

WATER QUALITY NEEDS OF THE  
NEW MEXICO INTERSTATE STREAM COMMISSION  
AND STATE ENGINEER OFFICE

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The New Mexico Interstate Stream Commission (ISC) and the State Engineer Office (SEO) cooperate with the U. S. Geological Survey (USGS) in an ongoing program to collect basic data on streamflow, reservoir content, ground water, physical and chemical quality of water and water use, and to make certain investigations of ground water aquifers in the state. Biochemical quality is also monitored at some sites.

The surface water and quality of water programs are statewide and of a continuing nature. The ground water monitoring program, also of a continuing nature, is generally confined to underground water basins declared by the state engineer and to areas outside declared basins where ground water has been extensively developed. These programs consist of data collection relative to streamflow, chemical quality, sedimentation, ground water pumpage and water levels. In addition, various noncontinuing, project-type investigations of geology and ground water resources are made in specific areas.

Very little water quality data, except for grab samples or sampling for limited purposes, were routinely collected in New Mexico before about 1940. Sediment sampling of any magnitude did not start until about 1950.

It is important to note that to be able to quantify water quality data--that is, to determine the salinity, sediment concentrations or load--it is necessary to know the flow of the stream at the point where

water quality is sampled. For that reason, most water quality sampling points are located at stream gauging stations.

The present water quality program of our office consists of collecting basic water quality data including both chemical quality and sediment load at selected surface water stations around the state. We also maintain the New Mexico Water Quality Control Commission (WQCC) surveillance network and collect suspended sediment and bed load information along the Rio Grande. We also conduct network analyses of both the chemical quality and suspended sediment collection program and limited ground water quality collection and analysis.

As of June 30, 1982, the ISC and SEO were cooperating with the USGS in the operation of 190 reservoir level and stream and canal gauging stations. In addition, our office, through the Costilla Creek Compact Commission and the Pecos River Commission, participates in the operation of 48 streamflow stations and three chemical quality stations. Chemical quality and/or sediment of surface waters is monitored at an additional 38 sites, including 11 water quality surveillance network stations necessary for the New Mexico WQCC program under the Clean Water Act. As a constituent agency of the WQCC, our office budgets funds for the commission's surveillance network.

In January, February and March of each year, personnel from the SEO and the USGS make depth-to-water measurements in wells throughout the state. In 1982, a total of about 3,190 depth-to-water measurements were made.

In addition to the cooperative program, the SEO, through the various watermasters which are appointed to administer the surface and ground

waters of the state, measures or determines certain diversions for beneficial use by ditches and pumps. Surface and ground water quality is also determined by the watermasters where quality impairment is or could be a problem. In addition, water quality data is collected by the four State Engineer district offices when required for water right transfers and where quality impairment may occur.

We have a number of cooperative ground water investigations underway which also address water quality aspects in general. These are:

1. Model Study of the Roswell Basin--The study initiated in October 1979 will produce a basin digital model that will simulate the major hydrologic components of the basin. The state engineer is particularly interested in refinement of the estimates of transmissivities, storage coefficients and leakage between the aquifers. A report on the steady state model has been prepared and is currently under review.
2. Reconnaissance and Evaluation of the Water Resources of the Mesilla Basin in New Mexico--This is a three-way cooperative study with the city of Las Cruces, the State Engineer and the USGS. The survey matches the contributions of the city and the SEO. The study began in October 1982 and will define the quantitative interconnection between the Rio Grande, the floodplain alluvium and the Santa Fe group aquifer and define chemical changes due to irrigation and pumping stress. It is expected that the monitoring phase will require a number of years to establish a good data base.
3. Mimbres Model Study--A two-dimensional model study of the Mimbres Basin has been completed and the report is currently undergoing colleague review. The report includes a discussion of the general hydrology of the basin and describes hydraulic properties of the aquifer.
4. Ground Water Resources of Catron, Cibola and Socorro Counties--These three investigations of the USGS are supported by the New Mexico Bureau of Mines and Mineral Resources and the SEO. The studies will define the ground water resources in each county. The report on Cibola County is scheduled for completion in fiscal year (FY) 1983 and the reports on Catron and Socorro counties are scheduled for completion in FY 1984.

5. Lea County Model Study--A draft report has been completed on the Lea County model and it should be released to open file in the current fiscal year. The steady state, two-dimensional model may be helpful in making projections of water availability.
6. Ground Water Resources of the San Agustin Plains--The State Engineer staff assisted the USGS in the investigation of San Agustin Plains. The final report, in preparation, will provide basic geohydrologic data and describe ground water availability, quality and the relationship to adjoining basins.
7. Ground Water Effects of San Juan Basin Mineral Development-- This study, supported by the Bureau of Indian Affairs, the Bureau of Land Management and the SEO will develop a predictive three-dimensional model to evaluate effects of ground water withdrawals. The USGS is working on a revised project proposal which will include a schedule for completing the study.
8. Hydrologic Effects of Geothermal Power Development in the Jemez Mountains--This study is also supported by the Bureau of Indian Affairs and the SEO. The principal objective of the study is to assess the effects of development of the geothermal aquifer. As no production is now taking place, most of the current effort is devoted to developing a better understanding of this complex system. Continuation of SEO support of this project is dependent upon geothermal development.
9. Digital Model Study of the Santa Fe Area--The Santa Fe model study is a cooperative effort of the Santa Fe Metropolitan Water Board, the SEO and the USGS. The study is under the direction of the survey and will produce a digital model that can simulate aquifer responses to pumpage and return flow.

Water quality information is needed for a variety of reasons by the water users and by water management, planning and administrative agencies. Water users, such as municipalities, irrigation districts and industries, utilize quality information for planning and design of diversion, distribution and water treatment systems. Some of the more important uses by the water management planning and administrative agencies include information for:

1. Designing and maintaining the channel of the Rio Grande for flood control, sediment transport, water salvage and water conservation
2. Designing, operating and maintaining the flood and sediment control and water storage facilities
3. Cooperating with the Colorado River Basin states to investigate salinity sources and develop salinity alleviation projects in order that the 1972 salinity levels in the lower mainstem of the Colorado River can be maintained while the Colorado River Basin states continue to develop and utilize their compact entitlements to beneficial use of water
4. Monitoring water quality, including biochemical quality, at selected sites on New Mexico streams for the New Mexico Water Quality Control Commission's program under the Clean Water Act
5. Monitoring ground water quality to determine the extent of water quality degradation and saline water encroachment in certain areas for use in water rights administration to prevent impairment of water quality
6. Studying erosion rates, reservoir sedimentation, water use, river channel aggradation and degradation, presence or absence of aquatic life, operation and maintenance of projects, and problems and costs associated with water diversion and use, including water treatment costs

The chemical quality of the state's water resources ranges from less than 100 mg/l in the headwaters of some streams to as much as 40,000 mg/l in the lower Pecos River. Similarly, suspended sediment ranges from nearly zero in some headwater areas to as much as 270,000 mg/l during flood events on the Rio Puerco, which enters the Rio Grande above Socorro.

In general, chemical quality of our streams degrades downstream from the headwaters. The degradation results from both man-made and natural causes. The major causes of degradation result from consumptive use and the presence of more soluble formations along the lower reaches of many of our stream systems. The consumptive use of water results in the concentration of salts. Generalizing, in agriculture about two-thirds of

the water applied to beneficial use is evaporated and transpired and about one-third returns to the stream or ground water system. The amount that is evaporated and transpired is essentially pure water; therefore, all of the salts in the water diverted are carried in the return flow. Again generalizing, if two-thirds of the water is evaporated, the concentration in the return flows would be increased threefold.

Sediment rates are a function of soil types, watershed slopes, vegetative cover, precipitation intensity and other factors. Sedimentation of some reservoirs is a major problem. Alamogordo Reservoir, now known as Lake Sumner, has lost about 30 percent of its original capacity since 1937, while McMillan Reservoir has lost about 65 percent of its original capacity. Elephant Butte Reservoir has lost about 20 percent of its original capacity to sediment which has not greatly impaired its conservation function because of its large capacity. Ramah Reservoir, a medium capacity reservoir, has lost 60 percent of its original capacity and its water conservation function is greatly impaired.

Sediment deposition in the Rio Grande channel is a major problem. Aggradation of the riverbed reduces the capacity of the channel to carry flood flows and contributes to drainage problems. At some locations, the river level is above the invert of the outfall of the drains, thus impairing their function. Resulting shallow ground water levels create problems for agriculture users and septic tank sewage disposal. Information on the amount and type of transported sediments is important in dealing with these problems.

The quality of much of the state's waters exceeds the recommended drinking water standards. However, some of the waters contain constitu-

ents which are harmful to irrigated crops and make the waters unsuitable for municipal or industrial use without treatment. In addition, chemical and biological quality monitoring is necessary to make proper and best uses of these waters.

In the present fiscal year, the state's cooperative work with the USGS for the three basic data programs--surface water, quality water and ground water--amounts to about \$1.3 million. Under the cooperative program, the costs are split between the USGS and the state on a 50-50 basis which helps stretch state and federal dollars.

In developing and maintaining a monitoring system, care must be taken in selecting the monitoring points and the parameters to be monitored for baseline data to obtain correct answers to the quality problems and to attain cost effectiveness.

One complete monitoring station, including the collection, analysis and publication of the data, may cost as much as \$25,000 annually. The operation of a single stream gauging station varies with the size of the stream and the location and will range in cost from about \$5,000 to \$8,000 per year. Chemical quality collection and analysis, depending on the number of parameters and the frequency of sampling, range from about \$3,000 to \$6,000 per year per station. Daily sediment sampling and analysis run about \$12,000 per year per station for major stations like those along the Rio Grande. Bed load samples run about \$1,500 per year. Some of the pesticide, herbicide, radio chemical and trace element sampling and analysis can amount to nearly \$10,000 per year per station.

Even though it is an expensive program, the growing water demands of the state make it essential to continue monitoring our water supplies for

quantity and quality so that we can make the maximum utilization of this most precious resource.