

COLORADO GROUND WATER CONDITIONS

Ground Water Importance: Ground water is an important resource in Colorado. Ground water supplies eighteen percent (18%) of the water used in the state. Nineteen counties of Colorado's 63 counties rely solely on ground water for drinking water and domestic uses. In 1990, 539 public water supply systems, serving over 429,000 people, were wholly dependent upon ground water (see chart). Private wells and the public water supply systems served an estimated 780,000 people or approximately 24 % of the state's population. In addition, 51 public water supply systems use a combination of surface water and ground water.

Colorado's agricultural industry relies heavily upon ground water; approximately ninety-six percent (96%) of the ground water produced is consumed by agriculture. Colorado has over 3,200,00 acres of irrigated cropland. Ground water is used to supplement surface water for irrigation, and in large areas of the state it is the only source of water available. Ground water is the primary source of irrigation water for the eastern high plains and the San Luis Valley, and it supplements surface water irrigation along major rivers and streams such as the South Platte River and Arkansas River. As the population of the state continues to grow at an unprecedented rate, the number of people dependent on ground water is also increasing. The state's population has increased by nearly 600,000 people, eighteen percent (18%), from 1990 to 1995. Much of the growth is occurring in the mountainous areas where ground water supplies are limited and highly vulnerable to contamination.

Where is it? Colorado's geology is very complex due to repeated mountain-building episodes that have divided the state into fractured crystalline rock mountain ranges, deep basins and relatively undisturbed areas of flat lying sedimentary deposits. Large quantities of ground water occur in deep basins such as the Denver Basin and the San Luis Valley and in the flat lying eastern High Plains Ogallala Aquifer. The alluvial aquifers in major river valleys also yield large quantities of ground water. However, much of the state has limited ground water resources due to fractured

crystalline rock or massive clay and shale deposits that yield limited quantities or no water at all.

How good is the Water? Ground water quality varies significantly across the state due to climatological conditions, topography, the geology, and man induced contamination. The climate in Colorado is semi-arid to arid. Most precipitation occurs in the higher elevations of the mountain ranges, here the water quality is very good to excellent. As the water drains from the upper watersheds out of the mountains into the valleys and basins, water quality begins to degrade. Ground water comes into contact with soluble minerals, and the water is used and reused many times before it reaches the state line. Ground water quality has also been impacted across the state by man's activities such as gold and uranium mining, agriculture, industry, and population growth. Water quality in the deep basin aquifers has been impacted only to a limited degree; however, population growth and agriculture have placed great demands on these aquifers. In the Denver Metropolitan area the Denver Basin aquifers are being mined and water levels are declining. Shallow or unconfined aquifers are vulnerable to surface contamination. Efforts are being made statewide to preserve the high quality of water in vulnerable aquifers like the Ogallala High Plains Aquifer.

Cost of Contamination: Billions of dollars have been spent in Colorado to clean up the legacy of the past. There are 17 Superfund sites in Colorado. Two of the sites are directly related to the production of armaments, including nuclear and chemical weapons. The remaining Superfund sites are related to mining, uranium or radium milling, industrial operations, and hazardous waste disposal. Industrial activities, mining operations (non-Superfund), leaking petroleum tanks, oil and gas production, agriculture, and waste disposal have contaminated other areas. The total cost of cleanups and monitoring are unknown, but the cost runs into the millions of dollars annually.

Efforts to Protect Ground Water: Ground water protection is managed as two separate issues of quantity and quality in Colorado. Quantity issues are managed through the Colorado Division of Water Resources/Office of the State Engineer. Beneficial use by individuals is insured through the state constitution and by water rights laws. Quality is protected by the Colorado Water Quality Control Act through a number of state agencies. The Colorado Department of Public Health and Environment is the lead agency. The Colorado Water Quality Control Commission is responsible for promulgating ground water classifications and standards. Statewide standards have been adopted for organic chemicals and radionuclides. Significant areas of the state have been classified for site specific use classification and the remainder of the state's ground water is protected by interim narrative standards.

Classifications and standards are implemented by seven separate state agencies through their rules and regulations for activities that they regulate. Regulated activities include: mining and reclamation, oil and gas production, leaking petroleum tanks, agriculture, Superfund sites, hazardous waste generation and disposal, solid waste disposal, industrial and domestic waste water discharges, well construction and pump installation, and water transfers. Colorado has proactive ground water protection programs that include monitoring ground water for agricultural chemicals and pesticides, issuing ground water discharge permits, voluntary cleanup program, permitting for large hog farm operations, and educational programs. Also, Water wells must have a permit and meet minimum standards of construction and pump installation. Colorado is continuing to develop

programs to assist public water supply systems such as the Safe Drinking Water Act Monitoring Wavier Program and voluntary Wellhead Protection Program. The focus of the state's effort has been on the development of individual programs to date.

What else is Needed? Colorado is faced with the growing need to coordinate its ground water protection program and to increase the efficient use of its limited resources. Efforts are currently under way to develop a comprehensive state ground water protection program and to provide a coordination mechanism for state agencies. A comprehensive program will improve coordination and cooperation between state and federal programs, better utilize the available resources, reduce or prevent duplication of effort, establish priorities, identify ground water protection gaps and needs. Additional resources are needed for state agencies to make full utilization of available technologies that facilitate the transfer of information and perform labor-intensive operations such as geographical Information systems (GIS) mapping and analysis. Other areas are:

- ◆ Mapping and monitoring of ambient ground water quality and quantity statewide
- ◆ Assistance to public water supply systems for development of ground water protection programs
- ◆ Technology transfer and training
- ◆ Ground water protection program development assistance
- ◆ Vulnerability mapping of aquifers utilized as sources of drinking water