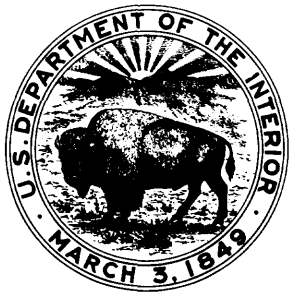
CURRENT WATER RESOURCES ACTIVITIES IN ARKANSAS, 1984-85

By Bobbie L. Louthian and E. E. Gann

U.S. GEOLOGICAL SURVEY

Open-File Report 85-554



Little Rock, Arkansas

1985

UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

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MESSAGE FROM ARKANSAS DISTRICT CHIEF

The U. S. Geological Survey, Water Resources Division, has maintained an active water-resources program in Arkansas since 1927 in cooperation with various State, local and other Federal agencies. I am very proud of the accomplishments of the agency during these years and honored to be directing the current activities of the Arkansas District. With the increasing competition for our finite water resources, the needs for water information have increased greatly. The USGS will continue to play an important role in helping to meet these water-information needs.

Significant changes have been made in recent years in the collection and processing of hydrologic data. Installation of data-collection platforms at several stream-gaging stations for transmitting hydrologic data by means of a satellite-relay system provides near real-time data for many stations. Implementation of a large minicomputer system in 1983 provides efficient storage, processing and retrieval of hydrologic data and allows flow simulation using complicated ground-water models.

Ground-water use, availability, and quality issues have been of particular concern during the 1980's. Recently completed interpretative reports provide statewide water-use information, present water-level maps for the state's two principal aquifers, describe saltwater contamination for selected areas, and summarize ground-water problems statewide. Recently initiated ground-water flow models for the state's two principal aquifers will provide water-level projections in response to future pumping stresses.

Sound and timely hydrologic information will continue to be needed for future development, conservation, and management of Arkansas' water resources. I look forward to continued cooperation with State, local, and other Federal agencies in helping to meet future water-information needs.

E. E. Gann
District Chief
U. S. Geological Survey, WRD
Little Rock, AR

U.S. GEOLOGICAL SURVEY ORIGIN

The U.S. Geological Survey was established by an act of Congress on March 3, 1879, to provide a permanent Federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of national domain." An integral part of that original mission includes publishing and disseminating the earth-science information needed to understand, to plan the use of, and to manage the Nation's energy, land, mineral, and water resources.

Since 1879, the research and fact-finding role of the USGS has grown and been modified to meet the changing needs of the Nation it serves. As part of that evolution, the USGS has become the Federal Government's largest earth-science research agency, the Nation's largest civilian mapmaking agency, the primary source of data on the Nation's surface- and ground-water resources, and the employer of the largest number of professional earth scientists. Today's programs serve a diversity of needs and users. Programs include:

- Conducting detailed assessments of the energy and mineral potential of the Nation's land and offshore areas.
- Investigating and issuing warnings of earthquakes, volcanic eruptions, landslides, and other geologic and hydrologic hazards.
- Conducting research on the geologic structure of the Nation.
- Studying the geologic features, structure, processes, and history of the other planets of our solar system.
- Conducting topographic surveys of the Nation and preparing topographic and thematic maps and related cartographic products.
- Developing and producing digital cartographic data bases and products.
- Collecting data on a routine basis to determine the quantity, quality, and use of surface and ground water.
- Conducting water-resource appraisals in order to describe the consequences of alternative plans for developing land and water resources.
- Conducting research in hydraulics and hydrology, and coordinating all Federal water data acquisition.
- Using remotely sensed data to develop new cartographic, geologic, and hydrologic research techniques for natural resources planning and management.
- Providing earth-science information through an extensive publications program and a network of public access points.

Along with its continuing commitment to meet the growing and changing earth-science needs of the Nation, the USGS remains dedicated to its original mission to collect, analyze, interpret, publish, and disseminate information about the natural resources of the Nation--providing "Earth Science in the Public Service."

Water Resources Division
Basic Mission and Program

The mission of the 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 and non-Federal agencies, by:

- Collecting, on a systematic basis, data 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 the 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 these 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 data for streams, lakes, reservoirs, estuaries, and ground waters.

- Providing scientifc 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.

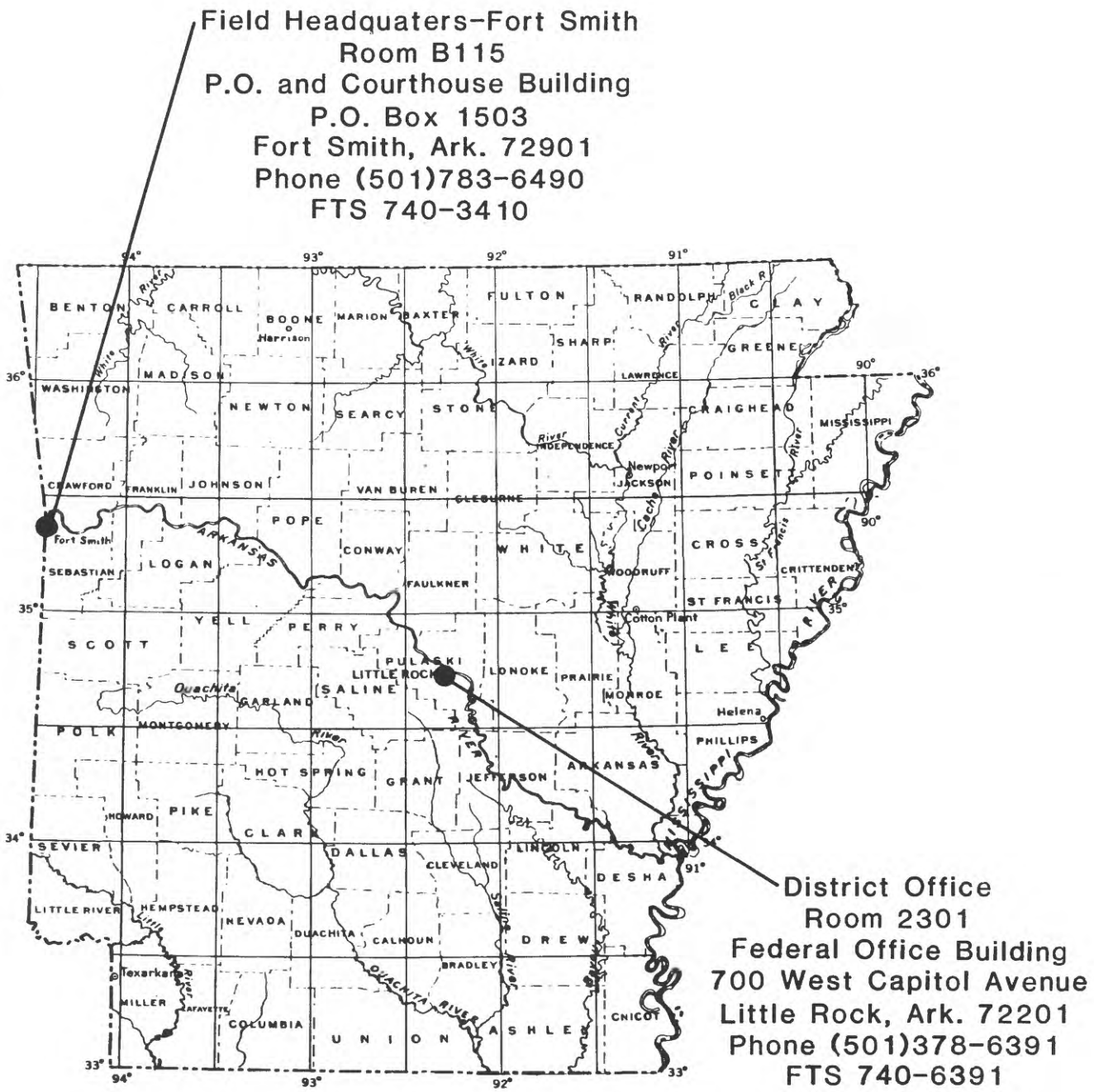
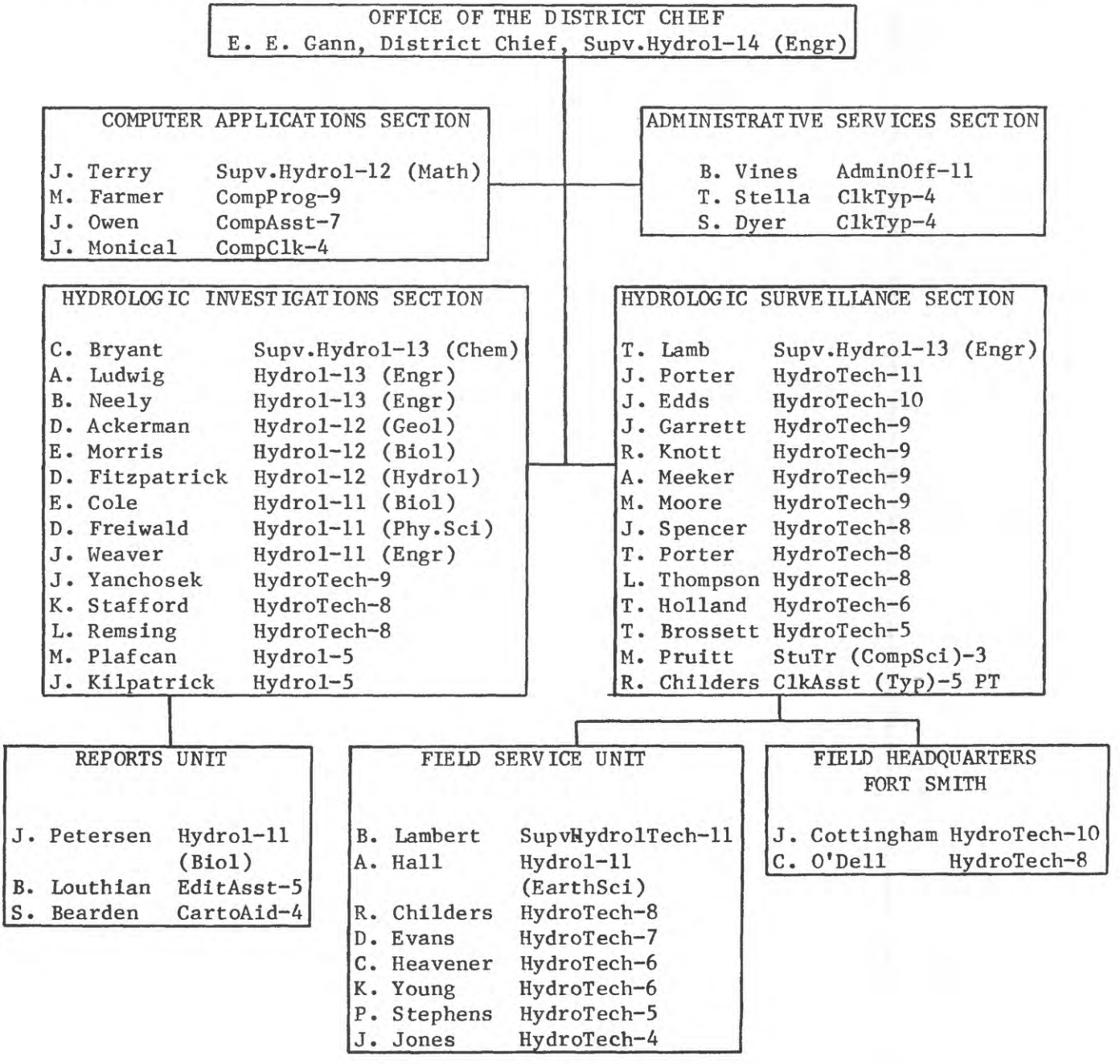


Figure 1.--U.S. Geological Survey, Water Resources Division offices in Arkansas.

ORGANIZATION OF THE ARKANSAS DISTRICT

The Arkansas District of the Water Resources Division consists of two operating sections and five support units. Water-resources projects conducted by the District are assigned to one of the operating sections with responsibility for a project assigned to a project chief. The Arkansas District consists of persons based at the District Office and Field Service Unit and Laboratory in Little Rock and at a Field Headquarters in Fort Smith.



TYPES OF FUNDING

Funding for programs of the Arkansas District falls into three categories:

1. Federal program which includes funds appropriated directly to the Geological Survey,

2. OFA program which includes funds transferred from other Federal agencies,

3. Cooperative program which includes investigations supported by services and (or) funds provided by State and local agencies, matched on a 50-50 basis by Federal funds.

For fiscal year 1985 the financial support for the programs in Arkansas are about $2,500,000 and are distributed as shown in figure 2.

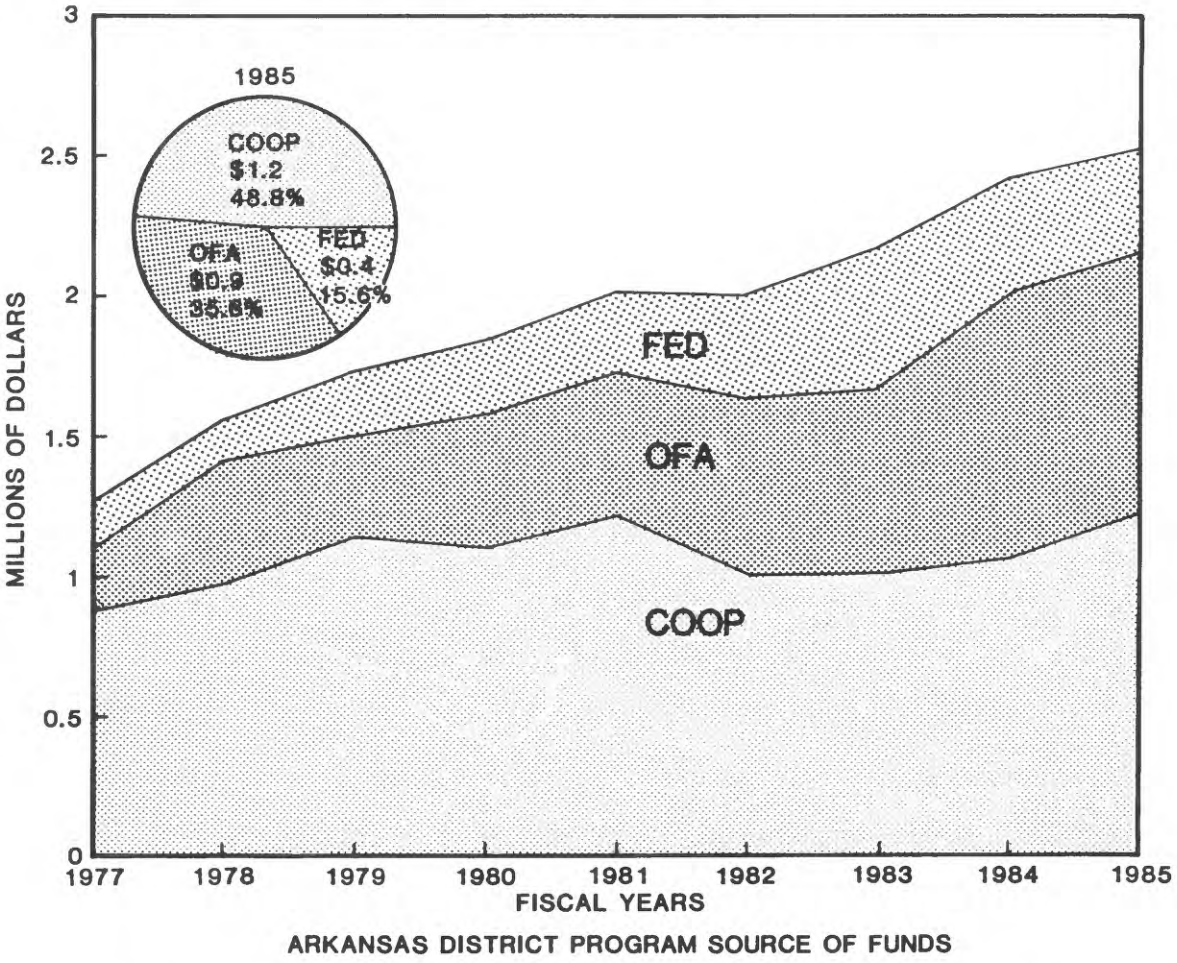


Figure 2.--Arkansas District Program source of funds.

Table 1.--Agencies supporting water-resources investigations during 1984-85 in the Arkansas District

Federal Agencies

U.S. Department of Agriculture
  Soil Conservation Service
  Forest Service
U.S. Department of the Army
  Corps of Engineers
    Little Rock District
    Memphis District
    Vicksburg District
U.S. Department of Commerce
  National Weather Service
U.S. Department of Interior
  Bureau of Land Management
  National Park Service
U.S. Department of Transporation
  Federal Highway Administration
U.S. Environmental Protection Agency
U.S. Federal Emergency Management Agency

State Agencies

Arkansas Geological Commission
Arkansas Department of Parks and Tourism
Arkansas Department of Pollution Control and Ecology
Arkansas Soil and Water Conservation Commission
Arkansas State Highway and Transportation Department

Local Agencies

Arkansas Power and Light Company

Water is one of Arkansas' most important resources. The total estimated water use in the State in 1981 from both ground water and surface water was 33,000 million gallons per day (Mgal/d). The total water use for each county from both surface- and ground-water sources is shown in figure 3. As water use in Arkansas increases so does the awareness of problems with availability and quality of water.

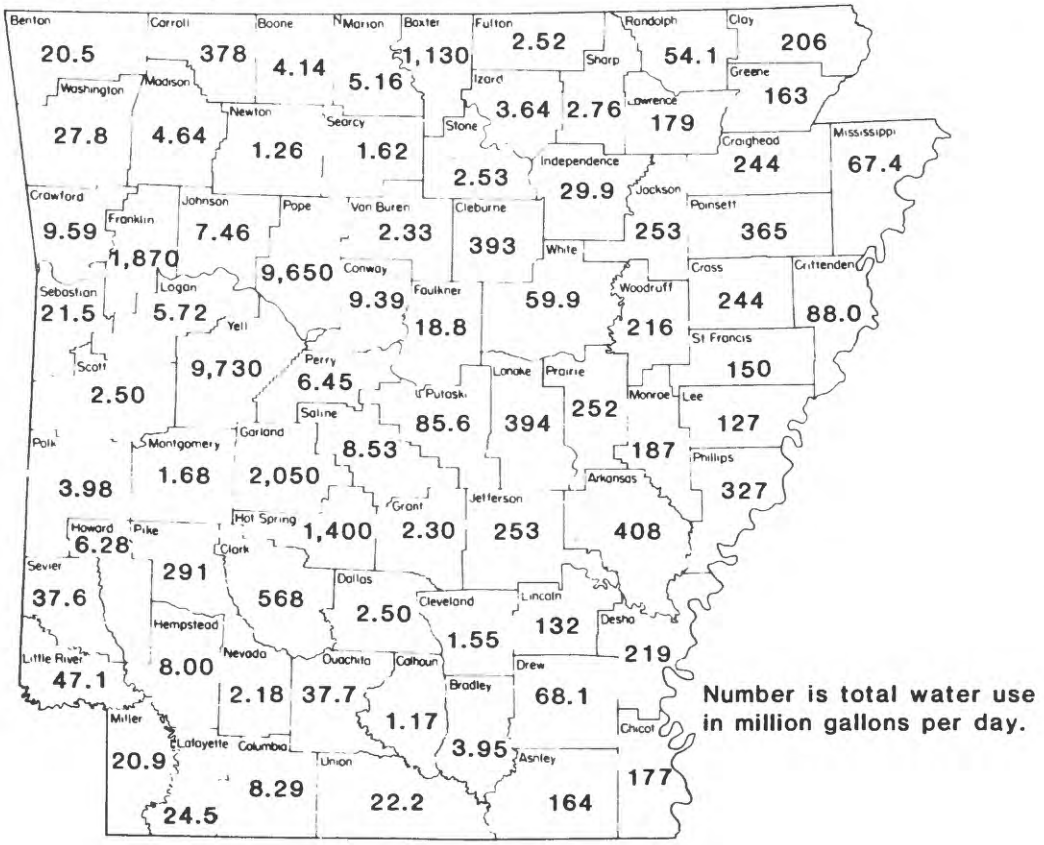


Figure 3.--Total water use in Arkansas, 1981 (Hall and Holland, 1984).

Water-Availability Issues

Irrigation pumpage since the early 1930's has caused water-level declines of more than 60 feet in the Mississippi River alluvial aquifer. Counties affected by this decline are Poinsett, Cross, Craighead, Prairie, Lonoke and Arkansas where pumping for irrigation has exceeded recharge. Arkansas and Poinsett Counties were the largest users of irrigation water in 1981, 380 Mgal/d and 356 Mgal/d, respectively (Hall and Holland, 1984). Water levels in the alluvial aquifer are declining by as much as 1 foot per year. In southern Arkansas, declines of over 200 feet in Columbia and Jefferson Counties and of about 300 feet in Union County of the Sparta Sand aquifer have resulted from irrigation, municipal, and industrial pumpage. Yields to wells of less than 10 gal/min occur in a large part of the Interior Highlands in west-central Arkansas.

Some surface water is now being used for irrigation in eastern Arkansas. Because of decreasing ground-water supplies, withdrawals of additional large quantities of water from the Arkansas, White, and Little Red Rivers for irrigation have been proposed as an alternative to the use of ground water. Withdrawals for irrigation during 1981 were estimated to be 4,370 Mgal/d. Of this amount, 3,760 Mgal/d (86 percent) was withdrawn from ground water and 618 Mgal/d (14 percent) was from surface water (Hall and Holland, 1984).

Water-Quality Issues

Several streams and surface-water bodies receive municipal, agricultural, and industrial waste-water discharges that adversely affect the suitability of the water for drinking, recreation, and aquatic life. Depletion of dissolved oxygen in the White River and eutrophication of Beaver Reservoir in northwest Arkansas are two widely publicized examples. Also contributing to concerns about the White River are nonpoint discharges of nutrients and sediments from agricultural and municipal sources. The Arkansas River is being considered as a source of water for public supply and irrigation. Seepage from salt deposits in Kansas and Oklahoma, which increases the salinity of the river, makes the river unsuitable for most uses during low flows. Municipal and industrial discharges to the Arkansas River may contribute wastes and chemicals that affect its potability. Storage effects of the Arkansas River Navigation System and tributary dams may have moderated the effects of salts and other pollutants. Potential pollution of water and accumulation of pesticides in bottom sediments of streams, lakes, and ponds is a concern in agricultural areas of the State.

Saltwater is intruding into freshwater aquifers in several areas of the State. Saltwater occurs in several places in the alluvial aquifer. The presence of saltwater in Monroe, Lincoln, Desha and Chicot Counties has been known for several years. In recent years, withdrawals from the aquifer have been suspended in local areas as a result of increasing salinity (Fitzpatrick, 1985). In Miller and Lafayette Counties, saltwater occurrences at shallow depth are the result of brines from deep beneath the surface invading the alluvial aquifer through unplugged wells. In Independence and White Counties, saltwater in the alluvial aquifer is a natural occurrence resulting from the upwelling of water from brine-containing rocks beneath the alluvium. The saltwater in the Arkansas River alluvium may have resulted as recharge from the Arkansas River, which at times contains saltwater derived from salt beds in Kansas and Oklahoma. The number and areal extent of saltwater occurrences in the alluvial aquifer have increased in recent years primarily as the result of the decline in water levels caused by large withdrawals for irrigation (Bryant and others, 1985). Saltwater also occurs in the Sparta Sand aquifer in southern Arkansas. In Union County, large-scale ground-water withdrawals from the Sparta aquifer have changed the natural flow direction and are allowing saltwater to migrate toward the center of pumping in the vicinity of El Dorado (Broom and others, 1984).

Permeable materials that allow water to recharge aquifers will also allow contaminants to enter the ground-water system. Therefore, the potential for contamination is closely related to the recharge rate and the disposal location of hazardous materials. CERCLA (Superfund) sites are hazardous sites considered to be potential sources of significant harm to human health or the environment. Seven such sites exist in Arkansas.

Flood-Hazard Information

Twenty-four hour rains of 5 to 10 inches are frequent in the State. As a result, localized flooding is common throughout the State. Widespread flooding in low-lying areas of the Gulf Coastal Plain is a continuing concern.

Flood-prone areas are identified for cities and towns having a population of more than 2,500 and for adjacent areas for which adequate maps were available and flood-frequency drainage-area relationships could be determined. These areas are shown on the map in figure 4. A total of 219 flood-prone area maps have been published for Arkansas. A list of the maps is found in table 2.

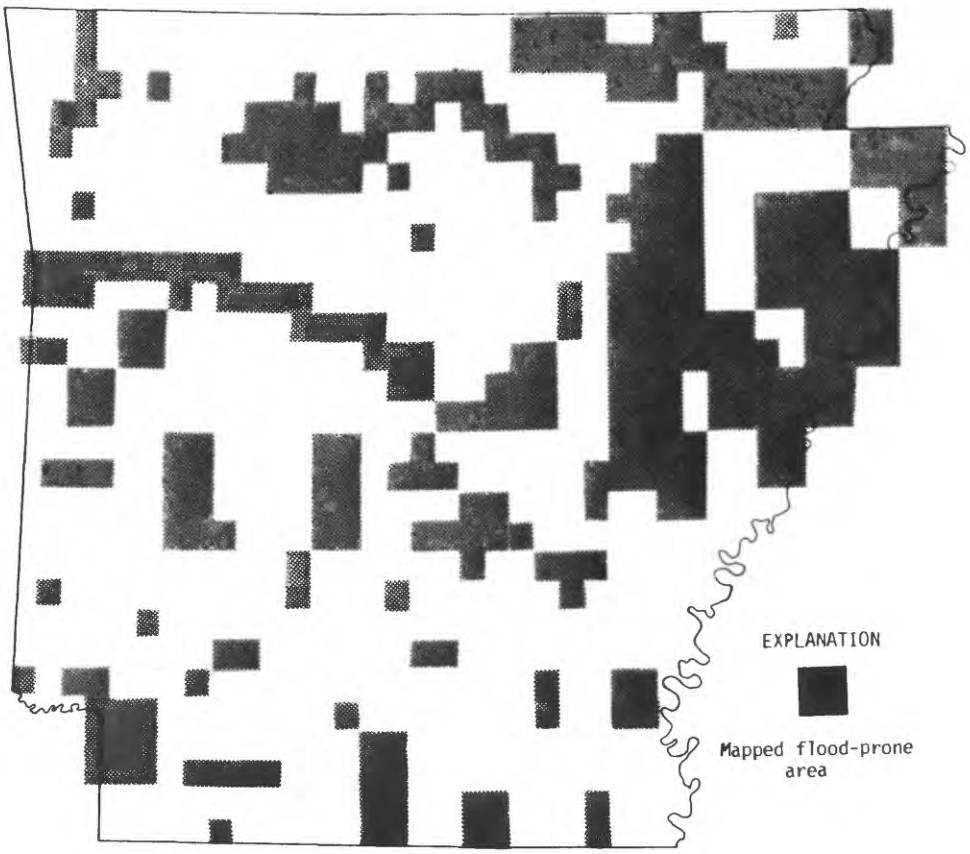


Figure 4.--Locations of flood-prone area maps for Arkansas.

Institutional and Management Issues

Water legislation passed by the 1985 Arkansas Legislature requires that a determination of the State's water needs be made prior to the 1987 legislative session. Specific items to be addressed include: (1) reporting of ground-water use for nondomestic wells exceeding 5 inches in diameter, (2) definition of critical water areas, (3) establishment of minimum streamflows, and (4) determination of surplus water in each of twelve hydrologic basins in the State.

Table 2.--Flood-prone area maps for Arkansas

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

Agnos
*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
DeQueene
Des Arc East
DeValls Bluff
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 Spring
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. Pleasand
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
Ponca
Portland
Potter
Poyen
Prague
Prairie Grove
Prattsville
Prescott East
Prescott West
*Princedale

Ravenden
Ravenden Springs
Ravenden Springs SE
Reydell
Rob Roy
Rusellville East
Russellville West

*Salem
Sheridan
Sitka
Smackover
Smackover NE
*Snowball
Snow Hill
Sonora
South 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 Springs
Western Grove
West Memphis
Wheeler
Williford
Wilmot
*Wynne

Vellville

CURRENT PROJECT DESCRIPTIONS

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 and Light Company, Arkansas Soil and Water Conservation Commission, U.S. Forest Service, Arkansas State Highway and Transportation Department, National Weather Service (NOAA), Arkansas Department of Parks and Tourism

PROJECT CHIEF: T. E. Lamb

PERIOD OF PROJECT: 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, pollution control, 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 publications 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), 3 stage stations, and 19 sites where occasional measurements are made for water-quality sampling. Operated and maintained a network of 53 crest-stage stations (fig. 5) and determined the annual maximum peak stage and discharge at each site. Installed and operated data collection platforms at 47 stations and an Accoustical Velocity Meter at 1 station.

Plans.--Operate network of 84 stream-gaging stations, 3 stage stations, and several sites as needed for water-quality sampling. Operate and maintain crest-stage network. Make discharage measurements to verify stage-discharge relations in range of shifting controls. Operate data collection platforms and Accoustical Velocity Meter.

Reports.--

U.S. Geological Survey, 1984, Water resources data for Arkansas--water year 1983: U.S. Geological Survey Water-Data Report AR-83-1, 561 p.

U.S. Geological Survey, 1985, Water resources data for Arkansas--water year 1984: U.S. Geological Survey Water-Data Report AR-84-1 (in press).

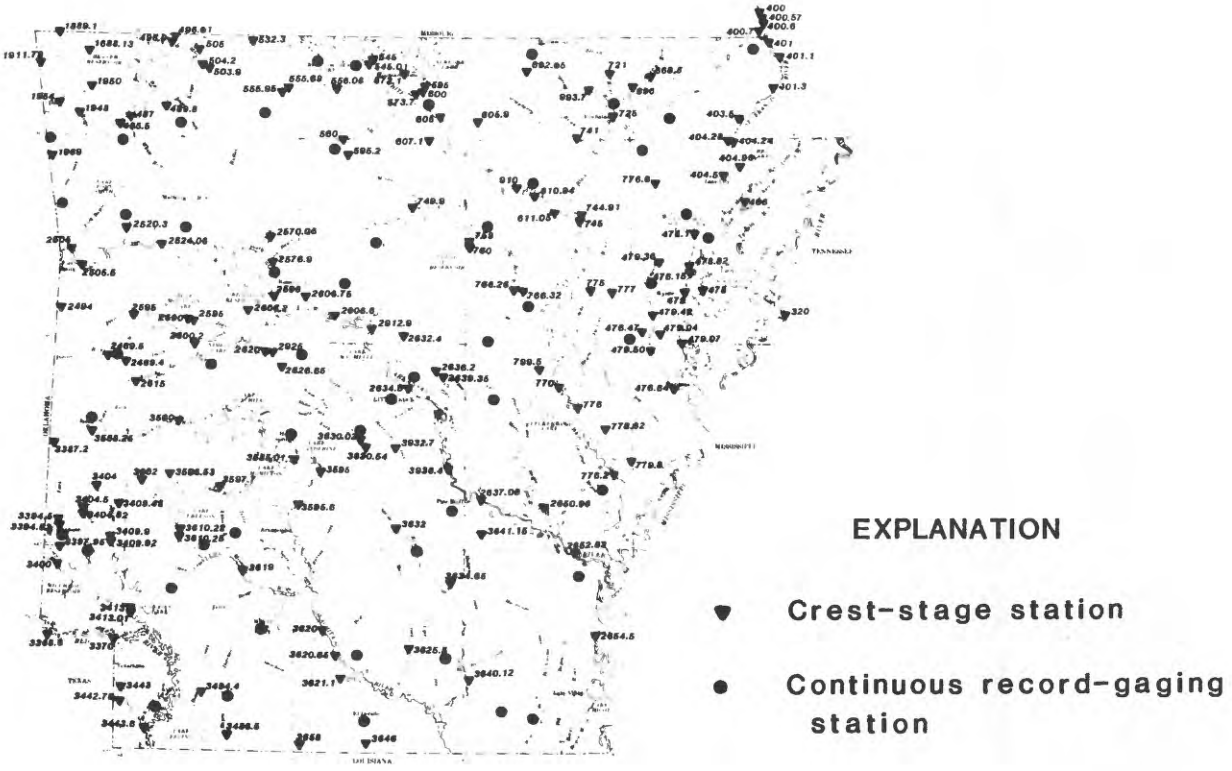


Figure 5.--Location of continuous record-gaging and crest-stage stations in Arkansas.

Collection of Ground-Water Data

COOPERATING AGENCIES: Arkansas Geological Commission, Arkansas Soil and Water Conservation Commission

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, assist in the prediction of future supplies, and 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 contamination and supply problems, and provide the data 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 675 wells (fig. 6) throughout the State as part of the USGS-AGC ground-water data-collection program. Electric and gamma-ray logs were made in approximately 10 newly drilled water wells in the State. Four reports showing ground-water levels in Arkansas were completed.

Plans.--Continue water-level monitoring. Prepare the ground-water section of "Water Resources Data for Arkansas, Water Year 1985" and publish water-level data for principal aquifers.

Reports.--

Edds, Joe, 1984, Ground-water levels in Arkansas, spring 1984: U.S. Geological Survey Open-File Report 84-711, 58 p.

_____, 1985, Ground-water levels in Arkansas, spring 1985: U.S. Geological Survey Open-File Report 85-478, 60 p.

Edds, Joe and Fitzpatrick, D. J., 1984, Maps showing altitude of the potentiometric surface and changes in water levels of the alluvial aquifer in eastern Arkansas, spring 1983: U.S. Geological Survey Water-Resources Investigations Report 84-4264, 1 sheet.

_____, 1984, Maps showing altitude of the potentiometric surface and changes in water levels of the Sparta Sand and Memphis Sand aquifers in eastern Arkansas, spring 1983: U.S. Geological Survey Water-Resources Investigations Report 84-4265, 1 sheet.

U.S. Geological Survey, 1984, Water resources data for Arkansas--water year 1983: U.S. Geological Survey Water-Data Report AR-83-1, 561 p.

U.S. Geological Survey, 1985, Water resources data for Arkansas--water year 1984: U.S. Geological Survey Water-Data Report AR-84-1 (in press).

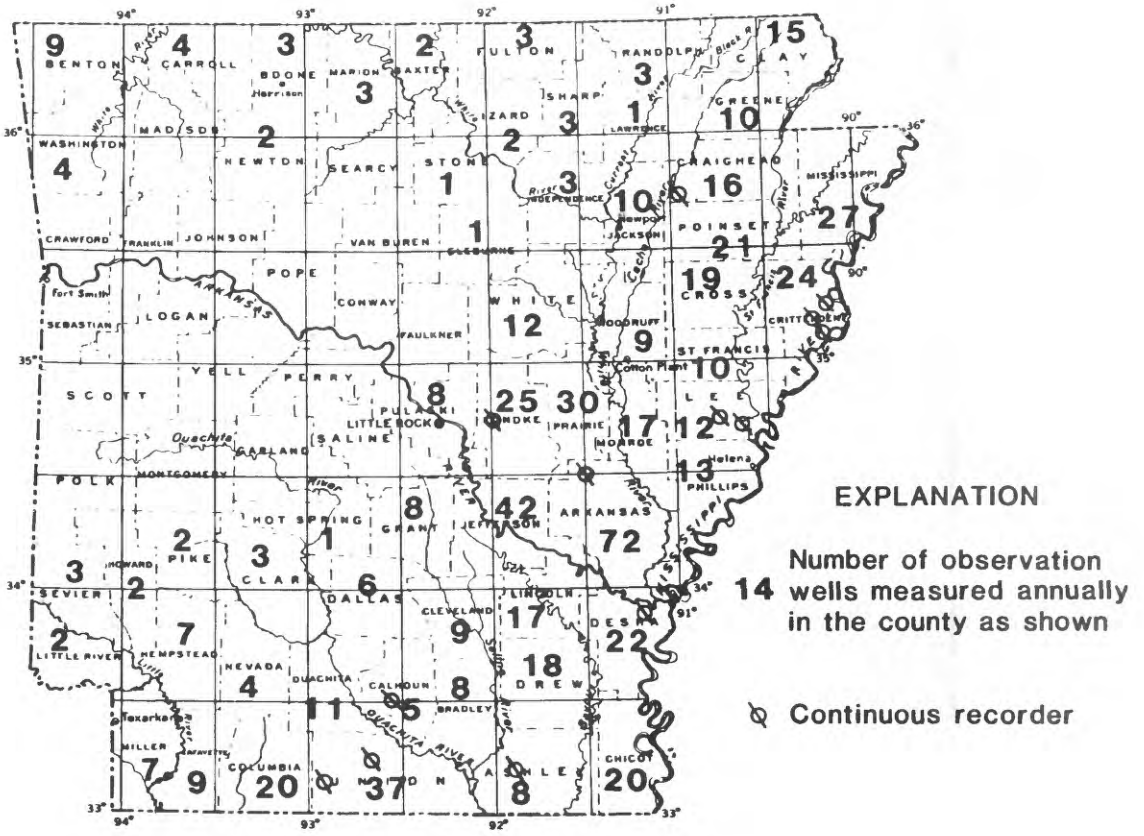


Figure 6.--Location of wells with continuous water-level recorders and number of observation wells measured annually.

Collection of Water-Quality Data

COOPERATING AGENCIES: Arkansas Geological Commission, Arkansas Department of Pollution Control and Ecology, U.S. Army Corps of Engineers,

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 streams and lakes 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 at 13 National Stream Quality Accounting Network stations, 1 Benchmark Network station, 5 cooperative stations, and 87 sites on 13 lakes. From 6 to 69 parameters were determined for samples from each station. The Arkansas Department of Pollution Control and Ecology collects and analyses water-quality samples at approximately 110 stations. The stations are shown on figure 7. Data from the Geological Survey and the Arkansas Department of Pollution Control and Ecology 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.--

U.S. Geological Survey, 1984, Water resources data for Arkansas--water year 1983: U.S. Geological Survey Water-Data Report AR-83-1, 561 p.
U.S. Geological Survey, 1985, Water resources data for Arkansas--water year 1984: U.S. Geological Survey Water-Data Report AR-84-1, 623 p.

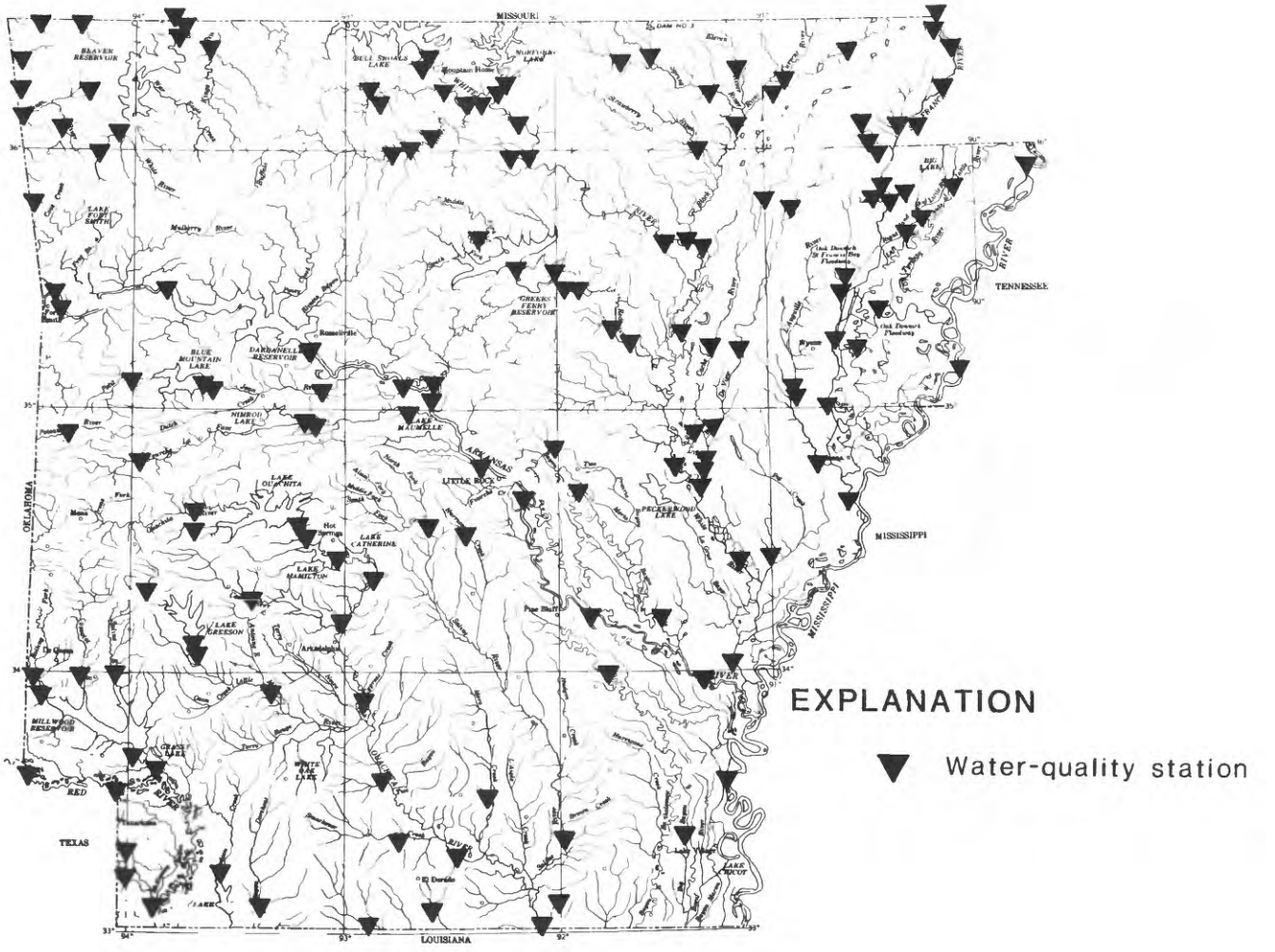


Figure 7.--Location of water-quality stations in Arkansas. Stations on Beaver, Blue Mountain, Bull Shoals, DeQueen, Dierks, Gillham, Greers Ferry, Greeson, Millwood, Nimrod, Norfork, Table Rock, and Tameycomo Lakes are not shown.

COOPERATING AGENCY: U.S. Army Corps of Engineers

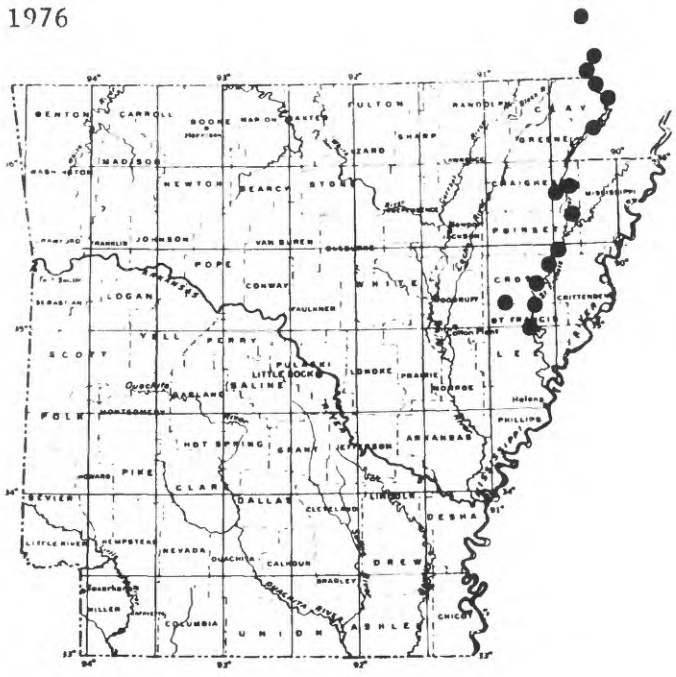
PROJECT CHIEF: B. Frank Lambert

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.--Established and operated 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 are collected at 15 stations on the St. Francis River and selected tributaries. Samples are collected on a daily basis at one station and analyzed for sediment concentration. Samples are collected monthly at six stations and eight times a year at the remaining stations. These samples are analyzed for concentration and for particles greater than 62 microns in diameter.

Plans.--Collect and analyze daily sediment samples at one station, monthly samples at six stations, and eight times per year at the remaining stations.

Reports.--

U.S. Geological Survey, 1984, Water resources data for Arkansas--water year 1983: U.S. Geological Survey Water-Data Report AR-83-1, 561 p.
U.S. Geological Survey, 1985, Water resources data for Arkansas--water year 1984: U.S. Geological Survey Water-Data Report AR-84-1, 623 p.

Arkansas River Basin Annual Flows, Arkansas-Oklahoma

COOPERATING AGENCY: Arkansas Soil and Water Conservation Commission

PROJECT CHIEF: T. E. Lamb

PERIOD OF PROJECT: Continuous since July 1977

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

Objectives.--Determine annual streamflow yields from five subbasins and deficiency for the compact area 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 and the U.S. Army Corps of Engineers. Annual reports will give the annual yield of each subbasin using the data 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. Annual yields will be computed and published. Available water-quality data will be included.

Reports.--

Moore, M. A., and Lamb, T. E., 1984, Report of the annual yield of the Arkanas River basin for the Arkansas River basin compact Arkansas--Oklahoma 1983 water year: U.S. Geological Survey Open-File Report 84-598, 24 p.

Moore, M. A., and Lamb, T. E., 1985, Annual yield and selected hydrologic data for the Arkansas River Basin Compact, Arkansas-Oklahoma, 1984 water year: U.S. Geological Survey Open-File Report 85-179, 30 p.

Water-Use Data for Arkansas

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

PROJECT CHIEF: Alan P. Hall

PERIOD OF PROJECT: Continuous since April 1979

LOCATION: Statewide

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 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. Data collection, report preparation and distribution will be handled by the U.S. Geological Survey with support from the Arkansas Soil and Water Conservation Commission as needed.

Progress.--A report on use of water in Arkansas for 1981 has been published as a Water Resources Investigations map report. Data are presently being tabulated for the 1983 report. Discharge measurements were made on selected trout farms in northwest Arkansas in 1984 to substantiate previous estimated applications. Rice irrigation wells were inventoried in three eastern Arkansas counties in 1983 to aid in rice application rates and determining from which aquifer the water is being withdrawn.

Plans.--A 1982 report on use of water in Arkansas will be published as a 1-page color map report. During calendar year 1985, special projects will be initiated on major self-supplied industries and Arkansas Power and Light Company's nuclear power plant if permission is granted. Finalize data on rice irrigation wells.

Reports.--

Hall, A. P., and Holland, T. W., 1984, Water use in Arkansas, 1981: U.S. Geological Survey Water-Resources Investigations Report 84-4070, 1 sheet.

Holland, T. W., and Hall, A. P., 1985, Water use in Arkansas, 1982: U.S. Geological Survey Water-Resources Investigations Report 85-4282, 1 sheet.

Flood Investigations

COOPERATING AGENCY: Federal Emergency Management Agency

PROJECT CHIEF: Jess D. Weaver

PERIOD OF PROJECT: April 1985 to February 1986

Problem.--The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 provides 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.

Objectives.--To conduct the necessary hydrologic and hydraulic evaluations and studies of areas assigned by FEMA and to present the results in an appropriate format.

Approach.--To conduct the necessary evaluations or to conduct surveys by ground or photogrammetric methods. Determine flood-discharge frequency relationships using local historical information, gaging station records, or other applicable information. Determine water-surface profiles using step-backwater models or by other acceptable methods and furnish the results in reports prepared to FEMA specifications.

Progress.--Field surveying of cross section properties and flood-discharge frequency relationships have been completed for two streams in Independence County. Step-backwater computations are being finalized for these streams.

Plans.--Make flood insurance studies using LDS methods for two counties in Arkansas. This will involve making cross sections and selecting roughness coefficients of streams. Determine water-surface profiles of streams using step-backwater analysis for selected recurrence intervals. Furnish the results in reports prepared to FEMA specifications.

Flood Frequency and Hydraulics

COOPERATING AGENCY: Arkansas State Highway and Transportation Department

PROJECT CHIEF: Braxtel L. Neely, Jr.

PERIOD OF PROJECT: Continuous since July 1960

LOCATION: Statewide

Problem.--Adequate definition of discharge and frequency is essential to proper design, construction, and maintenance of hydraulic structures in Arkansas. This need was addressed in a previous study, and the results were published in a report entitled "Floods in Arkansas, magnitude and frequency characteristics through 1968". Since that report was published, better definition of streamflow data is available by having 16 additional years of record at each gaging station and by having additional data at new stations and small-stream crest-stage gages. The Arkansas Highway and Transporation Department uses this type of data throughout the State in design of highway structures. They have requested that the flood frequency report for Arkansas be revised and updated based on the additional data.

Objectives.--The objectives of the project are (1) to present available flood-peak data for streams in Arkansas, and (2) to derive equations and graphs by which the magnitude and frequency of floods on streams in Arkansas can be evaluated. Make hydrologic and hydraulic analyses of floodflow characteristics at specific bridge sites.

Approach.--Discharge-frequency curves will be determined for all gaging stations which have at least 10 years of record. This will be done for all stations in Arkansas and for nearby streams in adjoining states. Each discharge-frequency curve will be derived with annual peak discharge data using the log-Pearson type III analysis following methods outlined in WRD Bulletin No. 17B. All climatic and basin parameters that affect peak discharge and that can be reasonably measured will be determined for each drainage basin. Analyze floodflow characteristics at specific bridge sites by use of standard methods of indirect computation of peak flows.

Progress.--Annual peak discharges for all stations have been entered into the peak flow file through the 1984 water year. Most of the basin parameters to be used in the final regression equation have been entered in the basin characteristics file.

Plans.--Compute discharge frequency curves for all sites using data through the 1984 water year. Develop regression equations for selected recurrence intervals. Complete flood frequency report. Analyze floodflow characteristics at specific bridge sites as requested.

Reports.--A Water-Resources Investigations Report is planned for completion by September 1986. The preliminary title will be "Floods in Arkansas, Magnitude and Frequency". Two bridge site reports are also being prepared in connection with this study. They are "Floodflow Characteristics of Current River at Arkansas State Highway 328 near Reyno, Arkansas" and "Floodflow Characteristics of Archey Creek Along U.S. Highway 65 at Clinton, Arkansas."

Water-Surface Profiles Along Bayou Meto and Rocky Branch near Jacksonville, Arkansas

COOPERATING AGENCY: U.S. Environmental Protection Agency

PROJECT CHIEF: Braxtel L. Neely, Jr.

PERIOD OF PROJECT: October 1983 to March 1985

Problem.--Elevations, discharges and limits of flooding were needed to evaluate the extent of possible contamination in Rocky Branch and Bayou Meto.

Objectives.--To compute water-surface profiles along Bayou Meto and Rocky Branch for the 2-, 5-, 10-, 25-, and 50-year floods. To delineate flood boundaries for Bayou Meto and Rocky Branch on topographic maps for the 2- and 5-year floods.

Approach.--Discharges for the 2- , 5-, 10-, 25-, and 50-year floods on Bayou Meto and Rocky Branch were computed using the equations by Patterson in the report "Floods in Arkansas, Magnitude and Frequency Characteristics Through 1968". Cross sections were picked from one-foot interval topographic maps furnished by the U.S. Environmental Protection Agency. Water-surface profiles were computed using the U.S. Geological Survey's step-backwater computer program number J-635. Flood boundaries were determined by transferring the elevations from the water-surface profiles to the topographic maps.

Progress.--Report has been completed and published.

Plans.--Additional work may be forthcoming to determine velocity vectors using a 2-D flow model.

Report.--

Neely, Braxtel L., Jr., 1985, Water-surface profiles along Bayou Meto and Rocky Branch near Jacksonville, Arkansas: U.S. Geological Survey Open-File Report 85-176, 12 p.

Buffalo River Flood Profiles

COOPERATING AGENCY: National Park Service

PROJECT CHIEF: Braxtel L. Neely, Jr.

PERIOD OF PROJECT: October 1982 to September 1984

Problem.-- Hydrologic and hydraulic data are needed for constructing, maintaining, and operating 17 park sites along the Buffalo River.

Objectives.--To develop water-surface profiles and typical hydrographs for the 100- and 500-year floods at the 17 park sites.

Approach.--Highwater marks recovered after the December 1982 flood were very beneficial in developing the profiles. Discharge-frequency curves were developed for the gaging stations at St. Joe and Rush using station data. The 100- and 500-year discharges were transferred to the park sites by using the ratio of the drainage areas to the 0.48 power. Water-surface profiles were developed using the step-backwater program number J-635. Typical hydrographs were developed for the 100- and 500-year floods at the gaging station at St. Joe. Typical hydrographs at the park sites were computed by making adjustments to the typical hydrographs at St. Joe.

Progress.--Report has been completed.

Plans.--No additional plans.

Reports.--

Neely, Braxtel L. Jr., 1985, The flood of December 1982 and the 100- and 500-year flood on the Buffalo River, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4192 (in press).

National Trends Network Acid Precipitation Site

COOPERATING AGENCY: None

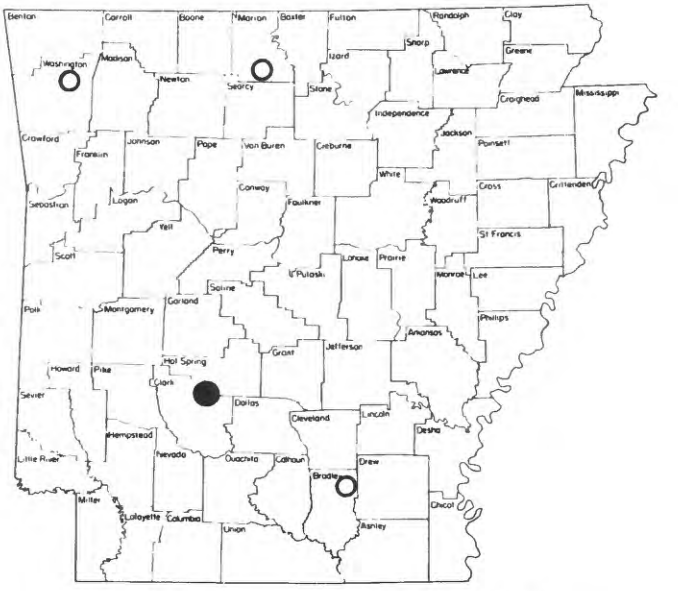
PROJECT CHIEF: James C. Petersen

PERIOD OF PROJECT: Continuous since December 1983

Problem.--Acidic precipitation has potential detrimental effects on aquatic and terrestrial systems. Data concerning the extent and severity of acidic precipitation in the United States is limited.

Objectives.--To increase the amount of precipitation quality data for Arkansas and to provide data for use in regional and national analyses.

Approach.--A wetfall collector and two precipitation gages (one recording gage) are used to collect weekly (7-day accumulations) samples of precipitation at one site near DeGray Dam and Caddo Valley, Arkansas. This site is one of four sites in Arkansas which are part of the National Atmospheric Deposition Program/National Trends Network (NADP/NTN). The other sites are operated by other agencies or corporations.



EXPLANATION

● USGS site

○ Other site

Progress.--Data collection began in December 1983.

Plans.--Continue operation of this site indefinitely.

Reports.--As the data for the Caddo Valley site is approved by the NADP Coordinator it will be published in the annual Water-Data Reports of the U.S. Geological Survey (see reference U.S. Geological Survey, 1985). Approved data for all sites in the NADP/NTN are published quarterly by the National Atmospheric Deposition Program.

Estimating Scour at Bridge Piers on Streams in Arkansas

COOPERATING AGENCY: Arkansas State Highway and Transportation Department

PROJECT CHIEF: Braxtel L. Neely, Jr.

PERIOD OF PROJECT: April 1985 to March 31, 1988

LOCATION: Statewide

Problem.--An adequate definition of potential scour at bridge piers is needed for proper design, construction, and maintenance of hydraulic structures in Arkansas. Several formulas for predicting scour are available, but the large range in predicted scour depths has prevented bridge engineers from using any of the formulas with confidence. Adequate and sufficient data need to be collected to verify existing scour depth formulas or to develop a new formula that can be used with confidence on streams in Arkansas.

Objectives.--The objectives of this project are: (1) collect adequate and sufficient data during flood events, (2) evaluate existing formulas for predicting scour, and (3) possibly develop a new formula that can be used on streams in Arkansas.

Approach.--Select about 20 sites on streams that are not undergoing channel adjustments, preferably at gaging stations. During flood events bed profiles will be defined below the upstream and downstream handrails as well as at several points upstream from the pier to define the limits of scour. Suspended sediment samples will be taken near the piers and near the middle of the stream away from the piers. Vertically integrated sediment samples will be taken at about ten equal width sections to define the average natural suspended sediment. Regression analyses will be made to relate maximum scour to physical characteristics of the stream.

Progress.--Bridge study sites have been selected and initial bridge characteristics defined by running cross sections and taking photographs of each bridge have been made at the 23 selected sites.

Plans.--Finish data collection and cross sections, install chains on piers, analyze available data, and prepare outline of report.

A Hydrologic Analysis of the Little Red River Basin
for Development of Surface-Water Allocation Procedures

COOPERATING AGENCY: Arkansas Soil and Water Conservation Commission

PROJECT CHIEF: Alan P. Hall

PERIOD OF PROJECT: July 1983 through September 1984

Problem.--The Arkansas Soil and Water Conservtion Commission is the 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 guidelines for 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 streams.

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.--A backwater discharge rating has been developed using the gages at Judsonia and Searcy for flows on the Little Red River at the head of the study reach. Daily mean discharges have been computed for each of the 16 diversion sites that were operated in the 1984 irrigation season. Flows in the Little Red River and water levels in the alluvium have been computed for the study period.

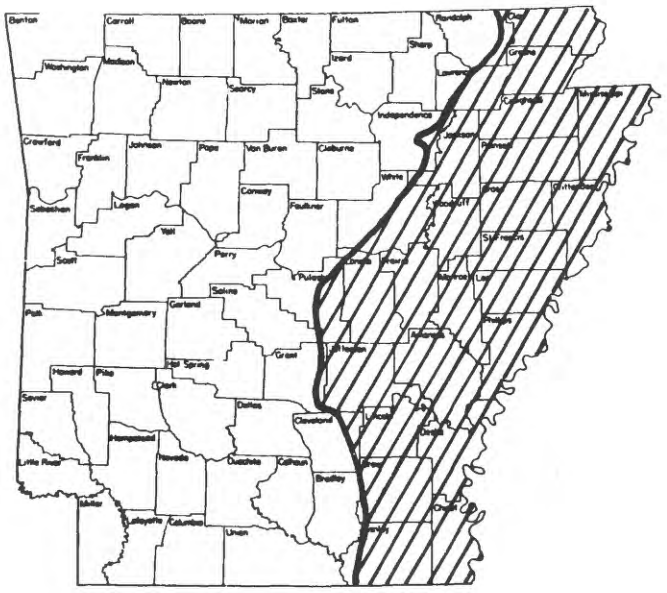
Plans.--Implementation of a diversion model of the available data to predict critical combinations of flow in the Little Red River and daily diversion pumpage to cause upstream movement of water from the White River into the Little Red River. Finish Water-Resources Investigations Report by the end of 1985 fiscal year.

Eastern Arkansas Water Conservation Project

COOPERATING AGENCIES: Arkansas Soil and Water Conservation Commission, Conservation Districts, Soil Conservation Service, and Arkansas Geological Commission

PROJECT CHIEF: A. H. Ludwig

PERIOD OF PROJECT: April, 1984 to September, 1989



Problem.--Farmers in eastern Arkansas rely heavily on the alluvial aquifer in the region as a source of water for irrigation of rice, cotton, and soybeans and for flooding thousands of acres of fish and minnow farms. Water users are becoming increasingly concerned about the prospect of ground-water shortages and quality deterioration of irrigation supplies. Since the drought of 1980, numerous wells have failed because pumping water levels have dropped below intake pipes, forcing owners to lower their pumps. In some parts of the Grand Prairie only about 20 feet of saturated thickness remain in the alluvial aquifer. Nearly 7,000 wells have been drilled since 1980 in eastern Arkansas. This represents a 33 percent increase in the total number of wells in place at that time. Compounding the water-supply problem is the fact that there has been an increasing number of incidents of saltwater encroachment in the alluvium. Among the problems facing irrigators in eastern Arkansas are (1) increasing competition among water users as overall demand increases, (2) lowering of the potentiometric surface with resulting increase in pumping lift, and (3) movement of saline water into parts of the aquifer that were previously fresh.

Objectives.--The objectives of the proposed study are: (1) compile, analyze, and publish water-level data collected by Soil Conservation Service and USGS personnel, and (2) develop a series of calibrated digital models of the alluvial aquifer to be used by State and Federal agencies for assessing the impact of projected irrigation demands and for evaluating alternate pumping schemes that could involve the conjunctive use of surface and ground water.

Approach.--Water level data collected by the Soil Conservation Service will be used to supplement USGS data from statewide observation well networks. The initial step in analyzing the alluvial flow system will be to develop a conceptual model of the study area. This will be accomplished primarily through an examination of results from the ongoing West Gulf Coast Regional

Aquifer System Analysis (RASA), and secondly through an evaluation of potentiometric and other data collected during previous aquifer studies as well as that being gathered as part of the current Eastern Arkansas Water Conservation Project. The second phase of the study will be to transform the conceptual model into working models. The third phase of the study will be the calibration process in which parametric adjustments will be made to accommodate the stress-response relationships in the aquifer system. The final phase will be to predict water levels resulting from various pumping stresses.

Progress.--Conducted orientation sessions at DeWitt and Jonesboro to acquaint Soil Conservation Service and Conservation District personnel with water-level measurement techniques. Implemented intensive water-level monitoring network in each county to supplement data from U.S. Geological Survey-Arkansas Geological Commission statewide network. Installed six observation wells adjacent to existing stream-gaging sites for use in defining stream-aquifer relationship. Maps showing the potentiometric surface for the spring and fall of 1984 as well as the data report for fall 1984 are in preparation.

Plans.--Continue to compile, analyze, and publish water-level data. Determine thickness of clay cap. Define stream-aquifer relationship. Publish potentiometric surface map for fall water levels. Calibrate and verify flow model for aquifer.

Reports.--Water-level data report, potentiometric surface maps, and groundwater levels in the alluvial aquifer in eastern Arkansas to be published annually. Aquifer model results to be published in two reports.

An Updated Water Plan for Arkansas

COOPERATING AGENCY: Arkansas Soil and Water Conservation Commission

PROJECT CHIEF: Elizabeth F. Cole

PERIOD OF PROJECT: June 1, 1985 to May 31, 1986

LOCATION: Statewide

Problem.--Water legislation passed by the 1985 Arkansas Legialature requires that a determination of the State's water needs be made by the Arkansas Soil and Water Conservation Commission (ASWCC) before the 1987 legislative session. ASWCC has determined that the State Water Plan for Arkansas, first completed in 1975, should be updated using all available hydrologic information in the State. The cooperative program between USGS and ASWCC is an effective tool for providing hydrologic information and expertise to assist State agencies in meeting their water-information needs.

Objectives.--The objective of this project is to provide hydrologic assistance to the ASWCC for updating the State Water Plan for Arkansas.

Approach.--A USGS hydrologist has been assigned full time to the project to work closely with ASWCC personnel and is physically located in their office for the project period.

Progress.--USGS hydrologist has relocated in ASWCC offices to begin full time work on the project.

Plans.--Determination of the following items will be made and addressed in reports for each of nine hydrologic basins in the State: (1) ground-water use, (2) definition of critical water areas, (3) establishment of minimum streamflows and (4) determination of surplus water available in each basin. Preliminary drafts of the basin reports will be completed in early 1986.

Statistical Summaries of Surface-Water Quality Data for Arkansas

COOPERATING AGENCY: Arkansas Geological Commission

PROJECT CHIEF: James C. Petersen

PERIOD OF PROJECT: October 1984 through September 1986

LOCATION: Statewide

Problem.--A large amount of water-quality data for Arkansas has been collected by the U.S. Geological Survey and the Arkansas Department of Pollution Control and Ecology and stored in the U.S. Geological Survey's WATSTORE computer system. Much of this data has never been statistically summarized and published.

Objectives.--Statistically summarize existing water-quality data for selected surface-water stations in Arkansas.

Approach.--Descriptive statistics (mean, median, range, standard deviation, and quartiles) will be calculated for approximately 115 stations. Water-quality data summarized will include data for discharge, pH, dissolved oxygen, specific conductance, total alkalinity, common ions, turbidity, fecal coliform and fecal streptococci bacteria, heavy metals, phosphorus and nitrogen. Regression equations for estimation of alkalinity, dissolved solids, and several ions from specific conductance values will be calculated.

Progress.--The stations which will be analyzed have been tentatively selected. The statistical methods and table formats have also been tentatively selected.

Plans.--Draft copy of an open-file report will be completed about October 1985.

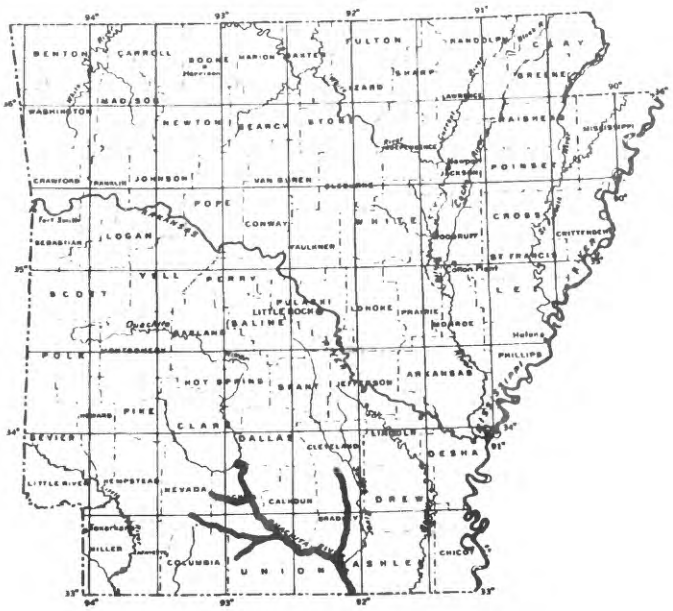
Water Quality Modeling of the Lower Ouachita River and Selected Tributaries in Arkansas

COOPERATING AGENCY: Arkansas Department of Pollution Control and Ecology

PROJECT CHIEF: E. 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 the figure, 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 final objective was 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 sets 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.--Project was completed.

Report.--

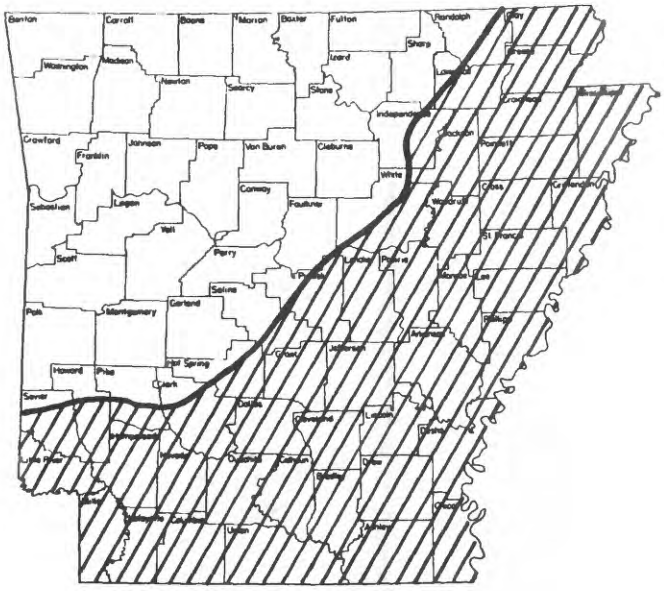
Petersen, J. C. and Morris, E. E., 1984, Compilation of data collected and derived for water years 1980 and 1981 for the purpose of water-quality modeling of the lower Ouachita River and selected tributaries, south-central Arkansas: U.S. Geological Survey Open-File Report 84-727, 130 p.

Geohydrologic Units of the Gulf Coastal Plain in Arkansas

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

PROJECT CHIEF: James C. Petersen

PERIOD OF PROJECT: October 1980 through March 1985



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 accompanying text are complete.

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

Report.--

Petersen, J. C., Broom, M. E., and Bush, W. V., 1985, Geohydrologic units of the Gulf Coastal Plain in Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4116, 20 p.

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 the figure.

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.

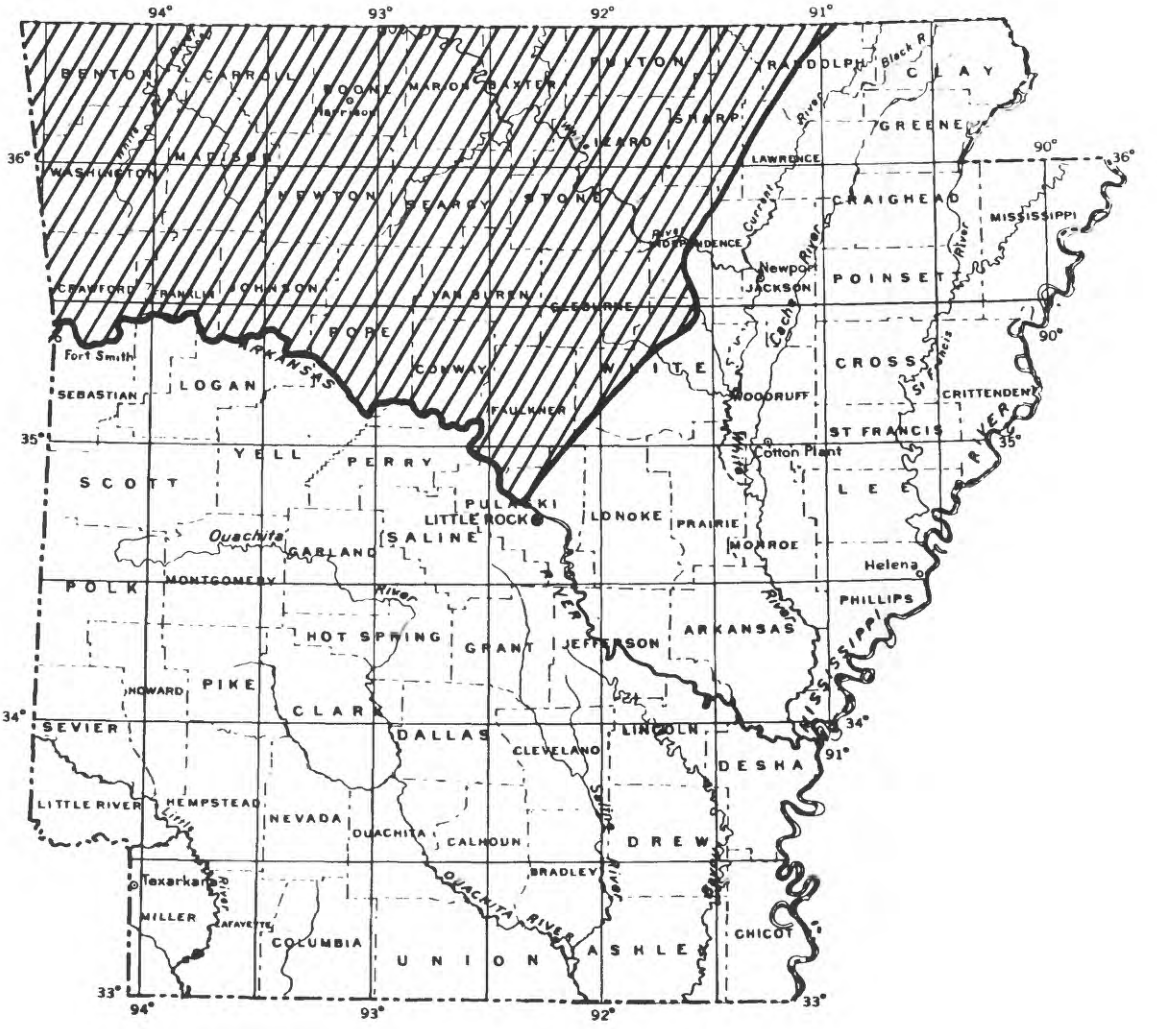
Progress.--Completed seepage runs on Spavinaw, Osage and Crooked Creeks and Illinois, Mulberry, Kings, Strawberry and Spring Rivers. Preparing a Water-Resources Investigations Report entitled "Streamflow Gain and Loss in Northern Arkansas". Tabulated historic water-use data and analyzed geophysical logs to determine total dissolved solids in deep aquifers. Finished Water-Resources Investigations Report "Average Annual Precipitation and Runoff for Arkansas, 1951-80". Wrote several sections for the CM RASA Professional Paper, Chapter G, "Geohydrology of the Ozarks Plateau". Assisted Missouri District personnel in the development of the ground-water computer model.

Plans.--Continue to analyze the data and finish preparing report on the seepage runs. Continue to assist the Missouri District in the Professional Paper writing and computer model development.

Reports.--

Freiwald, D. A., 1984, Average annual precipitation and runoff for Arkansas, 1951-80: U.S. Geological Survey Water-Resources Investigations Report 84-4363, 1 sheet.

Hedman, E. R., Skelton, John, Freiwald, D. A., 1985, Flow characteristics for selected streams in the Ozark subregion: U.S. Geological Survey Hydrologic Atlas 688, 4 sheets.



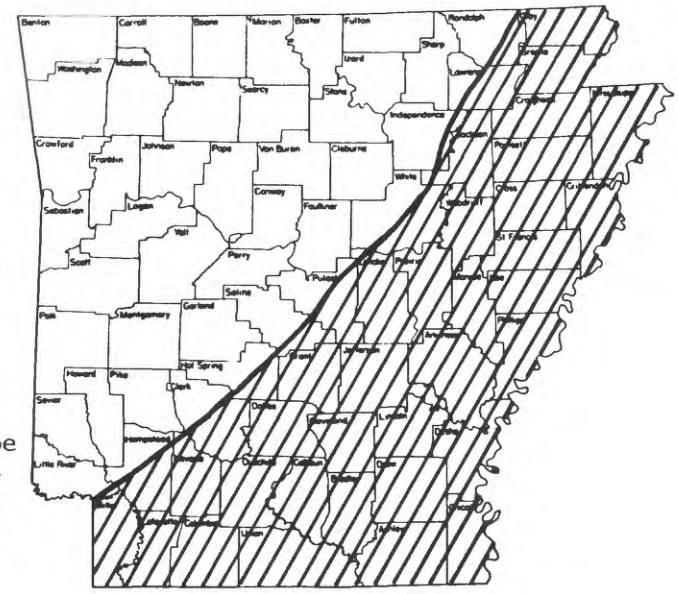
West Gulf Coast Regional Aquifer System Analysis in Arkansas

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 the figure.

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 1980 potentiometric maps for the alluvial aquifer, Sparta Sand aquifer and Cockfield Formation. Completed the geophysical-log data base for Arkansas. Completed water-use data base for all model layers in the regional project area. Continued screening data from the computer files for accuracy and completeness.

Plans.--Complete revision of data networks. Complete potentiometric maps for Wilcox Group and Carrizo Sand-Cane River system. Calibrate model of the Mississippi River alluvial aquifer.

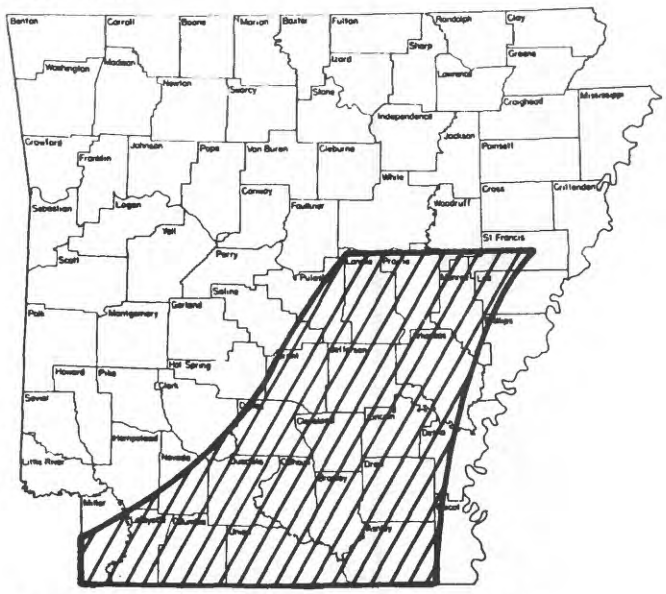
Reports.--First drafts of regional pumpage report and subregional model calibration report will be completed.

Sparta Model

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

PROJECT CHIEF: Daniel J. Fitzpatrick

PERIOD OF PROJECT: January 1985 to September 1987



Problem.--Locally heavy pumping has resulted in significant water-level declines in the Sparta Sand aquifer in southern and south-central Arkansas. Water levels have been drawn down as much as 300 feet in places. The condition of declining water levels could affect water availability, as well as increase the potential for saltwater intrusion.

Objectives.--Simulate ground-water flow in the Sparta Sand aquifer using a digital model for the purpose of evaluating the effect of present and future pumping stresses on the aquifer within the principle areas of concern.

Approach.--Assemble and evaluate existing data to define the hydrogeologic system as it relates to model input. Calibrate the McDonald and Harbaugh (1984) 3-D flow model to effectively simulate aquifer responses. Make sample model runs and prepare report.

Progress.--Data assembly and evaluation for model input are currently underway.

Plans.--Data assembly and evalution for model input will be completed and a preliminary model constructed by the end of the year.

Reports.--One report is planned by the end of the project entitled, "Simulation of the effects of pumpage on water levels in the Sparta Sand aquifer, Arkansas."

Ground-Water Problems in Arkansas

COOPERATING AGENCIES: Arkansas Department of Pollution Control and Ecology and Arkansas Soil and Water Conservation Commission

PROJECT CHIEF: Charles T. Bryant

PERIOD OF PROJECT: August 1983 through September 1984

LOCATION: Statewide

Problem.--Ground water is an important resource in Arkansas. Ground water withdrawals averaged 4,300 million gallons per day in the State in 1981. 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 the figure.

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.--The report was published in 1985. Project has been completed.

Reports.--

Bryant, C. T., Ludwig, A. H., and Morris, E. E., 1985, Ground-water problems in Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4010, 24 p.

Saltwater Intrusion into the Quaternary Aquifer in the Vicinity of Brinkley, Arkansas, 1984

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 abondonment of some wells and curtailment of pumping from other wells. Potentially, the problem includes widespread contamination in the two aquifers which are major ground-water 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.--All data entered to computer files. Writing of report in progress.

Plans.--Director's approval of report by September 30, 1985.

A Reconnaissance Study of Saltwater Contamination in the Mississippi River Alluvial Aquifer in the Boeuf-Tensas Basin, Arkansas

COOPERATING AGENCIES: U.S. Army Corps of Engineers, Vicksburg District and Arkansas Geological Commission

PROJECT CHIEF: Daniel J. Fitzpatrick

PERIOD OF PROJECT: June 1983 through September 1984

Problem.--The aquifer in a large part of the Boeuf-Tensas basin yields water containing high (greater than 250 milligrams per liter) concentrations of dissolved solids and chloride. Reports from farmers indicated that the quality of water had deteriorated to such a degree that residents were concerned about the suitability of water for irrigation. The location of the study area is shown in the figure.

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

Approach.--Assembled and evaluated existing data. Collected additional data needed and prepared report.

Progress.--The data collection phase of the project was completed. A total of 275 ground-water samples were collected and analyzed for chloride concentrations and specific conductance. Ground conductivity measurements were also made in selected areas using the electromagnetic induction method. Data analysis and report preparation were also completed. Report has been approved and printed as a Water-Resources Investigations Report.

Plans.--Project was completed.

Reports.--

Fitzpatrick, Daniel J., 1985, Occurrence of saltwater in the alluvial aquifer in the Boeuf-Tensas basin, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4029, 1 sheet.

Hydrologic Reconnaissance of the Ouachita National Forest, Arkansas with Emphasis in Areas of Highest Potential for Oil and Mineral Leases

COOPERATING AGENCY: Bureau of Land Management

PROJECT CHIEF: Elizabeth F. Cole

PERIOD OF PROJECT: October 1983 through September 1985

Problem.--A variety of mineral resources are found on or near the Ouachita National Forest. Recently, a great deal of interest has been generated over the probability of oil in a large area of western Arkansas, including the southern one-half of the Ouachita National Forest. Exploration and removal of these mineral resources will likely have considerable effect on the hydrologic environment. The data collection program will help to establish background levels for water quality of streams and aquifers in the area. The location of the study area is shown in the figure.

Objective.--Establish a hydrologic data base to document existing ground-water and surface-water conditions in potential mining areas.

Approach.--(1) Measure streamflow and collect water samples annually at selected sites during high-flow and low-flow conditions; (2) analyze surface-water samples for common constituents, suspended sediment, and trace metals; (3) collect water samples annually from selected wells from different rock units in the study area; (4) analyze ground-water samples for common constituents and trace metals; (5) evaluate current and historic chemical data from the study area; (6) prepare report.

Progress.--Data collection for the first year of the project has been completed. The data have been reviewed and placed in computer storage.

Plans.--Complete data collection for the second year of the project. Evaluate all current and historic chemical data from the study area. A report containing water-quality data and maps showing principal areas of mineral production and generalized geology of the study area will be published in 1985.

SOURCES OF WRD PUBLICATIONS AND INFORMATION

Publications of the U.S. Geological Survey

Professional Papers, Water-Supply Papers, and Bulletins are sold by the U.S. Geological Survey, Eastern Distribution Branch, 604 South Pickett Street, Alexandria, Virginia 22304; single copies of circulars still in print are available upon request from that address. Hydrologic Investigations Atlases, hydrologic unit maps, and other maps pertaining to Arkansas are sold by U.S. Geological Survey, Western Distribution Branch, Box 25286, Federal Center, Denver, Colorado 80225.

U.S. Geological Survey Water-Resources Investigations Reports and Open-File Reports are available for inspection at the Arkansas District Office, Water Resources Division, 2301 Federal Office Building, Little Rock, Arkansas 72201. In addition, these reports may be purchased as paper copy or microfiche from Open-File Services Section, U.S. Geological Survey, Box 25425, Denver Federal Center, Denver, Colorado 80225.

New reports are announced monthly in "New Publications of the Geological Survey." Subscriptions are available upon request from the U.S. Geological Survey, 582 National Center, Reston, Virginia 22092.

Water-Data Program

Water-data stations at selected locations throughout the Nation are used by the Geological Survey to obtain records on stream discharge (flow) and stage (height), reservoir and lake storage, ground-water levels, well and spring discharge, and the quality of surface and ground water. These data provide a continuing record of the quantity and quality of the Nation's surface and ground-water resources, and thus provide the hydrologic information needed by Federal, State, and local agencies and the private sector for the development and management of land and water resources. All data collected are stored in the Survey's National Water Data Storage and Retrieval System (see WATSTORE for additional information) and also are published by water year for each State in a publications series entitled "U.S. Geological Survey Water-Data Reports" (see Reports Approved for Publication or Released during 1984-85 in the Arkansas District).

Information about the Water-Data Program can be obtained from the Assistant Chief Hydrologist for Operations, 441 National Center, Reston, Virginia 22092 or from the District Chief of the State of interest.

NAWDEX

The National Water Data Exchange was established to assist users of water data to identify, locate, and acquire needed data. It provides a nationwide service for indexing and describing the characteristics of data available from the entire spectrum of data-collection activities throughout the Federal and non-Federal water-data community.

NAWDEX maintains two data bases: (1) a Water-Data Sources Directory, which identifies organizations that are sources of water and water-related data and locations within these organizations from which data may be obtained, and (2) a Master-Data Index of data collection sites. For services or additional information, contact:

National Water Data Exchange
U.S. Geological Survey
421 National Center
Reston, Virginia 22092
(703) 860-6031

WATSTORE

Access to all types of water data is through the National Water Data Storage and Retrieval System. Data are grouped and stored on the basis of common characteristics and data-collection frequencies. These data are organized into seven files. They are: (1) Station Header File, (2) Ground-Water Site Inventory File, (3) Water-Use File, (4) Daily-Values File, (5) Peak-Flow File, (6) Water-Quality File, and (7) Unit-Values File.

All types of water data can be retrieved through the central computer facilities in Reston, Virginia from a number of localities nationwide. The requestor is charged a minimal fee plus the actual computer cost incurred in retrieving the data. Cost estimates and information about WATSTORE can be obtained from Water Resources Division district offices and from:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, Virginia 22092

Public Inquiries Offices

Public inquiries offices provide general information about the programs of the Geological Survey and its reports and maps. The Public Inquiries Offices answers requests made in person, by mail, or by telephone; recommend publications relating to specific subjects and areas; and refer requests for specific technical information to the appropriate people. They sell limited quantities of published maps and books over the counter and distribute circulars, nontechnical publications, catalogs and indexes free of charge. Most are depositories for Open-File Reports. The regional office address for Arkansas is:

Public Inquiries Office
U.S. Geological Survey
1-C-45 Federal Building
1100 Commerce Street
Dallas, Texas 75242
(214) 767-0198

LIST OF REPORTS APPROVED FOR PUBLICATION OR RELEASED

DURING 1984 AND 1985 IN THE ARKANSAS DISTRICT

Broom, M. E., Kraemer, T. F., and Bush, W. V., 1984, A reconnaissance study of saltwater contamination in the El Dorado aquifer, Union County, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 84-4012, 47 p.

Bryant, C. T., Ludwig, A. H., and Morris, E. E., 1985, Ground-water problems in Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4010, 24 p.

Darling, M. E., and Lamb, T. E., 1984, Cost-effectiveness of the U.S. Geological Survey stream-gaging program in Arkansas: U.S. Geological Survey Water-Resources Investigations Report 84-4084, 62 p.

Edds, Joe, 1984, Ground-water levels in Arkansas, spring 1984: U.S. Geological Survey Open-File Report 84-711, 58 p.

Edds, Joe and Spencer, James L., 1985, Ground-water levels in Arkansas, spring 1985: U.S. Geological Survey Open-File Report 85-478, 60 p.

Edds, Joe, and Fitzpatrick, D. J., 1984, Maps showing altitude of the potentiometric surface and changes in water levels of the alluvial aquifer in eastern Arkansas, spring 1983: U.S. Geological Survey Water-Resources Investigations Report 84-4264, 1 sheet.

_____, 1984, Maps showing altitude of the potentiometric surface and changes in water levels of the Sparta Sand and Memphis Sand aquifers in eastern Arkansas, spring 1983: U.S. Geological Survey Water-Resources Investigations Report 84-4265, 1 sheet.

Fitzpatrick, D. J., 1985, Occurrence of saltwater in the alluvial aquifer in the Boeuf-Tensas basin, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4029, 1 sheet.

Freiwald, D. A., 1985, Average annual precipitation and runoff for Arkansas, 1951-80: U.S. Geological Survey Water-Resources Investigations Report 84-4363, 1 sheet.

Hall, A. P., and Holland, T. W., 1984, Water use in Arkansas, 1981: U.S. Geological Survey Water-Resources Investigations Report 84-4070, 1 sheet.

Moore, M. A. and Lamb, T. E., 1984, Report of the annual yield of the Arkansas River basin for the Arkansas River basin compact Arkansas--Oklahoma 1983 water year: U.S. Geological Survey Open-File Report 84-598, 24 p.

Moore, M. A., and Lamb, T. E., 1985, Annual yield and selected hydrologic data for the Arkansas River basin compact Arkansas--Oklahoma 1984 water year: U.S. Geological Survey Open-File Report 85-179, 30 p.

Neely, Braxtel L., Jr., 1985, The flood of December 1982 and the 100- and 500-year flood on the Buffalo River, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4192 (in press).

_____, 1985, Water-surface profiles along Bayou Meto and Rocky Branch near Jacksonville, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-176, 12 p.

Petersen, J. C., Broom, M. E., and Bush, W. V., 1985, Geohydrologic units of the Gulf Coastal Plain in Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4116, (in press).

Petersen, J. C., and Morris, E. E., 1984, Compilation of data collected and derived for water years 1980 and 1981 for the purpose of water-quality modeling of the lower Ouachita River and selected tributaries, south-central Arkansas: U.S. Geological Survey Open-File Report 84-727, 130 p.

U.S. Geological Survey, 1984, Water resources data for Arkansas--water year 1983: U.S. Geological Survey Water-Data Report AR-83-1, 561 p.

U.S. Geological Survey, 1985, Water resources data for Arkansas--water year 1984: U.S. Geological Survey Water-Data Report Ar-84-1 (in press).

SELECTED BIBLIOGRAPHY OF ARKANSAS DISTRICT REPORTS

Selected publications on water resources in Arkansas are listed below. Many of thse reports can be obtained from the District Office at the address shown on the title page. Professional Papers and Water-Supply Papers are sold by the U.S. Geological Survey, Branch of Distribution, 604 South Pickett Street, Alexandria, Virginia 22304.

Professional Papers

424-C Relation between median grain size and permeability in the Arkansas River valley, Arkansas, by M. S. Bedinger, 1961.

448-C Cretaceous aquifers in the Mississippi embayment, by E. H. Boswell, G. K. Moore, L. M. MacCary, and others, with discussions of Quality of the water, by H. G. Jeffery, 1965.

448-D Tertiary aquifers in the Mississippi embayment, by R. L. Hosman, A. T. Long, T. W. Lambert, and others, with discussions of Quality of the water, by H. G. Jeffery, 1968.

448-E Quaternary aquifers in the Mississippi embayment, by E. H. Boswell, E. M. Cushing, R. L. Hosman with a discussion of Quality of the water by H. G. Jeffery, 1968.

448-F Low-flow characteristics of streams in the Mississippi embayment in northern Arkansas and in Missouri, by P. R. Speer, M. S. Hines, M. E. Janson, and others, 1966.

448-G Low-flow characteristics of streams in the Mississippi embayment in southern Arkansas, northern Louisiana, and northeastern Texas, by P. R. Speer, M. S. Hines, A. J. Calandro, and others, with a section on Quality of the water by H. G. Jeffery, 1966.

501-B Computing stream-induced ground-water fluctuation, by M. S. Bedinger and J. E. Reed, 1964.

501-D The Carrizo Sand, a potential aquifer in south-central Arkansas, by R. L. Hosman, 1964.

600-B Grand Prairie region, Arkansas--An example of stream alienation, by M. S. Bedinger, 1968.

750-C Forest species as indicators of flooding in the lower White River valley, Arkansas, by M. S. Bedinger, 1971.

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813-H Summary appraisals of the Nation's ground-water resources--Arkansas-White-Red Region, by M. S. Bedinger, and R. R. Sniegocki, 1976.

813-N Summary appraisals of the Nation's ground-water resources--Lower Mississippi Region, by J. E. Terry, R. L. Hosman and C. T. Bryant, 1979.

1044-C The waters of Hot Springs National Park, Arkansas--Their nature and origin, by M. S. Bedinger, F. J. Pearson, Jr., J. E. Reed, R. T. Sniegocki, and C. G. Stone, 1979.

Water-Supply Papers

1615-A Studies of artificial recharge in the Grand Prairie region, Arkansas; environment and history, by Kyle Engler, F. H. Bayley, and R. T. Sniegocki, 1963.

1615-B Hydrology of a part of the Grand Prairie region, Arkansas, by R. T. Sniegocki, 1964.

1615-C Equipment and controls used in studies of artificial recharge in the Grand Prairie region, Arkansas, by R. T. Sniegocki, F. H. Bayley, and Kyle Engler, 1963.

1615-D Principles of siphons with respect to the artificial-recharge studies in the Grand Prairie region, Arkansas, by R. T. Sniegocki and J. E. Reed, 1963.

1615-E Geochemical aspects of artificial recharge in the Grand Prairie region, Arkansaas, by R. T. Sniegocki, 1963.

1615-F Problems in artificial recharge through wells in the Grand Prairie region, Arkansas, by R. T. Sniegocki, 1963.

1615-G Testing procedures and results of studies of artificial recharge in the Grand Prairie region, Arkansas, by R. T. Sniegocki, F. H. Bayley, Kyle Engler, and J. W. Stephens, 1965.

1615-H Laboratory study of aquifer properties and well design for an artificial-recharge site, by A. I. Johnson, R. P. Moston, and S. F. Versaw, 1966.

1669-L Ground-water potential of the alluvium of the Arkansas River between Little Rock and Fort Smith, Arkansas, by M. S. Bedinger, L. F. Emmett, and H. G. Jeffery, 1963.

Water-Supply Papers (Continued)

1669-V Ground water in the lower Arkansas River valley, Arkansas, by M. S. Bedinger and H. G. Jeffery, 1964.

1669-BB Reconnaissance of the ground-water resources of the Arkansas Valley region, Arkansas, by R. M. Cordova, 1963.

1681 Magnitude and frequency of floods in the United States, Part 7, by J. L. Patterson, 1964.

1779-G Geology and ground-water resources of Bradley, Calhoun, and Ouachita Counties, Arkansas, by D. R. Albin, 1964.

1779-V Ground-water resources of eastern Arkansas in the vicinity of U.S. Highway 70, by H. N. Halberg and J. E. Reed, 1964.

1809-J Water-resources reconnaissance of the Ouachita Mountains, Arkansas, by D. R. Albin, 1965.

1809-T Hydrology of the alluvium of the Arkansas River, Muskogee, Oklahoma to Fort Smith, Arkansas, by Harry H. Tanaka, Jerrald Hollowell, 1966.

1839-B Water resources of Pulaski and Saline Counties, Arkansas, by R. O. Plebuch and M. S. Hines, 1967.

1839-G Water resources of Jackson and Independence Counties, Arkansas, by D. R. Albin, M. S. Hines, and J. W. Stephens, 1967.

1857 Water resources of Grant and Hot Spring Counties, Arkansas, by H. N. Halberg, C. T. Bryant, and M. S. Hines, 1968.

1859-G Storage requirements for Arkansas streams, by J. L. Patterson, 1968.

1879-A Water resources of Clark, Cleveland, and Dallas Counties Arkansas, by R. O. Plebuch and M. S. Hines, 1969.

1879-B Water resources of Randolph and Lawrence Counties, Arkansas, by A. G. Lamonds, M. S. Hines, and R. O. Plebuch, 1969.

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1970-A Floods of May 1968 in south Arkansas, by R. C. Gilstrap, 1972.

1998 Water resources of Hempstead, Lafayette, Little River, Miller, and Nevada Counties, Arkansas, by A. H. Ludwig, 1972.

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Open-File and Water-Resources Investigations Reports are available for inspection at the Arkansas District and Reston, Virginia offices of the U.S. Geological Survey. For information about purchasing these reports contact the Open-File Services Section, U.S. Geological Survey, Box 25425, Federal Center, Denver, Colorado 80225, telephone (303) 236-7476

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Well records, depth-to-water measurements and logs of selected wells and test holes, and chemical analyses of groundwater in the Arkansas Valley region, Arkansas, by R. M. Cordova, 1962.

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Floodflow characteristics of Arkansas River at Interstate Highway 540 at Van Buren, Arkansas, by R. C. Christensen and R. C. Gilstrap, 1965.

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Drainage areas of streams in Arkansas, St. Francis River basin, by R. C. Christensen, R. C. Gilstrap, and J. N. Sullavan, 1967.

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A plan for water-resources investigations in Arkansas, with definitions of hydrologic units, by R. T. Sniegocki and M. S. Bedinger, 1970.

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78-175 Water-quality investigation of the Tyronza River watershed, Arkansas, by T. E. Lamb, 1978.

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81-114 Ground-water levels in Arkansas, Spring 1981, by Joe Edds, 1981.

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81-806 Water-quality reconnaissance of Patton Lake, Jefferson County, Arkansas, by J. C. Petersen, 1981.

81-819 Water-quality reconnaissance of the Larkin Creek watershed, Lee and St. Francis Counties, Arkansas, by J. C. Petersen, 1981.

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81-1058 Water-quality reconnaissance of Harding Creek, Lawrence County, Arkansas, by J. C. Petersen, 1981.

82-761 Reconnaissance of stormwater-runoff water quality of the Big Piney Creek segment of the Cedar-Piney Creeks watershed, Yell County, Arkansas, by J. C. Petersen, 1982.

82-852 Ground-water levels in Arkansas, Spring 1982, by Joe Edds, 1982.

83-268 Ground-water levels in Arkansas, Spring 1983, by Joe Edds, 1983.

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These reports were prepared by U.S. Geological Survey personnel in cooperation with the Arkansas Geological Commission. The reports are available from the Arkansas District Office, U.S. Geological Survey, 2301 Federal Office Building, Little Rock, Arkansas 72201 or the Arkansas Geological Commission, 3815 West Roosevelt, Little Rock, Arkansas 72204.

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Hydrologic Investigations Atlases (and other maps of areas west of the Mississippi River) are sold by the Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver Colorado 80225. For areas east of the Mississippi River order maps form Distribution Branch, U.S. Geological Survey, 1200 South Eads Street, Arlington, Virginia 22202.

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