WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN NEW MEXICO— FISCAL YEAR 1981

Compiled by Robert R. White and Jane G. Wells

U.S. GEOLOGICAL SURVEY

Open-File Report 83-772

Albuquerque, New Mexico

1983

UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

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WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN NEW MEXICO, FISCAL YEAR 1981

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ABSTRACT

The Water Resources Division of the U.S. Geological Survey investigates the occurrence, quantity, quality, distribution, and movement of the Nation's surface and underground waters, and coordinates Federal water-data acquisition activities.

During fiscal year 1981, the New Mexico District had 40 active projects, released 19 reports, and answered hundreds of requests of water-related information.

INTRODUCTION

The U.S. Geological Survey, through its Water Resources Division, investigates the occurrence, quantity, quality, distribution, and movement of the surface and underground waters that comprise the Nation's water resources, and coordinates Federal water-data acquisition activities.

The mission of the Division is accomplished through programs supported by the U.S. Geological Survey independent of or in cooperation with other Federal and non-Federal agencies. These programs involve:

1. 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.

2. Conducting analytical and interpretive water-resource appraisals describing the occurrence, availability, and the physical, chemical, and biological characteristics of surface and ground water.

3. Conducting basic problem-oriented research in hydrology to improve the scientific basis for investigations and measurement techniques, and to predict quantitatively the response of hydrologic systems to stress.

4. Disseminating water data and the results of these investigations and research through reports, maps, computerized information services, and other forms of public releases.

5. Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and ground waters.

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

The New Mexico District of the U.S. Geological Survey, Water Resources Division, along with other Federal and State agencies, shares in the responsibility for the appraisal of the quantity, quality, and distribution of surface- and ground-water resources of the State of New Mexico.

This report contains information concerning the U.S. Geological Survey's water-resources investigations and surveillance programs in New Mexico. The District office is located in Albuquerque with subdistrict offices and field headquarters located throughout the State (fig. 1). Requests for information should be addressed as follows:

Mr. James F. Daniel, District Chief
U.S. Geological Survey, WRD
Western Bank Building, Room 720
505 Marquette NW
Albuquerque, New Mexico 87102

Current District investigations include the following water-information topics:

1. Chemical quality of surface water in New Mexico

2. Chemical quality of ground water in New Mexico

3. Sediment transport in New Mexico streams

4. Surface-water supply

5. Surface-water diversions for irrigation

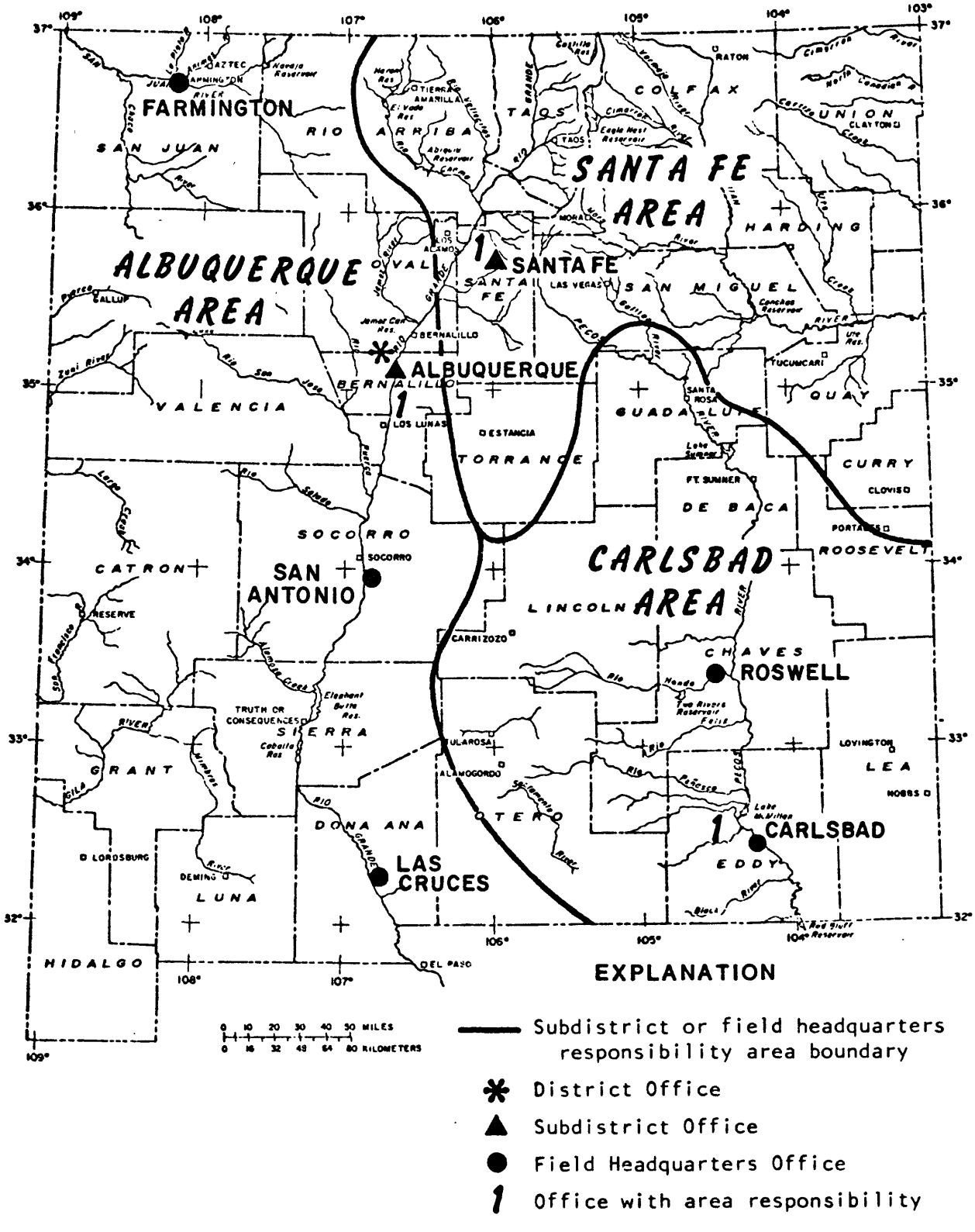


Figure 1.--Location of offices of the New Mexico District and areas of responsibility

6. Streamflow characteristics
   High flow
   Low flow
   Flood frequency

7. Effect of urban development on storm runoff

8. Inundation from floods

9. Effects of ground-water pumping

10. Long-term monitoring of ground-water levels

11. Ground-water and surface-water relationships

12. Consumptive use by phreatophytes

13. Hydrologic impacts of energy development

14. Ground-water supplies

During fiscal year 1981, the District had 40 active projects, released 19 reports and answered hundreds of requests for water-related information.

The programs of the District are supported by Federal funding to the Geological Survey and in cooperation with other Federal, State, and local agencies. Agencies that cooperated with the U.S. Geological Survey during fiscal year 1981 were:

State and Local

Albuquerque Metropolitan Arroyo Flood Control Authority
City of Albuquerque
Costilla Creek Compact Commission
New Mexico Bureau of Mines and Mineral Resources
New Mexico Environmental Improvement Division
New Mexico Interstate Stream Commission
New Mexico State Engineer Office
New Mexico State Highway Department
Pecos River Commission
Pueblo of Zuni
Rio Grande Compact Commission
Santa Fe Metropolitan Water Board

Federal

U.S. Department of Agriculture
  Forest Service
U.S. Department of the Army
  Corps of Engineers
  White Sands Missile Range
U.S. Department of Energy
U.S. Department of Housing and Urban Development
U.S. Environmental Protection Agency
U.S. Department of the Interior
  Bureau of Indian Affairs
  Bureau of Reclamation
  National Park Service
  Bureau of Land Managment

PROJECTS IN PROGRESS IN FISCAL YEAR 1981

Hydrologic-data stations are maintained by the Geological Survey at many locations in New Mexico. They constitute a network for obtaining records of stream stage and discharge, reservoir and lake elevation and storage, ground-water levels, well and spring discharge, and the quality of surface and ground water (figs. 2, 3, and 4). The Water Resources Division has both a current and a historical file of hydrologic data. Data collected are stored in the Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) and are available on request. This information can be retrieved in machine-readable form as computer-printed tables or graphs, or digital plots. Computer programs are available for statistical analysis of the data, and the results of these analyses are available. Local assistance in acquisition of services or products from WATSTORE can be obtained from the District Chief, Water Resources Division, in Albuquerque.

A summary of each data-collection program is included in this report. The summary consists of a map showing the location of the hydrologic-data stations, a list of cooperating agencies, a brief description of the program's purpose and scope, and project reports released during the fiscal year.

In addition to the hydrologic-data program, the Water Resources Division has a number of interpretive projects and continuing cooperative projects in New Mexico. The interpretive projects are initiated for the investigation of a particular hydrologic problem or of a specified area; these projects may be active for several years and are usually conducted in cooperation with one or more Federal, State, or local agencies. A few projects are continued for many years because of the need for long-term data collection and analysis.

The projects listed in this report have been grouped by geographical area, where this is applicable. The areas included are the Rio Grande Basin, Pecos River Basin, northwestern New Mexico (San Juan Basin), west-central New Mexico, and the Tularosa Basin. In addition, there is a group of projects that are statewide in scope and another group of miscellaneous area studies that are concerned with various parts of the state. Two regional aquifer studies are listed; each of these projects covers parts of several states.

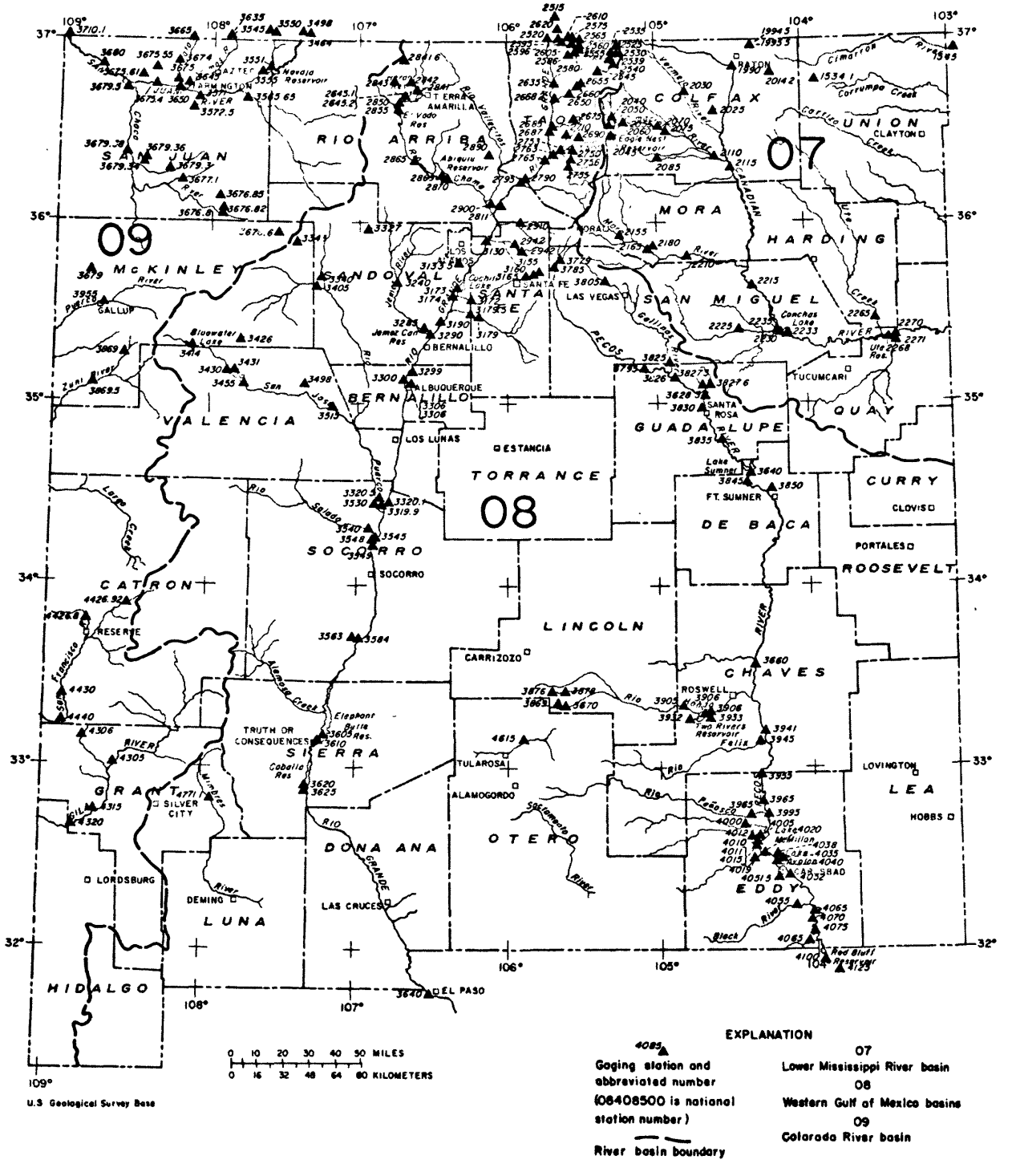


Figure 2. Map of New Mexico showing location of surface-water gaging stations.

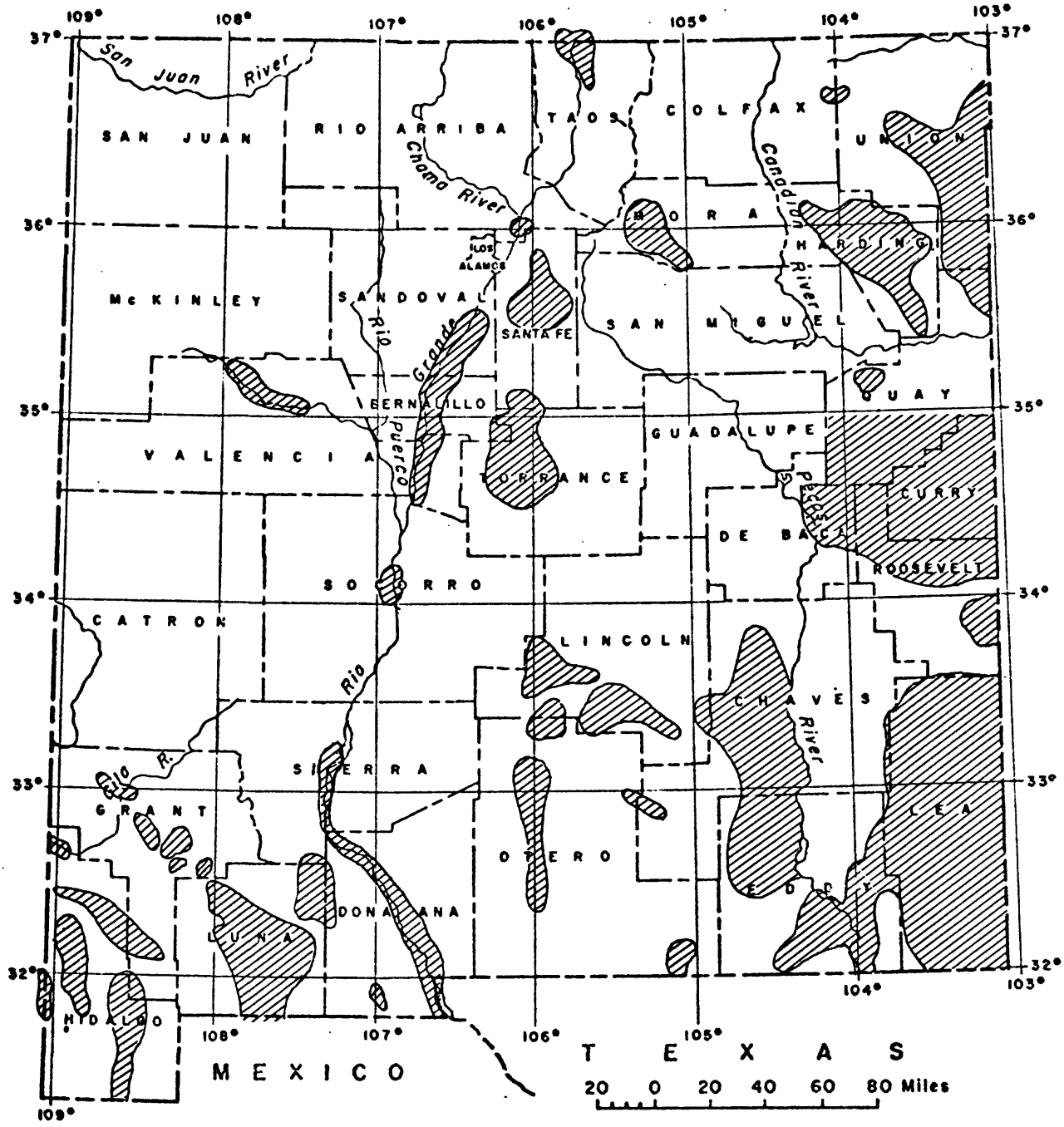
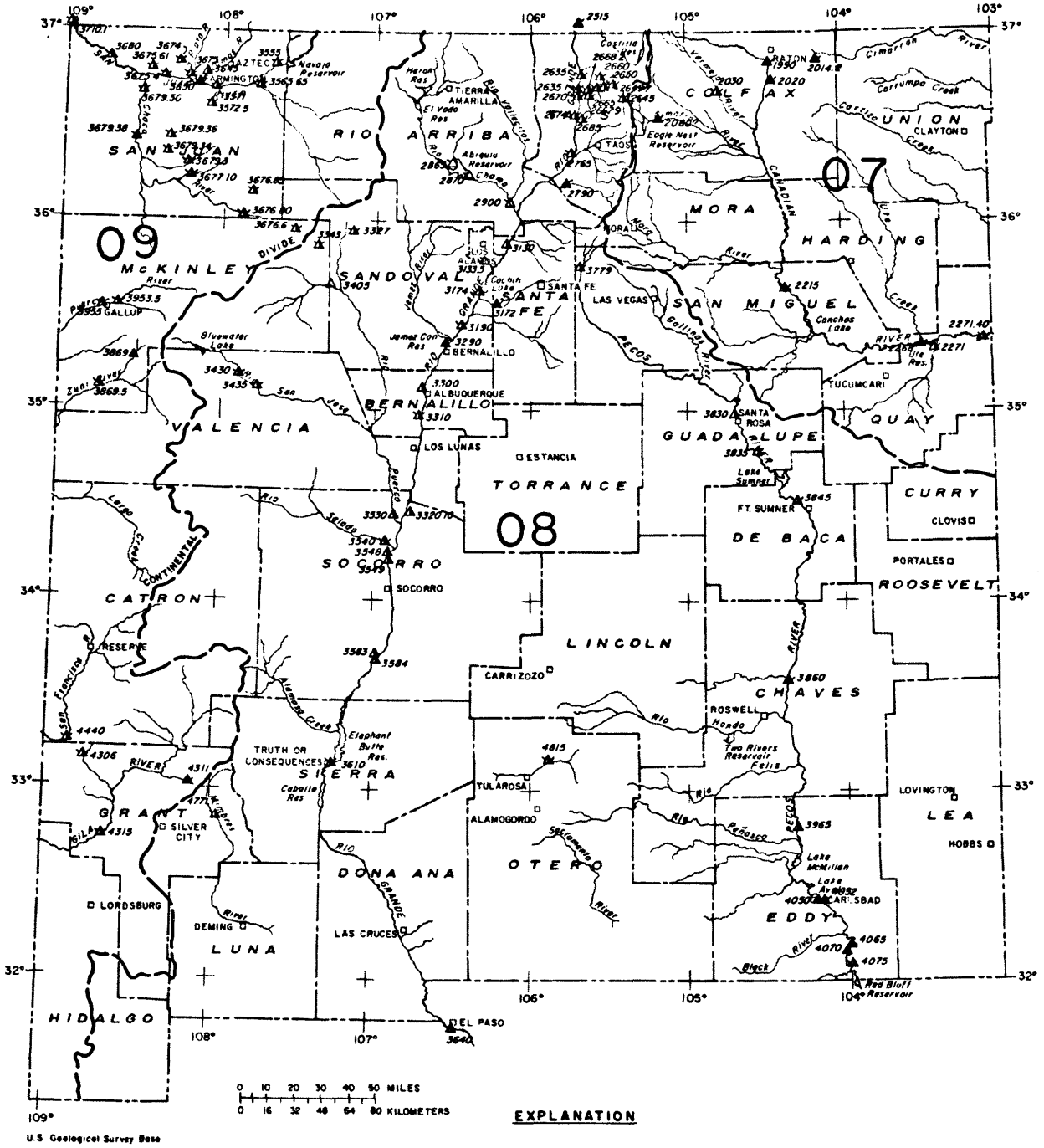


Figure 3.--Areas with many ground-water observation wells in New Mexico.



EXPLANATION

STATION AND SAMPLING FREQUENCY

Chemical quality: ▲ daily ▲ other than daily

Suspended sediment: △ daily △ other than daily

Chemical quality and Suspended sediment: ▲ both daily ▲ both other than daily

▲ daily chemical quality and other than daily suspended sediment

▲ daily suspended sediment and other than daily chemical quality

BASIN AND STATION NUMBER

River basin boundary:

Lower Mississippi River basin number: 07

Western Gulf of Mexico basin number: 08

Colorado River basin number: 09

▲ 227140

Number by symbol is abbreviated station number. Complete station number of example is:

07 227140

Basin no. Station no.

Figure 4. Map of New Mexico showing location of water-quality gaging stations.

Hydrologic - Data Program

PROJECT TITLE: Surface-water data

LOCATION: Statewide

COOPERATING AGENCIES: New Mexico State Engineer Office, New Mexico Interstate Stream Commission, Costilla Creek Compact Commission, Pecos River Commission, Albuquerque Metropolitan Arroyo Flood Control Authority, New Mexico Environmental Improvement Division, Bureau of Reclamation, National Park Service, Bureau of Indian Affairs, Corps of Engineers, Forest Service, and Bureau of Land Management.

PROJECT CHIEF: Louis P. Denis

PERIOD OF PROJECT: Continuous since 1930

Purpose and scope: Surface-water discharge (streamflow) and stage (water level) are collected for general hydrologic purposes such as assessment of water resources, areal analysis, determination of long-term trends, research and special studies, or for management and operational purposes. In New Mexico, discharge and stage data currently are being obtained at the number of stations given below.

Station classification	stations
Stream stations	390
Continuous stage and discharge record:	
Water year	167
Irrigation season only	37
Cumulative discharge record:	
Irrigation season total only	39
Partial stage and discharge record	147
Lake and reservoir stations	25
Continuous stage and contents	19
Intermittent stage and contents	6
Total	415

All stations, including those operated in support of other projects, are shown on the map (fig. 2) except partial-record stations that record peak flow only (147), low flow (6), and selected stations operated only during the irrigation season (76).

As part of interpretive hydrologic investigations, streamflow measurements are sometimes made at temporary gaging stations and at locations other than gaging stations.

Reports published or released during 1981: U.S. Geological Survey, 1981, Water Resources Data for New Mexico, Water Year 1980: U.S. Geological Survey Water-Data Report NM-80-1, 679 p.

PROJECT TITLE: Ground-water data

LOCATION: Statewide

COOPERATING AGENCIES: New Mexico State Engineer Office

PROJECT CHIEF: Jim D. Hudson

PERIOD OF PROJECT: Continuous since 1925

Purpose and scope: Ground-water data are collected to determine short-range changes and long-range trends in ground-water levels, to relate these data to changes in ground-water storage, and to provide the data base necessary for management of the resource. Water levels in wells, discharge of springs and wells, and water-quality data are critical for monitoring ground-water trends; however, they must be integrated with other observations and studies of ground-water systems in order to have the fullest meaning and usefulness. A basic network of observation wells is maintained in New Mexico for monitoring fluctuations of water levels. Other wells known as "project wells" are used for specific (generally short-term) studies and, although they are not part of the basic observation-well network, data obtained from them also are available. Beginning in 1980, most wells are to be measured every five years on a rotating basis, and only selected areas will be published. Approximately 1,700 wells are currently being measured (project wells are not included).

Locations of individual observation wells are not shown; however, areas of many observation wells are shown in figure 3.

Reports published or released during 1981:

Hudson, J. D., 1981, Ground-water depletion, in feet, allowed in a part of Curry County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map CU-21, 1 sheet.

_____1981, Ground-water depletion, in feet, allowed in the central part of Lea County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map LC-23, 1 sheet.

_____1981, Ground-water depletion, in feet, allowed in the northern part of Lea County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map LN-23, 1 sheet.

_____1981, Ground-water depletion, in feet, allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map RO-24, 1 sheet.

U.S. Geological Survey, 1981, Water Resources Data for New Mexico, Water Year 1980: U.S. Geological Survey Water-Data Report NM-80-1, p. 596-673.

PROJECT TITLE: Chemical and biological water-quality data

LOCATION: Statewide

COOPERATING AGENCIES: New Mexico State Engineer Office, New Mexico Interstate Stream Commission, Pecos River Commission, National Park Service, Bureau of Reclamation, Bureau of Land Management

PROJECT CHIEF: Richard L. Lepp

PERIOD OF PROJECT: Continuous since 1937

Purpose and scope: The chemical and biological water-quality program provides for the collection, analysis, storage, and publication of data from a network of surface- and ground-water sites in New Mexico.

Chemical and biological water-quality data are obtained at 86 continuous record stations for surface water. Information is also collected at numerous partial-record stations and miscellaneous sites. These stations are used to monitor the quality of surface water in New Mexico. Some of these stations also are part of the Geological Survey nationwide network known as the National Stream Quality Accounting Network (NASQAN), which is used to detect nationwide trends in water quality. The types of data determined at the continuous-record stations are given in the following table:

Data classification	Number of sites
Physical data:	
Water temperature	86
Specific conductance	86
pH	86
Chemical data:	
Inorganic constituents	82
Organic constituents	57
Pesticides and organic carbon	10
Organic carbon	53
Radiochemical data	32
Biological data	49

Miscellaneous water-temperature data, recorded at the time streamflow measurements are made, are available from the subdistrict offices.

Chemical water-quality data for ground water was also obtained in conjunction with project activities. (In 1981, approximately 340 sites were sampled).

Reports published or released during 1981: U.S. Geological Survey, 1981, Water Resources Data for New Mexico, Water Year 1980: U.S. Geological Survey Water-Data Report NM-80-1, 679 p.

PROJECT TITLE: Sediment data

LOCATION: Statewide

COOPERATING AGENCIES: New Mexico State Engineer Office, New Mexico Interstate Stream Commission, National Park Service, Corps of Engineers, Bureau of Land Management, and Bureau of Reclamation

PROJECT CHIEF: David E. Funderburg

PERIOD OF PROJECT: Continuous since 1937

Purpose and scope: The purpose of this project is to determine the load, size, and nature of sediment carried in New Mexico streams. Information is collected to provide information for the evaluation of sources of sediment, effects of changing land use, effects of water management on channel stability, and regional base-line conditions.

Sediment data is collected at 95 sites in New Mexico. At 15 of these sites a continuous record of sediment load is computed from samples collected by local observers and (or) automatic samplers that collect at least a daily sample. Samples are collected more frequently during high-water runoff periods. The remaining sites are sampled intermittently and during peak runoff periods.

Reports published or released during fiscal year 1981:

U.S. Geological Survey, 1981, Water Resources Data for New Mexico, Water Year 1980: U.S. Geological Survey Water-Data Report NM-80-1, 679 p.

Statewide Projects

PROJECT TITLE: New Mexico District Data Bank

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEF: Ed Thomas

PERIOD OF PROJECT: Continuous since November 1970

Problem: The New Mexico District has recently acquired a minicomputer system. Proper utilization of the increased potential provided by the minicomputer is necessary.

Objectives: Provide new computer applications for better utilization of District and State resources through project support specific to New Mexico's data program needs.

PROJECT TITLE: Water use - New Mexico

LOCATION: Statewide

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEFS: William K. Dein, U.S. Geological Survey
Earl F. Sorensen, New Mexico State Engineer Office

PERIOD OF PROJECT: Continuous since May 1978

Problem: A national program has been developed using a uniform system to collect, store, and retrieve reliable water-use data that will be available for planning, operation, and management purposes. New Mexico presently has a water-use data-collection program that is being modified and expanded to conform to the national program. In addition, there is a need for management of water-use data that will be collected in support of regional aquifer studies in New Mexico.

Objectives: Implement a program in cooperation with the State Engineer Office for the collection and computer storage of all water-use data in the State of New Mexico. Develop standard methods for collection, storage, and retrieval at the State level that will conform to those established for the national system.

PROJECT TITLE: Miscellaneous activities under the State Engineer Program

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEF: ----------

PERIOD OF PROJECT: Continous since January 1960

Problem: The Geological Survey receives many request from the public for information about the water resources and geology of the State. Occasionally, requests are received from the State Engineer Office for the compilation of specific data for which no project exists.

Objectives: Conduct spot reconnaissance studies, answer letter and telephone inquiries, and compile specific data.

PROJECT TITLE: Investigation and analysis of floods for small drainage areas in New Mexico

COOPERATING AGENCY: New Mexico State Highway Department

PROJECT CHIEF: ----------

PERIOD OF PROJECT: July 1979 to July 1989

Problem: The State Highway Department needs data on the frequency and magnitude of floods to better design highway drainage structures.

Objectives: Collect and analyze hydrologic data which can be used in the design of highway drainage structures. Relate the magnitude and frequency of floods to basin or channel geometry characteristics. One hundred and forty-six (146) gages are operated for peak flow only (crest-stage gages) under this project.

PROJECT TITLE: Program for developing investigations of hydrologic contamination in New Mexico

COOPERATING AGENCY: Environmental Improvement Division of the New Mexico Health and Environment Department, U.S. Geological Survey Federal Cooperative

PROJECT CHIEF: James F. Daniel

PERIOD OF PROJECT: Continuing since August 1981

Problem: The New Mexico Environmental Improvement Division (EID) is involved with detecting, controlling, and abating contamination in the atmosphere and the lithosphere. EID has consulted with WRD on several problem areas regarding the surface- and ground-water regimes. WRD's experience in hydrology has proved to be very useful to EID in solving their problems of contamination.

Objectives: The objective of this project is to develop long-term investigations with NMEID within those areas of expertise specific to WRD's mission.

Regional aquifer studies

PROJECT TITLE: High Plains regional aquifer system analysis (New Mexico)

PROJECT CHIEF: D. L. Hart, Jr.

PERIOD OF PROJECT: October 1977 to September 1982

Problem: The Ogallala aquifer underlies about 150,000 square miles of land in eight Western States. This study is part of a regional evaluation of the Ogallala aquifer. The aquifer underlies about 11,000 square miles of land in New Mexico and has experienced severe water-level declines due to pumpage for irrigation and municipal use.

Objectives: Determine the quantity and quality of the water resource and the operation of the system by collecting and analyzing data about hydrologic properties, recharge, quantity of pumpage, and distribution of pumpage. Provide the hydrologic evaluation needed to predict the response of the Ogallala aquifer to future pumpage.

PROJECT TITLE: Southwest alluvial basin (east), regional aquifer systems analysis

PROJECT CHIEF: David W. Wilkins

PERIOD OF PROJECT: September 1979 to September 1983

Problem: The Rio Grande drainage basin from north of Alamosa, Colorado, to Presidio, Texas, is experiencing rapid population growth, which has caused increased pumping from basin aquifers and a search for new sources of fresh ground water. The result is increased stress on the limited water resources of the area. Where surface-water supplies are available, the difference between available surface supplies and consumptive use has been made up by developing ground-water supplies from alluvial sediments adjacent to the streams. Where surface supplies are not available, water supplies have been augmented by withdrawing more ground water from alluvial desert basins. Increasing use of ground water has produced declines in ground-water levels, affected through-flowing streams, and inititated water-quality changes. The magnitude of these effects are undefined for the regional aquifer system. In some ground-water basins within the regional aquifer system, these effects are being studied, but the cause-and-effect relationships between basins are largely undefined.

Objectives: The overall objective is to define the hydrology of the regional aquifer system. Specific objectives for the study of ground-water basins in the system are to define: (1) the extent of the aquifers, their hydraulic properties, and water quality; (2) the relationship between surface and ground water; (3) the hydraulic connection between basins; and (4) past, present, and probable future stresses. When these basin objectives are met, specific objectives for the study of the regional aquifer system are to describe water-level changes, effects on streamflow, and water-quality changes as a result of past, present, and proposed development.

The study will bring together data collected from many past and present studies and data collected for this study. Digital models of the basin aquifers and regional system will be developed and made available for future use.

Rio Grande Basin

PROJECT TITLE: Urban flood-hydrology of Albuquerque area, New Mexico

COOPERATING AGENCIES: Albuquerque Metropolitan Arroyo Flood Control Authority and City of Albuquerque

PROJECT CHIEF: John P. Borland

PERIOD OF PROJECT: Continuous since February 1976

Problem: The City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority require reliable flood-frequency data for the design of urban drainage structures and the regulation of urban development. Present methodology uses unverified empirical relations and data from other urban areas. There is little data presently available regarding the chemical quality of storm runoff in the Albuquerque area.

Objectives: Define runoff characteristics from urban basins in the Albuquerque area and relate the characteristics to measurable basin and climatic variables. Investigate the applicability of empirical relations developed for other urban areas to the Albuquerque area; specifically, relations used to compute time and peak coefficients used in the Colorado urban hydrograph procedure. Develop relations between magnitude of flood discharges and measurable basin and climatic variables for watersheds in the Albuquerque area and provide estimates of chemical quality of runoff.

PROJECT TITLE: Hydrologic information needs in the Albuquerque-Belen basin, Central New Mexico

COOPERATING AGENCY: City of Albuquerque

PROJECT CHIEF: Georgianna E. Kues

PERIOD OF PROJECT: April 1981 to October 1981

Problem: Water management practices in the Albuquerque-Belen basin have been oriented towards the development of a distribution system; the availability of a sufficient amount of fresh water to meet demand has always been assumed. Recent population growth in the basin has increased water demand to the point that more sophisticated water management techniques would prove beneficial. The formulation of an overview of possible hydrologic studies of the basin would provide water planners and managers with information on the types of data that can be obtained through hydrologic investigations.

Objectives: Formulate a plan that will outline needed hydrologic investigations in the Albuquerque-Belen basin.

PROJECT TITLE: Determination of natural streamflow in the Jemez River at the boundaries of Indian lands

COOPERATING AGENCY: U.S. Bureau of Indian Affairs

PROJECT CHIEF: John P. Borland

PERIOD OF PROJECT: January 1981 to September 1981

Problem: The Jemez Indians, the Zia Indians, and the Santa Ana Indians have inhabited areas along the Jemez River since before the first European explorers came. The Jemez Indians, in particular, have been successful farmers, using diverted water for irrigation. Since the 1880's, several man-made changes have been made in the hydraulic characteristics of the drainage basin in addition to the changes caused by irrigation by the Indians. All of these changes may have significantly altered streamflow in the river.

Objectives: The Bureau of Indian Affairs has requested that the U.S. Geological Survey determine the natural streamflow in the Jemez River where the river crosses boundaries of Indian lands. Natural streamflow is defined as the streamflow that would occur if there had been no man-made changes in the hydraulic characteristics of the river basin. The purpose of the study, therefore, was to make the best possible estimate of the natural streamflow in the Jemez River where it enters the Jemez Reservation, where it leaves the Jemez and enters the Zia Reservation, where it leaves the Zia and enters the Santa Ana Reservation, and where it leaves the Santa Ana Reservation.

PROJECT TITLE: Hydrologic effects of geothermal power development in the Jemez Mountains, New Mexico

COOPERATING AGENCIES: U.S. Bureau of Indian Affairs and the New Mexico State Engineer Office

PROJECT CHIEF: Amjad M. J. Umari

PERIOD OF PROJECT: June 1981 to September 1985

Problem: The volcanic caldera of the Jemez Mountains is currently the object of extensive exploration for the commercial development of hydrothermal energy. Any commercial extraction of geothermal fluids may adversely affect the area's thermal spring flow and the base flow of streams draining the Jemez Mountains.

Objectives: To assess the effects of commercial development of the Jemez Mountains geothermal reservoir on the quantity and quality of the area's surface and subsurface water resources. This will be partially accomplished by the application of a digital geothermal simulation model.

PROJECT TITLE: Estimated natural streamflow in the Rio San Jose

COOPERATING AGENCY: U.S. Bureau of Indian Affairs

PROJECT CHIEF: Dennis W. Risser

PERIOD OF PROJECT: February 1981 to September 1981

Problem: Surface- and ground-water resources have been extensively developed in the upper half of the Rio San Jose drainage basin for many years. Pueblo Indians who inhabited the valley were using water from the Rio San Jose for irrigation before the Spanish entered the area in the 1500's. Since about 1870, both surface and ground water were used in increasing amounts from the Rio San Jose basin upstream from the Pueblos of Acoma and Laguna. The Indians are concerned that this development has significantly decreased the streamflow in the Rio San Jose on their lands.

Objectives: Estimate the natural streamflow of the Rio San Jose at the upstream boundaries of the Pueblo of Acoma and Pueblo of Laguna. Natural streamflow is defined for this study as the streamflow that would have occurred if water development in the basin upstream from the Pueblos had never taken place.

PROJECT TITLE: Water resources of Santa Fe County, New Mexico

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEF: Kevin F. Dennehy

PERIOD OF PROJECT: November 1971 to January 1981

Problem: Several land-development companies have purchased large tracts of land in Santa Fe County and have made plans for community developments. Water supply may be a problem in the development of these communities. A study of the quantity and chemical quality of the water resources of the county is needed for the use of those concerned with water supply, whether for household, community, stock, irrigation, or industrial use.

Objectives: Obtain geohydrologic data and evaluate aquifer yields, chemical quality of water, relationships between surface and ground water, and the effects of water-use developments in Santa Fe County.

PROJECT TITLE: Digital model study of Santa Fe area, New Mexico

COOPERATING AGENCY: New Mexico State Engineer Office
Santa Fe Metropolitan Water Board

PROJECT CHIEF: Douglas P. McAda

PERIOD OF PROJECT: June 1981 to October 1984

Problem: Accompanying the continued growth of the Santa Fe area is the constantly increasing demand for water. Recently the problem of declining water levels within the city has aroused public concern. Even though a public water-supply system exists, an increasing number of domestic wells are being drilled. These factors have a bearing on the local and regional hydrologic system. Because the area is expected to continue growing, steps need to be taken to understand the hydrologic system. This knowledge can be used in future planning to optimize the use of the water resources.

Objectives: To simulate the interaction of major hydrologic components as well as to demonstrate how each affects the regional hydrologic system. The simulation and demonstration are achieved by defining pertinent aquifer characteristics along with the location and quantity of both natural and man-caused recharge and discharge. The effects of existing stresses on the hydrologic system will be simulated and will be used to develop predictive capabilities on a regional basis.

PROJECT TITLE: Duties for the Rio Grande Compact Commission

COOPERATING AGENCY: Rio Grande Compact Commission

PROJECT CHIEF: William K. Dein

PERIOD OF PROJECT: Continuous since February 1948

Problem: The Rio Grande Compact Commission is composed of a Commissioner from each of the States of Colorado, New Mexico, and Texas, and a Federal Representative. The administration of the Compact requires that streamflow and water-storage data for that area of the Rio Grande Basin upstream from Fort Quitman, Texas be collected, compiled, correlated, and presented to the Commission.

Objectives: Perform duties of secretary as outlined in the rules and regulations of the Rio Grande Compact Commission. Principal duties are: compilation of streamflow and storage data and reporting this information to the Commissioners on a monthly basis; assembly for publication of the annual report of activity of the Commission and summary of hydrologic data on deliveries under the Compact; and maintenance of a record of all actions of the Commission.

Reports published or released during 1981: Rio Grande Compact Commission, 1981, Report of the Rio Grande Compact Commission, 1980: 55 p.

Pecos River Basin

PROJECT TITLE: Investigation of leakage from Santa Rosa Reservoir on the Pecos River, Guadalupe County, New Mexico

COOPERATING AGENCY: U.S. Army Corps of Engineers

PROJECT CHIEF: Dennis W. Risser

PERIOD OF PROJECT: July 1981 to March 1983

Problem: The amount of water leaking from Santa Rosa Reservoir needs to be quantified for administration of water rights on the Pecos River.

Objectives: Estimate the magnitude of leakage from Santa Rosa Reservoir.

PROJECT TITLE: Digital-model study of the Roswell Basin, New Mexico

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEF: Paul A. Davis

PERIOD OF PROJECT: October 1979 to September 1982

Problem: The Roswell ground-water basin is the major source of water for irrigation in Chaves and Eddy Counties. An understanding of the interaction between the components of the ground-water system is essential in all aspects of ground-water development.

Objectives: Produce a digital model that simulates the major components of the ground-water basin and their interaction.

PROJECT TITLE: Miscellaneous reach studies, Pecos River

COOPERATING AGENCY: Pecos River Commission

PROJECT CHIEF: George E. Welder

PERIOD OF PROJECT: Continuous since July 1969

Problem: The Pecos River Commission, which administers the Pecos River Compact between New Mexico and Texas regarding the Pecos River, often has need for special studies of the relationship of surface and ground water in specific reaches of the river.

Objectives: Relate gains or losses in streamflow to ground-water flow conditions, transpiration, evaporation, or flow diversions.

PROJECT TITLE: Hydrologic investigations related to a radioactive-waste repository in salt, southeastern New Mexico

COOPERATING AGENCY: U.S. Department of Energy

PROJECT CHIEF: Jerry W. Mercer

PERIOD OF PROJECT: May 1975 to September 1983

Problem: The Department of Energy is evaluating salt beds in southeastern New Mexico for use as a potential repository for defense-associated radioactive wastes. Information is needed on the occurrence and movement of water in the various water-bearing beds above and below the salt to assist in evaluation of the long-term hydrologic integrity of the site as well as to assess the environmental impact of the proposed project.

Objectives: Define the general occurrence of ground water in the area from near Roswell southeastward to the State line. Define in detail the direction and rate of movement of ground water in the Rustler Formation in the vicinity of the site, with less-detailed definition down-gradient to about 30 miles from the site.

Northwestern New Mexico

PROJECT TITLE: Hydrologic surveillance of coal-lease areas in northwestern New Mexico

COOPERATING AGENCY: Bureau of Land Management,

PROJECT CHIEF: Henry R. Hejl, Jr.

PERIOD OF PROJECT: August 1974 to September 1983

Problem: Certain areas of the San Juan Basin in northwestern New Mexico are undergoing changes in the use of water and land, most of which are related to energy development. Among these developments are strip mining of coal, oil and gas exploration, electric power generation, coal gasification, and agriculture. These developments may affect the condition of the water resources by changing drainage patterns, increasing sediment yield, and altering the chemical quality of water.

Objectives: Document hydrologic characteristics of streamflow and ground water associated with the coal seams and their variabilities in quantity and quality, obtain a knowledge of the flow systems and the principles and processes in effect, and determine the effects of coal extraction and associated development on the quantity and quality of water resources in the coal-lease areas of northwestern New Mexico.

PROJECT TITLE: Water-resources monitoring of coal development in the San Juan Basin, New Mexico

PROJECT CHIEF: Henry R. Hejl, Jr.

PERIOD OF PROJECT: Continuous since January 1977

Problem: Coal mining and associated activities in the San Juan Basin may have an adverse effect on the water resources of the area. Mine dewatering, changes in land use, waste disposal, stream-channel realignment, and water withdrawals for industries and municipalities may alter streamflow and ground-water systems and interfere with traditional water uses, or cause deterioration of remaining water resources.

Objectives: Monitor surface and ground water in the coal areas to detect and document changes in water quantity and quality that may result from coal mining and associated activities, and obtain knowledge of the regional flow system and the principles and processes in effect.

PROJECT TITLE: Precipitation-runoff modeling of watershed systems in northwestern New Mexico

COOPERATING AGENCY: Bureau of Land Management

PROJECT CHIEF: Henry R. Hejl, Jr.

PERIOD OF PROJECT: October 1977 to September 1983

Problem: The effects of surface mining for coal on the quantity and quality of surface flow in the strippable coal-lease area in the San Juan Basin are unknown. The Bureau of Land Management needs to predict the effects of surface mining on the water resources in the coal-lease areas in order to manage the coal-bearing areas of the public domain.

Objectives: Develop, test, and verify precipitation-runoff models for predicting surface-runoff characteristics and sediment yield under various land-use conditions in the coal-lease areas in northwestern New Mexico. Relate parameters used by the model to measurable physical features of a selected basin to facilitate transferability of the model from an instrumented basin to uninstrumented basins.

PROJECT TITLE: Exploration of techniques for separation and quantification of individual coal-mine effects from cumulative natural and cultural effects.

PROJECT CHIEF: Carole L. Goetz

PERIOD OF PROJECT: April 1980 to October 1982

Problem: Legal requirements of regulatory agencies have created a need to evaluate the hydrologic effects of proposed and actual coal mining activities. The situation on the San Juan River in northwestern New Mexico offers a promising set of circumstances to determine whether the effects of a single coal mine are large enough to be measured and separated from other natural and cultural effects using the cumulative hydrologic data collected at stream sites by the U.S. Geological Survey.

Objectives: Investigate various data-analysis techniques that can be used to quantify and separate individual coal-mine effects on streamflow, water quality, and sedimentation from cumulative natural and cultural effects.

PROJECT TITLE: Surveillance of water resources at Crownpoint and related mining areas, San Juan Basin, New Mexico

COOPERATING AGENCIES: U.S. Bureau of Indian Affairs

PROJECT CHIEF: Peter Frenzel

PERIOD OF PROJECT: October 1980 to September 1982

Problem: Most communities in the southern and western parts of the San Juan structural basin in northwestern New Mexico use ground water. Ground water supplies may be adversely affected by uranium mining, especially at Crownpoint where the main aquifer contains the uranium ore.

Objectives: Provide a hydrologic data base and monitoring network that could be used to predict and monitor the effects of development on water supplies in the area, especially within a 20 mile radius of Crownpoint.

PROJECT TITLE: Hydrologic assessment of uranium minewater discharge into Kim-me-ni-oli Wash, San Juan Basin, New Mexico

COOPERATING AGENCY: Bureau of Land Management

PROJECT CHIEF: Kim Ong

PERIOD OF PROJECT: June 1981 to September 1984

Problem: A uranium mine is discharging from 1 to 7 cubic feet per second of minewater into Kim-me-ni-oli Wash, formerly an ephemeral stream. Ground water from this and other planned mines will be discharged into Kim-me-ni-oli Wash or nearby arroyos. There is considerable concern about the quality of the discharged water, the effects of erosion in the stream channel and on manmade structures, the effects of water quality changes on existing ground-water supplies and livestock, the quantity of water lost to seepage and evaporation, and undesirable vegetation growth.

Objectives: To define the hydrologic effects of minewater discharge on Kim-me-ni-oli Wash. This will include determinations of loss in streamflow, sediment-transport changes, and water-quality changes in surface water and ground water, particularly changes in radiochemical constituents associated with uranium mining.

PROJECT TITLE: Hydrology of Coal Area 60, San Juan Basin, New Mexico and Colorado

PROJECT CHIEF: F. Eileen Roybal

PERIOD OF PROJECT: July 1981 to September 1982

Problem: The San Juan Basin is rich in energy resources such as coal, uranium, and petroleum. Development of these resources is dependent upon the relatively sparce water resources in this seim-arid area. The mining companies are required to determine hydrologic effects of mineral development and take appropriate steps to minimize adverse effects. The coal resource areas of the nation are divided into reporting areas; parts of three of these areas are located in New Mexico. There is a need to compile basic water-resources information in each coal area and present this information in a comprehensive and easily understood report.

Objectives: Describe the hydrology of Coal Area 60 in a concise and understandable report that can be used by coal-mining companies and by regulatory agencies. Although the report will relate specifically to coal hydrology, the data should be useful to other mining interests in the area, particularly uranium-mining companies, and to other groups, such as environmental organizations.

West-central New Mexico

PROJECT TITLE: Ground-water resources of Cibola County, New Mexico

COOPERATING AGENCIES: New Mexico State Engineer Office and New Mexico Bureau of Mines and Mineral Resources

PROJECT CHIEF: Joe A. Baldwin

PERIOD OF PROJECT: April 1980 to September 1983

Problem: Ground-water information is almost totally absent for much of Cibola County. Extensive aquifers such as the basalt flows (malpais) and underlying alluvium of the North Plains, the limestone aquifers south and west of the Zuni Mountains, and extensive sandstone aquifers of Triassic through Tertiary age have not been assessed. Less developed areas of the county are being considered for possible development because of their proximity to major energy-producing areas.

Objectives: Define the ground-water resources of Cibola County by conducting a well and spring inventory throughout the study area. Conduct aquifer tests and water-quality analyses where possible. Compile a geologic map of the study area.

PROJECT TITLE: Ground-water resources of the San Agustin Plains and adjacent areas, Catron and Socorro Counties, New Mexico

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEFS: Robert G. Myers, U.S. Geological Survey
James T. Everheart, New Mexico State Engineer Office

PERIOD OF PROJECT: October 1978 to September 1983

Problem: The Plains of San Agustin is a basin with interior surface-water drainage. It has been declared by the New Mexico State Engineer as part of the Rio Grande "underground-water basin." Complete information is needed on the quantity, quality, and availability of ground water in the Plains and adjacent areas for the proper management of ground-water resources. Previous to this study, very little information on the ground-water resources has been collected.

Objectives: (1) Collect basic information about wells, springs, geology of aquifers, water use, water chemistry, and aquifer hydraulic coefficients within the study area; (2) analyze the collected data to define the availability, quality, and quantity of ground water; and (3) determine the flow systems and relationships of aquifers within the Plains of San Agustin basin and adjoining basins.

PROJECT TITLE: Ground-water Resources of Socorro County, New Mexico

COOPERATING AGENCIES: New Mexico State Engineer Office
New Mexico Bureau of Mines and Mineral Resources

PROJECT CHIEF: ----------

PERIOD OF PROJECT: March 1981 to September 1984

Problem: Although a number of hydrologic investigations have been made in various parts of Socorro County, a comprehensive study of the whole county has not been done. Most of the domestic and public water supplies in the county are from ground-water sources, and significant quantities of ground water are used in agriculture, mining, and manufacturing. The potential development of energy resources, such as coal, will also have an impact on ground-water resources in the county.

Objectives: To better define the ground-water resources of Socorro County by conducting a well and spring inventory, collecting water samples for chemical analysis, and conducting a limited number of aquifer tests.

PROJECT TITLE: Ground-water resources of Catron County, New Mexico

COOPERATING AGENCY: New Mexico State Engineer Office and
New Mexico Bureau of Mines and Mineral Resources

PROJECT CHIEF: Robert G. Myers

PERIOD OF PROJECT: March 1981 to September 1984

Problem: There are no county-wide hydrologic studies for Catron County. Existing information is very sparse for most of the county except the San Agustin Plains area, which recently has been investigated. Hydrologic studies are virtually nonexistent for a large part of the county.

Objectives: (1) Assemble existing hydrologic data within the county; (2) expand on this data base by collecting additional hydrologic data; and (3) present the data in a county-wide data report. The report should aid in assessing the hydrologic conditions in areas of impending economic development.

PROJECT TITLE: Water resources of the Zuni Reservation

COOPERATING AGENCY: Pueblo of Zuni

PROJECT CHIEF: Brennon R. Orr

PERIOD OF PROJECT: January 1978 to September 1981

Problem: The Pueblo of Zuni requires information on the yield, variability, and quality of existing water supplies, as well as the potential for developing new supplies. There is potential for industrial development and expansion of the existing communities on the reservation.

Objectives: Provide a comprehensive analysis of the source, supply, chemical quality, and availability of water from streamflow, springs, and wells on the reservation.

Tularosa Basin

PROJECT TITLE: Selected Water-resources studies in the Tularosa Basin, New Mexico

COOPERATING AGENCY: U.S. Bureau of Reclamation

PROJECT CHIEF: Brennon R. Orr

PERIOD OF PROJECT: June 1981 to September 1984

Problem: The U.S. Bureau of Reclamation, as part of an energy and water-resources study of the Tularosa Basin, needs information about the occurrence of freshwater and saline-water resources within basin sediments.

Objectives: Conduct surface geophysical studies and collect hydrologic information from wells to determine the extent and distribution of freshwater resources in areas where no previous data are available. Conduct aquifer tests to determine the distribution of permeability of basin sediments saturated with saline water.

PROJECT CHIEF: Continuing reconnaissance and evaluation of water resources on the White Sands Missile Range

COOPERATING AGENCY: White Sands Missile Range

PROJECT CHIEF: Jim D. Hudson

PERIOD OF PROJECT: Continuous since July 1960

Problem: The population of the missile range is increasing, as is the use of ground water. Because the volume of fresh ground water is limited, the effects of increasing draft on the reservoir must be known with reference to depletion and to possible saline-water encroachment. Several wells on the missile range supply water to camp areas; continued operation of these wells is vital to the range.

Objectives: Obtain water-level and pumpage data so that periodic evaluation of reservoir depletion in the post headquarters area can be made. Monitor test wells for changes in chemical quality of the water. Observe water levels and chemical quality of water from wells in camp areas. Do short-term site studies where additional water supplies are needed. Evaluate approaches for economical recovery of the maximum available freshwater.

Reports published or released during 1981: Cruz, R. R., 1981, Annual water-resources review, White Sands Missile Range, New Mexico, 1980: U.S. Geological Survey Open-File Report 81-921, 27 p.

Miscellaneous area studies

PROJECT TITLE: Freshwater aquifers of the Delaware Basin, New Mexico and Texas

COOPERATING AGENCY: U.S. Environmental Protection Agency

PROJECT CHIEF: Jane G. Wells

PERIOD OF PROJECT: May 1981 to January 1982

Problem: The League of Women Voters of Odessa, Texas, recently petitioned the Environmental Protection Agency (EPA) to determine that the aquifers of the Delaware Basin in western Texas and southeastern New Mexico (the Capitan Limestone, Rustler Formation, Santa Rosa Sandstone, and Cenozoic alluvium) are the sole or principal drinking water sources for the area. A report of existing geohydrologic data is needed by the EPA to make a sole-source evaluation of these aquifers.

Objectives: Assemble hydrologic and geologic data from existing references and make maps showing the extent and thickness of the aquifers, the direction of ground-water movement (locally), and the general chemical quality of ground water.

PROJECT TITLE: Digital model study of the Mimbres Basin, New Mexico

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEF: Randall T. Hanson

PERIOD OF PROJECT: February 1980 to September 1983

Problem: Additional data and a conceptual/numerical model framework for the water resources of the Mimbres Basin are needed for administration of available water. Water levels are declining; a projected increase in development has resulted in a need to quantify the distribution and movement of the water resources.

Objectives: Compile quantitative data necessary to construct a geohydrologic framework of the water resources and construct a calibrated, steady-state, distributed-parameter, numerical model that simulates ground-water flow in this closed alluvial basin.

PROJECT TITLE: Model of the Ogallala aquifer system, Lea County, New Mexico

COOPERATING AGENCY: New Mexico State Engineer Office

PROJECT CHIEF: Douglas P. McAda

PERIOD OF PROJECT: March 1980 to September 1982

Problem: Water levels in parts of Lea County are declining due to heavy demands placed on the Ogallala aquifer system by irrigation, industrial, and municipal water resources. Well yields will be reduced as water is depleted and irrigation may become uneconomical with increased lifts, lower well yields, and higher energy costs. Questions remain as to the quantity and distribution of water that might be developed for cities, towns, and industry from the reduced saturated thickness of the Ogallala. These users may be able to economically salvage relatively large quantities of water that would not be economically available for irrigation from the system.

Objectives: The study will determine the quantity and distribution of the water in storage and determine the present rate of depletion. The data will be projected for future time periods so that estimates of water availability for these periods might be made. Municipal planners can then determine if their present well fields will be adequate or can be expanded, or if they should seek additional sources of water to supplement their supply.

PUBLICATIONS OF THE U.S. GEOLOGICAL SURVEY AND REFERENCE SOURCES ON THE HYDROLOGY AND GEOLOGY OF NEW MEXICO

Professional Papers, Water-supply Papers, Bulletins, Circulars, and the Yearbook of the Geological Survey are available from the U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, Virginia 22202 (authorized agent of the Superintendent of Documents, Government Printing Office). Hydrologic Investigations Atlases, Hydrologic Unit Maps, topographic maps, and other maps pertaining to New Mexico are sold by the U.S. Geological Survey, Branch of Distribution, P.O. Box 25286, Federal Center, Denver, Colorado 80225. Microfiche and black and white paper copies of open-file reports may be obtained from the Open-File Services Section, Branch of Distribution, U.S. Geological Survey, P.O. Box 25425, Federal Center, Denver, Colorado 80225. Water-Resources Investigations published after mid-1982 may be obtained from the Open-file Services Section in Denver. Information on obtaining earlier reports in the WRI series is available from the Librarian, U.S. Geological Survey, Room 720, 505 Marquette NW, Albuquerque, New Mexico 87102.

Records of streamflow, ground-water levels, and quality-of-water data were published for many years as Geological Survey Water-Supply Papers (WSP) in the series explained below. Beginning with the 1975 water year, these series have been replaced by a new publication series, "U.S. Geological Survey Water-Data Reports." This new series combines streamflow data, water-quality data for surface and ground water, and ground-water-level data from the basic network of observation wells. For New Mexico, the first report of this series was entitled "Water Resources Data for New Mexico - Water Year 1975: U.S. Geological Survey Water-Data Report NM-75-1". Other publication series of general interest are explained below. Further information on these publications can be obtained from the District Chief, U.S. Geological Survey, Water Resources Division, Room 720, 505 Marquette NW, Albuquerque, New Mexico 87102.

Streamflow records.--Records of daily flows of streams prior to 1971 were published in the Water-Supply Paper series "Surface-Water Supply of the United States which was released in numbered parts as determined by natural drainage basins. Until 1961 this was an annual series; monthly and yearly summaries of these data were compiled in two reports: "Compilation of Records of Surface Waters of the United States through September 1950" and "Compilation of Records of Surface Waters of the United States, October 1950 to September 1960." For 1960-70, two 5-year compilations were published. Data for New Mexico are published in part 7, volume 2; part 8, volumes 1 and 2; and part 9, volumes 2 and 3. For the years 1961-74, this information also was released annually on a state-boundary basis.

Ground-water records.--Prior to 1975 ground-water levels and artesian pressures in observation wells were reported by geographic areas in a Water-Supply Paper series published at 5-year intervals. Data for New Mexico are found in "Ground-Water Levels in the United States, Southern States." The New Mexico State Engineer Office also publishes ground-water data in a hydrologic-data series entitled, "Ground-Water Levels in New Mexico."

Quality-of-water records.--Data for quality of surface water prior to 1971 were published annually in the Water-Supply Paper series "Quality of Surface Waters of the United States," which also was released in numbered parts as determined by natural drainage basins. Data for New Mexico are in parts 7, 8, and 9. For the years 1964-74, this information also was released annually on a state-boundary basis.

Methods of estimating the frequency and magnitude of floods for selected streams are given in the Water-Supply Paper series "Magnitude and Frequency of Floods in the United States," which is composed of reports released in parts by drainage basins; data for New Mexico are in parts 7, 8, and 9. The Geological Survey also has outlined flood-prone areas on topographic maps as part of a nationwide Federal program for managing flood losses. In New Mexico, 67 topographic maps have been completed. Flood-prone area maps of New Mexico are listed in "Index of flood maps prepared by the U.S. Geological Survey through 1973," Water Resources-Investigations 73-57. Information on these maps is available from the District Chief, Water Resources Division, Albuquerque.

Summaries of research in progress and results of completed investigations are published each fiscal year in the Professional Papers "Geological Survey Research." Recent editions are: fiscal year 1978, PP 1,100; 1979, PP 1,150; 1980, PP 1,175, and 1981, PP 1,275.

Summary statements about the immediate national water situation are presented in the Water Resources Review, which is issued monthly. The Review may be obtained free on application to the U.S. Geological Survey, 420 National Center, Reston, Virginia 22092.

Indexes to the "Catalog of Information on Water Data" are available free from the District Chief in Albuquerque or the Office of Water Data Coordination, U.S. Geological Survey, 417 National Center, Reston, Virginia 22092. Current editions are as follows: (1) station listings for streamflow and stage, quality of surface water, and quality of ground water, 1974 [21 volumes by water-resources regions--stations in New Mexico are listed in volumes 11 (Arkansas-White-Red Region), 12 (Texas-Gulf Region), 13 (Rio Grande Region), 14 (Upper Colorado Region), and 15 (Lower Colorado Region)]; (2) index to areal investigations and miscellaneous water-data activities, 1970 (one volume); and (3) index to ground-water stations, 1968 (one volume).

The "U.S. Geological Survey Annual Report" (known as the "Yearbook" since 1977) provides a comprehensive description of the Federal Government's largest earth-science agency.

Topographic maps for New Mexico may be purchased from the Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, Colorado 80225. Available free from the same address is an "Index to Topographic Maps of New Mexico" which is updated periodically to show current availability. A quarterly edition of "Advance Material Available," which details the status of current mapping programs, is issued by the U.S. Geological Survey, Rocky Mountain Mapping Center, Federal Center, Box 25046, MS 504, Denver, Colorado 80225. Unedited advance prints are often available more than a year before maps are published in final form.

U.S. Geological Survey topographic maps may be purchased from private dealers in every major city in the State. Dealer prices may be slightly higher than prices at government facilities.

Many libraries maintain reference files of the published maps of the Geological Survey. In New Mexico, maps are deposited in the libraries listed below:

Albuquerque:	Library, University of New Mexico
Las Cruces:	Documents Division, New Mexico State University
Las Vegas:	Donnelly Library, New Mexico Highlands University
Santa Fe:	New Mexico State Library and Museum of New Mexico
Socorro:	New Mexico Bureau of Mines and Mineral Resources

A book entitled "Publications of the Geological Survey, 1879-1961" lists all books published by the Survey through 1961. A supplement lists publications issued between 1962 and 1970, and annual supplements have appeared since that time. A monthly series, "New Publications of the Geological Survey," lists the most recent books and maps published by the Survey.

A complete compilation of reports is given in "List of Geological Survey Geologic and Water-Supply Reports and Maps for New Mexico." This list is available free from the Branch of Distribution, U.S. Geological Survey, 1200 S. Eads Street, Arlington, Virginia 22202.

The Survey has published four bibliographies for parts of New Mexico, listing publications from all sources. The first of these, printed in 1978, is USGS Bulletin 1458, entitled "Bibliography of the Geology and Hydrology of the Albuquerque Greater Urban Area, Bernalillo and Parts of Sandoval, Santa Fe, Socorro, Torrance, and Valencia Counties, New Mexico." Another list was published in 1979 as Water-Resources Investigations 79-76, entitled "Bibliography of Geology and Hydrology, Eastern New Mexico." "Bibliography of Geology and Hydrology, San Juan Basin, New Mexico, Colorado, Arizona, and Utah" was published in 1979 as Bulletin 1481. A bibliography on southwestern New Mexico was published as Water-Resources Investigations 80-20. These four publications are for sale from the Branch of Distribution in Arlington, Virginia.

The New Mexico State Engineer Office in 1978 published a "Bibliography of Ground-Water Studies in New Mexico, 1873-1977" (compiled by Robert L. Borton). An update of this has also been published. This is the most complete bibliography available on a statewide basis. It is available without cost from the New Mexico State Engineer Office, Bataan Memorial Building, Santa Fe, New Mexico 87503. A list of publications by the State Engineer Office may be obtained from the same address.

The New Mexico Water Resources Research Institute, located at New Mexico State University, coordinates a wide variety of water studies. A free list of publications may be obtained by writing the Institute at P.O. Box 3167, Las Cruces, New Mexico 88003.

A free list of the publications of the New Mexico Bureau of Mines and Mineral Resources may be obtained from the Bureau at Socorro, New Mexico 87801. The Bureau issues publications on mining, geology, hydrology, and energy resources statewide. The Bureau offers for sale a "Bibliography of New Mexico Geology and Mineral Technology" in their Bulletin series. Publications of the New Mexico Geological Society may also be purchased from the Bureau of Mines and Mineral Resources.

A list of theses and dissertations by geology students at the University of New Mexico may be obtained from the Department of Geology, University of New Mexico, Albuquerque, New Mexico 87131. A "Bibliography of Dissertations and Theses on Water and Water Related Topics from New Mexico State University through December 1980" by Robert G. Myers and Karen M. Pinckley may be obtained from the New Mexico Water Resources Research Institute in Las Cruces.

A general historical and cultural bibliography of New Mexico is "20,000 Years of History--A New Mexico Bibliography", by Frances Leon Swadesh. There are some geologic and irrigation references. Other historical references to irrigation and water-right conflicts can be found in the indexes to the "New Mexico Historical Review" and "El Palacio" (Bulletin of the Museum of New Mexico). The "New Mexico Historical Review" index should be available for use at all major libraries in the state, and the "El Palacio" index is available at the Zimmerman Library at the University of New Mexico.

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Cranston, C. C., Kues, G. E., and Welder, G. E., 1981, Miscellaneous surface-water data, Pecos River Basin, New Mexico: U.S. Geological Survey Open-File Report 81-218, 8 p. (and a 537 page table).

Cruz, R. R., 1981, Annual water-resources review, White Sands Missile Range, New Mexico, 1980: U.S. Geological Survey Open-File Report 81-921, 27 p.

Dennehy, K. F., and Davis, P. A., 1981, Hydrologic testing of low transmissive zones in southeastern New Mexico: Ground Water, v. 19, no. 5, p. 482-489.

Dewey, J. D., 1981, Methods used to compute recharge for the Albuquerque-Belen sub-basin of the Southwest Alluvial Basin (East) study [abs]: 10th Rocky Mountain Ground-Water Conference, Laramie, Wyoming, 1981, p. 10.

Frenzel, P. F., Craigg, S. D., and Padgett, E. T., 1981, Preliminary data report for the San Juan Basin-Crownpoint surveillance study: U.S. Geological Survey Open-File Report 81-484, 33 p.

Goetz, C. L., 1981, Preliminary analysis of historical streamflow and water-quality record for the San Juan River Basin, New Mexico and Colorado, in Wells, S. G., and others, eds., Environmental geology and hydrology in New Mexico: New Mexico Geological Society Special Publication 10, p. 21-25.

Hudson, J. D., 1981a, Ground-water depletion, in feet, allowed in a part of Curry County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map CU-21.

_____1981b, Ground-water depletion, in feet, allowed in central Lea County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map LC-23.

_____1981c, Ground-water depletion, in feet, allowed in northern Lea County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map LN-23.

_____1981d, Ground-water depletion, in feet, allowed in Portales Valley, Roosevelt County, New Mexico, by U.S. Internal Revenue Service for calendar year 1980: New Mexico State Engineer Map RO-24.

Mercer, J. W., and Gonzalez, D. D., Geohydrology of the proposed Waste Isolation Pilot Plant site in southeastern New Mexico, in Wells, S. G., and others, eds., Environmental geology and hydrology in New Mexico: New Mexico Geological Society Special Publication 10, p. 123-131.

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Myers, R. G., and Pinckley, K. M., 1981, Bibliography of dissertations and theses on water and water-related topics from New Mexico State University through December 1980: New Mexico Water Resources Research Institute Report 138, 28 p.

Rio Grande Compact Commission, 1981, Report of the Rio Grande Compact Commission, 1980: 55 p.

Thomas, R. P. and Dunne, April, 1981, Summary of basin and flood characteristics for unregulated basins in New Mexico: U.S. Geological Survey Open-File Report 81-1070, 230 p.

U.S. Geological Survey, 1981, Water resources data for New Mexico, Water Year 1980: U.S. Geological Survey Water-Data Report NM-80-1, 679 p.

U.S. Geological Survey, 1981, Annual Report to the Pecos River Commission: 21 p.

Wilson, C. A., White, R. R., Orr, B. R., and Roybal, R. G., 1981, Water resources of the Rincon and Mesilla Valleys and adjacent areas, New Mexico: New Mexico State Engineer Technical Report 43, 514 p.

Wilson, C. A., and Myers, R. G., 1981, Ground-water resources of the Soledad Canyon re-entrant and adjacent areas, White Sands Missile Range and Fort Bliss Military Reservation, Dona Ana County, New Mexico: U.S. Geological Survey Water-Resources Investigations 81-645, 22 p.