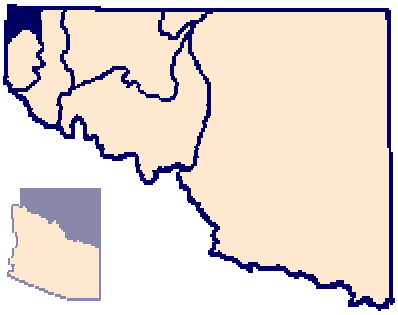
VIRGIN RIVER BASIN



The Virgin River basin is located in the extreme northwestern corner of Arizona and contains 433 square miles (Figure 10). The Virgin River basin is bounded on the north and the west by the Arizona-Utah state line and the Arizona-Nevada state line, respectively. The northeast-southwest trending Virgin and Beaver Dam Mountains form the basin's eastern and southern boundary. Elevations above mean sea level range from 8,000 feet in the Virgin Mountains to 1,550 feet along the Virgin River.

The Virgin River flows through the basin from the northeast to the southwest. About five miles upstream from Littlefield, Arizona, the Virgin River cuts through the Beaver Dam Mountains at a place called "the Narrows". South of "the Narrows", the Virgin River flows through a broad alluvial valley that is bordered on the northwest by an uplands area composed of sands and gravels, and to the southeast by the Virgin Mountains. Numerous washes drain the upland and mountain areas; springs provide small perennial reaches in some of the washes (Glandy and Van Denburg, 1969). Beaver Dam Wash is the largest tributary and has about a one mile perennial stretch above its confluence with the Virgin River. Numerous springs, primarily located upstream of Littlefield, Arizona, maintain the Virgin River's baseflow.

The Virgin River Valley and Beaver Dam Wash to the northwest are filled with basin-fill sediments composed of silt, sand, and gravel. Glancy and Van Denburg (1969) divided the basin-fill sand and gravel deposits into two units; a younger floodplain unit of silt, sand, and gravel that the Virgin River flows through, and an older underlying basin-fill unit of semi-consolidated silts, sands, gravels, and boulders. In the Beaver Dam Mountains, basaltic lava covers the sedimentary rocks. The Virgin Mountains are composed of igneous and metamorphic rocks.

Groundwater development in the basin is mostly in the alluvial basin-fill deposits that occupy the Virgin River Valley and Beaver Dam Wash. In the valley, the younger and older basin-fill units act as one aquifer. The alluvium in Beaver Dam Wash is largely isolated from other water-bearing units, although groundwater from the wash discharges into the alluvial aquifer of the Virgin River Valley (Black and Rascona, 1991). Most of the wells in the alluvium are 200 feet deep or less, and water levels range from 10 to 300 feet below land surface (Black and Rascona, 1991). Well yields vary from 5 gallons per minute in small domestic and stock wells, to 2,000 gallons per minute in larger irrigation wells (Levings and Farrar, 1979).

Groundwater also occurs in two other aquifers in the basin: the alluvial fan deposits that occur southeast of the Virgin River between Littlefield, Arizona, and the Virgin Mountains; and the Muddy Creek Formation. The alluvial fan deposits overlie a limestone, which is the top of a unit known locally as the "Littlefield Formation", and form a shallow water-table aquifer (Black and Rascona, 1991). Although few wells are completed in this shallow aquifer, many springs originate from it where groundwater flows over the limestone. Discharges from springs range from 10 to 50 gallons per minute and reported well discharges range from 30 to 1,500 gallons per minute (Black and Rascona, 1991). Depth to water in wells completed in the aquifer is 15 to 52 feet below land surface (Black and Rascona, 1991).

The Muddy Creek Formation, a series of siltstones, sandstones, and conglomerates, is known to yield water north of the City of Mesquite, Nevada which is adjacent to the Virgin River basin. A City of Mesquite well located in Section 3, Township 13 South, Range 17 East, is completed in the Muddy Creek Formation and yields 350 gallons per minute (Black and Rascona, 1991). The altitude of the water level and water chemistry in the well suggest that the Muddy Creek Formation is a separate aquifer from the alluvium in this area (Black and Rascona, 1991).

Only two known wells in the northeastern part of the basin tap the sedimentary rock units. Measured water levels in these wells were 262 and 838 feet below land surface (Black and Rascona, 1991). Many of the springs that support the

flow of the Virgin River and other washes probably originate from the sedimentary rock units (Glancy and Van Denburg, 1969).

An estimated 6,000 acre-feet of water were pumped from the Arizona portion of the basin in 1990 (Black and Rascona, 1991). Most of the water is used for irrigating crops grown in the Virgin River floodplain. The groundwater is used to supplement surface water diverted from the Virgin River. There are an estimated 1.7 million acre-feet of groundwater in storage above a depth of 1,200 feet below land surface (Arizona Department of Water Resources, 1988). Direct recharge from precipitation is small. Glancy and Van Denburg (1969) estimated that recharge to the Arizona portion of the lower Virgin River basin is not more than 5,900 acre-feet per year. Most recharge probably comes from infiltration of water from the Virgin River (Glancy and Van Denburg, 1969).

Historic data indicate that water levels in the Virgin River basin generally are not declining, however, long-term water-level information for the area is inadequate. Increasing groundwater withdrawals may adversely impact the riparian habitat of the Beaver Dam Wash. Increasing water demands in Nevada and Utah may warrant an interstate compact regarding the management of groundwater resources of the Virgin River basin.

Water quality generally is suitable for most uses, but wells near the Virgin River tested high in total dissolved solids and high in sulfate, sodium, and calcium ion concentrations (Glancy and Van Denburg, 1969). Wells in the alluvium of Beaver Dam Wash generally had better quality water.