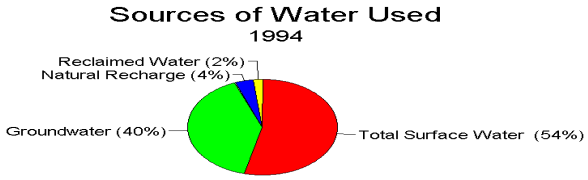
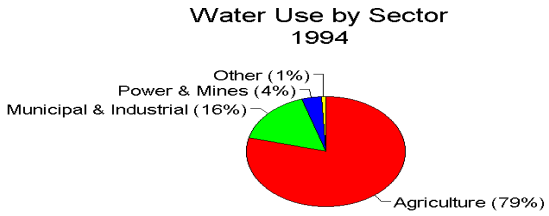
ARIZONA GROUND WATER CONDITIONS

Located in the southwestern US, Arizona is the 6th largest state and physically varies from hot lowland deserts to cool mountain ranges. Although much of Arizona is sparsely settled, the state's population is rapidly growing and includes the large urban centers of Phoenix and Tucson. Arizona's population is predominantly urban (84%) and is the 21st most populous state overall. Land ownership consists of federal (40%), Indian (35%), private (14%), and State (11%) with most of the non-urban desert, grassland and forests used for low-intensity livestock grazing. Precipitation is low, averaging less than 20 inches for the majority of the state, yet several major rivers flow through Arizona. The Colorado River is the largest watercourse, entering Arizona from the north and eventually forming the state's western border with Nevada and California. The Colorado River has 2 tributaries which drain most of the state: the Little Colorado River located in northeastern Arizona and the Gila River draining most of the southern and central portions of the state.



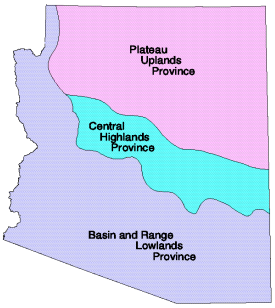
Ground Water Supply and Use - There are 3 sources of water supplies in Arizona: surface water, ground water, and effluent (**Figure 1**).

While renewable surface water, composed of water from the Colorado River partially brought in by the Central Arizona Project and various in-state rivers is the largest source used in the state, ground water supplies 40% of the state's water use as well as being the principal source for public supply. Ground water supplies have the advantage over surface water supplies in that they are largely drought-resistant.
However, if ground water is withdrawn at a greater rate than it is recharged, overdraft occurs which threatens the long-term viability of the ground water supply. The 1980 Arizona Ground water Management Act was enacted to minimize



overdraft problems in selected areas of Arizona. The availability of ground water is largely limited by location, depth, and quality and in many areas is the only available source of water. Over 40,000 ground water wells have been registered in the state. Agriculture is the largest water user in Arizona followed by municipal and industrial users, and power and mines (**Figure 2**).

In addition, ground water also provides baseflow to many streams in the state and is essential to watershed ecology.



The occurrence and quality of ground water are controlled by the hydrogeologic conditions in the 3 distinct water provinces: Basin and Range lowlands, Central highlands, and Plateau uplands (**Figure 3**). The Basin and Range lowlands is characterized by broad alluvial basins. With approximately 90% of the ground water withdrawn in Arizona from these aquifers, they are the most productive in the state The Central highlands is a mountainous area that separates the Basin and Range lowlands from the Plateau uplands; useable amounts of water are found only in small alluvial basins or where rocks are fractured or faulted. Ground water in the Plateau uplands in the northern part of the state is derived from consolidated sedimentary rocks. Because of the relatively sparse population, only about 3 percent of the total ground water withdrawn in Arizona is from aquifers in this province.

Ground Water Quality - Ground water quality is a major concern as ground water is the principal source of public supply in Arizona. Generally, ground water meets Safe Drinking Water standards in Arizona and is suitable for most uses. Ground water quality problems do exist, however, as the result of both human activities and natural conditions. Elevated levels of salinity (total dissolved solids) have been reported in both the Plateau uplands and Basin and Range lowlands water provinces while high concentrations of other inorganic parameters such as nitrate, fluoride, and sulfate are much more localized in their distribution. Organic contamination by volatile organic compounds or pesticides is infrequent except around specific sites such as underground storage tanks or industrial locations.

The potential effects of land use such as irrigation, mining, urbanization, and waste disposal on ground water quality have been documented. Irrigation of agricultural fields has been found to degrade ground water quality by concentrating salts and adding nitrogen from fertilizers. Mining operations have impacted ground water quality due to the leachate seepage of acidic mining and milling process solutions. Wastewater treatment by large numbers of domestic septic systems has been found to increase nitrate levels in some developing areas. Disposal of toxic wastes as well as leachates from landfills have impacted ground water quality in localized areas throughout Arizona though most waste sites are located near the cities of Phoenix and Tucson.

The Arizona Department of Environmental Quality (ADEQ) was established in 1986 to administer state programs involving water quality. These programs recognize the importance of ground water to the state and seek to protect this resource for present and future use for domestic and other purposes. The numerous sources of potential ground water contamination are regulated by a variety of ADEQ programs including those described below.

Aquifer Protection Permit Program (APP) - Intended to prevent contamination of ground water by point and non-point sources, the APP program issues permits to facilities that may potentially discharge a pollutant which has a reasonable probability of reaching ground water.

Water Quality Assurance Revolving Fund (WQARF) The state Superfund program designed to remediate already existing ground water contamination.

Goals for Ground Water Quality Protection in Arizona

With the rapid population growth and the associated development projected to continue, the importance of safeguarding the quality of ground water will become increasingly significant. Focus on this goal should continue to be prevention of ground water contamination which is more protective of public health and environmental quality rather than the more expensive remediation to ambient levels which may be fiscally or technologically not feasible. Sustained federal support commensurate with the population growth in the state will be required to insure the continued quality of this natural resource in Arizona.