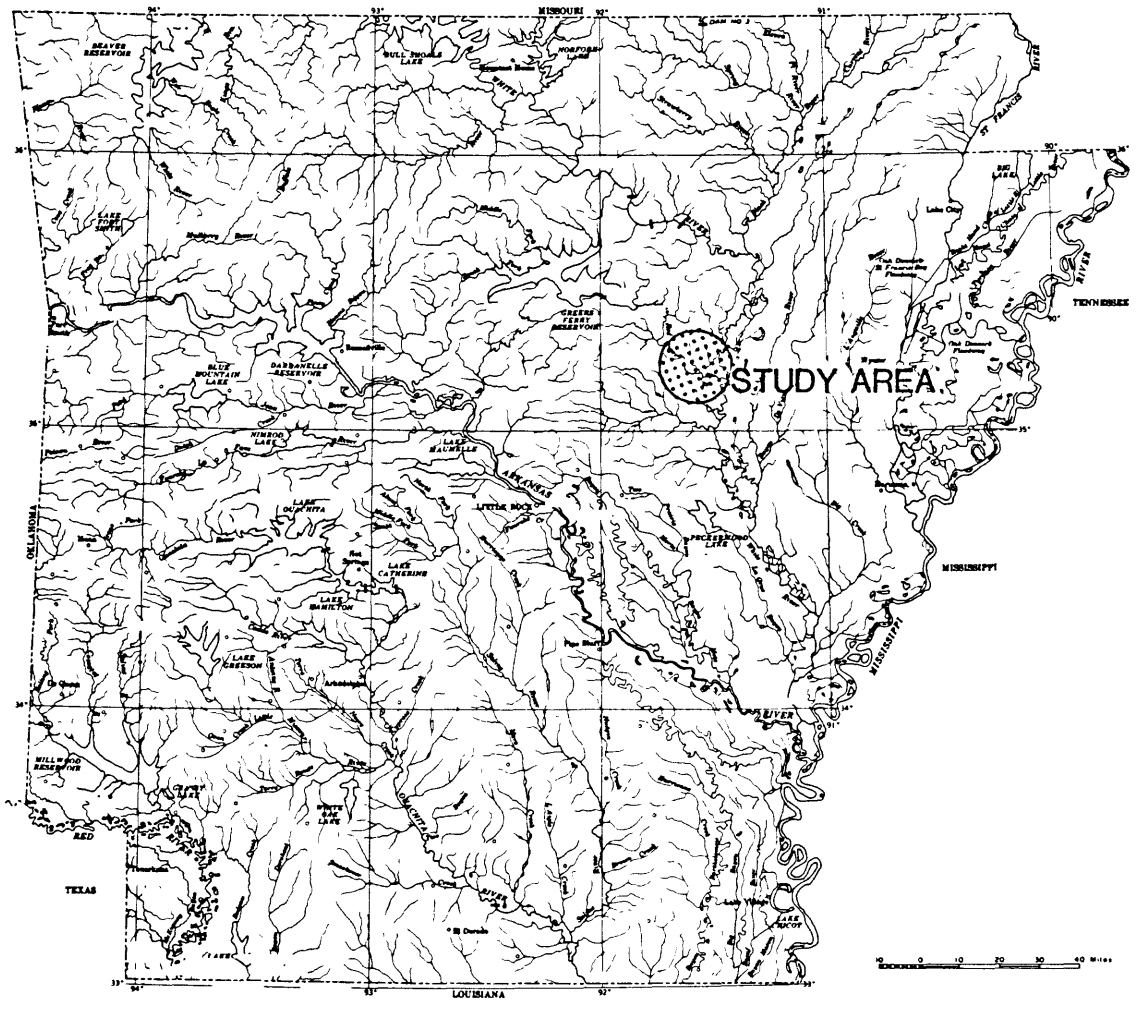


Figure 19.--Location of the lower Little Red River basin study area.

A Hydrologic Analysis of the Little Red River Basin for Development of Surface-Water Allocation Procedures - Searcy, Arkansas to Mouth

COOPERATING AGENCY: Arkansas Soil and Water Conservation Commission

PROJECT CHIEF: Alan P. Hall

PERIOD OF PROJECT: July 1983 through September 1984

Problem.--Proposed legislation presently under consideration by the Arkansas Legislature provides for allocation of surface water and regulation of ground-water withdrawals for water-critical areas within the State. The Arkansas Soil and Water Conservation Commission is the proposed State agency with responsibility for identification of water-critical areas and establishment of water-allocation and regulation guidelines. A significant factor in the development of such guidelines for many areas in the Coastal Plain of eastern Arkansas is the hydraulic connection between streams and aquifers. During dry periods, streams that are incised deeply enough into the aquifer and whose streambeds are sufficiently permeable have sustained low flows upon which diversion allocations may be based.

A complication affecting the allocation of surface water in the lower reaches of many tributary streams, such as the Little Red River, is the inability to accurately measure the low flow of a tributary stream during periods of backwater from the receiving stream.

Objectives.--Evaluate hydrologic relationships for a stream-aquifer system affected by backwater as an aid in development of surface-water allocation procedures.

Approach.--(1) Install streamgaging station at low-head dam near Searcy to accurately monitor low flows of Little Red River; (2) Continue operation of stage gage at Judsonia in cooperation with Corps of Engineers to monitor periods of backwater from White River; (3) Monitor water levels continuously in two alluvial wells located in a line perpendicular to the river. Inventory a minimal number of wells in the vicinity of the river and measure monthly to define potentiometric surface and changes in storage for the alluvial aquifer; (4) Inventory location and quantity of diversions from Little Red River during irrigation season; (5) Estimate total monthly withdrawals within study reach and compare with monthly flows at Searcy gage; (6) Define critical combinations of flow at Searcy and backwater at Judsonia for which water-allocation procedures are necessary to prevent depletion of channel storage and upstream movement of water from the White River; (7) Recommend surface-water allocation procedure for consideration by cooperator in allocating diversions during critical periods.

Progress.--Gage installed on Little Red River at Searcy pump house. Forty five wells are scheduled for potentiometric surface in river alluvium, two with recorders.

Plans.--Immediate plans for inventory of river relift pumps. The 45 privately owned wells will be measured monthly and the recorder wells will be serviced monthly.

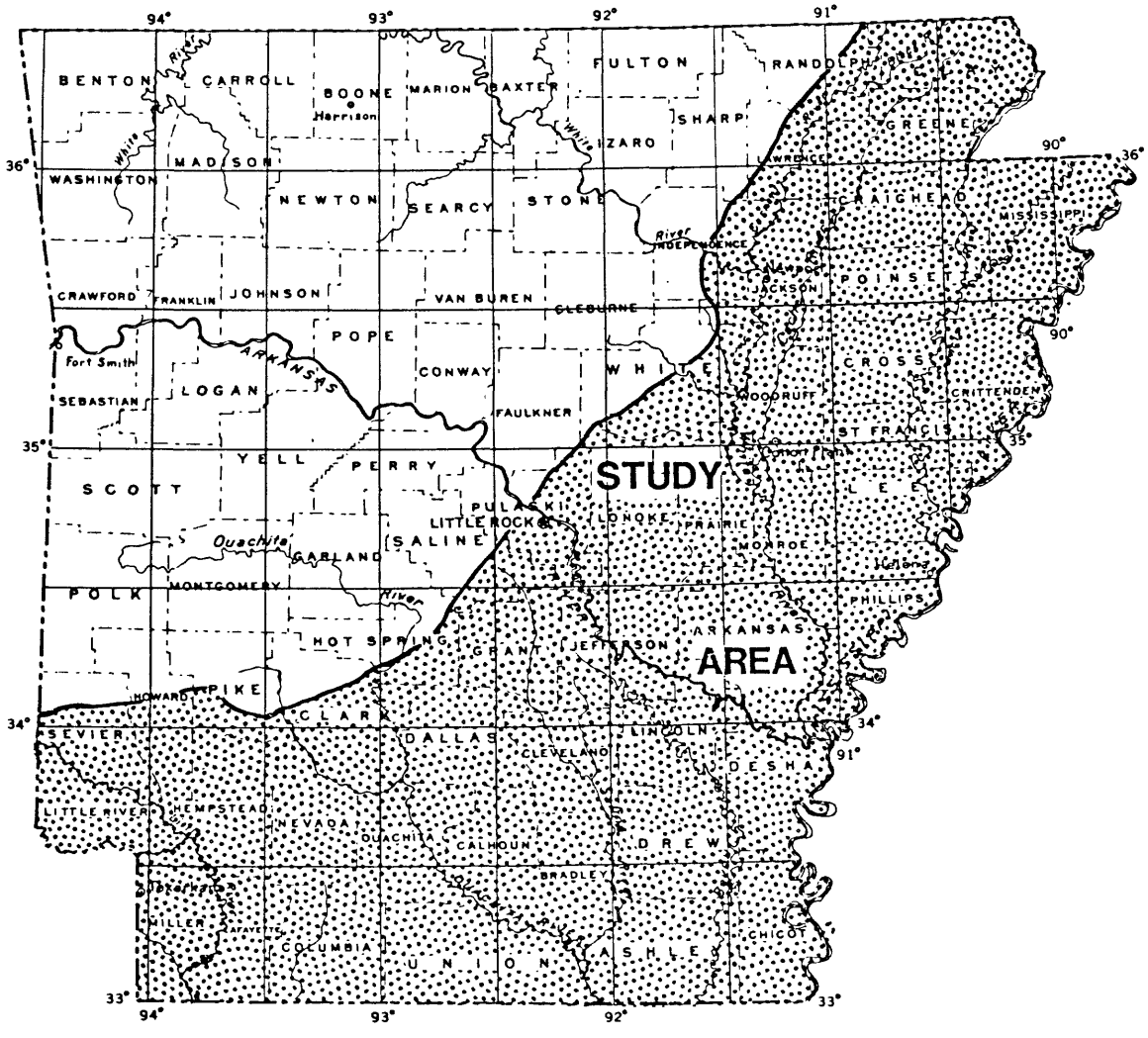


Figure 20.--Location of area included in the study of the geohydrologic units of the Gulf Coastal Plain of Arkansas.

Geohydrologic Units of the Gulf Coastal Plain of Arkansas

COOPERATING AGENCY: Arkansas Geological Commission, Arkansas Department of Pollution Control and Ecology.

PROJECT CHIEF: J. C. Petersen

PERIOD OF PROJECT: October 1980 through September 1983

Problem.--Information concerning altitude of structural top, thickness and dissolved-solids concentrations of geohydrologic units of the Gulf Coastal Plain of Arkansas is needed by the Federal Underground Injection Control Program. This information can be used in evaluating the capacity of geologic formations to receive waste and to contain that waste so that it cannot migrate to any freshwater aquifers.

Objectives.--Describe the structural top and thickness of the geologic units and the dissolved-solids concentrations of the aquifers in the study area. Provide this information in an easily usable form.

Approach.--Compile existing geophysical-log and water-quality data. Prepare a series of maps showing lines of equal structural top altitudes, thickness and dissolved-solids concentrations based on the existing data.

Progress.--Maps and an accompanying text are nearly completed.

Plans.--Release as a Water-Resources Investigations report.

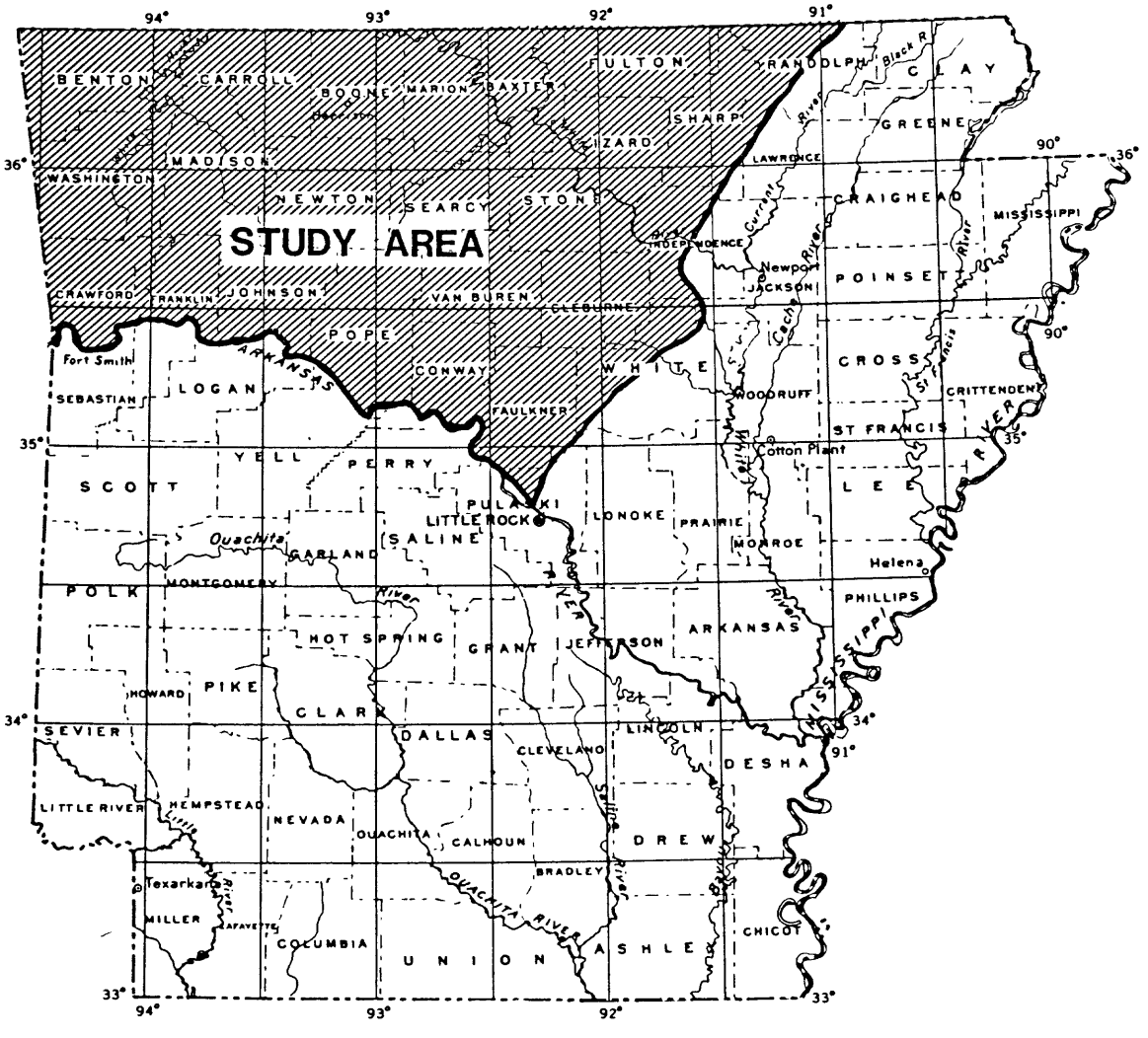


Figure 21.--Location of area included in the Central Midwest Regional Aquifer System Analysis study in Arkansas.

Central Midwest Regional Aquifer System Analysis in Arkansas

COOPERATING AGENCY: None

PROJECT CHIEF: A. H. Ludwig

PERIOD OF PROJECT: October 1980 through September 1985

Problem.--Paleozoic formations are important sources of freshwater for municipal, industrial, and domestic use in northwest Arkansas. Protection from contamination, especially at outcrop areas, is desirable. Knowledge of direction and rate of water flow is needed for evaluation of aquifers for any use.

Objectives.--Describe the hydrologic system, including aquifer designation, hydraulic characteristics, and quality of the water within the regional aquifers. Create a data base, including water use, water levels, lithologic logs, geophysical logs, and chemical analyses of water samples. Describe historic, present, and future problems associated with use of water. Evaluate aquifer-system responses to future conditions. The study area is shown in figure 20.

Approach.--Compile and analyze hydrologic, geologic, and water-quality data. Collect and analyze new data where needed and if feasible. Develop computer models of the aquifers or aquifer systems. Evaluate past and future impacts on the system resulting from development of ground water.

Progress.--Completed data input for lithologic, geophysical, water level, and geochemical data bases. Developed map sets from data bases and project data showing structural contours and thicknesses of units, potentiometric levels, and distribution of dissolved solids for each model layer. Updated rainfall and runoff maps for the State. Provided streamflow data for Arkansas to project staff members for preparations of a low-flow report on the study area.

Plans.--Continue to assist Missouri District project personnel with collection and assembly of data for the Ozark model study. Conduct seepage studies on streams in the study area in Arkansas. Continue the search for data to complete the structural maps of the Roubidoux and Gunter Formations throughout their areas of use or potential use in Arkansas.

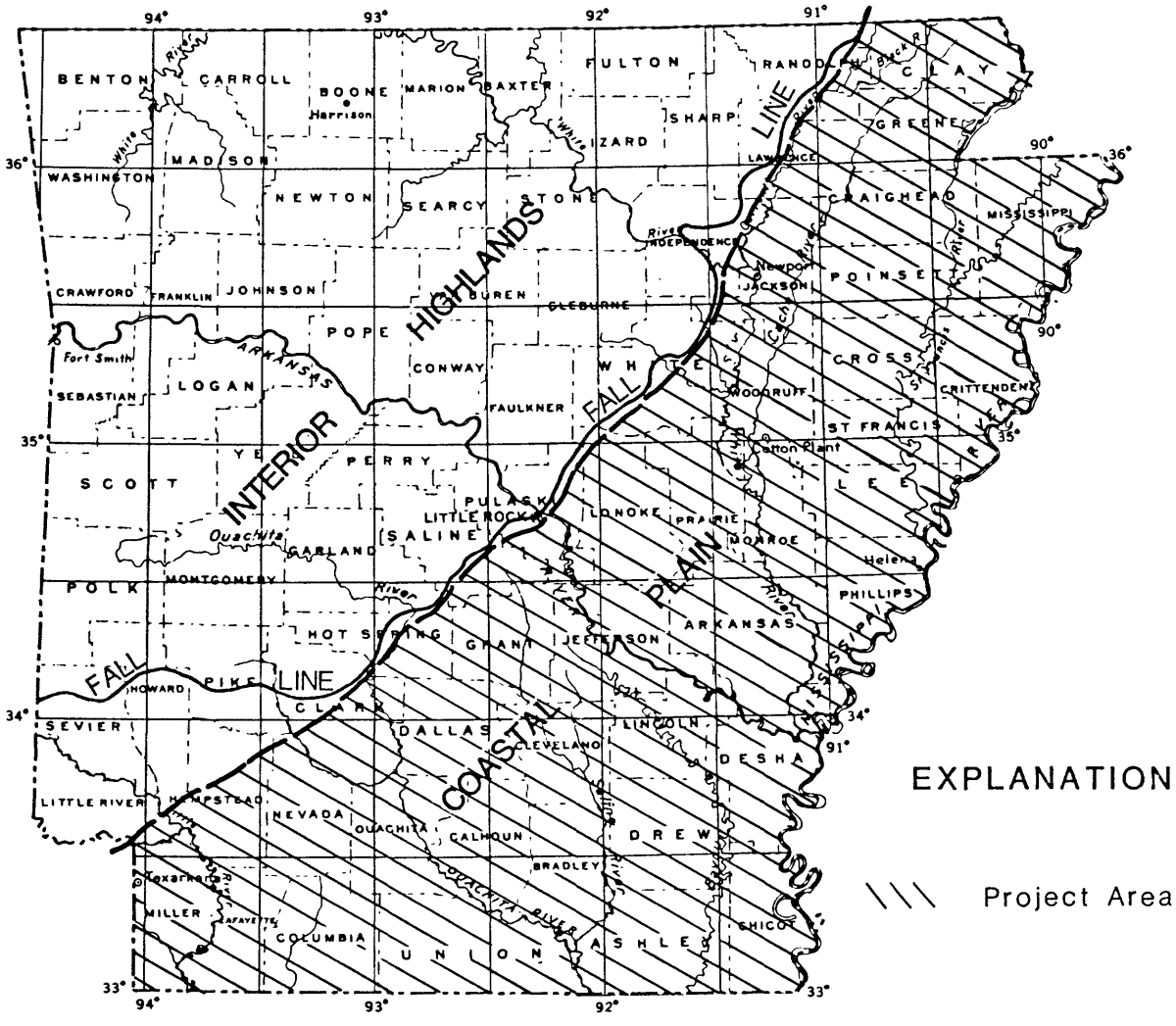


Figure 22.--Location of area included in the West Gulf Coast Regional Aquifer System Analysis study in Arkansas.

West Gulf Coast Regional Aquifer System Analysis in Arkansas

COOPERATING AGENCY: None

PROJECT CHIEF: A. H. Ludwig

PERIOD OF PROJECT: March 1982 through September 1986

Problem: Coastal plain deposits are important sources of freshwater for municipal, industrial, and irrigation use in the southeast half of Arkansas. Knowledge of the direction and rate of water flow in these sediments is needed for evaluation of aquifers for efficient use. Protection from contamination is highly important.

Objectives: Describe the hydrologic system, including aquifer designation, hydraulic characteristics and quality of the water within the regional aquifers. Create a data base including water use, water levels, lithologic logs, geophysical logs, and chemical analyses of water samples. Describe historic, present, and future problems associated with use of water. Evaluate aquifers system responses to future conditions. The study area is shown in figure 21.

Approach: Compile and analyze hydrologic, geologic, and water-quality data. Collect and analyze new data where needed and if feasible. Develop a computer model of the alluvial aquifer. Evaluate past and future impacts on the system resulting from development of ground water.

Progress: Completed the predevelopment water-table map for the uppermost geologic unit in southeast Arkansas. Completed coding data from selected geophysical logs for submission to the geophysical data base. Continued screening data from the computer files for accuracy and completeness.

Plans: Complete revision of data networks. Complete potentiometric maps for appropriate model layers. Develop the strategy for acquisition and compilation of data to model the alluvial aquifer throughout the lower Mississippi River valley and tributaries.

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2. Bryant, C. T., Lyford, F. P., Stafford, K. L., and Johnson, D. M., 1982, Hydrology of Area 42, Western Region, Interior Coal Province, Arkansas: U.S. Geological Survey Water Resources Investigations Report 82-636, 62 p.

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4. Edds, J., 1982, Ground-water levels in Arkansas, Spring 1982: U.S. Geological Survey Open-File Report 82-852, 51 p.

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7. Holland, Terrance, W., and Ludwig, A. H., 1981, Use of water in Arkansas, 1980: Arkansas Geological Commission Water Resources Summary No. 14, 29 p.

8. Hunrichs, R. A., 1983, Identification and Classification of Perennial Streams of Arkansas: U.S. Geological Survey Water-Resources Investigations Report 83-4063, Map (1 sheet).

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15. _____1981, Water-quality reconnaissance of Patton Lake, Jefferson County, Arkansas: U.S. Geological Survey Open-File Report 81-806, 16 p.

16. _____1982, Reconnaissance of stormwater-runoff water quality of the Big Piney Creek segment of the Cedar-Piney Creeks watershed, Yell County, Arkansas: U.S. Geological Survey Open-File Report 82-761, 19 p.

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18. Terry, J. E., Morris, E. E., Petersen, J. C., Darling M. E., 1983, Water-quality assessment of the Illinois River Basin, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 83-4092.

19. U.S. Geological Survey, 1982, Water resources data for Arkansas—water year 1981: U.S. Geological Survey Water-Data Report AR-81-1, 583 p.

20. U.S. Geological survey, 1983, Water resources data for Arkansas—water year 1982: U.S. Geological Survey Water-Data Report AR-82-1, 504 p.

FLOOD-PRONE AREA MAPS

[Maps shown with * are 15-minute quadrangles, all others are 7.5 minute]

Agnos
Alexander
*Alicia
Alma
Amagon
Amity
Arkadelphia
Ashdown East
Ashdown West
Atkins
*Augusta
Auvergne

Barling
Batesville
Beebe
Benton
Bentonville No.
Bentonville So.
Bethesda
Big Flat
*Blytheville
Board Camp
*Booneville
Boswell
Boxley
Brinkley
Bryant
Buckner
Buffalo City

Cabot
Cades
Caddo Valley
Calico Rock
Calion
Camden
Camp
Carthage
Cecil
*Clarendon
Clarksville
Clinton
Coal Hill
Concord
Congo
Conway
Cord
Cornerstone
Corning
Cotton Plant
Cozahome
Crocketts Bluff

Dalton
Deckerville
*Dee
Delaware
DeQueen
Des Arc East
DeValls Bluff
DeValls Bluff NE
DeValls Bluff SE
Domino

*Edmondson
*El Dorado

Fayetteville
*Felsenthal
Fletcher Lake
Fordyce
Foreman
Forrest City
Fort Smith
Fouke
Fouke NE
Fouke SE
Fountain Lake
Fourche
Fourche SW
Fulton

*Gainesville
Georgetown
Gleason
*Glenwood
Goosepond Mtn.
Gregory
Gregory SW
Grubbs
Guion
Hardy
Harrison
Hartford
Hartman
Haskell
Hasty
Haynes
Hindsville
Holla Bend
Holly Grove
Homan
Hope
*Horseshoe Lake
Houston
*Hunter
Huntington

Imboden

Jacksonport
Jacksonville
Jasper
Jericho
Judsonia

Keevil
Kensett
Kingsland

Lake Norrell
Latour
Lavaca
Leslie
Lewisville
*Lonoke
Lonsdale
Lonsdale NE

Madison
Magnolia
*Malvern
Mammoth Spg.
Mandeville
*Manila
*Marianna
*Marked Tree
*Marmaduke
Marshall
Martindale
Maumee
Mayflower
McAlmont
*McGehee
McRae
Mena
Monroe
Monticello No.
Monticello So.
Morrilton East
Morrilton West
Moscow
Mountainburg
*Mt. Ida
*Mt. Judea
Mt. Pleasant
Mulberry
Murray

Nashville
Newark
New Blaine
Newport
Norfork
Norfork Dam So.
No. Little Rock
Northwest Memphis

Ogden
*Osceola
Ozark

Paris
Park Grove
*Park Place

*Pastoria
*Piggott
Pine Bluff NW
Pine City
Pocahontas
Ponca
Portland
Potter
Poyen
Prague
Prairie Grove
Prattsvilleve
Prescott East
Prescott West
*Princedale
Ravenden
Ravenden Spgs.
Ravenden Spgs. SE
Reydell
Rob Roy
Russellville East
Russellville West

*Salem
Sheridan
Sitka
Smackover
Smackover NE
*Snowball
Snow Hill
Sonora
So. Fort Smith
Southwest Memphis
Springdale
Spring Lake
Stuart
Stuttgart No.
Stuttgart So.
Sylamore

Taylor
Texarkana
*Tilton
Traskwood
Tuckerman
Tull
Turner
Van Buren

Waldo
*Waldron
*Walnut Ridge
Warm Spgs.
Western Grove
West Memphis
Wheeler
Williford
Wilmot
*Wynne

Yellville