United States Geological Survey
Programs in New Mexico

Fact Sheet

The USGS provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, and land resources. We help find natural resources needed to build tomorrow, and supply scientific understanding needed to help minimize or mitigate the effects of natural hazards and environmental damage caused by human activities. The results of our efforts touch the daily lives of almost every American.

National Mapping Program

Among the most popular and versatile products of the USGS are its 1:24,000-scale topographic maps (1 inch on the map represents 2,000 feet on the ground). These maps depict basic natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines are used to depict the elevation and shape of terrain. New Mexico is covered by 2,035 maps at this scale, which is useful for civil engineering, land-use planning, natural-resource monitoring, and other technical applications. These maps have long been favorites with the general public for outdoor uses, including hiking, camping, exploring, and back-country fishing expeditions.

Hydrologic Monitoring

Data-collection stations are maintained at selected locations throughout New Mexico to record hydrologic data on streamflow and stage, reservoir and lake storage, ground-water levels, spring discharge, and the quality of surface and ground water. In 1994, the data-collection program in New Mexico consisted of 160 continuous streamflow-gaging stations (61 of these sites are equipped with data-collection platforms for obtaining real-time data), 184 streamflow partial-record stations, 45 precipitation stations, 6,200 ground-water network wells (21 are equipped with continuous recorders to monitor changes in ground-water levels), and 84 water-quality stations (fig. 1). All water-resource data collected by the USGS are entered into the National Water Information System and published in data reports. These stations have been established to provide Federal, State, and local agencies with a long-term data base that can be used for assessment of water resources for growth and long-term planning, operation of reservoirs or industries, forecasting, disposal of wastewater and pollution controls, compacts and legal requirements, research or special studies, and data for use in determining the general response of the hydrologic system to natural and induced stresses.

Ground-Water Depletion and Contamination in the Albuquerque Basin

A dominant water issue in New Mexico is the future water supply for Albuquerque, which is the largest municipality in the State. Public-supply, industrial, and military water requirements in the Albuquerque area primarily are met by ground water from sediments in the Albuquerque Basin. Ground water in the basin is the only current water supply utilized for the city, and recent studies indicate that the most productive zone of the aquifer system is much less extensive and thinner than was formerly assumed. Water-level declines, greater than predicted by hydrologic investigations in the 1960's, have occurred in the basin. Nonpumping water levels in production wells in the city have declined more than 100 feet in recent years. Furthermore, the potential for ground-water contamination in the basin, particularly by natural occurrences of arsenic, is of concern to water-management officials. This situation has caused the city to reassess its future water needs and evaluate the potential effects of city water use on ground- and surface-water resources in the Albuquerque Basin.

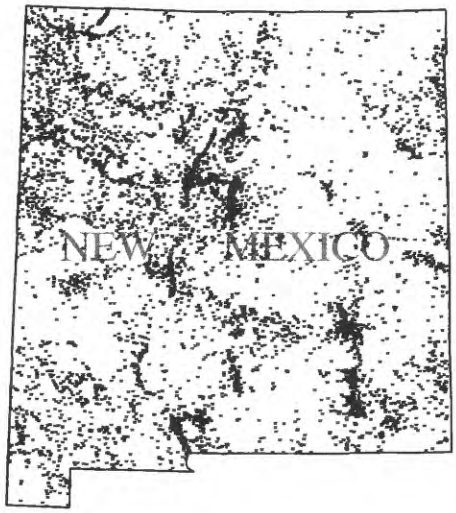

Figure 1. Water-quality data-collection sites in New Mexico.

The USGS, in cooperation with the city of Albuquerque, conducted a study during 1993–94 to provide an understanding of the hydrologic processes that occur in the Albuquerque Basin. During this study, the USGS developed spatial data bases, provided regional hydrologic information, and used numerical-modeling techniques to describe the system and its response to various possibilities of future pumping (fig. 2). This effort brought about a major change in public opinion and water-management focus. Results of the first phase of the study led local officials and water managers to begin advocating water conservation. The result of the second phase of the study is a high-resolution, detailed three-dimensional ground-water-flow model of the Albuquerque Basin. By using the ground-water-flow model as a basis,

Index of Subjects

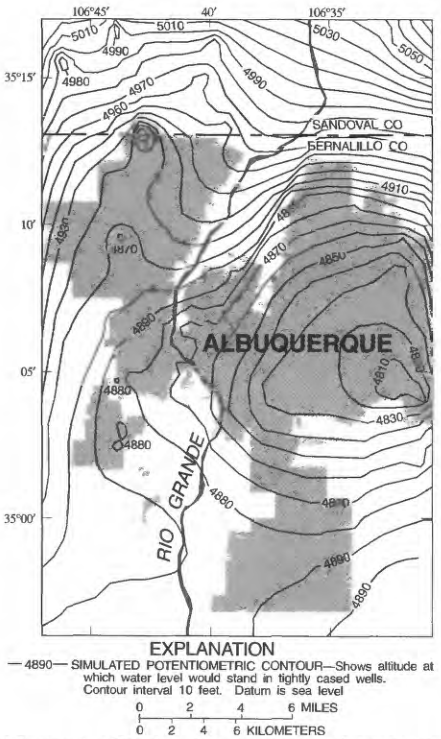

Figure 2. Simulated hydraulic heads in 2020 in the Albuquerque area, assuming medium growth and 30-percent conservation.

additional studies are being designed to understand the effects of pumping and processes affecting recharge from arroyos, canals, drains, and the Rio Grande. Understanding of the geohydrology of the Albuquerque Basin is rapidly evolving and improving. New information becomes available each year as continuous monitoring in the Albuquerque Basin is conducted and new geologic and hydrologic information is interpreted. The three-dimensional ground-water-flow model of the basin will be updated with this new information as it becomes available .

Erosion on the Zuni Reservation

As a result of intense arroyo development, gullying, and erosion from 1880 to 1920, the Zuni Land Conservation Act was created in 1990. In 1992, the USGS entered into a cooperative agreement with the Pueblo of Zuni to help the tribe develop and implement the Zuni resource-development plan, a requirement of the Act. The goals of this effort are to evaluate the erosion in selected subbasins of the Zuni Reservation, to train Zunis in various aspects of hydrology, geomorphology, and erosion control, and to develop a plan to monitor erosion-control practices. This information is helping the Pueblo of Zuni to prioritize erosion-control efforts.

Since initiation of this cooperative effort, the USGS has trained members of the Zuni Tribe in fluvial geomorphology; determined that most main-stem arroyos are aggrading in their lower and middle reaches, indicating that erosion-control efforts would be most effective in the upper reaches and active tributaries; and analyzed historical erosion-control structures in the Rio Nutria watershed, which revealed that 28 of 47 dams, or 60 percent, are no longer effective. The Zunis have begun erosion-control treatments in the Rio Nutria watershed and are monitoring erosion in the area.

National Water-Quality Assessment Program

The long-term goals of the National Water-Quality Assessment (NAWQA) Program are to describe the status of and trends in the quality of a large representative part of the Nation's surface- and ground-water resources and to identify the natural and human factors that affect their quality. The NAWQA Program is producing a wealth of water-quality information that is useful to policymakers and water managers at the local, State, and national levels.

Two NAWQA Program studies are underway in New Mexico–the Rio Grande Valley and the Southern High Plains. Communication and coordination among the USGS and water-management and other water-resource agencies are key components of the Program in the State. The projects distribute findings in a variety of technical and lay reports to local, State, and Federal agencies as results become available.

A critical requirement of the NAWQA Program is up-to-date information on land use and land cover to determine their influence on water quality. The USGS, in cooperation with several other Federal agencies, is acquiring satellite image data for the entire United States. These data are processed according to a consistent standard, then forwarded to NAWQA Program projects, as well as to other water-resource agencies, for water-quality research applications.

New Mexico Rio Grande Water-Quality Study

In 1992, the Pueblo of Isleta secured approval for recognition as a State and adopted water-quality standards for Pueblo surface waters. These standards determine, in part, National Pollutant Discharge Elimination System (NPDES) permit limitations for discharges upstream from the Pueblo. A major concern for the Pueblo is the discharges to the Rio Grande from the city of Albuquerque sewage-treatment plant. The city is concerned that adopted water-quality standards are too stringent because the standards limit concentrations of certain water-quality constituents to levels below current detection limits and do not consider natural background concentrations in the Rio Grande upstream from the city of Albuquerque. Unfortunately, existing water-quality data are not sufficient to determine ambient water-quality conditions in the Rio Grande upstream from the Pueblo of Isleta.

The USGS, in cooperation with the U.S. Environmental Protection Agency, the city of Albuquerque, the New Mexico Environment Department, and the Pueblo of Isleta, began a 2-year study in 1994 to collect additional data to augment existing water-quality data for concentrations of aluminum, arsenic, cyanide, and silver in the Rio Grande upstream from the Pueblo of Isleta. The study also is intended to resolve concerns regarding the quality of existing data for these constituents by collecting data using ultra-clean field and laboratory techniques. Study objectives include establishing baseline concentrations for aluminum, arsenic, cyanide, and silver; examining metals-partition coefficients for water-quality standards implementation; and addressing concerns of residents of the Pueblo of Isleta regarding the ingestion of arsenic contained in fish from Rio Grande and Isleta ponds. The data collected during the study are useful for comparison with applicable water-quality standards and criteria and for management agencies in addressing these issues.

Deep Percolation From Irrigated Areas

Water management in the Roswell Basin and other declared basins in New Mexico has been a critical issue for many years. The amount of deep percolation from applied irrigation water is one of the water-management problems for which better information is needed so that New Mexico and others can better understand the ground-water systems and estimate the amount of depletion in each basin. The Roswell ground-water basin is

located in the Pecos River Valley of southeastern New Mexico. The land adjacent to the river is used for irrigated farming, and the two main crops in the basin are alfalfa and cotton. Surface water is used for irrigation in part of the basin, but ground water is the primary source in the area around Roswell. The main source of ground water for irrigation around Roswell is a deep artesian aquifer, but the shallower water-table aquifer is becoming increasingly important. Several recharge studies have quantified the amount of recharge to the ground-water system in the deeper artesian aquifer, but little has been done to quantify the amount of recharge from deep percolation to the shallow aquifer. The USGS is working with the New Mexico State Engineer Office to estimate the amount of deep percolation from flood irrigation at two sites in the Roswell area by using two unsaturated zone investigative methods—water budget and volumetric water content. This effort will provide information to manage these basins more effectively.

Environmental Effects of Mining in the Mimbres Resource Area

The four-county Mimbres Resource Area, southwestern New Mexico has the largest recorded mineral production in the State. Several mines and two copper smelters are operating there. Large-scale extraction of metals from these operations creates numerous hazardous-waste-management problems and produces a patchwork of waste rock, mill tailings, furnace slag, and flue dust, all of which are deposited over the countryside. In conjunction with a minerals-resource assessment of the Mimbres study area, USGS scientists are assessing the contributions of elements to the soils resulting from ore extraction and ore-smelting processes. From these studies, the USGS has found that several key elements that may have an effect on human health and the environment are significantly enriched in the surface soils.

Gas Resources in the San Juan Basin

In the San Juan Basin, northwestern New Mexico, a major gas-producing region, the obvious and higher quality gas resources that are found in tight (less permeable) sandstone units have been steadily depleted. To discover additional resources and to extract the estimated technically recoverable 8 trillion cubic feet of gas, new technologies and strategies are needed. The USGS is initiating a new gas program to provide a comprehensive understanding of gas distribution and reasons for occurrence in the basin. The USGS works in cooperation with the New Mexico Bureau of Mines and Mineral Resources, various Indian Tribes, other Federal agencies, industry, and universities to provide information for managing Federal and State lands regarding gas extraction, developing Indian Tribes gas resources, and more accurate, unbiased estimates of gas resources in the State.

Landslide Hazards

Although frequently associated with areas of high rainfall, landslides also are a hazard in arid or semiarid States like New Mexico. Landslides in New Mexico range from large, slow-moving, deep-seated masses, which can destroy structures by gradual movement, to shallow, fast-moving debris flows that threaten life, as well as property. To provide guidance on the extent of landsliding in the State, the USGS, in cooperation with the New Mexico Bureau of Mines and Mineral Resources, the New Mexico State Highway and Transportation Department, and the Italian National Research Council, has mapped the distribution of past and present landslides of these various types. These maps can be used by industry, consultants, and local jurisdictions to avoid areas where buildings are likely to be damaged by landslides. The maps also form the basis for continuing analysis aimed at forecasting areas susceptible to future ground movement.

Taos County Land-Slope Analysis

The Taos County Planning Department recently initiated a project to classify Taos County into one of three land-slope categories (fig. 3). Knowledge of land-slope classification is important in timber management, soil erosion prevention, recreation facility planning, and urban development siting. County planners set out to complete the project by manually calculating slope through visual inspection of the contours on each of the 47 USGS topographic maps that cover Taos County at 1:24,000 scale. The county planners requested assistance from the New Mexico State Office of the Bureau of Land Management (NMSO–BLM). By using computerized methods, NMSO–BLM calculated the slope categories in less than 2 minutes. This was possible because high-quality, high-resolution digital elevation data were already available from the USGS as part of an ongoing cooperative effort between the NMSO–BLM and the USGS.

Metallic Mineral Potential of Mexican Spotted Owl Habitat in New Mexico's National Forests

The forest habitat for the Mexican Spotted Owl, a subspecies closely related to the Northern Spotted Owl of the Pacific Northwest, is located primarily in New Mexico and Arizona. The USGS, in cooperation with the U.S. Forest Service, determined the extent of areas of suitable habitat for Mexican Spotted Owls that coincide with national forest lands having mineral potential for undiscovered gold, silver, copper, or molybdenum. These commodities have historically been the most valuable of the metals extracted from New Mexico's U.S. Forest Service lands. Five distinct areas within the forests of New Mexico were found to have high potential for gold, silver, copper, or molybdenum exploitation and an additional five areas were found to have moderate potential. The assessment is useful to develop strategies for the protection of the owls' habitat in the event of future exploitation of mineral resources.

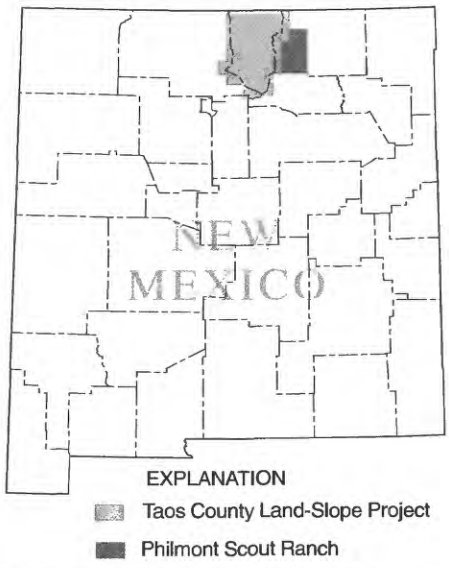

Figure 3. Taos County Land-Slope Project.

Surface Management Responsibility Maps

In 1993, the USGS updated the roads, streams, and names of geographic features on the 1:500,000-scale topographic base map of New Mexico in cooperation with the NMSO–BLM. The USGS base map provides the foundation for the new NMSO–BLM Surface Management Responsibility Map, which was produced by combining the base map, which was compiled by using traditional cartographic processes, with USGS-produced digital elevation data. NMSO–BLM added additional thematic data, such as township and range lines and county boundaries. As a result of the automation of the thematic data captured for this map enables NMSO–BLM to more efficiently and less expensively maintain the data for future projects. Maps printed at two scales (1:500,000 and 1:1,000,000) became available in January 1995.

Upper Rio Puerco Basin

The USGS and NMSO–BLM cooperatively produced high-quality, high-resolution, digital elevation data in the 16,000-square-kilometer upper Rio Puerco basin west of Albuquerque. The digital data are being used by USGS scientists, in collaboration with researchers from other Federal agencies, to study the dynamics of the stream channel. The Rio Puerco produces more sediment than most other streams in the United States. The high sediment load causes erosion and damages the streamside ecosystem downstream. Results of the research will enable land managers to understand and control damaging soil erosion better.

Earth Observation Data

Through its Earth Resources Observation Data Center near Sioux Falls, South Dakota, the USGS distributes a variety of aerial photographs and satellite image data products that cover New Mexico. Mapping photographs of some sites go back about 40 years. Satellite images dating from 1972 can be used to study changes in regional landscapes.

Albuquerque Seismological Laboratory

The Albuquerque Seismological Laboratory (ASL) is an instrument laboratory operated in support of the USGS's Global Seismology Program. Data systems are designed, assembled, and calibrated for USGS seismological observatories, the tsunami warning service, and other data-collection and processing tasks. Technical support is provided to 150 observatories located in more than 60 countries and islands. The work of the Laboratory is partially supported by the U.S. Department of Defense and the National Science Foundation. The ASL has been operated by the USGS since 1973 when it was transferred from the National Oceanic and Atmospheric Administration.

Cooperative Programs

The USGS cooperates with more than 40 local, State, and Federal agencies in New Mexico. Cooperators include county and municipal public works departments, public health agencies, natural-resource agencies, other Federal agencies, and many more. Cooperative activities include water-resources data collection, interpretive water-availability and water-quality studies, mineral-resource assessments, and mapping. When local and State agencies are involved, activities typically are funded on a matching-funds basis. In addition to agencies already mentioned, the USGS cooperates with the Albuquerque Metropolitan Arroyo Flood Control Authority, the New Mexico Environment Department, Bernalillo County, the Elephant Butte Irrigation District, the Rio Grande Compact Commission, the Sandia National Laboratories, and the International Boundary and Water Commission, to name only a few.

The USGS provides support to the New Mexico Water Resources Research Institute, which conducts a program of research, education, and information and technology transfer.

For more information contact any of the following:

For water information
District Chief
4501 Indian School Rd. NE
Suite 200
Albuquerque, NM 87110-3929
(505) 262-5301

For map information
Chief, Rocky Mountain Mapping Center
Denver Federal Center, Mail Stop 510
Denver, CO 80225
(303) 236-5825

For geologic information
Assistant Chief Geologist
Denver Federal Center, Mail Stop 911
Denver, CO 80225
(303) 236-5438

Albuquerque Seismological Laboratory
Building 10002, Kirtland AFB-East
Albuquerque, NM 87115-5000
(505) 846-5646

Additional earth science information can be found by accessing the USGS "Home Page" on the World Wide Web at "http://www.usgs.gov".

For more information on all USGS reports and products (including maps, images, and computerized data), call 1-800-USA-MAPS.

U.S. Department of the Interior
U.S. Geological Survey
Fact Sheet FS-031-95