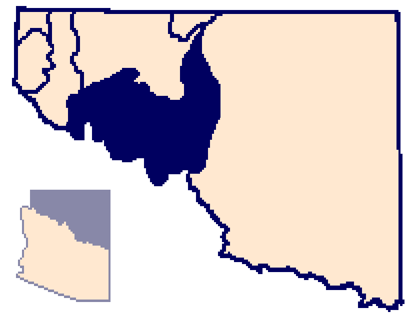
COCONINO PLATEAU BASIN



The Coconino Plateau basin covers about 5,548 square miles in north-central Arizona (Figure 10). Situated in the Plateau uplands province, the area is bounded on the north by the Colorado River as it cuts through the Grand Canyon. To the southwest, the Coconino Plateau borders with the Verde River and Peach Springs basins and to the east with the Little Colorado Plateau basin. The boundary to the southwest and east generally follows the surface-water divide with drainage flowing toward the Colorado River. The topography is characterized by rolling high plateaus, deeply-incised canyons, and rounded volcanic mountains. Elevation above mean sea level ranges from over 12,000 feet on the San Francisco Peaks, to 6,000-7,000 feet across the plateaus, to 1,500 feet where the Colorado River exits the basin at the downstream end of the Grand Canyon.

Characteristic of the Colorado Plateau, the Coconino Plateau basin is composed of a relatively flat-lying sequence of sandstones, limestones, and shales. Widely-spaced high-angle faults and monoclines cross the area and provide structural control for the movement of groundwater along the regional gradient. As outlined in McGavock and others (1986), the major water-bearing units are divided into two aquifers, the Coconino aquifer and the limestone aquifer. Although the Coconino aquifer is the main source of groundwater in adjacent areas to the south and east, as mentioned previously, it generally is drained of water in the Coconino Plateau basin. Most of the water recharged in the area moves downward into the underlying Supai Formation and the limestone aquifer along major fracture zones. Near Tusayan, a 3,000-foot well recently drilled in Section 24, Township 30 North, Range 2 East was completed in the Mississippi Redwall Limestone. In 1989, the well had a reported yield of 80 gallons per minute and a static water level of 2,420 feet below land surface. Exceptions exist, however, near Cataract Creek and Tusayan where perched water is found at 950 feet and 500 feet below land surface, respectively (McGavock and others, 1986). Well yields generally are less than five gallons per minute.

The limestone aquifer consists of several hydraulically-connected limestone, dolomite, sandstone, and shale units (McGavock and others, 1986). Most of the water in the aquifer is derived from the downward migration of water from the overlying Coconino aquifer. Shale units within the limestone aquifer impede the downward migration of water while solution cavities and fracture zones provide avenues for lateral movement. A large part of the groundwater moves northward and is discharged from springs along the Little Colorado and Colorado Rivers and Havasu Creek. The largest of these springs includes Blue Springs and Havasu Springs which discharge 100,000 gallons per minute and 29,000 gallons per minute, respectively (Johnson and Sanderson, 1968). The location of the groundwater divide in the southern part of the basin is unknown. McGavock and others (1986) speculate that a large amount of groundwater also moves toward the south contributing up to 21,900 gallons per minute (50 cubic feet per second) to the Verde River south of Williams.

Groundwater development in the basin is small and limited by the great depth to water and by the low yield to wells. Depth to water in the limestone aquifer is at least 3,000 feet below land surface west of Flagstaff (McGavock and others, 1986). Wells that penetrate the limestone aquifer yield from a few gallons per minute to a few tens of gallons per minute (McGavock and others, 1986). Yields are highly dependent upon fractures, faults, and solution channels.

The Moenkopi and Chinle Formations, volcanic rocks, and sedimentary deposits which overlie the Coconino and limestone aquifers, provide locally important sources of water for domestic and livestock purposes but do not contain water over large areas. Such local, perched aquifers saturating volcanic and consolidated and unconsolidated sedimentary rocks are usually dependent upon direct recharge from precipitation and runoff and may not provide a dependable year-round or multi-yearly supply. For example, Fort Valley, near Flagstaff, is in a small volcanic basin where the regional aquifer in the Redwall Limestone is at a depth of about 2,000 feet below land surface. The perched groundwater in the shallow sediments and lava flows are rather unstable during low precipitation periods. Similarly, groundwater in the lava flows near Williams is also drought sensitive and cannot provide a dependable supply for larger developments.

Quality of water from local sources and the regional aquifer is suitable for most uses (McGavock and others, 1986). Radiological constituents are naturally elevated in some springs issuing along the South Rim of the Grand Canyon (Arizona Department of Environmental Quality, 1990).