WATERSHED BASICS

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A watershed is the land that water flows across or under on its way to a stream, river, or lake. The movement of water is greatly influenced by the contour of land and geologic features such as mountains, valleys and hills. A watershed consists of uplands, floodplains, and a stream channel. Uplands often comprise more than 99% of the watershed's area, with the floodplain and stream channel making up the remaining 1%.

Watersheds exist at different scales or levels. Large watersheds like the ones for the Colorado River, Mississippi River, Columbia River, and Chesapeake Bay are made up of many smaller watersheds across several states. Watersheds come in many different shapes and sizes and have many different features. Watersheds can have hills or mountains or be nearly flat. They can have farmland, rangeland, small towns, and big cities. Watersheds exist at different scales or levels, depending on a particular point of reference. If the Colorado River is the point of reference then almost the entire state of Arizona consists of a single watershed. This is because almost all of Arizona's land eventually drains to the Colorado River. The only exceptions are certain areas draining through Mexico into the Gulf of California and a few closed basins such as the Willcox Playa.

There are approximately 2 million miles of rivers and streams in the United States, all of which contribute to one of seven major drainage systems (Fig. 1). The Atlantic Ocean receives water from New England and Mid-Atlantic states east of the Appalachian Mountains. The Gulf of Mexico is the ultimate drainage for more land mass in the United States than any other body of water. The Gulf receives water from the states west of the Appalachian Mountains to the Continental Divide, plus parts of Florida, the expansive watersheds of the Ohio River, the Tennessee River, the Upper and Lower Mississippi River, the Missouri River, and the Rio Grande. Of course, the waters of the Gulf of Mexico ultimately mix with those of the Atlantic Ocean.

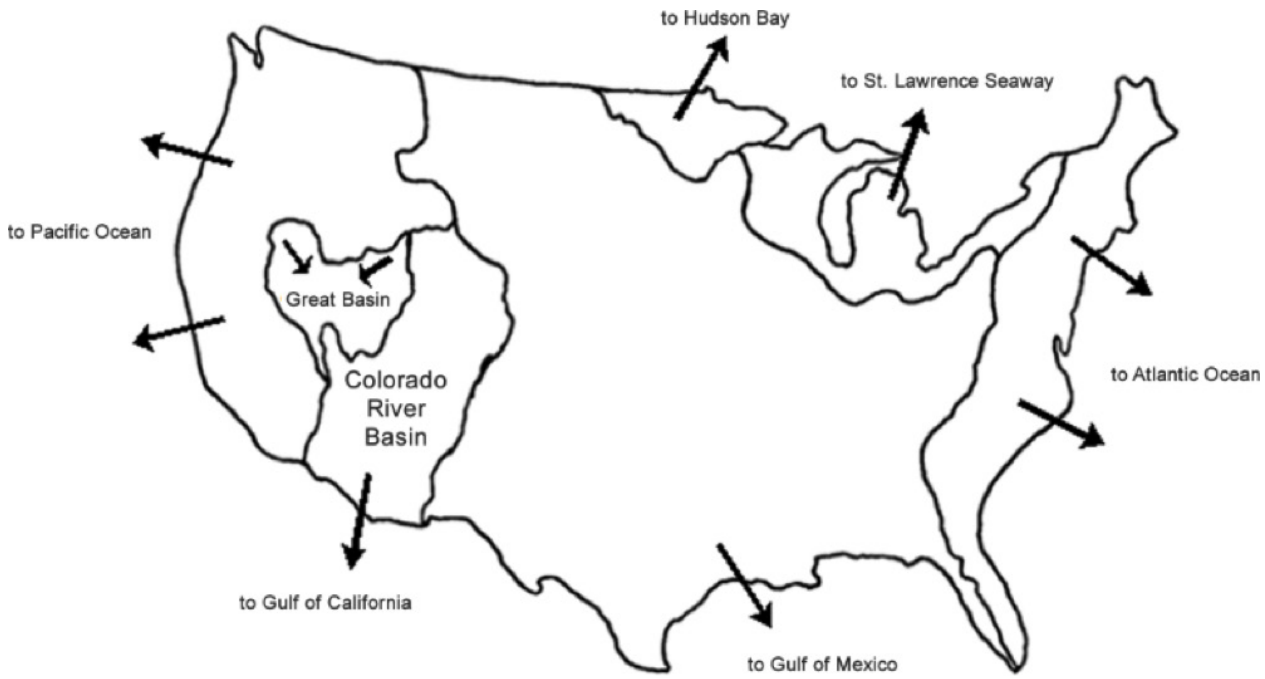

Figure 1. Major Drainage Systems of the United States.

The St. Lawrence Seaway is the outlet for the Great Lakes, which contain one-fifth of all the freshwater on earth and drain all of Michigan as well as northern portions of Minnesota, Illinois, Indiana, Ohio, Pennsylvania, and New York. The seaway flows into the Atlantic Ocean. Hudson Bay receives water from a portion of Minnesota and North Dakota.

The little water that exists in the arid lands of Nevada and western Utah flows to the Great Basin. The Great Basin is an example of a final destination of water in the United States that is not an ocean. Most of the water that flows into the Great Basin either evaporates or provides freshwater input to the Great Salt Lake in Utah.

Water that flows west of the Continental Divide created by the Rocky Mountains and that does not first drain into the Gulf of California or the Great Basin ends its long journey in the Pacific Ocean. The Pacific Ocean drains most of the land in California west of the Sierra Nevada and all land that is in the Columbia River watershed in western Montana, Idaho, Oregon, and Washington.

Lastly, and most importantly for those of us in Arizona, is the drainage into the Gulf of California. Water from southwestern Wyoming, western Colorado, eastern Utah, western New Mexico and Arizona, flows to or is drained into the Gulf, largely by the Colorado River.

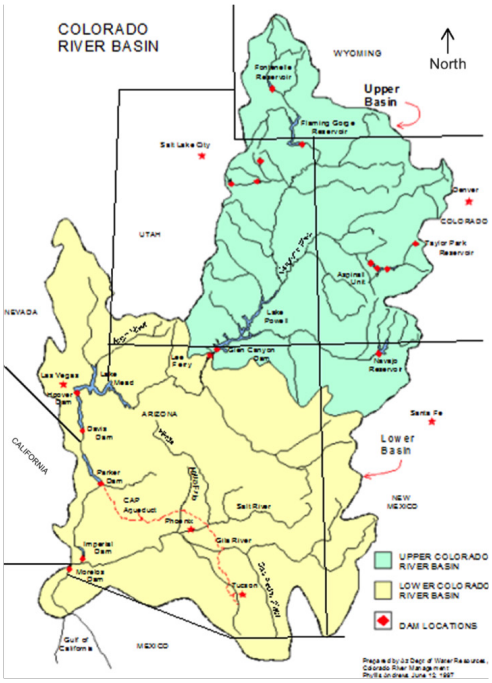

Figure 2. Colorado River Basin.

ARIZON AWATERSHEDS

Arizona shares the Colorado River watershed with six other states and Mexico (Fig. 2). Dams have been built in many areas for flood control, power generation, water storage, and /or recreation purposes. The Central Arizona Project (CAP) is a system of reservoirs, canals, and pumps that brings water from the Colorado River through Phoenix and into Tucson.

On its way to the Colorado River, water in Arizona flows through various drainage systems that are in themselves watersheds. In other words, smaller watersheds—also called subwatersheds—are nested within larger ones (Figure 3). Devised by the U.S. Geologic Survey (USGS), there are 18 - six digit watersheds (accounting units) and 84 – eight digit sub-watersheds (cataloging units) within Arizona. Each cataloging unit is a geographic area representing part of or all of a surface drainage basin, a combination of drainage basins, or a distinct hydrologic feature. Numbers assigned to each act as a "zip-code" for that particular watershed. For example: the University of Arizona campus in Tucson is located within the USGS Region 15 (Lower Colorado Region); Sub Region 1505 (Middle Gila); Accounting Unit 150503 (Santa Cruz); and Cataloging Unit 15050301 (Upper Santa Cruz). To find your watershed address go online to the US Environmental Protection Agency (EPA) "Surf Your Watershed" website at http://www.epa.gov/surf/.

ARIZONA SIX-DIGIT WATERSHEDS

- **140700** Upper Colorado-Dirty Devil
- **140801** Upper San Juan
- **140802** Lower San Juan
- **150100** Lower Colorado-Lake Mead
- **150200** Little Colorado
- **150301** Lower Colorado
- **150302** Bill Williams
- **150400** Upper Gila
- **150501** Middle Gila
- **150502** San Pedro-Willcox
- **150503** Santa Cruz
- **150601** Salt
- **150602** Verde
- **150701** Lower Gila-Agua Fria
- **150702** Lower Gila
- **150801** Rio Sonoyta
- **150802** Rio De La Concepcion
- **150803** Rio De Bavispe

Figure 3. Arizona Watersheds

WATERSHED MANAGEMENT

Watersheds catch and store precipitation, releasing the stored water to stream channels. These functions are influenced by climate, elevation, the type of soil and vegetation, steepness of the slopes, their orientation to the sun, and size of the watershed.

Although climate determines the amount of precipitation entering the watershed, man can significantly influence how well or poorly the watershed functions. Land management activities, such as forestry, recreation, grazing, agriculture and urbanization can impact the vegetation and soil which in turn affects the quantity and timing of water moving through the watershed.

Properly managed vegetation within a watershed dissipates the energy of water, slowing the flow to the stream channel and allowing more water to enter the soil and percolate down into the aquifer. Less erosion occurs on well managed uplands. In a healthy watershed less sediment enters the stream to degrade water quality. More of the precipitation falling to the ground is available to contribute to late season stream flow, and reducing high early season runoff.

Removing or altering vegetation in a watershed, such that areas of bare ground are exposed, increases the potential for erosion. Water runs off the surface before it has an opportunity to soak into the soil. Its energy is concentrated, thereby accelerating erosion. Downcutting within the stream channel may occur, resulting in lowered water tables. Runoff over bare ground carries more soil to the stream, degrading water quality by increasing sedimentation. Less water soaks into the soil so it is not available for use by vegetation.

The objective of good watershed management is to maintain desirable and abundant vegetative cover so that water enters the soil, can be stored within the rocks and soil, and slowly released into the stream over an extended period of time. Healthy watersheds will optimize long-term benefits for all uses – your actions count.

ADAPTED FROM

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