

## 2.2 ENVIRONMENTAL CONTEXT

The Eastern Arizona Framework Study Area encompasses southeastern Arizona east of Maricopa, Pinal, and Pima counties, an area of approximately 29,000 square miles. The study area includes portions of Apache, Navajo, Pinal, Coconino, and Yavapai counties and all of Santa Cruz, Cochise, Graham, Greenlee, and Gila counties. These counties are discussed by environmental resources according to the three focus groups that compose the study area: (1) Mogollon Rim Focus Area, (2) Copper Country Focus Area, and (3) Cochise-Santa Cruz Focus Area.

This environmental overview identifies natural, cultural, and man-made resources in the study area. The purpose of this overview is to identify those resources or areas that would need additional study for future or proposed transportation projects.

### 2.2.1 Geology and Topography

Geology within the study area is relatively homogenous and consists of sedimentary and igneous rocks. The geology of the Mogollon Rim Focus Area is characterized mostly by sedimentary (sandstone, limestone, shale, coal, etc.) and igneous (basaltic/volcanic) rocks. Igneous (volcanic and metavolcanic) rocks can be found near the Pinetop-Lakeside area and Chinle Moenkopi formations can be seen north of Show Low and Springerville (Reynolds, Stephen. *Arizona Geological Map: Interactive*, 2008). This area contains many mountain ranges separated by several basins, such as the Georges and Tonto basins. The Copper Country Focus Area consists of volcanic, subvolcanic, sedimentary, and intrusive igneous rocks. Along with alluvial fans, these are the major geologic features that are consistently found in the area. Volcanic, basaltic, and sedimentary rocks make up the Cochise-Santa Cruz Focus Area and are found throughout Graham, Greenlee, and Gila counties. The geology of the Cochise-Santa Cruz Focus Area includes eolian deposits (sand, silt, clay, etc.) alluvium deposits, and glacial deposits.

Arizona is a state that includes tremendous topographic diversity. The range of elevation within the study area is from 3,000 to 12,000 feet above sea level (asl). The topography from southeast to northwest includes a mountainous region with maximum elevations ranging between 9,000 and 12,000 feet asl. Topography in the communities within Navajo County varies between gently rolling to hilly elevations, ranging from 5,000 feet asl in the City of Holbrook to 7,500 feet asl in the Town of Pinetop-Lakeside. Apache County is characterized by rolling hills and lies 4,000 feet asl and includes peaks that exceed 10,000 feet in elevation. Santa Cruz County, located in the southeastern portion of the study area, includes basin and range topography with elevations ranging from 3,000 to 9,000 feet asl, including the Santa Rita and Patagonia mountains. The topography of Greenlee County consists of high mountain ranges, river valleys, and desert terrain.

### Slope Analysis

The study area consists mostly of 0 to 5 percent slope and 20 percent or greater slope with little variation. Erosion is affected directly by the steepness and length of slope; consequently, greater slopes increase the runoff velocity and the movement of sediment carried in runoff. Poor drainage may occur with some soils, which could increase velocity and erosion; therefore, specific soil characteristics should also be taken into consideration.

The Mogollon Rim Focus Area (Figure 2-3a) includes all of Gila County, and portions of Navajo and Apache counties. The northeastern portion of the Mogollon Rim Focus Area contains slopes ranging from 0 to 5 percent. When rainfall occurs over lower and more gradual slopes, the runoff intensity is reduced, and the amount of sediment that is carried away decreases; and overall, erosion is reduced. The southwest corner of this focus area contains the Tonto National Forest, Apache-Sitgreaves National Forest, and the White Mountains and consists primarily of slopes of 20 percent or greater. These slopes feature rough, vertical-walled canyons and steep cliffs that could increase runoff and erosion from storm runoff.

The Copper Country Focus Area (Figure 2-3b) is dominated mostly by mountain ranges, including the White Mountains, Gila Mountains, Santa Teresa Mountains, and a portion of the Galioro Mountains. All these mountain ranges have slopes of 20 percent or greater and could have high rates of erosion. Lower slopes can be found along the Gila and San Simon rivers, which run from the central to the southern portion of the focus area. However, these rivers are bordered by the Gila and Santa Teresa mountains, so when a rainfall event occurs, it could increase the amount of sediment that is carried into the rivers, which in turn could impact water quality and the aquatic environment.

The Cochise-Santa Cruz Focus Area (Figure 2-3c) contains more areas of 0 to 5 percent slope than the Copper Country Focus Area. The central region (from Willcox to Douglas) and northeast corner of the focus area contain the most areas of 0 to 5 percent slope, which could result in the least amount of erosion if rainfall occurs. The Dos Cabezas and Chiricahua mountains to the west may indirectly contribute sediment to these lower sloped areas. The southwest corner contains many areas with slopes of 20 percent or more, which have potential for increased erosion in this area.

### **Land Subsidence and Earth Fissures**

Earth fissures are associated with land subsidence that accompanies extensive groundwater mining. As our population increases and more demand is put on our groundwater resources, earth fissures could potentially occur in any of the three focus areas. Earth fissures are mostly located in the central and southern portions of the state in the basin and range province (Arizona Department of Water Resources [ADWR] 2008, para. 2). They occur along or near the basin boundaries where depth to water has declined. The Santa Cruz Basin is the site of the greatest concentration of earth fissures due to groundwater withdrawal (Gelt, Joe, 2008, para 31). In relation to the study area, known subsidence has occurred in the Copper Country Focus Area (Graham County) and the Cochise-Santa Cruz Focus Area (Cochise and Santa Cruz counties). Fissures have been identified in the City of Willcox and in the San Simon Basin in Cochise County. Currently, most fissures are found in Pinal and Maricopa counties (U.S. Geological Survey [USGS], Pinal and Maricopa County Planning Map, 2008), which are not within the study area. Complete map data showing the locations of earth fissures in each county are not yet available but are in the process of being developed by the Arizona Geological Survey (Arizona Geological Survey, 2008, para. 3).