Water demands in Colorado west of the Continental Divide generally are met by appropriation of surface water, and water demands east of the Continental Divide are met by conjunctive use of ground water and surface water augmented by transmountain diversions. Ground water supplies 18 percent of the total water used in Colorado. Of the total quantity of ground water used, 96 percent is used for irrigation, 2 percent for public supply, 1 percent for rural domestic supplies, and 1 percent for livestock and industrial uses. Public supplies provide ground water to about 320,000 people. The major issues related to ground water in Colorado are:

- Decreasing ground-water supplies,
- Contamination of ground water by hazardous wastes, and
- Effects of land use on ground-water quality.

U.S. Geological Survey Programs

The U.S. Geological Survey (USGS), established in 1879, is the principal source of scientific and technical expertise in the earth sciences within the Federal government. USGS activities include research and services in the fields of geology, hydrology, and cartography. The mission of the Water Resources Division of the USGS is to develop and disseminate scientific knowledge and understanding of the Nation's water resources. The activities of the Water Resources Division in Colorado are conducted by scientists, technicians, and support staff in offices in Lakewood (two offices), Grand Junction, Durango, Meeker, and Pueblo.

Hydrologic-data stations are maintained at selected locations throughout Colorado and constitute a water-resources-data network for obtaining records on stream discharge and stage, reservoir and lake storage, ground-water levels, well and spring discharge, and the quality of surface and ground water. Water-resources data are stored in the USGS National Water Data Storage and Retrieval System. These data are used by water planners and others involved in making decisions that affect Colorado's water resources.

During 1987, the USGS maintained a network of about 1,570 observation wells in Colorado for monitoring fluctuations in water levels, in cooperation with Federal, State, and local agencies. Water-level measurements from wells are used for monitoring ground-water trends; however, they must be integrated with other observations and ground-water investigations to have the most relevance and usefulness.

The USGS has conducted more than 200 hydrologic investigations in Colorado. During fiscal year 1987, the USGS entered into agreements with 70 Federal, State, and local agencies involving 40 hydrologic investigations in Colorado; 22 investigations included studies of ground-water quantity and quality. These investigations will provide information needed to answer hydrologic questions that are specific to the State's principal ground-water issues. Also, some of these investigations will provide information on statewide, multistate, and nationwide hydrologic problems. Three examples of ground-water studies by the USGS that were designed to address specific ground-water issues in Colorado are discussed in the following sections.

Ground Water in the Denver Basin

Population growth in the Denver area has increased the demand for water. Surface-water supplies are fully appropriated, and ground water is the primary source for new development in the Denver basin, which is underlain by four major bedrock aquifers. Increased pumpage from these aquifers has resulted in a rapid decline in ground-water levels.

Information on ground-water movement, areas of ground-water recharge and discharge, chemical quality of ground water, and the development potential of the aquifer system was needed by State and local officials to effectively manage the resource. From 1975 through 1984, the USGS, in cooperation with the Colorado Department of Natural Resources, Division of Water Resources, Office of the State Engineer, and agencies from six

![Study Areas Map]
separate counties, studied the ground-water resources of the Denver basin. During the study, geohydrologic data were obtained from about 700 wells, and water-quality data were obtained from about 500 wells. Aquifer tests were made in 80 bedrock wells, and data were compiled for an additional 150 aquifer tests. Maps showing the extent, thickness, structure, sand content, and water quality of the four bedrock aquifers were published. A ground-water flow model of the four principal bedrock aquifers in the Denver basin was constructed. The model was used to define the steady-state water budget and to investigate the water-level response of the aquifers to four alternative ground-water development plans that included various rates of pumping and artificial recharge. The results of this study (Robson, 1987) are used by water managers in the Denver basin to plan for future ground-water development.

GROUND-WATER MANAGEMENT

The principal State agencies responsible for ground-water management in Colorado are the Department of Natural Resources, Division of Water Resources and the Colorado Department of Health. The Division of Water Resources is responsible for the administration of water law in Colorado, and the Department of Health is responsible for coordinating efforts to protect the quality of the State's water resources. Both agencies use ground-water data and the results of ground-water studies provided by the USGS. During 1987–88, the following Federal, State, and local agencies entered into interagency or cooperative cost-sharing agreements with the USGS to conduct ground-water investigations in Colorado:

- Cherokee Water and Sanitation District
- City and County of Denver, Board of Water Commissioners
- City of Colorado Springs, Department of Public Utilities
- Colorado Department of Natural Resources
- Colorado Geological Survey
- Division of Mined Land Reclamation
- Division of Water Resources, Office of the State Engineer
- Colorado Water Conservation Board
- Douglas County
- Lower Fountain Water Quality Management Association
- Metropolitan Denver Sewage Disposal District No. 1
- North Kiowa-Bijou Ground Water Management District
- North La Junta Water Conservancy District
- Rio Blanco County
- Rio Grande Water Conservation District
- Southeastern Colorado Water Conservancy District
- Upper Arkansas River Water Conservancy District
- U.S. Air Force Academy
- U.S. Department of the Army, Fort Carson
- U.S. Department of the Interior Bureau of Land Management
- Bureau of Reclamation
- Office of Surface Mining Reclamation and Enforcement
- U.S. Environmental Protection Agency

SELECTED REFERENCES


Information on technical reports and data related to ground water in Colorado can be obtained from:

- District Chief
  U.S. Geological Survey, Water Resources Division
  Box 25042, Mail Stop 415
  Denver, Colorado 80225

- Director
  Colorado Water Resources Research Institute
  Colorado State University
  Fort Collins, Colorado 80523