COLORADO RIVER WATERSHED

The Colorado River watershed is located in the northern and western portions of Arizona. The watershed also extends through two other planning areas: the Plateau to the north and Lower Colorado River to the southwest. The Upper Colorado River planning area is approximately one-third the total area of the Colorado River watershed which lies in Arizona.

Streamflow Characteristics

The major drainages in the Colorado watershed portion of the planning area are ephemeral and contribute very little or nothing to the flow of the Colorado River. Substantial streamflow occurs in the mountains as a result of high-intensity storms, but the flows seldom reach the middle of the valleys; most of the flow is lost to evapotranspiration and infiltration (Gillespie and Bentley, 1971).

Sacramento Wash and Truxton Wash are two principal streams which exhibit ephemeral flow. They are located in Sacramento and Hualapai Valleys, respectively. Approximately 130 springs and seeps are present in the Sacramento and Hualapai Valleys. Most of the springs emerge from the igneous, metamorphic, and volcanic rocks in the mountain areas. No springs are known to occur in the alluvium on the valley floors. The median spring discharge is approximately two gallons per minute, which is approximately 940 acre-feet of water discharged per year. Probably less than one-fourth of the annual spring discharge is recharged to the groundwater reservoir in the valleys; the rest is lost to evapotranspiration (Gillespie and Bentley, 1971). Surface discharge from the Sacramento Wash is estimated to be about 500 acre-feet per year (Gillespie and Bentley, 1971).

There are no major contributing tributaries to the Colorado River between Davis Dam and Hoover Dam. The only perennial streams in this portion of the watershed is a two-mile unnamed reach upstream from Hoover Dam at Spencer Canyon (Brown and others, 1981).

Within the boundaries set by the planning area, the Colorado River is virtually the only surface water found in the Colorado watershed. Streamgaging information on the Colorado River above Lake Havasu is listed in Table 17.

Reservoirs

The Colorado River is regulated throughout its entire length in Arizona by a series of reservoirs. In the planning area, the three reservoirs on the Colorado River are (in downstream order) Lake Mead, Lake Mohave, and Lake Havasu. Reservoir capacities for these lakes are listed below.

Reservoir	Dam	Storage Capacity (acre-feet)
Lake Mead	Hoover Dam	29,755,000
Lake Mohave	Davis Dam	1,820,000
Lake Havasu	Parker Dam	720,000

Lake evaporation rates for Lake Mead and Lake Mohave are approximately 83 inches per year, while lake evaporation at Lake Havasu is approximately 87 inches per year (Cooley, 1970). Assuming full capacity, the evaporation for each lake, in acre-feet, is listed below.

Reservoir	Surface Area (square miles)	Evaporation (acre-feet/year)
Lake Mead	157,900	1,092,668
Lake Mohave	28,192	195,088
Lake Havasu	24,900	180,525

TABLE 17

ANNUAL FLOWS FOR USGS STREAMGAGING STATIONS ON THE COLORADO RIVER (UPPER COLORADO RIVER PLANNING AREA)

Station Name	Station Number	Period of Record	Mean Annual Flow (ac-ft)	Median Annual Flow (ac-ft)	Record Annual High Flow (ac-ft)	Record Annual Low Flow (ac-ft)
Colorado below Hoover Dam	9421500	1933-1990	10,186,636	8,844,840	22,141,040	5,407,510
Colorado below Davis Dam	9423000	1905-1907 1949-1990	10,533,690	8,924,450	23,422,170	7,484,090
Colorado near Topock	9424000	1918-1978 1981-1982	10,639,860	8,367,130	21,569,240	4,871,170
Colorado Aqueduct near Parker Dam*	9424150	1982-1990	1,131,500	1,202,680	1,313,270	738,030

*Under a contract between the U.S. and the Metropolitan Water District of Southern California, the U.S. built Parker Dam on the Colorado River with funds provided by the District. The dam is owned and operated by the U.S. and provides regulation for diversion of water into the Colorado River Aqueduct. This aqueduct was constructed by the District to carry Colorado River water to the southern California coastal plain. The water district's first objective in constructing the Colorado River Aqueduct was to supply Colorado River water for domestic, industrial and other beneficial uses to the area within its boundaries (U.S. Department of Interior, 1946).

Source: U.S. Geological Survey, 1992, National Water Information System

Water Quality

Salinity is a major concern in the Colorado River basin and threatens agricultural, industrial, and municipal users in the United States and Mexico. High salinity increases water treatment costs, damages plumbing and fixtures, increases maintenance on pumps and distributing systems, lowers crop yields, and increases the need for special drainage facilities on farms.

The Colorado River carries approximately 9 million tons of salt past Hoover Dam in 10 million acre-feet of water per year (U.S. Department of Interior, 1989). The salinity comes from natural diffuse sources, saline springs, and agricultural sources. Natural sources add almost half the total salt load, irrigation return flows add over one-third, and a minor part of

the salt load is from municipal and industrial sources (U.S. Department of Interior, 1989). In addition, the depletion of good quality water reduces the dilution of saline inflow which increases the salinity of the Colorado River.

To maintain water quality standards for agriculture, aquatic life, drinking water, full body contact recreation, and wildlife use, a sampling program was implemented along the Colorado River in 1982 and 1983 (U.S. Department of Interior, 1985). As part of this program, 150 locations were sampled in the Colorado River watershed in Arizona. By State standards, no deterioration of water quality had occurred in the basin, but some areas of concern were identified and are listed below.

1. The Colorado River is high in dissolved salts, particularly sulfates. At Parker Dam, average concentrations of sulfates and total dissolved solids exceeded the recommended secondary maximum contaminant level established by the U.S. Environmental Protection Agency.
2. Chlorination of Colorado River water may cause trihalomethane production. This would require changes in the treatment process for the drinking water systems of cities and towns within Arizona which plan to utilize Colorado River water.
3. High levels of fecal coliform bacteria were found in some areas along the river. These high bacteria levels were probably caused by high river flows which cause the overflow of septic tanks. Although this situation may only be temporary, an increase in development and recreation in the area could cause sewage disposal problems (U.S. Department of Interior, 1985).
4. The regulation of the basin has caused a decrease in variation of flow and salinity. Salinity concentrations in the Colorado River generally vary inversely to flow. Years of lower flows are characterized by higher total dissolved solids concentrations than years of higher flows (U.S. Department of Interior, 1985).