Chapter 3. Affected Environment

3.1. INTRODUCTION

This chapter describes the environment within the Lower Sonoran Planning Area that would potentially be affected by actions proposed under the alternatives described in Chapter 2, *Alternatives* (p. 27). While the Bureau of Land Management (BLM) is only responsible for managing BLM-administered public lands (public lands) within the Planning Area (i.e. the Lower Sonoran and Sonoran Desert National Monument [SDNM] Decision Areas), proposed decisions may affect environmental components outside the Decision Areas. Therefore, unless indicated otherwise, discussion and analysis in this section encompasses the Planning Area as a whole.

The environmental components potentially impacted consist of resource and management activities listed below. The foreseeable environmental effects of the alternatives on these same resource and management activities are described in Chapter 4, *Environmental Consequences* (p. 371).

Resources

Air Quality

Cave Resources

Climate Change

Cultural and Heritage Resources

Geology

Paleontological Resources

Priority Wildlife Species and Habitat Management

Soil Resources

Vegetation Resources

Visual Resources

Water Resources

Wild Horse & Burro Management

Wilderness Characteristics

Wildland Fire Management

Resource Uses

Lands and Realty

Livestock Grazing Management

Minerals Management

Recreation Management

Travel Management

Special Area Designations

National Landscape Conservation System

Administrative Designations

Other Special Designations

Social and Economic

Tribal Interests

Hazardous Materials and Public Safety

Social and Economic Conditions

The data and descriptions of these categories are drawn from the Analysis of the Management Situation (AMS) (BLM 2005) and subsequent, completed resource assessments on several of the environmental components occurring within the Planning Area. The AMS is available for public review at the BLM's Phoenix District Office.

3.2. RESOURCES

3.2.1. AIR QUALITY

3.2.1.1. Clean Air Act Land Classifications

The BLM's role in air-resource management is to ensure that agency activities comply with applicable air-quality standards and that BLM-authorized leases and permits include conditions and stipulations that require compliance with applicable air quality rules and standards. This is done through interagency coordination, participation in State implementation plans, environmental impact analyses as required by NEPA, and adaptive management practices as outlined in BLM Handbook H-1601-1.

Under the Federal Clean Air Act (CAA), national parks 6,000 acres or larger and wilderness areas 5,000 acres or larger existing in 1977 were designated as Class I. The class 1 designation gives Federal land managers the opportunity to impose the strictest rules protecting air quality. The Planning Area includes one wilderness area with a Class I air quality designation, Superstition Wilderness, located east of Phoenix. Undeveloped, remote areas deserving of natural or scenic resource preservation could be designated as Class II. Other wilderness areas and national parks, including those designated after 1977, are classified as Class II, and land managers are limited to less strict protection of air quality. State and local air quality planning and permitting agencies give such places special consideration under the CAA through Prevention of Significant Deterioration criteria even though they do not qualify as Class I. Within the Planning Area, nine wilderness areas have been designated Class II for air quality. These include three areas containing designated wilderness outside the Decision Areas (Organ Pipe Cactus National Monument, Cabeza Prieta National Wildlife Refuge (NWR), and Four Peaks wildernesses), three within the Lower Sonoran (Woolsey Peak, Signal Mountain, and Sierra Estrella wildernesses), and three within the SDNM (Table Top, North Maricopa Mountains, and South Maricopa Mountains wildernesses).

The CAA requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants harmful to public health or the environment. It also establishes two types of national standards: primary standards to protect health and secondary standards to protect welfare. The EPA sets NAAQS for six principal or "criteria" pollutants. The pollutants are carbon monoxide (CO), lead, nitrogen dioxide (NO_2), one-hour ozone (O_3), sulfur dioxide (SO_2), and particulate matter smaller than 10 micrometers in effective diameter (PM_{10}).

Geographic areas are designated as attainment, nonattainment, or unclassified for each of the criteria pollutants with respect to NAAQS. An area is designated as "attainment" if pollutant concentrations meet the NAAQS, "nonattainment" if pollutant concentrations exceed the NAAQS, or "unclassified" if the status of attainment has not been verified through data collection. For planning and permitting purposes, unclassified areas are treated as attainment areas. All counties making up portions of the Planning Areas, with the exception of Yuma County, contain some areas that are designated as nonattainment with respect to specific criteria pollutants that include PM_{10}, SO_2, CO, and O_3 (Arizona Department of Environmental Quality [ADEQ] 2006). The air-pollution nonattainment areas are shown in Map 3-1: Air Pollutant Nonattainment Areas.

3.2.1.2. Emission Sources

Diverse emission sources within the Planning Area collectively affect air quality on a local and regional scale, including major, minor, non-permitted, mobile, and fugitive emission sources. For permitting purposes, a major source is defined as an emission that has the potential to emit 100 tons or more per year of any single criteria pollutant, 10 tons per year of any single hazardous air pollutant, or 25 tons per year of any combined hazardous air pollutants. Major sources include industrial facilities such as gas-fired power plants, natural gas pipeline compressor stations, landfills, mineral processing facilities, and various manufacturing plants with large fuel combustion equipment or use substantial quantities of volatile organic materials, typically in application of finishes and coatings.

A minor source is defined as an emission that has the potential to emit pollutants at a level greater than the "significance" threshold, but less than a major source. The significance threshold provides an emission baseline for criteria pollutants that determines which facilities must obtain permits. Minor sources include industrial and commercial facilities of many kinds, especially in the more developed portions of the Planning Area. Although minor emission sources vary outside the metropolitan Phoenix area, common sources are rock-product plants that produce crushed and screened materials, and hot-mix asphalt and concrete plants. These plants can be found in the Lower Sonoran and are often portable, which means that they can be moved as the local demand for their product moves. The primary emissions from these sources are particulate matter; however, nitrogen dioxide (NO_2) can also be significant if any equipment operates using fuel-fired generators.

Many small, stationary emission sources, such as agricultural operations and large-scale construction projects, do not produce air pollution levels that would substantially affect regional air quality, and are not required to have an operating permit. Such sources may occur in the Decision Areas on occasion. However, emissions from these facilities, mostly in the form of particulates, can affect local air quality due to the arid soil conditions. While non-permitted sources are not tracked as closely as permitted sources, these must also comply with applicable Federal, State, and local regulations.

Vehicle travel on paved roads, especially in the metropolitan Phoenix area, represents the largest single emission source in and surrounding the Planning Area. When CO from vehicle emissions combines with the extreme desert heat, O_3 is created. Other major contributors in the Planning Area include traffic on interstates and other major thoroughfares, including Interstates 10, 17, and 8 (I-10, I-17, and I-8); U.S. Highways 60 and 89 (U.S. 60 and U.S. 89); and State Highway 87 (SR 87). In a similar fashion, railroad corridors can be significant emissions contributors in the Planning Area's central portions. Particulate matter carried onto paved roadways from wind and rain events and soil tracked onto highways by vehicles entering from unpaved roads are common sources of PM_{10} pollution.

Most vehicle routes in the Decision Areas are unpaved. Travel on unpaved routes results in particulate emissions, or fugitive dust. Although fugitive dust is not included in air quality evaluations, it can affect local air quality, especially in areas of concentrated travel on unpaved roads and during periods of high winds.

The largest source of particulate matter emissions in the Planning Area is surface-disturbing activities, including construction, mining, and off-highway (recreation-related) travel, all of which occur in the Decision Areas. State and local nonpoint-source rules guide these activities.

Maricopa County recommends best management practices (BMPs) such as applying water or chemical dust suppressants to reduce particulate matter emissions.

The northern part of the Lower Sonoran is most likely to be affected by automobile emissions, including CO, CO_2, SO_2, and PM_{10} due to road density and proximity to the Phoenix metropolitan area. Such emission sources could also affect the northern-most portion of SDNM. Traffic on I-8 and State Highways 85 and 238 (SR 85 and SR 238), as well as the railroad corridor, are significant contributors of emissions in the Monument's central and southern portions. Travel on unpaved roads also results in fugitive dust emissions.

3.2.1.3. Quantifiable Indicators

Quantifiable indicators associated with air quality include criteria air pollutants, conditions, and observed levels of visibility. Criteria air pollutants associated with NAAQS, as identified in the CAA and regulated by the EPA, include NO_2, CO, SO_2, O_3, PM_{10}, and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). Visibility varies with the levels of criteria air pollutants in the atmosphere.

Pollutants

A review of air monitoring data required by Arizona Revised Statutes (ARS) 49-424.10 indicates considerable progress has been made in reducing airborne pollutants throughout the state. The most drastic change has occurred in CO concentrations in the highly urbanized areas of Tucson and Phoenix. Such concentrations, which regularly exceeded standards in neighborhoods and near busy intersections in Phoenix (and to a lesser extent in Tucson), are now well below the eight-hour CO NAAQS of 9 parts per million (ppm). Ozone concentrations have shown slight decreases in the metropolitan areas of Tucson and Phoenix, though a very slight increase has been observed in some rural areas. In comparison with CO, O_3 concentrations may prove to be more difficult to curb due to its relatively high background levels. Trends in PM_{10} are quite variable and location dependent. Long-term trend sites in Phoenix show a slight decrease in PM_{10} concentrations for most areas, though there may be localized, unimproved areas. The Tucson metropolitan area, on the other hand, has seen a general increase in PM_{10} concentrations, but their magnitude is significantly less than in Phoenix. Monitoring of $PM_{2.5}$ is a new program begun in the late 1990s. While there is insufficient data to assess $PM_{2.5}$ trends confidently, the variability in concentration of these fine particles over time appears to be relatively constant, with Phoenix and Nogales, Arizona, having the greatest magnitudes.

A substantial number of air-quality monitors, scattered in and around the Planning Area, measure and record ambient air concentrations for criteria air pollutants (i.e. CO, NO_2, O_3, SO_2, PM_{10}, and $PM_{2.5}$). In 2004, all monitors with recorded data indicated compliance with the NAAQS for all pollutants except O3 (8-hour standard) and PM_{10} (24-hour and annual standards). Such data allow a review of historic trends for certain pollutants. Data trends for criteria air pollutants measured and recorded at various monitors were evaluated based on data obtained from annual Air Quality Reports issued by ADEQ.

A small portion of the SDNM, about 3,500 acres downwind from the City of Phoenix, is within the nonattainment area of the Maricopa Intrastate Air Quality Control Region. The 3,500 acres encompasses sections of Woolsey Peak, North Maricopa Mountains, and the Sierra Estrellas. It should be noted that ozone production in the lower atmosphere is mostly an inner-city condition. Ground-level ozone is caused by, among other things, motor-vehicle exhaust, industrial

emissions, and gasoline vapors, as well as natural sources that emit nitrogen oxides and volatile organic compounds.

A portion of the Monument is within the area designated by Maricopa County as "Area A" for PM_{10}. All projects and program components within this area must comply with Section 176 (c) of the CAA, as amended, and regulations under 40 Code of Federal Regulations (CFR) part 93 subpart W, concerning conformity of general Federal actions to the applicable State Implementation Plan (SIP) for nonattainment and maintenance areas. Under those authorities, "no department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an applicable implementation plan." Therefore, a Federal agency must determine that a Federal action conforms to the applicable implementation plan before it is done.

For all pollutants, PM_{10}, SO_2, CO, and O_3, no standards were violated in the Planning Area's western region, which encompasses most of the Lower Sonoran (e.g. Ajo Block and Saddle and Gila Bend Mountains). Most areas where standards are exceeded are in the immediate vicinity of, and to the northeast of, metropolitan Phoenix (see Map 3-1: Air Pollutant Nonattainment Areas), which includes the northernmost portion of the Lower Sonoran. Trends here have been variable. The Ajo and Globe-Miami areas historically were designated nonattainment for SO_2, primarily due to emissions related to the large copper mines; however, in 2004, Ajo was re-designated as in attainment, and Miami-Globe has been recommended for attainment status. The Ajo PM_{10} nonattainment area has been recommended for attainment because it has not exceeded the standard since 1998 (EPA 2006; EPA 2007; ADEQ 2007; Maricopa County Air Quality Department [MCAQD] 2006)

Carbon Monoxide, Nitrogen Dioxide, and Sulfur Dioxide. With few exceptions in the Planning Area, CO-monitoring data indicate a general decrease in pollutant levels since 1997, with none exceeding air quality standards. In January 2005, the Phoenix metropolitan area was in attainment with CO standards. Nitrogen dioxide showed a general increase for hourly and daily measurements from 1998 to 2000, then decreases in pollutant levels since 2001. Overall, the annual pattern of emissions has remained steady and within standards. Sulfur dioxide shows variable 3-hour and daily concentrations, but overall concentrations are steady or decreasing and within standards. The Ajo and Globe-Miami areas historically were nonattainment areas for SO_2, primarily due to emissions related to the mines; however, in 2004, Ajo was re-designated in attainment, and Miami-Globe has been recommended for attainment status.

Ozone. Ozone is measured under a 1-hour and an 8-hour standard. In May 2005, EPA changed the Phoenix metropolitan area designation to attainment of the 1-hour ground level O_3 standard. This change was based on not exceeding the 1-hour O_3 standard for the prior eight years. For O_3 on an 8-hour average, the 3-year average of the fourth highest value recorded must be below 0.08 ppm. Nine monitors exceeded this value in and around the Planning Area, with values ranging from 0.08 to 0.085 ppm; the majority are located in the metropolitan Phoenix area. In January 2005, the EPA designated the Phoenix metropolitan area as nonattainment for the 8-hour O_3 standard. Air-quality agencies are now working on control measures that are more stringent to attain the O_3 standard (EPA 2006; EPA 2007; ADEQ 2005; ADEQ 2007; MCAQD 2006).

In the Phoenix metropolitan area and the northeast portion of the Planning Area, O_3 levels have been variable with no prominent trends since 1998. The Gila Bend Mountains and Saddle Mountain area has had a decreasing trend in O_3 over this same period.

Particulate Matter. Particulate matter is monitored for both PM_{10} and $PM_{2.5}$. In both sizes, the Phoenix area, including much of Maricopa and Pinal counties, are exceeding standards. The 24-hour PM_{10} NAAQS is 150 µg/m3; the annual PM_{10} NAAQS is 50 µg/m3. In 2004, the 24-hour standard was exceeded 41 times at 12 sites in the metropolitan Phoenix area, and five sites exceeded the annual standard. Primary pollution sources contributing to this nonattainment are windblown dust from construction sites, agricultural fields, unpaved roads and parking lots, and disturbed vacant lots.

Based on 1997 air quality standards, the entire state of Arizona is in attainment of the $PM_{2.5}$ standard. In 2006, however, the EPA created standards that are more stringent and expects to issue new designations in 2010 based on data collected in 2007-2009 (EPA 2007). As a result, the ADEQ and county departments of environmental quality have been looking closely at $PM_{2.5}$ emissions. Air-quality agencies are working on control measures that are more stringent to decrease particulate matter, both PM_{10} and $PM_{2.5}$, with a goal to decrease $PM_{2.5}$ emissions by 5 percent per year.

For all pollutants, no standards were exceeded in the Planning Area's western region, which encompasses most of the public lands, including the SDNM, Ajo Block, Saddle Mountain, and Gila Bend Mountains. Most exceeded-standard areas are in the immediate vicinity of, and to the northeast and southeast of, the metropolitan Phoenix area. Emission sources located within or near the Decision Areas could potentially contribute to exceeding the PM_{10}NAAQS standard, although insufficient data is available to identify specific causes or sources except (in some cases) high winds.

For PM_{10}, annual averages have been stable in most locations since 2000; however, hourly and daily standards occasionally have been exceeded. Rolling three-year data for the annual PM_{10} standard analyzed by the EPA show that for the years 2001 through 2006, the Phoenix nonattainment area averages 62 µg/m3, while the standard is 50 (EPA 2006). The 24-hour PM_{10} NAAQS is 150 µg/m3. EPA data analysis shows that the rolling three-year data indicates an average of 256 µg/m3 (EPA 2006). In October 2010, the EPA proposed a new PM_{10} nonattainment area comprised of western Pinal County.

Particulate matter less than 2.5 microns in diameter is collected in only a few locations and shows no clear trend except that concentrations have been relatively stable. Neither EPA current evaluations nor future projections indicate that any areas in Arizona will be out of compliance with the new $PM_{2.5}$ standards. The Ajo PM_{10} nonattainment area has been recommended for attainment status because it has not exceeded the standard since 1998 (EPA 2006, 2007; ADEQ 2007; MCAQD 2006).

Visibility Conditions

Visibility and regional haze conditions in the Planning Area are a function of the nature and emission height of certain air pollutants and meteorological conditions. The Cooperative Institute for Research in the Atmosphere operates a network of monitoring stations and publishes Integrated Monitoring of Protected Visual Environments (IMPROVE) data to identify and evaluate patterns and trends in regional visibility. Data pertaining to the Planning Area show that visible haze patterns measured in the Sonoran Desert characterize typical sites in the Southwest. The monitoring results revealed:

- Fine and coarse particulate concentrations were the largest contributors to poor visibility in the spring, then summer and fall, and lowest in the winter.

- Contributions to visibility degradation consisting of sulfates, organics, and soil in the fine particulate mass measurements were highest in the summer, and then fall, spring, and again lowest in the winter (IMPROVE 2000).

Based on the above observations, the haziest days in the Sonoran Desert occur in the summer and the best visibility occurs in the winter.

In 2004, the visibility conditions at the Tonto National Monument IMPROVE monitor, which is located northeast of the Superstition Class I Wilderness Area, were 110, 155, and 220 kilometers for the worst, typical, and best visual range values, respectively (Visibility Information Exchange Web System [VIEWS] 2006). For example, on the worst days, someone could identify a dark object against the horizon up to 110 kilometers away. Downtown Phoenix visibility also has been measured in recent years. Preliminary data from 2004 and 2005 indicates that approximately 50 percent of the days were considered good or excellent and 50 percent were considered fair, poor, or very poor (Arizona Department of Environmental Quality 2006). In recent years, Phoenix area parks had five cameras installed to monitor visibility conditions, including Superstitions Mountains and Estrella Mountain County and South Mountain parks within the Planning Area. These could be used to assess visibility trends in the future. Limited trend data is available on visibility in the Planning Area, due primarily to a single IMPROVE monitor located to the northeast of Phoenix. Based on data available from 1991-2001, there was an improvement in visibility and standard visible range. Visibility distances on the worst days ranged from 87 to 103 kilometers and on the best days from 176 to 199 kilometers (VIEWS 2003a, 2003b). Actions to decrease O_3 and particulate matter are likely to improve visibility.

Meteorological Conditions

The Planning Area is typical of the Sonoran Desert (i.e. warm and dry), and air quality is closely linked to an area's meteorological conditions.

- Average annual maximum temperatures vary across the Planning Area. Long-term data indicates an average annual maximum temperature of 89ºF in the western portion to 76ºF at the eastern edge, and from 79ºF in the north to 84ºF in the south. Minimum temperatures range from 56ºF in the western side to 47ºF in the east, and from 61ºF in the north to 59ºF in the south (Western Regional Climatic Center [WRCC] 2006a). Average monthly temperatures in the western part of the Planning Area, where most of the Decision Areas' lands are located, range from the mid 40s in the winter to the mid 90s in the summer.

- Annual average mean precipitation levels range from 6-16 inches west to east, with rainfall ranging from 6-10 inches in the west and south, and higher rainfall levels to the northeast (WRCC 2006a). Precipitation is almost entirely in the form of rain and is unevenly distributed throughout the year, with, on average, more rain in July and August during the summer monsoon season.

- The average annual wind speeds range from 5.5 to 7.7 miles per hour (mph), with the average monthly wind speed ranging throughout the year from 4.0 to 8.9 mph (WRCC 2006b).

These climate and meteorological factors often contribute to the generation of fugitive dust, especially from vehicular travel on unpaved roads, earthmoving activity, and mineral material handling.

3.2.2. CAVE RESOURCES

The BLM is required to comply with the Federal Cave Resources Protection Act (FCRPA) regarding caves in the Planning Area. Caves on Federal lands are managed under 43 CFR, Part 37. These regulations provide guidance for identifying, nominating, evaluating, and designating significant cave resources. According to FCRPA, a cave is "any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or manmade. Such term shall include any natural pit, sinkhole, or other feature, which is an extension of the entrance."

The Planning Area contains Paleozoic sedimentary deposits and Tertiary volcanic rocks known to contain caves elsewhere in Arizona. While Paleozoic limestone occurs in the Sand Tank Mountains, no caves or cave resources have been found in the Decision Areas; however, two lava tubes are known to occur in Sentinel Plain. Small rock overhangs and shallow openings are present in some rock units; however, these are not deep enough to meet the criteria to be considered a cave. Two lava tubes have been identified in the Decision Areas as cave resources. There may be additional undocumented caves located in geologically suitable areas. Any newly discovered caves would be evaluated for scientific, educational, and recreational value according to the FCRPA.

3.2.3. CLIMATE CHANGE

Climate is the composite of a region's generally prevailing weather conditions throughout the year, averaged over a series of years. Historical weather patterns within the Planning Area are characterized by mild winters, hot summers, and low levels of rainfall consistent with the Sonoran Desert's arid climate. Temperatures in the Planning Area show a consistent warming trend since recording began in 1896 (National Weather Service Forecast Office 2009), and recent warming in the Southwest has been "among the most rapid in the nation" (United States Global Change Research Program 2010). Across the West, the increase in average temperature during the past five years has been 70 percent higher than in the world as a whole (Saunders, et al. 2008). In Arizona, average-temperature increases during winter and spring months have been greater than during the summer or fall, and increases in daily minimum temperatures have been more common than increases in daily maximum temperatures. Winter minimum temperatures in the Sonoran Desert now are higher, and freeze-free periods are longer, than at any time during the 20th century, a trend likely to continue into the future (Weiss and Overpeck 2005). Climate models' projections for the future of the western U. S. consistently show higher temperatures to come. Increases of 3.6ºF (2ºC) in both summer and winter are likely by 2050, as are annual increases of 7.2-9ºF (4-5ºC) by 2099 (Garfin, Crimmins and Jacobs 2007).

3.2.3.1. Emission Sources

Ongoing scientific research has identified the rise of greenhouse-gas (GHG) emissions as a major contributor to this increase in the global average temperature. Evidence that GHGs affect climate is "unequivocal," according to hundreds of scientists working with the United Nations

Intergovernmental Panel on Climate Change (IPCC 2007). GHGs include carbon dioxide (CO2), methane (CH4), nitrous oxide (N20), water vapor, and several trace gases. Through complex interactions on a regional and global scale, they cause average temperatures at the Earth's surface to rise, primarily by decreasing the amount of heat energy radiated back into space. Although GHG levels and corresponding variations in climatic conditions have varied for millennia, industrialization and burning of fossil carbon sources have caused GHG concentrations to increase significantly and contribute to overall climatic changes, typically referred to as global warming or climate change.

Some GHGs, such as CO2, occur naturally and are emitted into the atmosphere through both natural process and human activities, while others are created and emitted solely through human activities. The GHGs that enter the atmosphere due to human activities include CO2 from the burning of fossil fuels, solid waste, and trees and wood products; CH4 emitted during the production and transport of coal, natural gas, and oil, as well as by livestock, deforestation, and agricultural practices; N2O from agricultural and industrial activities and the combustion of fossil fuels and solid waste; and fluorinated gases that result from a variety of industrial processes (EPA 2008).

Total U.S. GHG emissions have risen by 14.7 percent from 1990 to 2006. The primary GHG emitted by human activities in the United States was CO2. It totals approximately 84.8 percent of all GHG emissions, with the largest source being fossil fuel combustion. According to the EPA Inventory of U. S. Greenhouse Gas Emissions and Sinks (2008), CO2 emitted in the United States totaled 7,054.2 teragrams in 2006. These GHG emissions are partly offset by carbon sequestration in forests, trees, urban areas, and agricultural soils, which, in aggregate, offset 12.5 percent of total U.S. emissions in 2006 (EPA 2008).

3.2.3.2. Global Effects

The Earth's global mean surface temperature rose 1.3ºF (0.74°C) from 1906 to 2005 (IPCC 2007). In 2007, the Intergovernmental Panel on Climate Change (IPCC) indicated that by the year 2100, global average surface temperatures would rise 2.0-11.5°F (1.1-6.4°C) above 1990 levels. Increasing concentrations of GHGs are likely to accelerate the rate of climate change in the future, and there is evidence of this happening already (IPCC 2007). However, uncertainties remain as to how climate change will affect different regions. Computer model predictions indicate increases in temperature will not be equally distributed but are likely to be accentuated at higher latitudes. Data collected by the Goddard Institute for Space Studies (2007) indicate that northern latitudes have exhibited temperature increases of nearly 2.1°F since 1900, with a nearly 1.8°F increase since 1970.

3.2.3.3. Regional Effects

The average temperature in the Southwest has already increased approximately 1.5ºF (0.83ºC) above a baseline period of 1960-1990 and is projected to rise a total of 4.0-10.0ºF (2.2ºC-5.6ºC) by the end of the century (Justus and Fletcher 2007). It is not possible to predict with certainty the effects of climate change on local- or regional-scale ecosystems, but climate change is certain to affect natural and human systems within the Planning Area and is likely to have a large impact on BLM management strategies. The 2007 U. S. Government Accountability Office (GAO) Report on Climate Change states, "Federal land and water resources are vulnerable to a

wide range of effects from climate change, some of which are already occurring. These effects include, among others:

- Physical effects such as droughts, floods, glacial melting, and sea level rise;
- Biological effects, such as increases in insect and disease infestations, shifts in species distribution, and changes in the timing of natural events; and
- Economic and social effects, such as adverse impacts on tourism, infrastructure, fishing, and other resource uses" (GAO 2007, 2).

In the Sonoran Desert, the most likely effects of climate change include:

- Higher average temperatures, particularly at night;
- Scarcer water supplies due to lower overall rainfall and earlier melting of upstream snowpack resulting in earlier peak stream flows in the Salt, Verde, Gila, and Colorado rivers in spring and potentially reduced flows in summer;
- Precipitation patterns that are more variable than what is observed currently, including longer, more frequent droughts and more intense storms bringing increased flooding;
- Higher rates of soil erosion;
- Growth in invasive plant species, particularly non-native annual grasses;
- Increased frequency and intensity of wildfires;
- Shifting habitats for wildlife, including the development of "novel" ecosystems in which species that have been geographically separate in the past begin to share habitat.

The most important way climate change is likely to affect the Planning Area is by decreasing already scarce water resources. Drought and flood cycles lasting months, years, or even decades already are a regular occurrence in the Sonoran Desert. An extended drought has gripped Arizona since the 1990s, and the total amount of water available for all uses — including wildlife and plants, ecosystem services, and human needs — is expected to decline as climate change advances (United States Global Change Research Program 2010).

Currently, yearly precipitation in Phoenix, which is adjacent to the Planning Area, averages 7.63 inches, with wide seasonal variations. Historically, most rain falls during the summer monsoon and winter rainy seasons, while spring and fall "shoulder" seasons may see no rain at all. The monsoon season, typically mid-July to mid-September, is defined by a shift in wind patterns that brings moisture up from the Gulf of California, the Gulf of Mexico, and the eastern Pacific. Average rainfall increases during this time from just over a tenth of an inch in June to an inch or more in July (0.97"), August (1.03"), and September (0.84") (National Weather Service Forecast Office 2009). The other half of the region's rain typically falls from December through March, when the winter rainy season brings in storms from the west and northwest. On average, these storms drop between three-quarters to one inch of rain per month, with December posting the highest monthly average (0.93") from 1896-2008 (National Weather Service Forecast Office 2009). However, yearly rainfall is highly variable and rarely fits the "average" pattern (Sheppard, et al. 2002). Under most climate-change scenarios, storm intensity and attendant flooding are likely to become more common as the timing, location, and potentially the amount of precipitation

shifts (Archer and Predick June 2008). Nonetheless, the effect climate change will have on the overall amount of precipitation in Arizona is not clear.

The effect that higher temperatures, both observed and projected, will have on the region's water supplies is much clearer. Snowpack currently supplies some 70 percent of all water in the West (Saunders, et al. 2008) and almost all the water to the rivers that flow into the Planning Area. The timing and capacity of these supplies are dependent on overall precipitation and temperature, which determines when the snowpack melts. Recent years have seen snowmelt push the timing of peak stream flows in spring as much as a month earlier than normal, thereby reducing flows in the summer and fall when demand typically peaks (Saunders, et al. 2008; United States Global Change Research Program 2010). Reduced stream flows in the summer will leave ecosystems more dependent on increasingly uncertain summertime rains. Further exacerbating this vulnerability is the increasing tendency of rain to fall during infrequent, large-scale events that drain quickly and cause flooding and erosion. Such changes to the hydrologic cycle of the Sonoran Desert could have massive impacts on the region's wildlife and vegetation.

Climate change-related shifts from desert to grassland ecosystems will also increase the risk of wildfire throughout the Sonoran Desert (GAO 2007; Archer and Predick 2008). Higher winter temperatures and earlier peaks in spring snowmelt runoff already have led to increases in both the frequency and intensity of wildfires in higher elevations of the Rocky Mountains (Westerling, et al. 2006). Current conditions in the Sonoran Desert represent the extreme range for many plant species, and the combination of increasing temperatures and decreasing water availability is likely to shift the range of many plants and animals northward or even cause them to go extinct (Saunders, et al. 2008; Weiss and Overpeck 2005). Increasing CO2 concentrations also lead to fertilization and growth of specific plant species. Such shifts could bring the woody, herbaceous plants common to northern Mexico into areas now dominated by iconic succulents such as the saguaro cactus and native grasses (Saunders, et al. 2008; Weiss and Overpeck 2005). The "novel" ecosystems created by climate change-induced habitat shifts also could lead to significant management challenges as plants and animals that once were geographically distinct combine in new ways.

3.2.4. CULTURAL & HERITAGE RESOURCES

Cultural and heritage resources within the Planning Area represent evidence of more than 10,000 years of human occupation of the region. There are many thousands of historic districts, buildings, and structures within the Planning Area, but the great majority of these are located in urban areas not managed by the BLM. Most of the cultural resources on public lands are archaeological sites reflecting both pre-Columbian and post-contact occupation. The BLM estimates that about 80 percent of the sites on public lands reflect aboriginal occupation and 13 percent Euro-American occupation, with a high percentage of sites of unknown age or cultural affiliation.

Because cultural resources are abundant within the Decision Areas, it is a major challenge to inventory and evaluate them. Densities of 5-15 archaeological sites per square mile are common. Available information indicates that between 5 and 6 percent of the Planning Area has been surveyed for cultural resources, and more than 6,300 archaeological and historical sites have been recorded (see Table 3.1, "Estimated Extent of Cultural Resources Survey and Recorded Resources" (p. 264)). Only 4 percent of the Lower Sonoran has been surveyed, with 588 sites recorded, while 6 percent of the SDNM has been surveyed, with more than 300 sites recorded. These statistics suggest there could be more than 100,000 archaeological sites within the Planning Area, with 13,000 in the Lower Sonoran and 5,000 within the SDNM. Because these estimates

are based on incomplete and sometimes ambiguous data collected over many decades, they are subject to an unknown margin of error; however, they do indicate that only a small percentage of cultural resources have been found and recorded.

Table 3.1. Estimated Extent of Cultural Resources Survey and Recorded Resources

	Planning Area (including Private Inholdings and Non-BLM Land)			Applicable Decision Areas (BLM-Administered Public Land Only)		
	Lower Sonoran	SDNM	Entire Planning Area	Lower Sonoran	SDNM	Both Decision Areas
Size (acres)	8,371,400	496,600	8,868,000	932,000	486,600	1,418,600
Percentage of total area	94%	6%	100%	66%	34%	100%
Surveyed for cultural resources (acres)	466,578	29,826	496,404	36,804	29,708	66,512
Percentage of all surveys	94%	6%	100%	55%	45%	100%
Percentage of total area that has been surveyed	5.6%	6.0%	5.6%	4.0%	6.1%	4.7%
Number of recorded cultural resources	6,038	307	6,345	588	291	879
Density (sites/mile)	8.3	6.5	8.2	10.1	6.3	8.5
Projected number of resources	99,800	5,000	104,800	12,800	4,800	17,600
SOURCE: AZSITE Cultural Resource Inventory (supplemented with additional information from BLM files) 2003						

Evaluating the significance of archaeological and historical sites recorded on public lands is an ongoing aspect of BLM's cultural resource management program. The criteria for inclusion in the National Register of Historic Places (NRHP) are used for evaluating the significance of archaeological and historical sites. Approximately 70 percent of currently evaluated sites are NRHP eligible, most often under Criterion D of 36 CFR 60, which is an evaluation of the potential of the site to yield information important in history or prehistory. The BLM also allocates prehistoric and historic sites to various use categories when developing a management strategy for cultural resources. These use categories include conservation for future use and traditional, public, scientific, and experimental uses. If cultural resources lack significant value, they may be discharged from management. A majority of the currently recorded archaeological sites within the Planning Area are allocated to the scientific use category.

Other forms of allocation and protection for cultural resources include designation as national monuments, NHTs, and cultural areas of critical environmental concern (ACECs). There are a total of 322 individual properties and 17 districts within the Planning Area listed in the NRHP.

The Juan Bautista de Anza NHT is one of 19 congressionally designated national scenic and historic trails in the U.S. and the only NHT within the Decision Areas. Approximately 165 miles of the Anza NHT runs through the Planning Area, with 32.5 miles situated within the Lower Sonoran and 16.75 miles within the SDNM. The setting of the trail through the SDNM probably has been altered less since its original use than any other segment of the entire 1,200 mile route (National Park Service [NPS]1996). Historic documents indicate the Anza Expedition camped 10 times along the Trail within the Planning Area, including one camp in the SDNM. Although no physical evidence of these camps has been found to date, these locations have public interpretation potential. In the 1840s, the Mormon Battalion built a wagon road along the same corridor. In the late 1850s and early 1860s, the Butterfield Overland Stage improved the route, and subsequently, tens of thousands of immigrants traveled west along this route to California.

Factors threatening the historical integrity of cultural resources include disturbance or destruction by various development projects or land uses, natural erosion, route proliferation, and unauthorized excavation and artifact collecting by vandals or uninformed recreational users. Available data indicate that approximately 40 projects, on average, have been reviewed annually since 1980, and an average of eight sites annually have been affected by development projects. Some sites were avoided by project modifications, but archaeological data recovery studies were conducted at an average of five sites annually to mitigate project impacts. Reviews and treatment plans associated with these data-recovery projects were conducted in consultation with the State Historic Preservation Office (SHPO) and concerned Native American tribes.

Roughly 5 percent of monitored archaeological and historical sites on public lands are being damaged by erosion. Intentional vandalism and unauthorized collection of artifacts have damaged cultural resources, but there is little quantified information about the extent of this threat. Proliferation of unauthorized travel routes within the Decision Areas has increased over the last 10 years to the point that some cultural resources, formerly considered to be in remote locations with difficult access, have become quite easy to access by vehicle. In many cases, routes were discovered leading to sites or cutting through site areas. These additional routes, and the overall increases in all-terrain vehicle (ATV) use, have led to far higher rates of vehicle damage to many sites and increased site visitation.

The BLM has responded to these threats with several different strategies. One of the most successful is providing systematic site monitoring through the statewide Site Steward Program. Physical protection measures are employed when damage or threats are perceived. Barriers to limit access and signs to inform visitors about laws protecting sites are installed as needed. Administrative measures, such as road closures, or special management designations, such as the Monument, also are used to protect cultural resources. One other way to provide protection to selected sites is to develop them for public interpretation. Interpretive site development includes intensive planning and installation of protective measures and interpretive media that enhances visitor experiences.

An examination of historical inventory data allows for a projection of future cultural resource work in the Planning Area to be an annual average of 10 to 15 square miles surveyed and 70 to 90 sites recorded. These projections cover roughly the next 10 years. At this projected rate of coverage, the vast majority of sites in the Decision Areas would still be unrecorded by 2020. Most previous cultural resource inventory was done for project compliance reviews under Section 106 of the National Historic Preservation Act. In recent years, some Federal funds have been allocated to document and research the archaeological and historical sites on public lands, but Section 106 surveys for major development projects (funded by project proponents) will undoubtedly continue to be the primary source of inventory information in the foreseeable future.

The scope and scale of development projects on public lands and the level of cultural resource threats they pose, vary widely, but the historical trend indicates an increasing number of projects on BLM-administered public lands are being reviewed each year. This trend suggests an average of 60 to 80 reviewed projects on public lands annually within the next 10 to 15 years. Recent years witnessed a substantial increase over the historical trend, and could indicate an even faster growth in the level of threats from various developments. The number of resources threatened but avoided by projects each year has fluctuated considerably from year to year. The historical trend suggests 10 to 20 sites threatened annually, but avoided by project modifications over the next 10 to 15 years. Similarly, the number of archaeological sites studied to mitigate project impacts is increasing, and could double to about 10 sites annually over the next 10 to 15 years. This

represents a small fraction of the estimated 17,000 to 18,000 archaeological and historical sites on the Lower Sonoran and SDNM.

Historical trend data indicates that 20 to 30 sites might be protected annually over the next 10 to 15 years through various administrative and physical measures. Installation of physical measures such as signs, fences, and gates are common responses to specific instances of resource damage. The historical data indicate annual monitoring of 50 to 80 sites is likely over the next 10 to 15 years.

Over the last decade, the BLM's cultural resource management program has devoted more effort to public interpretation, and this trend is likely to receive more emphasis in the future. Interest in cultural resource-based heritage tourism is expected to increase, particularly within the Monument.

3.2.5. PALEONTOLOGICAL RESOURCES

Paleontological resources include vertebrate and invertebrate animal fossils, plant fossils, and trace fossils. The latter are preserved indicators that an animal was present (e.g. footprints, burrows, borings, and waste droppings). These resources are a fragile and nonrenewable scientific record of the history of life on earth. Fossils have been found in many parts of Arizona and in almost all of the geologic deposits from Cambrian through the Quaternary. In the Planning Area, vertebrate fossils are typically found in unconsolidated Quaternary silt, sand, and gravel deposits and Tertiary sedimentary rocks. Various invertebrate marine fossils, including coral, trilobites, brachiopods, cephalopods, and bryozoans have been found in Cretaceous sedimentary rocks.

While paleontological resources in central and south-central Arizona generally are considered less abundant or less scientifically significant as those found in northern or southeastern Arizona, the BLM considers any discovery of vertebrate fossils and noteworthy occurrences of invertebrate and plant fossils as important. Within the Planning Area, such fossils are most likely to be found during ground disturbing activities in Quaternary sedimentary deposits, while others may also be found in Paleozoic and Mesozoic deposits. Increased ground-disturbing activities in these deposits may increase the threat to noteworthy fossils.

No significant paleontological resources are known to occur in either the Lower Sonoran or SDNM. It is the scarcity of fossils in these Decision Areas that makes subsequent finds that much more significant. Fossils of mammals, birds, and fish are present but not common in unconsolidated Quaternary and Tertiary sedimentary rocks. Although not significant or abundant, invertebrate marine fossils occur in Paleozoic limestones in southwest Pinal and southeast Maricopa counties, and are found in Cretaceous sedimentary rocks in the Decision Areas.

3.2.6. PRIORITY WILDLIFE SPECIES & HABITAT

In Arizona, the BLM manages habitat for many different categories of priority wildlife species:

- Special status species, including species listed as threatened or endangered, or those proposed for listing (candidate species) under the Endangered Species Act (ESA) and BLM sensitive species (BLM Manual 6840);
- Bats;

- Migratory birds, including birds of conservation concern;
- Raptors;
- Game species;
- Species for which there is a signed conservation agreement or strategy.

A number of priority animal species inhabit the Planning Area. A priority species list for wildlife and fish can be found in Appendix J, *Wildlife & Plant Priority Species* (p. 1235). The BLM focuses most of its wildlife-management efforts on the habitats of priority species as required by a variety of laws, regulations, policies, plans, manuals, and agreements. This is especially the case for species listed under the ESA and candidate species for listing. Because the priority species label covers many different types of wildlife species, the following discussion on habitat requirements for priority species is pertinent to most, if not all, wildlife species in the Planning Area. Therefore, there will not be a separate "general wildlife" discussion in this chapter.

BLM sensitive species are those species that require special management consideration to avoid listing under the ESA and are designated as sensitive by a BLM state director, usually in cooperation with the State agency responsible for its management. The BLM sensitive species designation normally is given to species on public lands whose conservation status can be significantly affected by BLM management. Instead of maintaining a list of State threatened and endangered species, the AGFD identifies certain species as "species of greatest conservation need" (AGFD 2006).

In general, wildlife populations have declined over the last 10 years. This is likely due to a combination of causes including drought, habitat loss due to urban development, habitat degradation and fragmentation from roads and other developments, and increased recreational use. Few species have been tracked closely enough to determine specific trends; however, AGFD does track game species such as bighorn sheep and mule deer.

Generally, mammal populations are expected to diminish without active management due to extended drought conditions, urban expansion, and habitat loss and fragmentation. Small mammal populations are cyclical and become depressed during years of below-normal precipitation when forage plants, water, and seeds are scarce or less nutritious. Predator populations will eventually follow and are expected to drop due to fewer prey species and other factors. Human-wildlife interactions are expected to increase under drought conditions because wildlife could potentially be forced farther from their home ranges into urban areas to find food and water.

3.2.6.1. Wildlife Habitats

While the BLM keeps abreast of wildlife-population trends and takes appropriate steps to conserve or improve the habitats that sustain species, responsibility for animal-population management is delegated to the State, specifically the AGFD. For federally listed species, population-management responsibility falls to the U.S. Fish and Wildlife Service (USFWS), which collaborates with State agencies, academics, and other recognized technical experts. The USFWS also regulates hunted migratory species.

Vegetation resources management provides the foundation for wildlife and habitat management on public lands. Wildlife typically occupies or avoids habitats in predictable ways based on life history requirements of individual species. The Planning Area supports a variety of natural

vegetative communities and landscape features that offer a diversity of wildlife habitat types. While these habitat types correspond with the associated vegetative communities, they are also defined by a number of distinct landscape features such as rock outcrops and hillsides, cliffs and taluses, mesquite bosques, and mines. All such features contribute to the diversity and abundance of wildlife in the Planning Area as they generally provide a microhabitat for wildlife uniquely adapted to, or dependent upon, these features. To maintain diverse, viable, and abundant populations of wildlife, a mosaic of biologically and structurally diverse habitat types is thus necessary.

Habitat Connectivity/Fragmentation

While maintaining patches of diverse habitats is important, ensuring connectivity of these habitat patches also is important to provide plants and wildlife the ability to move along elevation gradients and between habitat areas. As climatic conditions change, both wildlife and plants must be able to adapt to their associated changing niches by expanding and contracting their range; however, developments related to human population growth such as subdivisions, highways, and related infrastructure create barriers to wildlife and plant movement, resulting in what is known as habitat fragmentation.

While the Planning Area includes numerous isolated tracts of public lands that are interspersed with other Federal, State, tribal, and private lands, most of the public lands consist of large, consolidated areas that have the potential to provide connectivity between important habitat patches for various wildlife species, habitats on public lands are fragmented. This is due to the existing transportation network crisscrossing public lands (including one interstate highway, several state highways, and numerous paved and unpaved county and secondary roads) and utility and energy rights-of-way (ROWs). Certain large tracts of public land also are separated from nearby public lands by population centers, agricultural areas, and other such developments.

Wildlife Movement Corridors

In order to reduce habitat fragmentation and ensure connectivity in important areas, the BLM took into consideration recommendations from the Arizona's Wildlife Linkages Workgroup (AWLW) strategy of 2006 to develop movement corridors that maintain habitat connectivity. The AWLW is a collaborative effort between public- and private-sector organizations formed to address habitat fragmentation through a comprehensive, systematic approach. Through this partnership and commitment, a statewide assessment was conducted to identify large blocks of habitat, potential wildlife-movement corridors between and through these habitats, and factors that could threaten linkage zones for wildlife. The AWLW took the first step in a process to identify areas of importance for wildlife movement throughout the State. As a part of the workgroup, the BLM embraces the ideology of linkage corridors and is proposing movement corridors for wildlife to migrate from one habitat area to another, especially within priority species habitats where the BLM has management authority.

Wildlife Water Developments

While most wildlife species within the Planning Area are adapted to drought conditions and limited sources of permanent water, approximately 45 wildlife-water catchments and spring developments occur on public lands within the Planning Area. These catchments and spring developments provide intermittent or perennial sources of water that support wildlife diversity.

Few, if any, new wildlife-water developments have been constructed in the past 10 years as it is more cost effective to modify and enlarge existing catchments. Modifying and expanding existing developments reduces the need for maintenance and water to replenish the catchments.

The location of wildlife-water catchments varies depending on the priority wildlife species under consideration and the distance to other water sources. For example, wildlife-water sources constructed in lower elevations, primarily for collared peccary (*javelina*) (*Pecari tajacu*) and mule deer (*Odocoileus crooki*), would be placed primarily in the creosote bush-bursage, palo verde-mixed cacti, or xeroriparian communities. By contrast, higher elevation water sources for use by bighorn sheep (*Ovis canadensis mexicana*) are constructed primarily in the palo verde-mixed cacti and Sonoran Desert mountain communities or in the creosote bush-bursage community adjacent to mountains used by bighorn sheep. Numerous livestock waters have been modified to accommodate wildlife use. Many wildlife species use these water sources and return to them regularly. Bats also forage over water developments as they are attracted by the increased abundance of flying insects. Resident bird species may nest and forage in or near water developments year-round, while migratory bird species may forage and rest in these areas during their migration.

3.2.6.2. Threatened, Endangered, and Candidate Wildlife Species

This section focuses on species on public lands within the Planning Area that are addressed in Manual Section 6840 (see footnote1 above) and species listed under the ESA (1973) as threatened or endangered, proposed for listing (candidate species), species of special concern, and those within five years of being delisted. Federally listed species were identified through the USFWS Arizona Ecological Service Office website on June 12, 2009 (USFWS 2009).

Five special status species that occur or potentially occur on public lands in the Planning Area are federally listed under the ESA: the lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), Sonoran pronghorn antelope (*Antilocapra americana sonoriensis*), Sonoran Desert population of the bald eagle (*Haliaeetus leucocephalus*), southwestern willow flycatcher (*Empidonax traillii extimus*), and Yuma clapper rail (*Rallus longirostris yumanensis*). Two species occurring or potentially occurring on public lands are listed as candidate species: the yellow-billed cuckoo (*Coccyzus americanus*) and the Tucson shovel-nosed snake (*Chionactis occipitalis klauberi*).

Lesser Long-nosed Bat. The endangered lesser long-nosed bat is a nectar-, pollen-, and fruit-eating bat that migrates seasonally from Mexico to southern Arizona and southwestern New Mexico (Arita 1991). The species typically arrives in Arizona in early April, inhabits mainly desert scrub habitats, and departs in mid to late September. The bats roost in caves, abandoned mines, and unoccupied buildings at the base of mountains where agave, saguaro, and organ pipe cacti are present, and fly long distances from their day roosts to forage each night. Potential foraging habitats, in the form of columnar cacti (e.g. saguaros and organ pipe cacti) or agave stands, occur in the Decision Areas (Map 3-3: Federally Protected Plant & Animal Species). There are no documented lesser long-nosed bat roost sites or maternity colonies within the Decision Areas; however, four known maternity colonies do occur near the Arizona-Mexico border on lands not administered by the BLM.

The most significant threat to the survival of the lesser long-nosed bat is habitat loss. The species must have suitable roosts in proximity to adequate food sources both in the southwestern United States, where the young are born during the summer, and at their wintering grounds throughout the arid areas of Mexico (USFWS 1995). While many roost sites in the United States and

Mexico receive some legal protection and are relatively safe because their locations are remote and unknown to the general public, even very slight human disturbance to roosts can displace the species. For example, Fleming (1993) has documented bats temporarily abandoning their roost after only one brief visit by humans. In Mexico, some roosts are severely threatened by efforts to control the vampire bat, which is often confused with other species by farmers and other stakeholders (53 FR 38456).

Threats to food plants also indirectly threaten the lesser long-nosed bat. There is a complex, mutually beneficial relationship between columnar cacti, agaves, and long-nosed bats (Fleming et al. 1995). As native vegetation is increasingly removed for development, other projects, and through grazing, food sources become less and less available near roost sites and along migration routes. The over-harvesting of agave for the legal and illegal manufacture of tequila is particularly detrimental to food sources for the lesser long-nosed bat (53 FR 38456).

There is no widespread consensus on the current status of the overall population of this bat species. Disagreements about the validity of census techniques have kept estimations, even to a higher order of magnitude, from being made (USFWS 1995). Because surveys in Arizona and Mexico conducted between the mid-1970s and 1985 failed to document large numbers of lesser long-nosed bats, it was federally listed as endangered in 1988. Since listing, the species appears to be much more abundant than previously thought, but is still vulnerable because of its gregarious roosting behavior. As many as 150,000 adults and sub-adults may forage in southwestern Arizona on any given summer night. In 1992-1993, a census of 17 roosts in Arizona and Mexico produced estimates of 200 to 130,000 individuals living in any particular roost (USFWS 1995). Ten years of monitoring data (1996-2005) from one known maternity roost within the boundaries of the Lower Sonoran Planning Area (but not on public lands) indicates a general increase in population size.

Sonoran Pronghorn Antelope. The Sonoran pronghorn antelope is listed as a federally endangered subspecies of the American pronghorn that was found over much of southwestern Arizona, northwestern Mexico, and southeastern California in the late 1800s. By the mid-1900s, its numbers and distribution were greatly reduced from historic norms.

Estimates of the Sonoran pronghorn population in Arizona have been collected since 1925. Although these estimates are not directly comparable because of the variety of methods used and geographical areas studied, they all indicate that relatively low numbers of pronghorn (50 to 150 animals) were present in southwestern Arizona within an increasingly small area of distribution. Hunting contributed to the decline of the Sonoran pronghorn before the 1930s but has since been banned (Wright and deVos 1986).

In more recent years, fragmentation, human disturbance, disease, and loss of habitat have been the major factors threatening the subspecies. The most significant habitat fragmentation occurs along the Mexico/United States border, particularly with the installation of the border fence, which inhibits the population's movement between the two countries. Sonoran pronghorn management is further complicated by differing recovery efforts on either side of the border.

The U.S. population primarily is limited to the Barry M. Goldwater Range (BGR), Cabeza Prieta NWR, Organ Pipe Cactus National Monument, and public lands in the Ajo area west of SR 85 in the Lower Sonoran. This animal also is found periodically in the Sentinel Plain south of I-8. Although recovery of the Sonoran pronghorn antelope is an important management priority on public lands where it occurs, these lands constitute less than 4 percent of this animal's current range in the United States (USFWS 2003b).

The area of the Ajo Block in which Sonoran pronghorn occurs lies within the Coyote Flat, Childs, and Cameron grazing allotments (Map 3-4: Sonoran Pronghorn Classification Areas). The Cameron allotment is the only allotment on which this species has been observed in recent years. Although the Ajo Block and Sentinel Plain are both minor components of this animal's active habitat, of the two areas, the Ajo Block currently appears to be more important to the species. In 1997, the USFWS issued a biological opinion (BO) for the Ajo Block allotments and concluded that the proposed grazing activities were not likely to jeopardize the continued existence of the pronghorn (USFWS 1997). In response to a sharp decline in the U.S. Sonoran pronghorn population in 2002 and the continuing severe drought conditions, the BLM amended the Lower Gila South Resource Management Plan (RMP) in 2004 to close the Cameron allotment to livestock grazing and acquire range improvements from the permit holder.

Emergency recovery actions were initiated in an attempt to reverse the recent decline in the status of the U.S. sub-population of the Sonoran pronghorn. The construction of a semi-captive breeding facility in Cabeza Prieta NWR and of water sources and forage enhancement plots in the Planning Area are expected to temper the effects of drought. The U.S. population was at an all-time low in 2002 with drought eliminating all but 22 animals, down from 135 animals the previous year. In 2008-09, the U.S. Sonoran population was estimated at approximately 68 wild animals with another 73 animals in the semi-captive breeding enclosure. Surplus animals are released from the pen annually.

While drought was the direct cause of the Sonoran pronghorn antelope's decline during 2002, the high level of human activities and disturbance on the U.S. side of the antelope's range has intensified the effects of drought. The U.S. sub-population of Sonoran pronghorn antelope has been and is subject to myriad human activities that have the potential to adversely affect the species and its habitat. Such activities include livestock grazing, recreation, military activities on the BGR, and an increasing influx of undocumented aliens (UDAs) and smugglers and corresponding response from the U.S. Border Patrol and other law-enforcement agencies. Further, the range of the U.S. pronghorn subpopulation is limited by highways, fences, canals, railroads, vehicle barriers, and towns that act as physical barriers to movement and prevent pronghorn antelope from accessing foraging areas (USFWS 2003c). Historically, these animals were able to travel many tens of miles across barrier-free habitat to seek out more favorable forage and water (USFWS 2003). Livestock and ROW fences can be a significant cause of pronghorn mortality when they restrict the animals' movements to procure food and water or to escape predation (Yoakum 1978). The species have difficulty jumping over or going through fences; however, fences can be modified to allow safe passage for the pronghorn antelope, as was done within the Cameron, Coyote Flat, and Why grazing allotments (USFWS 1997).

Bald Eagle. The bald eagle is a large bird with a wingspan of 6 to 7.5 feet. Adults are dark brown with a white head and tail and a large yellow beak. Immature eagles are dark with mottled white under the wings and at the base of the tail. The feet of both adults and immatures are bare of feathers.

The USFWS classified the bald eagle in 1978 as endangered in 43 states (including Arizona) and threatened in five other states. The species was not listed in Alaska and it does not occur in Hawaii. In 1995, the species was downlisted to threatened in all recovery regions of the lower 48 states. In 1999, the USFWS proposed to remove the bald eagle from the Federal threatened and endangered species list nationwide. The USFWS removed the bald eagle from federally threatened and endangered species list in August 2007, except for the population in the Sonoran

Desert of Arizona, south of the Mogollon Rim, where it remains with threatened status. This includes the bald eagle population within the Planning Area.

In Arizona, bald eagles typically place their nests within a mile of a creek, lake, or river, although there are some rare exceptions. Nests are placed mostly on cliff edges, rock pinnacles, and in cottonwood trees; however, nests have been found in artificial structures, junipers, pinion pines, sycamores, willows, ponderosa pines, and snags.

Within the Planning Area, a pair of bald eagles has successfully nested near the confluence of the Gila and Salt Rivers in an area referred to as the Pee Posh Wetlands in 2009. These eagles likely forage up and down the rivers and on the adjacent uplands, including portions of the Decision Areas.

Southwestern Willow Flycatcher. The southwestern willow flycatcher is a small (5.75 inches), olive-colored or grayish-brown, neotropical migratory bird that is federally listed as an endangered species. This flycatcher is a riparian obligate species found throughout the Southwest, where it breeds in dense riparian habitats along rivers, streams, or wetland areas where trees and shrubs are adjacent to or near surface water.

Throughout its range, the southwestern willow flycatcher has shown both historic and recent population declines. Its breeding range once extended across southern California, extreme southern Nevada, southern Utah, Arizona, New Mexico, southwestern Colorado, western Texas, and northernmost Sonora and Baja California del Norte (Hubbard 1987; Unitt 1987; Browning 1993). Historically, the southwestern willow flycatcher was widespread in riparian areas throughout the Southwest. Its current range is similar to the historical range, but the quantity of suitable habitat within that range is much reduced from historical levels (USFWS 2002).

The most significant factor in the cause of these declines is the extensive loss, fragmentation, and adverse modification of riparian breeding habitat, particularly cottonwood-willow associations (Katibah 1984; Johnson et al. 1987; Unitt 1987; USFWS 1995). These losses have occurred in connection with urban and agricultural development, fire, water diversion and impoundment, channelization, livestock grazing, off-road vehicle use and recreation, replacement of native habitats by introduced plant species, and hydrological changes resulting from these and other land uses (USFWS 1993; Tibbitts et al. 1994). Brood parasitism by the brown-headed cowbird (Molothrus ater) is another major threat to the southwestern willow flycatcher (Brown 1988; Sogge, 1995a and 1995b; USFWS, 1993 and 1995; Whitfield and Strong 1995).

In 2002, approximately 1,153 southwestern willow flycatcher territories were located among 243 sites in suitable riparian areas throughout the Southwest (Sogge et al. 2003). Currently, there are approximately 430 pairs of southwestern willow flycatchers documented at 37 sites within Arizona. The AGFD has conducted periodic flycatcher surveys along the Gila River within the Planning Area since 2002. One flycatcher was detected once in 2002 in a thin strip of salt cedar that was judged to be marginal habitat. No southwestern willow flycatchers have been detected in the Planning Area since that time (AGFD unpublished).

Critical habitat was formally designated for the species on Oct. 19, 2005, which includes 15 management units totaling 737 miles of river in Arizona, California, Nevada, Utah, and New Mexico (70 FR 60886). No critical habitat for the southwestern willow flycatcher lies in the Decision Areas.

Yuma Clapper Rail. The Yuma Clapper Rail is a chicken-sized bird about 14 inches long. It is listed as endangered (32 FR 4001, March 11, 1967) without critical habitat. It is a marsh bird with long legs and a short tail. Its bill is long, slender, and curved downward slightly. Its anterior coloration is mottled brown with a gray background. Its flanks and underside are dark gray with narrow vertical white stripes that produce a barred effect.

Associated with dense riparian and marsh vegetation, the Yuma Clapper Rail inhabits freshwater or brackish stream sides and marshlands under 4,500 feet in elevation. It requires a wet substrate, such as a mudflat, sandbar, or slough bottom that supports cattail and bulrush stands of moderate to high density adjacent to shorelines.

Historic occupation is uncertain. Yuma Clapper Rail may have occurred in the marshes of the Lower Colorado River and its tributaries in Mexico and the United States. There are no records of the species in U.S. before 1902. A type specimen was taken near Laguna Dam in 1921 in Yuma County, Arizona.

The Yuma Clapper Rail is known to occur along the Colorado River (Yuma, La Paz, and Mohave counties, Arizona), from Lake Mead to Mexico; on the Gila and Salt rivers upstream to the area of the Verde confluence (Maricopa and Pinal counties, Arizona); at Picacho Reservoir (Pinal County, Arizona); and on the Tonto Creek arm of Roosevelt Lake (Gila County). The Yuma Clapper Rail may be expanding into other suitable marsh habitats in western and central Arizona.

Yellow-Billed Cuckoo. The Western yellow-billed cuckoo is a medium sized neotropical migratory bird considered a candidate species by the USFWS. In 2001, the species was determined to warrant listing under the ESA but was precluded by other, higher-priority listing actions (66 FR 38611).

As recently as the 1990s, cuckoo pairs were observed along the Gila River in Maricopa County (Corman 2005). In 1999, 168 pairs and 80 single birds were located in Arizona, based on preliminary results from a statewide survey that covered 265 miles of river and creek bottoms (USFWS 2004). From these results, it is evident that cuckoo numbers in 1999 are substantially less than some previous estimates for Arizona, including a 1976 estimate of 846 pairs for the lower Colorado River and five major tributaries (Groschupf 1987). According to information in the Heritage Data Management System (HDMS) (AGFD 2006), there has not been a single detection of yellow-billed cuckoos in the Decision Area.

The yellow-billed cuckoo historically ranged from southern British Columbia to northern Mexico (Bent 1940). Arizona is believed to contain the largest remaining population of yellow-billed cuckoos. Breeding pairs are found in south, central, and extreme northeast Arizona. Within the Planning Area, cuckoos may be found in riparian woodlands, particularly along the Salt and Gila rivers (Corman 2005).

Habitat loss, degradation, and fragmentation from groundwater pumping, surface-water impoundment, agricultural and urban conversion, invasive species, and overgrazing are the main threats to survival of the western yellow-billed cuckoo (USFWS 2001). Fragmentation effects include the loss of patches large enough to sustain local populations, leading to local extinctions and the potential loss of migratory corridors affecting the birds' ability to recolonize habitat patches (Hunter 1996). Losses have been greatest at lower elevations (below about 3,000 feet) along the Lower Colorado River and its major tributaries, which have been strongly affected by upstream dams, flow alterations, channel modification, and clearing of land for agriculture

(Groschupf 1987). Habitat conservation efforts are ongoing in Arizona outside the Planning Area (USFWS 2004).

Tucson Shovel-Nosed Snake. The Tucson shovel-nosed snake was listed as a candidate species in March 2010 (75 FR 16050). It was recently petitioned for listing as an endangered species; however, its listing is precluded by higher priority actions. The Tucson shovel-nosed snake is a subspecies of shovel-nosed snakes that is considered regionally vulnerable due to habitat loss, which has restricted its range (The Nature Conservancy [TNC 2004]). Much of the lowland valley floor habitat within the species' restricted range has been cleared or severely impacted by agricultural and urban development. The snake's distribution is currently limited to portions of Pinal, Maricopa, and Pima counties, with its greatest abundance believed to be west of Mobile in the SDNM (P. Rosen, personal comm.).

The shovel-nosed snake is found in areas with soft, sandy loams; loose soil; fine, wind-blown sands (such as in washes); or occasionally on rocky hillsides with pockets of sand among rocks (Stebbins 1985, Pima County 2001, TNC 2004). The snake requires these deep valley fill soils for burrowing and nesting. The western shovel-nosed snake utilizes the soil substrate around creosote bushes as foraging habitat (Pima County 2001). Creosote bushes also serve as escape habitat (Stebbins 1985, Pima County 2001).

The Tucson shovel-nosed snake was found at sites with soils that have a high percentage (ranging from 49 to 85 percent) of fine sand, silt, and clay (classified as sandy loams, loamy sands, gravelly-sandy loams, and silty-sandy loams (TNC 2004). The species was found in areas of the SDNM that correspond to creosote bush-bursage Desert Scrub and Valley Xeroriparian Scrub (i.e. ephemeral wash) communities.

Sonoran Desert Tortoise. There are two populations of desert tortoise: the Mojave and the Sonoran. The Mojave population is federally listed as a threatened species and inhabits the area north and west of the Colorado River. The Sonoran population includes tortoises south and east of the Colorado River in Arizona and extends south into Mexico (Arizona Interagency Desert Tortoise Team 2000. Under Arizona State Law, it is unlawful to collect wild desert tortoises or release captive desert tortoises into the wild (ARS 17-101).

Only the Sonoran population occurs in the Planning Area, and in December of 2010, the Sonoran population was added to the USFWS's candidate species list (FR Vol. 75, No. 239, page 78094). The Sonoran population is vulnerable to habitat loss and degradation, habitat fragmentation, genetic contamination, collection, and disease (AGFD 1996). The BLM has a disproportionate responsibility for the conservation of desert tortoise because the agency manages the majority of desert tortoise habitat across the species' entire range (BLM 1990). To address its management responsibilities, the BLM has developed a management plan for desert tortoise on public lands and a strategy for carrying out the plan in Arizona, Strategy for Desert Tortoise Habitat Management on Public Lands in Arizona: A Rangewide Plan (BLM 1990). The BLM characterizes tortoise habitat on their managed lands into three categories (see Map 3-3: Federally Protected Wildlife & Plant Species). Category I desert tortoise habitat includes habitat that is necessary to maintain populations with the highest densities, which are stable or increasing, and experiences the fewest conflicts with current land uses. Category II habitats may support stable populations and/or are contiguous with medium to high-density habitat. Category III habitats are the least manageable and contain medium to subpar habitats; however, these areas do exist between Category I and II habitats and should be managed for dispersal between Category I and II habitats. The goal of the BLM is to maintain stable and viable populations with no net loss

of habitat in Category I and II habitats and to limit population declines to the extent possible in Category III habitats by mitigating impacts.

The Decision Areas are regionally significant for desert tortoise conservation as they contain a large portion of the total Category I habitat in Arizona, including a portion of the largest contiguous Category I habitat (238,790 acres) in the Sand Tank and Sauceda mountains. As delineated by the BLM, the majority of desert tortoise habitat in the Decision Areas occurs on rocky slopes where tortoises are free from most human impacts and associated disturbance. Paved and secondary roads dissect desert tortoise habitat and may represent a mortality risk or an impediment to movement across otherwise suitable habitat.

Regional trends in land use and other human activities potentially threaten the Sonoran population of desert tortoise. Sustained urban expansion in the Phoenix and Tucson areas continues to lead to loss of habitat for the tortoise. In addition to habitat loss, other correlates of human development potentially affect the desert tortoise in the region, which include tortoise collection, release of pet tortoises that introduce diseases into native desert tortoise populations, feral animals that prey on tortoises, and removal of habitat components such as boulders desert tortoises use for shelter sites. While desert tortoise are long lived, they typically have low recruitment rates. As a result, increases in mortality rates above natural rates may not be offset (Arizona Interagency Desert Tortoise Team 2000). The habitat preference for the Sonoran populations of the desert tortoise consists of palo verde-mixed-cacti vegetation communities on rocky or bouldery slopes below 4,000 feet in elevation.

Cactus Ferruginous Pygmy-Owl. The cactus ferruginous pygmy-owl is a small, non-migratory bird approximately 6.75 inches in length. Its diet includes other birds, lizards, insects, and small mammals (USFWS 2003a). The pygmy-owl is primarily diurnal but can be active at dawn and dusk, as well. Fledging and dispersal occurs from June through August *(Federal Register 2002)*.

Although the cactus ferruginous pygmy-owl was federally listed in 1997 as endangered in the Arizona portion of its range (62 FR 10730), the USFWS delisted the species in 2006 (71 FR 19425) following litigation. While pygmy-owls are currently not listed, the species has been petitioned for listing under the ESA. The USFWS issued a 90-day finding on the petition, finding it was valid and presented substantial evidence that listing of the pygmy-owl may be warranted (73 FR 31418). The USFWS currently is working on the status review of this species to determine if listing is warranted. Until such review is completed and a final decision is made, the pygmy-owl is not protected under the ESA. The species continues to receive Federal protection under the Migratory Bird Treaty Act.

A significant threat to the pygmy-owl in Arizona is the loss and fragmentation of habitat. The complete removal of vegetation and natural features, as well as the infrastructure required for many large-scale residential developments, directly and indirectly influences pygmy-owl survival and recovery. In addition, livestock grazing may threaten the pygmy-owl through the destruction or modification of its habitat (BLM 1988).

In 2002, the USFWS issued a BO for the five grazing allotments near Ajo. The opinion concluded that grazing activities may, but are not likely to, adversely affect the pygmy-owl when implementing the conservation measures and applying the "Not Likely to Adversely Affect" criteria identified in the Guidance Criteria for Determinations of Effects of Grazing Permit Issuance and Renewal on Threatened and Endangered Species (USFWS 1999).

3.2.6.3. BLM Sensitive and Other Priority Wildlife Species

With the exception of the federally listed and candidate species discussed above, the main groups of priority species are discussed below. Fish species are not discussed due to the limited amount of water and suitable habitat available for management on public lands within in the Planning Area.

Reptiles and Amphibians

In addition to desert tortoise, the Planning Area supports a variety of reptiles, including priority species, due to a diversity of vegetation communities and habitat types. Some reptiles prefer dense brushy or rocky areas, such as rosy boas (*Lichanura trivirgata*) and chuckwallas (*Sauromalus ater*), whereas others inhabit areas that are more open, such as sidewinders (*Crotalus cerastrus*) and desert iguanas *(Dipsosaurus dorsalis*).

The Decision Area's general lack of open water severely limits habitat for amphibians, which require wetland sites or ponds for at least part of their life cycle. These sites are generally limited to ephemeral rainwater collection areas such as impoundments, including the water retention dikes in the Vekol Valley; earthen livestock waters; and depressions in rocks. These areas support priority amphibian species such as the Sonoran green toad (*Bufo retiformis*), Great Plains narrow-mouthed toads (*Gastrophryne olivacea*), and Sonoran Desert toads (*Bufo alvarius*). Some portions of the Gila River are perennial and provide habitat for amphibians, including the non-native bullfrog.

Amphibian populations have seen dramatic declines worldwide. Disease, drought, environmental pollution, invasive species, and habitat loss appear to be the primary contributors to the decline of amphibians. Reptile populations are subject to habitat loss, direct mortality from vehicle traffic, drought, disease, and collection. Specific trend information for reptiles and amphibians is not available for the Planning Area. Protection of valley bottoms, vegetation structure, and rocky substrates could potentially maintain healthy reptile and amphibian populations.

Raptors

Golden Eagle. The plumage color of golden eagles ranges from black-brown to dark brown, with a striking golden-buff crown and nape. The upper wings also have an irregular lighter area. Immature birds resemble adults, but have a duller more mottled appearance, a white-banded tail, and a white patch at the carpal joint. Such colors gradually disappear until full adult plumage is reached in the fifth year.

In North America, golden eagle populations have declined over the past century; however, it is faring better than populations on a global scale. The main threat is habitat destruction, which by the late 19th century already had driven golden eagles from some regions they used to inhabit. In the 20th century, organochloride and heavy metal poisonings were also commonplace, but these have declined due to tighter regulations on pollution. Within the United States, the golden eagle is legally protected under the Bald and Golden Eagle Protection Act.

While golden eagles are uncommon throughout the Planning Area, they have been observed in many parts of the Decision Areas. There are no documented golden eagle nests in the Planning Area; however, systematic surveys for nesting golden eagles have not been conducted.

Other Raptors. Red-tailed hawks (*Buteo jamaicensis*), Harris' hawks (*Parabuteo unicinctus*), and American kestrels (*Falco sparvarius*) are some raptors that occur within the Planning Area. Many raptor species such as golden eagles and peregrine falcons (*Falco peregrinus*) use cliff faces and rocky ledges to roost or nest. Owl species documented include western screech owl (*Megascops kennicottii*), great-horned owl (*Bubo virgineanus*), elf owl (*Micrathene whitneyi*), barn owl (*Tyto alba*), and cactus ferruginous pygmy-owl.

Trend information for birds is difficult because of migration timing and patterns, climatological changes and events, and human-caused effects. Some of these changes may positively affect one species while negatively affecting another species. Specific trend information, by species, beginning in 1966 is available in the U.S. Geological Survey's (USGS's) North American Breeding Bird Survey at http://www.mbr-pwrc.usgs.gov/bbs/.

Game and Other Species of Interest

Small Game Species. In Arizona, small game species include but are not limited to small mammals, upland game birds, and migratory game birds. Common small-game species on public lands in the Planning Area include cottontail rabbits (Sylvilagus audubonii), Gambel's quail (Callipepla gambelii), mourning dove (Zenaida macroura), and white-winged dove (Z. asiatica). Populations of mourning doves in the Western Management Unit, which includes Arizona, have shown a downward trend since 1966, the year population-trend data collection began (Dolton and Rau 2006). Quail reproduction in Arizona depends on winter/spring precipitation to produce abundant forage and insects to sustain the coveys. The lack of precipitation during this critical time results in low reproduction and decreased population levels.

Furbearers and Predators. Furbearers in the Decision Area include but are not limited to raccoons (*Procyon lotor*), ringtail cats (*Bassariscus astutus*), and bobcats (*Lynx rufus*). Bobcats are also grouped with predators along with coyotes (*Canis latrans*), gray foxes (*Urocyon cinereoargenteus*), striped and spotted skunks (*Mephitis mephitis* and *Spilogale putorius*), and badgers (*Taxidea taxus*).

Big Game Animals. Big game animals found on public lands in the Planning Area include desert bighorn sheep *(Ovis canadensis mexicana*), javelina (*Pecari tajacu*), mountain lion (*Puma concolor*), mule deer (*Odocoileus hemionous crooki*), and white-tailed deer (*O. virginianus couesi*). See Map 3-4: Sonoran Pronghorn Classification Areas for known mapped habitats.

Bighorn Sheep. Bighorn sheep typically are found in dry, inaccessible mountainous areas in foothills near rocky cliffs and seasonally available water sources. Bighorn sheep disperse between mountain ranges and most often are observed crossing during cooler weather (Monson and Sumner 1980). Wildlife movement corridors between mountain ranges are an important habitat and genetic diversity component for bighorn sheep and other wildlife in the Planning Area. The BLM participates with the AGFD and other agencies in the ongoing effort of identifying appropriate linkage corridors to allow the management of multiple resource uses and fragmented land parcels in such a way as to facilitate movements of wildlife and aid in maintaining genetic diversity

The BLM published an ecosystem-management strategy for desert bighorn sheep habitat on public lands (BLM 1995). Guidelines set forth in the Rangewide Plan (BLM 1988, 1995) include providing maximum habitat protection to lambing grounds, migration routes, mineral licks, and permanent water sources. The guidelines also propose fencing standards requiring

mitigation plans and surface use stipulations, supporting habitat enhancement projects, research, and outreach in bighorn sheep habitat.

Domestic livestock, particularly domestic sheep, can transmit certain diseases to bighorn sheep. The major disease posing a threat is Pasturella, which is a bacterium that occurs in nasal passages of both bighorn sheep and domestic sheep and goats. When Pasturella is introduced to big horn sheep, it can cause respiratory issues such as pneumonia, which can ultimately lead to mortality of individuals or entire herds.

Bureau of Land Management Instruction Memorandum (IM) No. 98-140, Revised Guidelines for Management of Domestic Sheep and Goats in Native Wild Sheep Habitats, sets forth guidelines that pertain to the management of domestic sheep and goats in native sheep habitats. This document outlines mitigation, adaptive management, and best management practices for native wild sheep populations. Such guidelines include not allowing domestic sheep grazing within 9 miles of wild sheep habitats, which would reduce the potential for disease introduction from domestic sheep and goats into native sheep habitats and populations.

Migratory Birds

All migratory birds receive protection under the Migratory Bird Treaty Act, while Executive Order (EO) 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds, signed in January 2001) requires the BLM to evaluate the effects of Federal actions on migratory birds. In addition, IM 2008-050 (Migratory Bird Treaty Act: Interim Management Guidance) provides interim guidance to enhance coordination and communication toward meeting the BLM's responsibilities under the Migratory Bird Treaty Act and EO 13186. Such guidance establishes a consistent approach for addressing migratory bird populations and habitats when adopting, revising, or amending land use plans and when making project-level implementation decisions until a national Memorandum of Understanding (MOU) with the USFWS is established.

There are approximately 450 non-game bird species native to Arizona, with about 291 species documented as breeding in the State. Of the breeding species, 237 are neotropical migrants, or birds that breed in the United States or Canada and winter to the south, from Mexico to South America. While a migratory bird inventory has not been completed, 163 of Arizona's neotropical migrants are known to nest in the Planning Area regularly or irregularly (AGFD 2001a). Such species depend on quality habitats containing adequate substrate and cover for nesting purposes, as well as diverse vegetation to supply food for brood rearing. The Decision Areas contain breeding, nesting, brood rearing, and wintering areas, as well as migration routes that are important for migratory birds.

Bats

Bat species are considered sensitive species in Arizona and are best protected by conserving roosting sites and foraging areas. Although little information is available specifically for bats, a number of bat species occur on or near public lands in the Planning Area. Mines and natural caves, as well as crevices associated with cliffs, provide potential roosting habitat for bats. Bats may also roost on trees, beneath loose tree bark, under bridges, and in open buildings. The big brown bat (*Eptesicus fuscus*), cave myotis (*Myotis velifer*), occult little brown bat (*Myotis lucifugus occultus*), California leaf-nosed bat (*Macrotus californicus*), pallid bat (*Antrozous pallidus*), western pipistrelle (*Pipistrellus hesperus*), and fringed myotis (*Myotis thysanodes*) are most likely to inhabit public lands.

3.2.6.4. Non-native Invasive Animal Species

Invasive species occur throughout the Planning Area and generally can be defined as "alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health" (BLM 1999). Invasive species, which have often been introduced accidentally or purposely into ecosystems by humans, can be detrimental to the environment by directly causing harm to native species through either predation or competition (Van Devender et al. 1997). This, in turn, can affect general ecosystem functions.

Invasive animals, both terrestrial and aquatic, include starlings (*Sturnus vulgaris*), Eurasian collared doves (*Streptopelia decaocto*), crayfish (*Procambarus clarkii*), bullfrogs (*Rana catesbeiana*), Rio Grande leopard frogs (*Rana berlandieri*), and Mediterranean geckos (*Hemidactylus turcicus*). Infestation by some of these species is so great that some native species are threatened with extirpation due to competition as well as habitat degradation and destruction.

3.2.7. SOIL RESOURCES

Soils are primarily the product of climate, parent material (i.e. underlying bedrock lithology or alluvium), and landscape. The Natural Resources Conservation Service (NRCS), formally known as the Soil Conservation Service (SCS), completed five soil surveys that, when combined, cover most of the Planning Area: Maricopa County, Central Part (SCS 1977); Eastern Maricopa and Northern Pinal Counties (SCS 1974); Pinal County, Western Part (SCS 1991); Gila River Indian Reservation (NRCS 1991); and Gila Bend-Ajo Area (NRCS 1997). (See Map 3-6: Soil Types.) A small part of the Planning Area, principally the Sand Tank Mountains in the Monument, falls outside these published reports.

Landforms in the Planning Area consist of broad, alluvial basin floors separated by basaltic or granitic mountains, hills, and rock outcrops, dissected by several major drainages and numerous ephemeral ones. In the western half, which includes most of the public land managed in the Lower Sonoran, the dominant basin soils are deep, usually calcareous, sandy loams (Gunsight, Denure, and Rillito soils). In the eastern and southeastern portions, including areas in the Santa Cruz Basin, Casa Grande and Mohall soils are more common. Casa Grande soils developed in sediments deposited along the axis of the Santa Cruz River, with Mohall soils forming on tributary alluvial fans (NRCS 1991; SCS 1991). Organic material and sodium contents are low in soils throughout the Planning Area.

Upland parts of the basins are carved by desert washes with soils that are coarse- to medium-textured and cobbly to gravelly on the surface. Glocker (SCS 1991) notes several fan surfaces preserved in the area, which have some of the oldest soils in the Planning Area. Soils located higher on broad alluvial fans often derive directly from upslope bedrock, and underlain by a caliche (hardened calcium carbonate) layer (i.e. Cipriano). Farther down on the alluvial fan, soils, such as Denure and Dateland, often occur with loamier texture in the upper horizons and less distinct carbonate layering.

Several large desert ephemeral (i.e. xeroriparian) washes divide the Planning Area. Deep, stratified sands, silts, and cobbles underlie the channels and floodplains with textures dependent on flow regimes. Some cobbly reaches along the Gila and Salt rivers are relics of the period before upstream dams diverted the rivers' perennial flows. More loamy soils exist on the higher floodplains. In the areas inundated by Painted Rock Dam, silt and clay layers of desiccation and salt accumulation are found, and, in some places, these layers are scoured by subsequent

flood events. Terrace soils that parallel the main channel of these rivers on one or both sides are coarse, gravelly, and stratified with low organic content (less than 1 percent), and recently active sediments overlaying older, valley alluvium or bedrock. Dunes are occasionally found where fine sand and consistent winds are common.

Current soil conditions are evaluated on grazing allotments, which make up a large percentage of the Decision Areas. Quantitative soil-resource data is available from the NRCS soil surveys. Some additional quantitative and qualitative data are collected for the Arizona Standards for Rangeland Health grazing-allotment evaluations. These data estimate the current condition and trends of soil resources based on periodic measurement of surface condition indicators. Five indicators for which some observations have been made include:

- **Total vegetative canopy cover**: These data are collected on line transects that are usually established as permanent monitoring sites, called key areas, in two or three key areas of each grazing allotment. The land health standard for cover has been set as the percent cover that is appropriate for each ecological site. Nearly all allotments are meeting land health standards showing that the percentage of canopy cover is sufficient to protect most of the soil surfaces in the Lower Sonoran and SDNM from accelerated erosion. This conclusion is supported by direct observation of existing erosion in the Decision Areas, which currently shows slight erosion in all but a few severely disturbed surfaces, such as roads, ROWs, and at livestock watering sites.

- **Bare ground**: Other cover data that is collected at key areas to factor into soil stability includes percentage of gravel and stone cover, litter presence, and cryptogams (biotic crusts), all of which help prevent soil erosion, and bare ground. Bare ground is an important measure of erosion potential. The proportion of bare ground on arid ecological sites is relatively high even on sites that are meeting standards. These sites may produce comparatively high runoff during precipitation, but rates of surface erosion are not abnormal or accelerated. As in the case of the cover indicator, most of the Decision Areas are meeting standards, which is consistent with observations that, except on or near roads and other major surface disturbances, little accelerated erosion is occurring in the Decision Areas.

- **Density of unsurfaced roads:** The average density of unsurfaced roads (i.e. roads without asphalt, gravel, or long-lasting palliative) is relatively low in both Decision Areas: below 1.2 miles of road per section throughout most of the Decision Areas. Road density is much greater within a few areas, such as Buckeye Hills and other northern areas of the Lower Sonoran and the area near the west end of the Anza Trail in the SDNM that have a density of 1.4 miles per section or higher.

- **Miles of roads or other disturbances that are on soils sensitive to wind or water erosion:** About 20 percent of the roads in the Decision Areas that are currently open are on soils that are classified by NRCS as sensitive to wind and water erosion. Some water erosion has already been observed on or near roads that have channeled runoff in the north portion of the Lower Sonoran and north of SR 238 in the SDNM. Eighty-eight miles of roads have been temporarily closed to motorized vehicle traffic due to the risk of wind and water erosion from roads with fine-textured surfaces that have been damaged by the disturbance of traffic.

- **Area of protective desert pavement or biological soil crusts that have been disturbed:** Desert pavement and biological soil crusts are located throughout both Decision Areas. They are very effective in preventing soil erosion, but are quite vulnerable if disturbed. Fine material that sifts below desert pavement is easily displaced by wind or water if the protective

layer on the surface is disturbed. Similar effects occur when biological soil crusts are disturbed. Due to the lack of data on the total area covered by desert pavement or biological soil crusts in the Decision Area, this indicator is qualitative in nature.

Desert pavement, found in parts of the Planning Area, is a dense surface layer of rounded stones, sometimes coated with desert varnish and underlain by a porous, skeletal layer of wind-transported silt or fine sand. The formation of desert pavement appears to be the result of surface heaving, which allows wind-deposited, fine-grained particles to sort downward and exposes the coarser layer (McFadden et al. 1998).

Biological soil crusts, also known as biotic crusts or cryptogamic soils, are found throughout the Planning Area and can be composed of cyanobacteria, green algae, lichen, mosses, microfungi, and other bacteria (Belnap et al. 2001). In the Sonoran Desert, these crusts most commonly include heterocystic cyanobacteria, gelatinous lichen, squamulose lichen, and short mosses and are most often present in areas with flat topography (unlike cooler, higher-elevation basin and range deserts). These soils represent a critical component of the arid West's ecology because they tend to fix nitrogen and contribute to the sparse nutrients available to desert plants.

Both biotic crusts and desert pavement provide protection against wind and surface-sheet erosion. Biological soil crusts appear to be indicators of rangeland health (Cameron 1960; Kade and Warren 2002) and may require considerable time to revegetate (Kade and Warren 2002). Little study or mapping of either desert pavement or biological soil crusts has occurred in the Sonoran Desert. Disturbed areas are most often found in close proximity to livestock waters, where the livestock generate heavily used trails, and in areas where intense cross-country off-highway vehicle (OHV) use creates new routes. Available trend data show generally static conditions for desert pavement and biological soil crusts.

Soil disturbance and compaction are present in long-term use areas, including livestock-congregation sites, roads, and parking areas. Larger areas of accelerated erosion and sedimentation are mainly in the Vekol Valley south of I-8. Historical uses, such as construction of water-spreading dikes in areas with higher erosion hazards, created these effects. While uses that could cause soil resource degradation have increased in the Planning Area over the last 20 years, protective and restoration practices have generally kept pace. On the other hand, ongoing drought and intensive dispersed uses, such as illegal off-road travel, continue to threaten soil resource conditions, as indicated by BLM grazing allotment records, NRCS ecological site guides, NRCS range health reference sheets, and NRCS soils surveys. If the current regional drought continues, impacts from recreation, livestock grazing, and other ground-disturbing uses could be compounded. Similarly, if urban demands for water increase on lands adjacent to the Decision Areas, soil loss could worsen.

Based on best-available data and analysis in the allotment evaluations, accelerated soil erosion occurs infrequently. Water-erosion hazard is highest on the coarse-textured, steeper soils found in the granitic soils in the western and southwestern portions of the Planning Area. Wind-erosion hazards are highest on the fine-textured, irrigated soils of the major drainages. Except for data collected on allotments, very little soil condition data is collected that could be used to indicate trends.

Table 3.2, "Lower Sonoran & SDNM Decision Area Soils (BLM Land)" (p. 282) identifies major soil associations and erosion potential, while Map 3-7: Soil & Erosion Potential shows areas of wind-erosion potential. These are typically areas of Mohall, Dateland, Denure, Indio, and Casa

Grande soils. Younger soils with silty surfaces and little cover, often occurring on drainage floodplains in the Planning Area, are the most susceptible to wind erosion.

Table 3.2. Lower Sonoran & SDNM Decision Area Soils (BLM Land)

Map Name	Texture	Slope %	Water Erosion Potential	Wind Erosion Potential	Elevation of Occurrence	Acres	% of Total
Scattered Parcels							
Hyder-Coolidge-Cipriano-Cherioni	basalt flow, colluvium, cobbly	1%-65%	moderate	slight	430-4,400	389,700	28%
Gunsight-Rillito-Denure-Chuckawalla	gravelly, sandy loam	1%-40%	moderate/high	slight	430-3,100	477,500	34%
Mohall-Denure-Coolidge	gravelly, sandy loam	0%-8%	moderate/high	high	350-2,400	228,500	16%
Rock outcrop-Quilotosa-Momoli	granitic colluvium, stony	3%-55%	severe	slight	800-2,800	216,600	15%
Rock outcrop-Quilotosa-Hyder-Gachado	extremely gravelly sand	5%-65%	severe	slight	1,150-3,100	38,500	3%
Denure-Dateland	loam	0%-8%	slight	moderate	1,140-2,000	34,000	2%
Why-Wellton-Gunsight-Growler-Denure	loam	0%-7%	very slight	moderate	550-800	9,900	1%
Spudrock-Rock outcrop-Cellar	no data	25%-60%	moderate/high	no data	3,300-5,200	3,700	<1%
Tremant-Pinamt-Ebon	gravelly loam	0%-12%	moderate/high	no data	1,400-2,600	2,600	<1%
Pinaleno - Eba	no data	5%-30%	moderate/high	no data	3,650-3,900	200	<1%

Soils in the SDNM have many soil series and associations in common with the Lower Sonoran. On the other hand, there is a significant difference between the geology of Oatman Mountains and Sentinel Plains in the Lower Sonoran and that of the Maricopa Mountains in the Monument. The dominant bedrock parent material in the Lower Sonoran is basaltic, while in the SDNM, granitic parent material predominates with gneiss (metamorphic rock) mixed in. The vegetation communities are similar desert shrub types, and the potential use and management is also similar, but granitic material is often more prone to water erosion. Rutting and roadway damage from vehicle use in the area between the North and South Maricopa Mountains is consistent with the more fragile soil types.

3.2.8. VEGETATION RESOURCES

The Planning Area lies within two different Major Land Resource Areas (MLRAs), as defined by the NRCS's soil surveys. They are the Sonoran Basin and Range and Arizona Mogollon Chaparral. An MLRA is a broad geographic area characterized by a particular pattern of soils, climate, water resources, vegetation, and land use. Each MLRA has subdivisions based on precipitation zones in which rangeland and forestland occur, and is further divided into ecological sites. The most common ecological sites within the Planning Area are identified in the plant community descriptions below.

Public lands support a variety of upland vegetation communities and a riparian plant community along the Gila River. These vegetative communities are determined in large part by site-specific topography, soil type, and climatic conditions. Vegetative community classifications follow the USGS's Gap Analysis Program (GAP) vegetation community map system.

3.2.8.1. Vegetation Communities

Eight vegetation communities are found on the Decision Areas. These are detailed in Table 3.3, "Vegetative Communities on Public Lands in the Planning Area" (p. 283)and illustrated on Map 3-8: Vegetative Communities. Although boundaries between vegetative communities are not precise, as several types or developmental stages may be found in any vegetative community, the grouping system can be used to describe vegetation over vast regions, such as the Planning Area.

Table 3.3. Vegetative Communities on Public Lands in the Planning Area

	Acres and Percent of Vegetative Community			
	Total on Public Lands		Applicable Decision Areas	
Vegetative Community	Acres	Percent	Lower Sonoran	SDNM
Creosote Bush-Bursage	777,300	54.87%	597,700	179,600
Palo Verde-Mixed Cacti	615,300	43.43%	312,000	303,300
Riparian (within Fred J. Weiler Green Belt)	447	0.03%	447	0
Apacherian-Chihuahuan Mesquite Upland Scrub	3,800	0.27%	3,400	400
Sonoran Mid-Elevation Desert Scrub (Woodlands)	3,800	0.27%	1,800	2,000
Mogollon Chaparral	1,500	0.11%	1,400	100
Desert Grassland	1,054	0.07%	0	1,054
Desert Washes (Xeroriparian), Linear Inclusion of Other Vegetation Communities	2,628 miles[1]	N/A	1,658 miles[1]	970 miles[1]
Total public lands in Planning Area	1,416,600[2]	99.05%	930,200[2]	486,400[2]

[1]Data Source: USGS 1:100,000 scale topographic quadrangles. Desert washes are measured in miles, not acres, so are not included in area totals. Vegetation community mapping is currently not available at a high enough resolution to distinguish desert wash communities from dominant vegetation communities surrounding them.

[2]Totals do not add up because some plant communities are too small to be included in this list.

Creosote Bush-Bursage

The creosote bush-bursage is considered a subgroup of the Sonoran desert scrub vegetative community. It covers a greater percentage of Planning Area public lands than all other vegetative communities combined (55 percent). Occurring at elevations from 400 to 3,000 feet above sea level, it is the most arid of the vegetation communities, consisting primarily of creosote bush and white or triangle leaf bursage (Shreve 1951; Brown 1994). This vegetative community is most associated with the limy fan, limy upland deep, and sandy loam deep ecological sites in the 2-inch to 7-inch, 7-inch to 10-inch, and 10-inch to 13-inch precipitation zones.

Palo Verde-Mixed Cacti

The palo verde-mixed cacti vegetative community is another subgroup of the Sonoran desert scrub community and is the second most prevalent on public lands in the Planning Area, covering 44 percent. It is found at elevations from approximately 1,500 to 4,500 feet above sea level. Compared to the creosote bush-bursage community, this community is found in areas with different soil types, higher rainfall, and higher elevation gradients and contains a greater diversity of plant and wildlife species. Vegetation in the community consists of extensive stands

of saguaro cacti interspersed with cholla, barrel cacti, palo verde, brittlebush, creosote bush, ocotillo, mesquite, cat claw acacia, and ironwood (Shreve 1951; Brown 1994; Marshall 2000). This vegetative community is most commonly associated with the Limey upland, Granitic hills, Volcanic hills, and Basalt hills ecological sites in the 2-inch to 7-inch, 7-inch to 10-inch, and 10-inch to 13-inch precipitation zones.

Apacherian-Chihuahuan Upland Scrub

Vegetation for this shrubland community typically is dominated by mesquite species (Prosopis glandulosa or Prosopis velutina) and succulents. Other desert scrub/trees that may co-dominate or dominate includes acacia species (Acacia neovernicosa or Acacia constricta) or junipers (Juniperus monosperma or Juniperus coahuilensis). Perennial grass cover is typically low due to deep soils and unavailable moisture. Less than 0.3 percent of the Decision Areas consist of Mogollon chaparral, with the main concentrations occurring in the Globe-Miami area at elevations between 3,400 and 6,000 feet. The NRCS has not completed a soil survey and the associated Ecological Site Description for this community.

Mogollon Chaparral

The Mogollon Chaparral vegetative community is a warm, temperate scrubland containing woody species such as shrub live oak, mountain mahogany, desert ceanothus, and cliffrose. While such vegetation types are found mainly at elevations between 3,400 and 6,000 feet, they can also be found at higher elevations with drier and warmer slopes. Only 0.1 percent of the public lands in the Planning Area consist of Mogollon chaparral, with the main concentrations occurring in the Globe-Miami area. Periodic, naturally occurring, wildland fires are important in maintaining the plant community. Depending upon the fire's temperature, Mogollon Chaparral shrubs typically re-sprout from root crowns or germinate from long-lived seeds following fire. Woodland species now dominate the community, especially near urban areas, with a concomitant reduction in important understory species due to current and past fire suppression strategies. This vegetative community is most associated with the Granitic ecological site in the 12-inch to 16-inch precipitation zone.

Sonoran Mid-Elevation Desert Scrub (Woodlands)

The Sonoran Mid-Elevation Desert Scrub community is found mainly near mountain peaks surrounded by the palo verde-mixed cacti community. It covers approximately 3,800 acres of the Planning Area, receives higher precipitation, and has a higher diversity of native plants than that of the surrounding communities. The vegetation typically is composed of an open shrub layer of creosote bush, narrow leaf goldenbush (Ericameria linearifolia), or flattop buckwheat (Eriogonum fasciculatum) with taller shrubs, such as crucifixion thorn (Canotia holacantha) or jojoba (Simmondsia chinensis). The herbaceous layer generally is sparse. Relic communities of juniper, yucca, and elephant tree have also been observed in the Sonoran Mid-Elevation Desert Scrub community (BLM 1989; PBI 2003). Due to the more remote location of this vegetation type, it has generally escaped human-related impacts. This vegetative community is associated with the volcanic and basalt hills ecological sites in the 7-inch to 10-inch and 10-inch to 13-inch precipitation zones.

Riparian

The proportion of public land occupied by riparian vegetation is extremely small in relation with many of the other vegetation types (less than 0.03 percent), but this community's biological and ecological importance is greater than its limited geographic occurrence. The only riparian area in the Planning Area is associated with the Fred J. Weiler Green Belt along the Gila River, established as a resource conservation area in 1970. The Green Belt includes 45,978 acres of the Gila River channel and floodplain allocated for wildlife and migratory bird management. The BLM manages approximately 447 acres, or 1 percent of the Green Belt, with riparian vegetation. The remaining 99 percent of the Green Belt is in mixed ownership and under various withdrawals for use by other State and Federal agencies. The Gila River once was lined with native cottonwoods, willows, and mesquite bosques, but now contains only small pockets of native vegetation. The majority of it has been replaced with non-native salt cedar or tamarisk (Tamarix ramosissima and T. chinensis), a shift encouraged by changes in functionality and water flow from water impoundments, agriculture, and groundwater pumping. Such changes have resulted in an increased risk of unnatural, high-intensity wildland fires (BLM 2003). Areas appropriate for firebreaks in the Fred J. Weiler Green Belt have been identified to reduce wildfire severity, increase public safety, reduce tamarisk invasion, and restore vegetation to a more native composition.

Desert Washes (Xeroriparian)

The Desert Wash, or xeroriparian, vegetative community occurs as small inclusions in large areas of upland sites. They typically flow only briefly in direct response to significant precipitation events. The vegetation of desert washes is quite variable, ranging from sparse and patchy to moderately dense, and usually occurs along the banks but may occur within the channel. The woody layer typically is intermittent to open, and may be dominated by shrubs and small trees. Common species include mesquite, catclaw acacia, blue palo verde, and desert ironwood. While such plant species also are found in upland habitats, species growing in ephemeral washes commonly are larger and occur at higher densities than in adjacent uplands. This plant community is associated with the sandy wash ecological site in the 2-inch to 7-inch, 7-inch to 10-inch, and 10-inch to 13-inch precipitation zones.

Desert Grassland

The Desert grassland community is characterized as a warm, temperate grassland dominated by tobosa grass and ranging in elevation from 2,300 to 4,900 feet. Only 0.07 percent of public lands in the Planning Area consists of desert grassland. In fact, the only area supporting this community occurs in the southeast portion of the Monument, abutting the Tohono O'odham Indian Reservation. This plant community likely supported occasional wildfire historically, although it is quite arid in nature. It is associated with the Clayey Swale ecological site in the 7-inch to 10-inch precipitation zone.

3.2.8.2. Special Status Plant Species

There are six special status plant species within the Planning Area: one endangered, two candidate and four BLM sensitive. These species occur or potentially occur in the Decision Areas and are listed in Table 3.4, "Special Status Plant Species on Public Lands in the Planning Area" (p. 285).

Table 3.4. Special Status Plant Species on Public Lands in the Planning Area

Common Name	Scientific Name	Status
Arizona Hedgehog Cactus	*Echinocereus triglochidiatus var. arizonicus*	Federal Endangered
Acuña Cactus	*Echinomastus erectocentrus var. acunensis*	Federal Candidate

Common Name	Scientific Name	Status
Murphy Agave	*Agave mupheyi*	Federal Candidate
Kofa Mt. Barberry	*Berberis harrisoniana*	BLM Sensitive
Arizona Sonoran rosewood	*Vauquelinia californica spp. sonorensis*	BLM Sensitive
Tumamoc Globeberry	*Tumamoca macdougalii*	BLM Sensitive

Arizona Hedgehog Cactus. The Arizona hedgehog cactus is an endangered species and was listed in 1979 without critical habitat. It is a diploid, perfect-flowered cactus of southeastern Arizona, southwestern New Mexico, and northern Mexico. It can generally be distinguished from other similar subspecies by its thicker stems and spines. The cactus' flowers are brilliant red, are produced along the side of the stem, and appear in late April to mid-May. The species can be found on dacite or granite bedrock, open slopes, in narrow cracks between boulders, and in the understory of shrubs in the ecological zone between Madrean Evergreen Woodland and Interior Chaparral at elevation of 3,200-5,200 ft). The Arizona hedgehog cactus has been documented in Gila and Pinal counties in central Arizona, including locations in the Planning Area. Exact locations are not provided because illegal collecting threatens the species.

Acuña Cactus. The Acuña cactus (*Echinomastus erectocentrus var. acunensis*) is a candidate species for listing under the ESA. Seven populations are currently known, five in the U. S. and two in Sonora, Mexico. Four out of the five U.S. populations occur in four locations in the Planning Area: one location is on NPS lands in Organ Pipe Cactus National Monument (OPCNM); two locations are on public lands in Coffeepot ACEC (Lower Sonoran) and SDNM; and one location is on private land in Ajo. The cactus is restricted to well-drained knolls and gravel ridges between major washes in Sonoran desert scrub habitat at elevations ranging from 1,300 to 2,000 feet. The amount and quality of habitat for this species are currently not possible to assess due to limited information on its distribution. Recently monitored populations in OPCNM and SDNM range from 40 individuals (Arcadis, Geraghty & Miller and SWCA 1997) to more than 300 individuals (OPCNM 1998; BLM unpublished). Because this species grows in small, widely scattered populations and only a small part of its potential range has been surveyed, it is probable that additional populations have not been detected. The NPS and BLM populations of the Acuña cactus are located solely on Federal lands and are relatively secure; however, they are susceptible to drought conditions and poaching. Individual plants have been illegally removed from OPCNM population study plots (OPCNM 1998). The SDNM population is remote and relatively inaccessible; therefore, it is less at risk from poaching and currently appears relatively stable. The Coffeepot ACEC population is monitored annually and has experienced some decline due to drought conditions. The Ajo population, which is on private land, has been reduced due to impacts associated with mining.

Kofa Barberry. The Kofa barberry (*Berberis harrisoniana*), also known as Harrison's barberry, is a rounded, evergreen shrub that can grow to over 6-feet tall. Their range includes the Kofa Mountains in Yuma and La Paz counties, Sand Tank Mountains in Maricopa County, and north end of the Ajo Mountains in Pima County. The species has 1.6 to 3.5-inch long trifoliate leaves, with three leaflets that taper to a short, stout spine. The plant flowers mid-February to March and fruits in late March to April. The flowers are bright yellow and the fruits are blue-black berries. The Kofa barberry prefers bottoms of deep, shady, rocky canyons with soils derived from andesite or rhyolite, at 2,200 to 3,500 feet in elevation.

Arizona Sonoran Rosewood. The Arizona Sonoran rosewood (*Vauquelinia californica spp. sonorensis*) is a medium-sized tree with a dense, dark green canopy that typically grows up to 16 feet tall but can range from 10-16 feet tall as a large shrub or small tree. The plants' habitat is mainly in southwestern Arizona in the Ajo, Diablo, Mesquite, and Santa Rosa mountains of

Pima County, and Sand Tank Mountains of Maricopa County. The plant can be identified by its leathery leaves that are green on top and white-hairy on bottom. The leaves are approximately ¼ inch to nearly ½ inch wide and up to 4 inches long, with serrated margins and pronounced spines. Flowers are white, approximately ¼ inch to ½ inch wide, and clustered in flat-topped corymbs 2 to 3 inches broad.

Tumamoc Globeberry. Tumamoc Globeberry (*Tumamoca macdougalii*) is a perennial vine of the gourd family that produces fruit. In Arizona, the species' habitat exists from southern Pinal and Maricopa counties into Pima County, where it is widespread. It grows from a tuberous root and features a smooth, slender stem and grasping tendrils. The stems sprout annually and die back after fruiting. The roots typically are 2-6 inches long and united into a woody crown with a short stem. The plants' lacy leaves have three main lobes, each with narrow, linear secondary lobes ½ inch to 1.5 inches long. When the foliage is touched, it gives off a fetid smell. Globeberry flowers are pale yellow to greenish yellow and are united below their middle with male and female organs born in separate flowers. Male flowers outnumber female flowers, and male flowers form in racemes of two to six flowers. The perianth lobes narrow to 1⁄5 of an inch long. Female flowers have shorter lobes and are born singly in axils. Fruits are succulent and berry-like, resembling tiny, round watermelons that are pale green with darker stripes becoming yellow, then turning red when ripe. Seeds consist of two to several per fruit, and are ¼-inch long, quadrate, tubercular-rugose.

3.2.9. VISUAL RESOURCES

The BLM manages the scenic values of public lands through the Visual Resource Management (VRM) program. In a two-step visual resource inventory (VRI) process, objectives are established for four "classes" of visual quality. In the first step of the VRI process, the BLM inventories scenic resources through three indicators: scenic quality, viewer sensitivity, and distance zones.

Scenic quality, which considers the character and diversity of landform, vegetation, water, color, and man-made features, measures the inherent visual appeal of a landscape on a rating scale of "A" (highest appeal) to "C" (lowest appeal). Views with similar ratings are grouped to produce a map, or overlay, of scenic quality units over the Planning Area.

Viewer sensitivity is a measure of expected public concern for change to the scenic quality of each rating unit, and is determined on a scale of high, moderate, or low, based on such factors as user type, amount of use, public interest, adjacent land uses, and presence of special areas. In this step, the BLM considers public comments and other management concerns to adjust the boundaries of the VRM inventory classes or even to change the class.

Distance zones establish the relative visibility of landscapes from major travel routes or observation points, characterized as foreground-middleground, background, and seldom seen.

For the second step of the VRI process, the three indicator maps are overlaid across the Decision Areas, and areas of similar interaction between the three indicators are grouped into VRI Class I, II, III or IV. See Map 3-9: Visual Resource Inventory Classes for the VRI classes identified for the Decision Areas.

The VRI was conducted by Otak, Inc. from October to December 2009 to determine visual values within the Decision Areas at a specific point in time as outlined in BLM VRI Handbook, H-8410-1. Visual resource inventory classes provide the basis for considering visual values in

the RMP process. They do not establish management direction and are not used as a basis for evaluating surface-disturbing activities.

The extent of VRI classes in the Lower Sonoran and SDNM is shown in Table 3.5, " Extent of VRI Class Designations" (p. 288). Approximately 72 percent of the Lower Sonoran is inventoried as Class III or IV, which allow for moderate to major modifications to the visual landscape character. In contrast, approximately 65 percent of the SDNM is managed as Class I or II due to a higher percentage of designated wilderness. Presidential Proclamation 7397 that created the Monument does not specifically refer to scenic resources, but the visual quality of the Monument's landscapes inherently contributes to the natural and cultural resources for which the Monument was established. Wilderness areas and the Juan Batista de Anza NHT within the SDNM could be impacted through visual landscape changes.

Table 3.5. Extent of VRI Class Designations

VRI Class	Lower Sonoran		SDNM	
	Acres	% of Total	Acres	% of Total
I	91,800	9.9%	159,000	33%
II	166,800	17.9%	158,000	32%
III	290,900	31.3%	169,300	35%
IV	380,700	40.9%	100	0%
Total	930,200	100%	486,400	100%

Based on the VRI, the BLM assigned VRMclasses to the Decision Areas to define management objectives for each of the alternative identified in Chapter 2, *Alternatives* (p. 27). While the assignment of classes is ultimately based on management decisions made in the RMP, visual values must be considered throughout the planning process. All proposed actions resulting in surface disturbances must consider the impacts a project may have on visual resources. Management decisions in the RMP must reflect these important values, and may be the driving force for some decisions.

The objectives for VRM classes are:

- Class I: The objective is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

- Class II: The objective is to retain the existing landscape character. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract, the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

- Class III: The objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

- Class IV: The objective is to provide for management activities that require major modification of the existing landscape character. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer

attention; however, every attempt should be made to minimize the impact of these activities, through careful location, minimal disturbance, and repeating of the basic elements.

3.2.9.1. Visual and Scenic Resources

The scenic quality of the Lower Sonoran and SDNM consists of classic Sonoran Desert views, made up of jagged and isolated mountain ranges that are often thickly vegetated along the flanks with "forests" of columnar cactus and scrubby trees and jut dramatically from vast, flat valleys. Valley floors typically are vegetated with unbroken expanses of low growing, woody shrubs. Dominant colors range from dark browns and tans to gray, with textures ranging from coarse and broken in the mountain ranges to smooth on the valley floors. The colors and contrasts provided by permanent water usually are absent; however, ephemeral drainage washes across the valley floors produce intricate, dendritic lines of greener vegetation that relieve the unbroken expanses. Modifications to landscape views in the form of residential developments and infrastructure (i.e. highways, pipelines, and transmission lines) have greatly increased during the last 15 years.

Viewer sensitivity to visual changes in dominant landscapes increases with residential growth. Although numerous factors fuel residential growth, the rugged and open nature of the Sonoran Desert landscape plays, in part, a role in attracting increased numbers of residents. Through public meetings and comments during the planning process, the BLM has learned that the interested public places high concern and value on open space, natural landscapes, and mountain views.

Distance zones may also be affected by residential growth as new and expanded subdivisions provide viewing locations from which additional, landscape change may be noticeable to more residents. Distance zones may also be affected as new travel routes are constructed to accommodate increased population or as heavier traffic occurs on existing routes.

3.2.10. WATER RESOURCES

3.2.10.1. Groundwater

Most groundwater in the Planning Area lies in sand-and-gravel alluvium, filling the basins between rock outcrops and surrounding mountain ranges. The quantity of water stored in these basins varies widely because the numerous rock outcrops and shallow bedrock form barriers to groundwater flow. The alluvial stratigraphy, or layers, is similar in all of the larger basins. It is defined primarily by bedrock structure and associated variations in sedimentary-layer thicknesses that serve to isolate the groundwater and produce large variations in depths and availability. Three hydro-stratigraphic units are in the larger sub-basins: (1) an Upper Unit of coarse-grained basin fill; (2) a Middle Unit that contains finer-grained and evaporate (salt lake) units; and (3) a deep, conglomeratic Lower Unit.

Groundwater Quantity

The main subsurface sources of groundwater in the Planning Area are the Middle Unit and upper interval of the Lower Unit. Over the last 100 years, the Upper Unit has largely been dewatered through use as groundwater levels dropped below its lower boundary. Groundwater withdrawal is continuing throughout the Planning Area.

Deep groundwater monitoring in wells is done in terms of water levels, well yields, and water-quality concentrations. Current and past groundwater monitoring show that groundwater withdrawal for irrigation and potable water for urban development is continuing, as new subdivisions are developed in the Planning Area and near the Decision Areas. Most other uses are small. Increasing water demand for solar energy development in the Decision Areas is probable.

Arizona's 1980 Groundwater Management Act defined boundaries for the State's five Active Management Areas (AMAs) by identifying areas where groundwater pumping has significantly exceeded recharge. The law established guidelines for long-term management, designed to mitigate the effects of groundwater pumping in excess of recharge rates, including subsidence (collapse of a depleted aquifer resulting in sinking and fissuring of the ground at the surface) and other immediate impacts.

The Planning Area includes portions of twelve groundwater basins, including portions of special-management areas in the Harquahala Irrigation Non-Expansion Area (INA) and the Phoenix, Pinal, and Tucson AMAs (Map 3-10: Groundwater Basins). The rules for groundwater pumping in an AMA are stricter than in adjacent rural areas, and include sustainability targets for both water quantity and quality. The Arizona Department of Water Resources (ADWR) also places restrictions on increasing irrigated acreage in an INA. Available groundwater in the Phoenix AMA was quantified in the Third Management Plan (ADWR 1999a), which shows that the current rate of groundwater pumping will cause levels under the Planning Area to decline; however, the effects will vary in different locations. The Pinal AMA shows a similar trend, with most impacts caused by irrigation pumping.

The ADWR monitors groundwater depletion in the AMAs. The USGS and ADWR predict that ground subsidence, due to groundwater withdrawal, is likely to continue in the areas where it currently occurs, and in additional areas of significant groundwater depletion (Carpenter 1999). Although subsidence has occurred in many parts of the Planning Area, none has been detected in the Decision Areas.

Groundwater Quality

Most groundwater-quality issues in the Planning Area are caused by the infiltration of polluted agricultural irrigation water, particularly in the Gila and Salt River valleys. Groundwater quality in other parts of the Planning Area is not well documented. The Pinal Active Management Report (ADWR 1999b) reports little evidence of groundwater pollutants outside the Planning Area's urban and agricultural zones. No groundwater-quality trend has been addressed within the report.

The Phoenix AMA includes the northern third of the SDNM. Groundwater uses primarily are limited to livestock watering. Groundwater-quality monitoring wells were drilled in the SDNM about 30 years ago, but no recent data is available. Few, if any, new water developments other than wildlife waters are expected in the Monument.

3.2.10.2. Surface Water

Although perennial surface water is uncommon on public lands in south-central Arizona, ephemeral, intermittent, and effluent-dependant lotic (streams) and lentic (standing) water are both common and important. (See Table 3.6, "Monthly Mean Discharge (Flow) of Key Streams in Planning Area" (p. 291) for stream-flow data.) Desert washes are key resources in the Planning Area; however, most flow has been impounded for various purposes. Small water-control devices

including spreader dikes, berms, dirt tanks, and remnant impoundments from mining activities – are scattered across the Planning Area to capture rainfall and ephemeral flows in desert washes for use by livestock and wildlife. The Gila River is the primary watercourse and is ephemeral for its entire length in the Planning Area except for the discharge of treated effluent, which flows to about SR 85 most of the year. When there is precipitation and runoff, which mostly likely occurs in the summer (see Table 3.7, "Montly Temperature & Precipitation for Planning Area (Gila Bend Weather Station)" (p. 291) for climate data), flow occasionally continues into Painted Rock Reservoir.

Table 3.6. Monthly Mean Discharge (Flow) of Key Streams in Planning Area

Gage (USGS Reference Number)	January		April		July		October	
	Record high flow (year)	Mean flow	Record high flow (year)	Mean flow	Record high flow (year)	Mean flow	Record high flow (year)	Mean flow
Salt River at 51st Ave. (09512406)	5,484 ft^3/s (2005)	808 ft^3/s	4.92 ft^3/s (2007)	1.5 ft^3/s	7.46 ft^3/s (2006)	2.2 ft^3/s	9.15 ft^3/s (2005)	2.0 ft^3/s
Gila River near Maricopa (09479350)	0 ft^3/s	0 ft^3/s	0.3 ft^3/s (2005)	0.02 ft^3/s	8.1 ft^3/s (2006)	0.54 ft^3/s	8.4 ft^3/s (2006)	0.63 ft^3/s
Gila River at Estrella Parkway near Goodyear (09514100)	53,880 ft^3/s (1993)	3,480 ft^3/s	5,104 ft^3/s (1993)	388 ft^3/s	55.6 ft^3/s (1993)	3.9 ft^3/s	62 ft^3/s (1993)	11 ft^3/s
Hassayampa River near Arlington (09517000)	133 ft^3/s (2001)	79 ft^3/s	69 ft^3/s (2007)	47 ft^3/s	121 ft^3/s (1999)	46 ft^3/s	311.6 ft^3/s (2000)	77 ft^3/s
Centennial Wash at Southern Pacific RR Bridge near Gila Bend (09517490)	85 ft^3/s (1993)	4.0 ft^3/s	2.8 ft^3/s (1982)	0.17 ft^3/s	18 ft^3/s (1996)	2.9 ft^3/s	21.1 ft^3/s (2000)	0.94 ft^3/s
Below Painted Rock Reservoir (09519800)	6,348 ft^3/s (1993)	390 ft^3/s	16,160 ft^3/s (1993)	793 ft^3/s	3,286 ft^3/s (1980)	265 ft^3/s	3,996 ft^3/s (1980)	226 ft^3/s
Source: USGS 2010								

All water-quality issues discussed above for the Planning Area apply to the Lower Sonoran Decision Area. Nearly all water-quality issues relate to the Gila River. Portions of all 12 surface-water sub-basins occur in the Lower Sonoran Decision Area. About 40 percent of the LSFO's northwest portion, all public land in San Tan Mountain area and near Apache Junction, is included in the Phoenix AMA. As identified in Table 3.7, "Montly Temperature & Precipitation for Planning Area (Gila Bend Weather Station)" (p. 291), summer is the wettest season, followed by winter, while spring and fall are the driest. This is only partly reflected in monthly mean discharges of key streams in the Planning Area (see Table 3.6, "Monthly Mean Discharge (Flow) of Key Streams in Planning Area" (p. 291)) because other factors such as natural water regimes being restricted by impoundments and water being diverted for irrigation purposes greatly influences stream flows.

Table 3.7. Montly Temperature & Precipitation for Planning Area (Gila Bend Weather Station)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	69.0	73.6	79.8	88.0	96.7	106	108.9	107.2	103.1	92.1	78.5	69.2	89.3
Average Min. Temperature (F)	38.7	41.8	46.1	51.7	59.6	68.2	78.1	76.8	70.0	57.2	45.2	38.7	56.0

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An-nual
Average Total Precipitation (in.)	0.62	0.63	0.63	0.22	0.11	0.05	0.73	1.02	0.51	0.40	0.51	0.69	6.13
Source: Western Regional Climate Center, *http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?azgila*, accessed Sept. 26, 2010													

Surface Water Basins

The nation's watersheds are organized into a hierarchy of hydrologic units, each with a unique hydrologic unit code (HUC).Under the hydrologic watershed naming system, the entire Planning Area lies in the Lower Colorado Region. Within that region, most of the Planning Area is in either the Lower Gila or the Salt sub-region, identified by four-digit HUCs. Going down the hierarchy, the next subdivision is the basin, or six-digit HUCs. Sub-basins (eight-digit HUCs) are most commonly used to describe state-level drainage areas. Watersheds (ten-digit HUC) and sub-watersheds are commonly used in project-level planning but are too numerous to be individually described in this plan.

Table 3.8. Definition of Hydrologic Unit Codes in the Planning Area

Order	No. of Digits	Name	Unit Size
1	2	Region	Avg. 177,560 sq. miles
2	4	Subregion	Avg. 16,800 sq. miles
3	6	Basin	Avg. 10,596 sq. miles
4	8	Sub-basin	Avg. 703 sq. miles
5	10	Watershed	Range: 40,000-250,000 acres
6	12	Sub-watershed	Range: 10,000-40,000 acres
Based on Missouri Information Network (University of Missouri 2002)			

There are parts of 20 fourth-order hydrologic units or sub-basins (as defined in Table 3.8, "Definition of Hydrologic Unit Codes in the Planning Area" (p. 292)) in the Planning Area (Map 3-11: Surface Water Sub-Basins). The San Cristobal, San Simon (near Ajo), Lower Santa Cruz, Santa Rosa Wash, Roosevelt Lake, Lower Salt, Middle Gila, Lower Gila, Lower Gila-Painted Rock Reservoir (which includes the SDNM), Centennial Wash, and Tenmile Wash (Gila Bend Mountains area) comprise most of the Decision Areas. The Lower Verde, Sonoyta Valley, San Carlos, Colorado (Yuma-Mexico), and Brawley Wash sub-basins occupy only a small proportion of the Planning Area and are not discussed further.

Table 3.9. Surface Water Sub-basins in Planning Area

Name	Acres within Planning Area	% of Planning Area
Agua Fria Sub-basin	11,347	0.1%
Aguirre Valley Sub-basin	408,471	4.6%
Brawley Wash	36,626	0.4%
Centennial Wash	286,064	3.2%
Colorado (Yuma-Mexico)	43,105	0.5%
Hassayampa	24,470	0.3%
Lower Gila	294,981	3.3%
Lower Gila-Painted Rock Reservoir	1,291,772	14.6%
Lower Salt	505,992	5.7%
Lower Santa Cruz	559,450	6.3%
Lower Verde	111,892	1.3%
Middle Gila	1,058,211	11.9%
Roosevelt Lake	150,967	1.7%
San Carlos	26,362	0.3%

Name	Acres within Planning Area	% of Planning Area
San Cristobal Wash	893,832	10.1%
San Simon Wash	1,373,521	15.5%
Santa Rosa Wash	783,352	8.8%
Sonoyta Valley	267,466	3.0%
Tenmile Wash	741,013	8.4%
Tonto	88	<0.1%
Total	8,868,982	100%

San Cristobal and San Simon Sub-basins. The surface-water resources in these two sub-basins are not well documented. The San Cristobal Sub-basin, located south and west of Ajo, consists of ephemeral watercourses. The San Simon Wash Sub-basin contains over 1.4 million acres; however, only a small portion of the upper watershed in the sub-basin is within the Lower Sonoran.

Lower Santa Cruz Sub-basin. The Lower Santa Cruz Sub-basin is characterized by the lower Santa Cruz River, which is an ephemeral river. This river's single, topographically defined channel runs from the eastern boundary of the Planning Area to the confluence with the Gila River, albeit is often difficult to follow.

Roosevelt Lake Sub-basin. Only the southern tip of the Roosevelt Lake Sub-basin (sometimes referred to as the Upper Salt Sub-basin) is included in the Planning Area. It also includes the eastern-most portion of the Lower Sonoran, near the Globe-Miami communities. Drainages in this sub-basin flow to the Salt River and Roosevelt Lake, the latter being the largest of the Salt River Project (SRP) reservoirs on the river.

Lower Salt Sub-basin. The Lower Salt Sub-basin includes the Salt River from Roosevelt Dam to its confluence with the Gila River. The stream is highly urbanized within the Planning Area, and has a great deal of influence on downstream water resources, including critical parts of the Lower Sonoran. The Salt River originates in the White Mountains and drains 5,980 square miles. It is ephemeral as it passes through the Planning Area on the way to its confluence with the Gila River. A chain of dams operated by SRP control the flow of the Salt River and creates a number of reservoirs, including Roosevelt, Apache, Canyon, and Saguaro lakes. Downstream from the last reservoir is Granite Reef Diversion Dam, which is not used to store water but to divert the entire river's flow into SRP's irrigation-canal system.

Middle Gila Sub-basin. The Middle Gila Sub-basin comprises the main stem of the Gila River from the outfall of San Carlos Reservoir to its confluence with the Salt River. This is one of the most heavily impacted streams in the Planning Area in terms of water quantity; however, very little of the watershed lies within the Lower Sonoran boundaries. Because it is a large watershed draining most of southeastern Arizona, peak flows on the Gila River can be large relative to other Arizona rivers. Most of the Gila River between San Carlos Reservoir and Ashurst-Hayden Dam is dependent on irrigation releases from the reservoir.

Lower Gila/Painted Rock Sub-basin. The Lower Gila/Painted Rock Sub-basin contains a large portion of the Decision Areas, including the SDNM and several wilderness areas, and receives most of the flow from all the previously discussed drainages.

Lower Gila Sub-basin

The Lower Gila Sub-basin below Painted Rock Dam receives runoff from the extreme western part of the Planning Area, including the Sentinel Plain area.

Centennial Wash Sub-basin. Centennial Wash extends about 100 miles from the Gila River up to Wenden, Arizona, then runs east to about 10 miles west of Wickenburg, Arizona. Centennial Wash drains many parts of the Lower Sonoran, including Saddle Mountain and parts of Woolsey Peak and Signal Mountain wildernesses.

Tenmile Wash Sub-basin. Tenmile Wash is a long, ephemeral watercourse that drains a large amount of public land in the Lower Sonoran. It contains numerous water bodies protected for their riparian values. The wash goes through public lands a few miles east of Ajo, and includes most of the current flows emanating from the New Cornelia Mine and associated tailings pile located in the Ajo mining district. Any flows or contaminants from the mining district are transported to adjacent public lands. The wash also enters and bisects the BGR, and joins the lower Gila River near Dateland. There are no active USGS gauging stations in the Tenmile Wash Sub-basin.

Surface-Water Quality

The ADEQ assesses water quality in specific stream segments, or reaches, by determining if it is sufficient to carry out its designated uses. The assessment results are published every other year as part of the biennial State of Arizona 305(b) Report to Congress. The last report was issued in November 2008 (ADEQ 2008), although it did not include any new data since the 2006 report. A full report with new sampling data was planned for 2010 but was not published as of November 2010. The 305(b) report includes the 303(d) list, which lists all state stream segments with impaired water quality for their designated uses, and the pollutants causing the impairment . The Clean Water Act (as amended) requires that every stream placed on the 303(d) list must have a water-quality improvement plan prepared. A key element of these plans is the development of a total maximum daily load (TMDL), which is the concentration of a pollutant allowed for the stream to meet State water-quality standards. Each TMDL is specific to a given stream, its uses, and the pollutants that impair it.

In 1998, ADEQ classified all the sub-basins in Arizona as part of the Arizona State Unified Watershed Assessment (ADEQ 1998). All watersheds that included impaired streams, at that time, were designated Category 1 watersheds; however, this classification system currently receives little use. More common is the EPA classification system for impaired streams, which classifies streams in Categories 1-5. Category 1 refers to specific stream segments that have no impairment, while Category 5 refers to streams on the 303(d) List.

The three ADEQ water-quality basins that cover the Planning Area are the Santa Cruz/Rio Magdalena/ Rio Sonoyta, Middle Gila, and Colorado/Lower Gila. The Santa Cruz/Rio Magdalena/Rio Sonoyta water-quality basin includes all ephemeral washes draining the southeastern quadrant of the Planning Area. The most common water-quality pollutants identified for this basin by ADEQ include the following:

- Bacteria, chlorine, and cyanide from the Nogales International Wastewater Treatment Plant on the upper Santa Cruz River;
- Historical mining uses causing copper, zinc, and other metals to enter water bodies and washes;
- Mercury in fish at Arivaca and Peña Blanca Lakes;
- High turbidity in Nogales Wash.

There are ten impaired stream segments in the Santa Cruz/Rio Magdalena/Rio Sonoyta water-quality basin, but none in the Decision Areas. It is unlikely that any of the impaired segments could affect or be affected by any future BLM decisions.

The Middle Gila and Colorado/Lower Gila River water-quality basins have impairments that could influence BLM management actions. While the BLM manages more than a quarter of the land in the Middle Gila watershed, nearly all of which is in the Planning Area, the only public land stream reaches are along the Gila River between the Salt River and Painted Rock Reservoir. There are 11 water bodies (i.e. stream segments and lakes) in this water-quality basin on the 303(d) list, including those listed by EPA as not meeting standards for pesticides and with fish-consumption advisories.

The designated uses of the Gila River as it passes through the Gila River Indian Community are ephemeral aquatic and biota, partial immersion recreation, and fish consumption. Parts of the Salt River under Gila River Indian Community jurisdiction are designated for effluent-dependent, aquatic and wildlife, warm water fishery, and livestock watering. The Arizona reaches of the Gila River above the Gila River Indian Community are designated for aquatic and wildlife, ephemeral, partial body contact, and livestock watering, except for a short reach below the Florence Wastewater Treatment Plant that is effluent-dependent. From the Gila River Indian Community to Gillespie Dam, the designated uses are partial body contact, fish consumption, irrigation, and livestock watering. Below Gillespie Dam to Painted Rock Reservoir and on to the Planning Area's western boundary, the designated uses are aquatic and wildlife, full body contact, fish consumption, livestock watering and irrigation; however, there is a fish-consumption advisory for Dichlorodiphenyltrichloroethane (DDT) and other pesticides. All stream segments with fish-consumption advisories are on the 303(d) list. The ADEQ also assesses use attainability of the Grand Canal for agricultural livestock and livestock watering.

The USGS reports that past use of agricultural pesticides and herbicides in the west Salt River Valley is the origin of these compounds along the Gila River, from below the confluence with the Salt River to Painted Rock Reservoir (Cordy et al. 2000). Arizona Department of Environmental Quality studies have shown a sharp decrease in pesticides in fish over recent years (Marsh 2002). During 1999, collected fish tissue samples suggested much lower DDT levels than previous studies. Nevertheless, DDT levels were still high enough to trigger EPA advisories on fish consumption. Some samples contained high concentrations of toxaphene, an insecticide used heavily in agricultural treatments until banned in 1990.

The Gila River reach within the Planning Area, between Gillespie Dam and Centennial Wash, continue to exceed standards for boron and selenium, but the sources and trends of these impairments have not been determined. If the boron stream concentration remains at the current level (0. 370-2. 7 mg/l), there may be some effects on boron-sensitive riparian plants. The potential for this impact is unknown.

Gila River TMDL standards for boron and selenium will begin in 2012. The ADEQ recognizes the risks involved to the Yuma clapper rail and southwestern willow flycatcher resulting from exceeding water-quality standards for selenium, making it a high priority TMDL, although complicated by large numbers of potential sources of the pollutants and seasonal influences. Pesticides impair the entire length of the Gila River, from the Salt River to Painted Rock Reservoir. Pesticide TMDLs in all reaches should be completed in 2011.

Painted Rock Borrow Pit Lake exceeds State (EPA-approved) standards for dissolved oxygen and pesticides. The TMDL determination started in 2009, and is scheduled for completion in 2011.

Fecal coliform criteria changed in the last Arizona triennial review of water-quality standards: Painted Rock Reservoir may be removed from the 303(d) list after the 2012 triennial review.

In the Planning Area and above it on the Salt and Gila rivers, much of the surface water has been impounded behind dams for irrigation, industrial, municipal, and other uses. Dozens of stock ponds and other structures in the Decision Areas, such as water bars, spreader dikes, and impoundments designed to capture rainfall or ephemeral water flows in desert washes, may be contributing to a loss in flow by evaporation or infiltration; however, these are very small amounts compared to naturally occurring evaporation and infiltration.

3.2.10.3. Water Rights

The Planning Area is in the Gila River System and Source General Stream Adjudication (Gila Adjudication). Such judicial proceedings determine the nature, quantity, and priority (i.e. seniority) of water rights in Arizona. The majority of both Decision Areas lie in the Gila River Watershed, but small areas are also included in the Upper Salt River, Upper Gila River, and Upper Santa Cruz watersheds. Although the Gila Adjudication began in 1974, litigation is still unsettled in the San Pedro Basin. See Table 3.8, "Definition of Hydrologic Unit Codes in the Planning Area" (p. 292) for definitions of hydrologic unit codes in the Planning Area.

The BLM has filed claims in the Gila Adjudication for state appropriative water rights and well permits on numerous springs, small reservoirs, wildlife-water developments, and wells for stock watering, wildlife, or recreation purposes. The BLM has no in-stream flow water rights within the Decision Areas because there are no suitable perennial or intermittent streams on public lands.

The six wilderness areas in the Planning Area, designated by the 1990 Arizona Desert Wilderness Act, created an expressly stated, federally reserved water right for each wilderness area upon designation. The BLM has inventoried, quantified, and submitted notification of its Federal reserved rights to ADWR for Signal Mountain, Woolsey Peak, North Maricopa Mountains, South Maricopa Mountains, Table Top, and Sierra Estrella wildernesses. The sources claimed by notification to ADWR are for small amounts from springs, seeps, and potholes. No perennial or intermittent surface water exists in the wilderness areas, other than that which may flow for short distances from springs.

The Gila Stream Adjudication in Arizona is ongoing and will eventually address claims for water in the Planning Area. Current adjudication activity is limited to the San Pedro Basin, and the schedule for adjudicating water rights in the Middle and Lower Gila Basins is uncertain. The enabling Presidential Proclamation for SDNM explicitly states that the Monument has no water reservation, with exception of lands in North Maricopa, South Maricopa, and Table Top wildernesses. If water is needed for use outside of the wilderness areas in the SDNM, the BLM must secure water rights for those uses by appropriation from the State.

3.2.11. WILD HORSE & BURRO MANAGEMENT

The Painted Rock Herd Area (PRHA) is located approximately 85 miles southwest of the metro Phoenix area and about 11 miles west of Gila Bend, Arizona, and surrounds the Painted Rock Reservoir area. The Herd Area (HA) encompasses approximately 38,737 acres, of which 31,106 acres are BLM-managed public lands, 4,834 acres are private lands, and 2,796 acres are Arizona state lands. The HA includes portions of three allotments: Artex, Painted Rock, and Dendora Valley. All three allotments are classified as ephemeral. The HA has been home to wild burros

and a small band of horses over the years. Management of the herd area applies only to the Lower Sonoran Decision Area. No Herd Management Areas (HMAs) have been allocated within either Decision Area. The Painted Rock Herd Area is shown on Map 3-15.

The habitat of the Painted Rock Herd Area consists about 10,700 acres of river bottom between the Painted Rock Dam and Oatman Mountain. Approximately 28,000 acres of the Herd Area are upland volcanic flow in a region known as the Sentinel Plain. This area consists of broad lower Sonoran Desert plains cut by sandy washes and low mountain ranges. Vegetation consists of palo verde, cacti, creosote bush, and sage. The Gila River bisects the northern portion of the HA and is characterized by salt cedar, mesquite, cottonwood, and willows. Wildlife species that also inhabit the area include desert mule deer, javelina, dove, quail, water fowl, and a variety of small mammals, birds, amphibians, and reptiles.

The wild burros primarily live off water and forage found on private farmlands along the Gila River corridor to the west of the PRHA, and move in and out of the herd area in response to available farm feed. The horses follow the same general pattern of movement in the PRHA, but also make use of public lands to the north and west of the PRHA.

In 1971, Congress passed The Wild Free-Roaming Horses and Burros Act (WFRHBA, or "The Act"). The overall goal of the BLM's Wild Horse and Burro Program is to preserve the health of the land and water resources by managing wild horse and burro populations so as to restore and maintain a thriving natural ecological balance. Appropriate management levels (AML) for the herds, the habitat requirements of the animals, the relationships with other uses of the public and adjacent private lands, are analyzed to determine the health of both the animals and the rangeland resources (43 CFR 4710.3-1). Wild horses and burros are to be managed as self-sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat, while maintaining their free-roaming behavior (43 CFR 4700.0-6). However, wild horses and burros must be managed within the limits the animals' herd areas (43 CFR 4710.4).

In 1980, the population in the PRHA was estimated to be between 15 and 25 animals, but more animals may have been present, as the area's dense vegetation made it difficult to place high confidence on this estimate (BLM 1985). In 1993, a herd area inspection indicated the presence of 20 to 40 animals. In 1999, BLM removed 42 horses from the herd area and offered them for adoption due to concerns over potential overgrazing and impacts to privately owned farmlands. Another inspection later in 1999 found no animals. The BLM continues to receive occasional complaints regarding burros and horses grazing on the private farmlands within the herd area.

The WFRHBA defined wild horse and burro ranges as "the amount of land necessary to sustain an existing herd or herds of wild free-roaming horses and burros, which does not exceed their known territorial limits, and which is devoted principally but not necessarily exclusively to their welfare in keeping with the multiple-use management concept for the public lands." Established Herd Management Areas (HMAs) are designated lands that can provide adequate rangelands for the purpose of maintaining healthy herds of wild horses and/or burros, as well as wildlife and livestock. Elsewhere, wild horses and burros compete with livestock and wildlife for these resources.

For nearly four decades, the Painted Rock Herd Area has vacillated between trying to manage for a population of wild horses and burros as an HMA, and removing all burros and horses within the HA. The affected environment in which the animals reside is burdened with issues that negate the ability to manage the herd area for healthy, sustainable populations of wild horses

and/or wild burros. Details of these issues are provided in Appendix M, *Painted Rock Burro Herd Manageability Analysis* (p. 1257), but are summarized as follows:

1. Essential habitat components (forage, water, cover, and space) are not available for healthy herds of wild horses and/or burros. There is very limited forage and no year-round water source within the boundaries of the Painted Rock Herd Area.

2. Wild horse and burro movement in the area is restricted. Fences, roads, highways, and natural barriers isolate the Painted Rock HA from other (distant) herd areas, and restrict wild, free-roaming behavior of these animals. Immigration and emigration is very limited. In fact, resources are so scarce that a limited number of livestock are permitted in on the associated allotments *only* during years of above-average precipitation, pursuant to the Special Ephemeral Rule, and are otherwise prohibited in order to provide enough forage for wildlife.

3. This population of wild horses is unhealthy and unsustainable. The PRHA is isolated from other wild horse and burro herds, causing low genetic variability. Genetics testing of the Painted Rock horses in 2000 and 2010 indicated that genetic variation "is very low and well below the critical level, . . . likely due to a low population size over a few generations. . . . Inbreeding within the herd is likely and will probably continue and increase [which] could cause physical defects and low fertility (Cothran 2010)." Genetics were not conducted on wild burros, but it is also likely that genetic similarity exists in the burros in the area. Furthermore, it is unlikely that the addition of 2 or more outside mares or jennies, as suggested by the analysis (Cothran 2010), would enhance the blood lines enough to make these healthy, sustainable populations of wild horses or burros. Management of wild horse and burro herds under these conditions is inconsistent with the spirit of the WFRHBA and with 43 CFR 4700.0-6.

4. Wild horses and burros are to be managed as self-sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat (43 CFR 4700.0-6). A minimum population size of 50 effective breeding animals (i.e., a total population size of about 150-200 animals) is currently recommended to maintain an acceptable level of genetic diversity within reproducing wild horse and burro populations (Cothran, 2009). (Research has not yet established a recommended minimum breeding herd size for burros [BLM Handbook, H-4700-1, 2010]). Due to the scarcity of forage, water, cover, and space, a herd size of 150-200 animals (either wild horses or wild burros) is unsustainable in the Painted Rocks area.

5. In accordance with the Wild Horses and Burros Management Handbook (2010), "If wild horse herd size in small, isolated HMAs is so low that mitigation is not feasible, consideration should be given to managing the HMA for non-reproducing wild horses or to removing the area's designation as an HMA through land use planning." Because of the reasons stated above (lack of essential habitat components, movement outside the HA boundaries, and barriers limiting free-roaming behavior), managing the Painted Rock Herd Area as a HMA with non-reproducing wild horses is not feasible. Non-reproducing animals would face the same issues and have to resort to the same foraging habits (i.e., utilizing private agricultural fields and waters) as reproductive animals in order to survive.

3.2.12. WILDERNESS CHARACTERISTICS

Background

Inventories for wilderness characteristics were conducted by the BLM between 2003 and 2010. In addition, citizens' proposals were submitted to the BLM by the interested public (particularly the Arizona Wilderness Coalition [AWC] and the AGFD). As part of the land use planning process and in response to input received during scoping, the BLM assessed the Planning Area for wilderness characteristics.

Field Assessments

Assessment of lands with wilderness characteristics was developed from the following four sources:

1. A review of Wilderness Review, Arizona: Intensive Inventory of Public Lands Administered by BLM, Decision Report (BLM 1980) and Wilderness Review, Arizona: Initial Inventory of Public Lands Administered by BLM, Decision Report (BLM 1979). These documents are comprehensive evaluations of wilderness characteristics on public lands in Arizona that were conducted during 1978-1980, as directed by section 603 of the Federal Land Policy and Management Act (FLPMA).

2. Public input received during scoping that delineated tracts of public lands reported to possess wilderness characteristics.

3. Fieldwork conducted by the BLM in 2003 and 2005 to ascertain the continuing validity of the findings of the 1980 inventory and appraise input received from the public during scoping.

4. Citizen groups' wilderness characteristics proposals submitted between 2003 and 2005. The citizens' proposals were based upon their application of BLM's 1978 "Blue Book" wilderness inventory handbook process. The "Blue Book" process required route forms, road/way definitions, size requirements, definitions of "outstanding," and files, narratives and documentation for all areas proposed. Some submitted citizen proposals were highly detailed reports based on the "Blue Book" process. Other citizen proposals were maps of areas considered by citizen groups to possess wilderness characteristics.

Based on BLM's knowledge of the planning area and each inventory unit's current land uses and resource conditions, it may not necessarily be the case that all of the citizen's proposal in Alternative D contains wilderness characteristics as those characteristics are defined in the BLM Land Use Planning Handbook (H-1601–1) policy guidance. For example, off-highway vehicle use on some of these lands could affect wilderness characteristics.

The BLM field-checked public lands using 1978-1980 inventory records. Findings were documented by a variety of means: narratives, check lists, field map notations, photographs, and field inventory. All inventory findings were focused on naturalness and outstanding opportunities for solitude and primitive and unconfined recreation. All lands inventoried by the BLM or submitted as proposals by the public are considered in the range of action alternatives.

Findings

Wilderness characteristics are fully considered in the current draft of the LS-SDNM DRMP. In Alternative D, approximately 429,500 acres were considered, representing over 31 percent of the

lands in the combined Planning Area. Citizen information on wilderness characteristics utilized in Alternative D was provided by the Arizona Wilderness Coalition (AWC) in 2004. Additional areas inventoried by the BLM were added to form the largest acreage of lands managed to protect wilderness characteristics.

Alternatives C and E include only areas with wilderness characteristics fully inventoried by BLM. Alternative D includes all those lands considered in Alternative C, plus lands submitted as part of AWC's citizen's proposal, and some parts of former WSAs with wilderness characteristics. Table 3.10, "Units Under Consideration - Wilderness Characteristics" (p. 301) details the field inventory status of each unit under consideration and documents whether the consideration of the unit was initiated by BLM, by a citizen's proposal, or by both BLM and a citizen' proposal.

Comparison of the 1978-1980 wilderness characteristics review with fieldwork conducted in 2003-2005 identified five findings or trends. They are:

1. Overall, the Decision Areas maintained a high degree of naturalness. There were no large-scale or incompatible land uses with long-lasting or irreversible effects on naturalness occurring over the intervening period since 1980.

2. More acres of public lands in the Decision Areas exhibited potential wilderness characteristics in 2005 (compared to the original inventory in the 1980s), mainly due to either additional lands (acres) not considered in the 1980 wilderness review or changing land uses coupled with natural reclamation. Changing land uses often reflected less mineral exploration and assessment.

3. The 2003-2005 fieldwork indicated that three former wilderness study areas (WSAs) found to have wilderness characteristics in 1980 – but not included as part of the congressionally designated wilderness areas – continue to exhibit such character since their release from FLPMA Section 603 protection in the Arizona Desert Wilderness Act of 1990.WSAs released in their entirety in 1990 were Saddle Mountain, Face Mountain and the Butterfield Stage Memorial.

4. The 1978-1980 wilderness review did not include an evaluation of withdrawn lands administered by the U. S. Air Force and re-conveyed to BLM with the passage of the National Defense Authorization Act for Fiscal Year 2000. These lands primarily consisted of the Sand Tank Mountain area (formerly Area A) of the SDNM and Sentinel Plain area of the Lower Sonoran Field Office. Public lands next to the military lands, previously inventoried for wilderness characteristics in 1978 – 1980, were re-evaluated for wilderness characteristics in context with these contiguous re-conveyed lands. While much of the Sand Tank Mountains and adjoining areas were not inventoried in 1980, the area was found to have wilderness characteristics. These areas make up the majority of the 153,000 acres in the SDNM Monument assessed for wilderness characteristics.

5. Finally, the BLM's field assessments and BLM's comprehensive inventory of vehicle routes found a rise in motorized public visitation and the popularity of many areas for driving four-wheel drive and all-terrain vehicles (ATV). Many washes, and most upland routes, were being used for motorcycle and ATV travel – motorized uses not common in this area in 1980 as ATV use and technologies was were not yet developed or readily available to recreationists at that time. As such, the implementation of travel management may have considerable influence on lands managed to protect wilderness characteristics.

Table 3.10. Units Under Consideration - Wilderness Characteristics

LSFO Decision Area Unit Name	Acres	Miles: Vehicle Routes	Miles: Routes in Washes	% of Wash Routes	Status of BLM Inventories or Field Assessments	Origin of Inventory Unit
Lower Sonoran						
Total Acres Considered for Wilderness Characteristics	276,500					
Batamote Mountains East/West	45,725	52.3	3.4	7%	(1)	(3)
Black Mountain	10,154	19.9	0	0%	(1)	(4)
Cortez Peak	16,070	22.5	6.2	28%	(2)	(4)
Cuerda de Lena	10,961	25.3	5.2	21%	(2)	(4)
Face Mountain	30,905	46.2	27.1	59%	(1)	(4)
Gila Bend Mountains	25,314	33.4	11.1	33%	(2)	(4)
Oatman Mountain	13,434	10.5	4.7	45%	(2)	(4)
Palo Verde Hills	12,139	10.4	1.9	18.2%	(2)	(5)
Pozo Redondo	18,210	26.8	6.6	25%	(2)	(4)
Saddle Mountain	24,413	39.8	0.1	0.3%	(1 and 2)	(4)
Sauceda Mountains	10,367	4.0	0	0%	(1)	(3)
Sentinel Plain	25,282	6.9	0	0%	(2)	(5)
Why	4,162	12.1	0	0%	(2)	(4)
Yellow Medicine Butte	29,364	31.8	20.1	63%	(2)	(4)
SDNM						
Total Acres Considered for Wilderness Characteristics	153,000					
Blue Plateau – Sand Tank Wash	55,701	65.1	23.4	36%	(1)	(3)
Butterfield Stage Memorial	9,352	7.7	0.2	2.6%	(1)	(4)
Javelina Peak	51,970	48.9	9.5	19%	(1)	(3)
Margie's Peak	13,427	8.8	1.6	18%	(1)	(4)
South Maricopa Mountains Addition	9,520	2.9	0.1	3.4%	(1)	(5)
White Hills	13,030	5.0	4.7	94%	(1)	(5)

(1) Presence of wilderness characteristics confirmed by BLM. BLM conducted field inventory or assessment of unit. This inventory or assessment included BLM reviewing and field checking inventory reports/maps submitted by interested publics. BLM also examined the 1978 - 1980 BLM wilderness inventory findings (if applicable) for subject unit.

(2) Presence or absence of wilderness characteristics not yet determined. These units were submitted to BLM by interested publics. They submitted reports or maps for lands they considered to possess wilderness characteristics. BLM field checked some units, reviewed the submitted reports/maps, and also examined the 1978 - 1980 BLM wilderness inventory findings (if applicable) for subject unit.

(3) Both BLM and citizen's proposal initiated wilderness characteristics consideration of unit.

(4) Citizen's proposal initiated wilderness characteristics consideration of unit.

(5) BLM initiated wilderness characteristics consideration of unit.

* 5,500 acres of released Saddle Mountain WSA retains wilderness characteristics determined present in BLM wilderness inventories conducted between 1978 and 1981.

3.2.13. WILDLAND FIRE MANAGEMENT

3.2.13.1. Fire Ecology

In natural desert scrub communities, the distance between shrubs is too great for fire to spread, unless annual plant growth in the interplant spaces is sufficient to carry fire along between shrubs. As a result, such communities experience long fire-return intervals, with frequencies extending hundreds of years (McAuliffe 1995; Rogers and Steele 1981). Wildland fire is thus not a major natural process in the Sonoran Desert ecosystem and associated vegetation types are not dependent or adapted to fire (BLM 2002). Wildfires, whether of human or natural causes, are relatively rare and typically do not exceed one or two acres before burning out naturally. Above-average winter precipitation, such as the winter of 2005, can generate sufficiently dense grasses and other annual plants to carry wildfire over a more widespread area than normal. In years with typical precipitation levels, this effect most likely occurs in the upland and mountainous areas of the Decision Areas, where high annual plant densities and steep slopes may combine to create conditions to carry fire. The upslope effects of wind and convection are often factors in propagating fires in these circumstances.

Within Sonoran desert scrub habitats, the establishment and spread of non-native grass species such as red brome (*Bromus rubens*) has increased wildfire frequency. As mentioned above, interplant spaces within this community have historically had low fuel levels that would not carry fire. Because introduced, non-native annual grasses are prolific seed producers and grow rapidly, especially during wet years, they occupy interplant spaces and enable fire to carry throughout the non-fire adapted community. With an increased fire frequency, native grasses and shrubs cannot compete, resulting in a loss of native plant communities. In addition, fires burn hotter and farther, reducing the natural mosaic pattern typical of desert scrub communities (i.e. patchy distribution of plants and open space) (Esque et al. 2003). Since such fires have the potential to burn uncharacteristically in terms of intensity, severity, and extent and could have long-term, adverse impacts on ecosystem components and processes (e.g. biodiversity, soil productivity, and hydrologic processes), they are considered wildfires of special concern.

There is little evidence of extensive wildland fires in southwestern floodplain ecosystems prior to European settlement. Lightning- and human-induced fires now occur across a variety of low-elevation, riparian ecosystems where non-native plant species such as salt cedar (*Tamarix spp.*) has invaded (Busch 1995, cited in Ellis et al. 1998). Colonization and naturalization of non-native plant species affect native ecosystems by altering historical fire regimes. The deciduous nature of salt cedar, combined with periodic flooding suppression needed in river floodplain ecosystems to decrease forest-floor litter, has resulted in increased accumulation of fuels, rendering the riparian communities highly susceptibility to wildfires (Ohmart and Anderson 1982, cited in Ellis et al. 1998). In addition, these conditions put floodplain ecosystems at high risk of unnatural, high-intensity wildfire events (BLM 2003).

In some cases, wildland fire frequency in riparian ecosystems has increased, with fire return intervals being as short as five-to-fifteen years, which can create monotypic stands of salt cedar in the ecosystems. Salt cedar sprouts prolifically after a fire, but native riparian vegetation, including cottonwood, is not well adapted to severe fire (Ohmart and Anderson 1982; Busch 1995, cited in Ellis et al. 1998). The increasing frequency of wildfires in riparian ecosystems can further change the vegetation composition and structure, and may have detrimental effects on riparian-obligate species.

3.2.13.2. Fire and Fuels Management

All public lands within the Planning Area are assigned to one of the following categories for fire management (BLM 2003):

- Category 1: Wildland Fire Use (areas suitable for wildland fire use for resource-management benefit)
- Category 2: Non-Wildland Fire Use (areas not suitable for wildland fire use for resource-management benefit)

Within the Planning Area, there are limited lands in Category 1. Most lands are in Category 2 and consist of large areas dominated by desert scrub communities. Fire is not a part of the natural regime in these communities and is typically human-caused.

The goal of the Arizona BLM Wildland Urban Interface (WUI) Strategy is to implement an efficient and effective fuels reduction program. The WUI is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (NWCG 2008). One of the BLM's fire-management goals is to work collaboratively with communities at risk for wildfire property loss within the WUI to develop plans for risk reduction (BLM In Press). The desired resource condition is to maintain fuels at non-hazardous levels in WUI areas to provide for public and firefighter safety (BLM In Press). Fuels treatments within the Lower Sonoran, both WUI and non-WUI, focus on reducing the size and frequency of wildfires within the non-fire adapted, Sonoran Desert ecosystems, as well as the residual, native riparian plant communities, with WUI fuels treatments being the priority. These treatments are conducted utilizing fire, mechanical equipment, herbicide, and biological treatments (e.g. grazing). The desired resource condition is to maintain fuels at non-hazardous levels in WUI areas to provide for public and firefighter safety (BLM In Press).

Fire Management Units

Fire Management Units (FMUs) are specific land management areas defined by fire management objectives, management constraints, topographic features, access, values to protect, political boundaries, and fuel types. The Planning Area is subdivided into three fire management units (FMU): Phoenix District South (PHD) of I-10, Phoenix District Wilderness Areas, and the SDNM. Table 3.11, "Fire Management Units in Phoenix District that Overlap the Planning Area" (p. 303)1 provides descriptions of the FMUs geographical locations and areas.

Table 3.11. Fire Management Units in Phoenix District that Overlap the Planning Area

Fire Management Area	Location	Acres
PHD Desert South of I-10	The Lower Sonoran minus wildernesses areas.	845,454
Phoenix District Wilderness Areas	Signal Mountain, Woolsey Peak, North and South Maricopa Mountains, Sierra Estrella, and Table Top Wilderness Areas	249,450
SDNM.	The SDNM minus wilderness areas	408,646
Source: (BLM In press)		

Table 3.12, "Communities at Risk in the Planning Area by Fire Management Unit" (p. 304) shows the communities at risk within the Planning Area by FMU. The FMU with urbanized communities of concern is the Phoenix District (PHD) Desert South of I-10 FMU. The current description of

communities at risk could change as wildland fire risk assessments are accomplished through Maricopa, Pinal, and Gila County Community Wildfire Protection Plan (CWPP) efforts over the next few years.

Table 3.12. Communities at Risk in the Planning Area by Fire Management Unit

Fire Management Unit	Wildland Urban Interface/Communities at Risk
PHD Desert South of I-10 FMU	Pinal County: Maricopa, Stanfield, Casa Grande, Florence, Apache Junction, Queen Creek
PHD Desert South of I-10 FMU	Gila County: Globe
PHD Desert South of I-10 FMU	Maricopa County: Apache Junction, Avondale, Buckeye, Buckeye Valley, Gila Bend, Goodyear, Avondale,
Source: Maricopa County and Pinal County (CWPPs)	

3.2.13.3. Fire Regimes and Condition Classes

Fire regime refers to the nature of fires occurring over long periods of time and their immediate effects that generally characterize an ecosystem (Brown 2000b). Fire regimes can be defined through the attributes of frequency, seasonality, size/spatial extent, rotation (or fire cycle), predictability (or variation in fire frequency), and magnitude (both intensity and severity) (Agee 1993; Morgan et al. 2001). Fire regimes can be subdivided into components that vary in time, space, and magnitude. However, fire regime descriptions are often limited to frequency and severity. See Table 3.13, " Historical Fire Regimes Based on Fire Frequency and Severity" (p. 304) for a full description of fire regimes in the Planning Area.

Fire regimes vary considerably by both vegetation types and landscape characteristics. Table 3.13, " Historical Fire Regimes Based on Fire Frequency and Severity" (p. 304) displays the historical/natural fire regimes, based on fire frequency and severity, for the lands in the Planning Area. They are classified as Fire Regime III (fire frequency of 35 to over 100 years with mixed severity) and Fire Regime IV (fire frequency of 35 to over 100 years and high severity). These fire regime groups are generalized and address only the primary types of fire that occur in the Planning Area. (See Map 3-13: Fire Regime Groups.)

Table 3.13. Historical Fire Regimes Based on Fire Frequency and Severity

Fire Regime Group	Fire Frequency and Severity	Vegetative Communities	Acres of Vegetative Community		
			Planning Area	Lower Sonoran	SDNM
I	0-35 years; low (surface fire most common) severity	None in the Planning Area	0	0	0
II	0-35 years; high (stand replacement) severity	Desert Grassland and Apacherian-Chihuahuan Mesquite Upland	4,854	3,400	1,054
III	35-100+ years; mixed severity	None in the Planning Area	0	0	0
IV	35-100+ years; high (stand replacement) severity	Sonoran Mid-Elevation Desert Scrub and Mogollon Chaparral	5,300	3,200	2,100
V	> 200 years; high (stand replacement) severity	creosote bush-bursage, Palo Verde-Mixed Cacti, Sonoran-Mohave Mixed Salt Desert Scrub, and Riparian	1,401,400	918,500	482,900
Data Source: (Hann et al. 2004; National Interagency Fuels, Fire, and Vegetation Technology Transfer 2008)					

A vegetative community's current condition is a function of the degree of departure from historical fire regimes, resulting in alterations of key ecosystem components, such as species composition, structural stage, stand age, and canopy closure. This departure may have resulted from a number of factors, including fire exclusion or suppression, vegetation resources, grazing, introduction and establishment of exotic plant species, insects or disease (introduced or native), or other past management activities (Hann and Bunnell 2001).

To identify departures from historical conditions, the Planning Area lands are organized in condition classes (CCs) as indicators of fire-management needs (see Table 3.14, "Current Fire Regime Condition Classes by Vegetative Community" (p. 305)). CC1 describes lands that are within or near historical ranges, CC2 describes lands where fire regimes have changed moderately from historical ranges, and CC3 are fire regimes significantly altered from historical ranges. (See Map 3-14: Fire Regime Condition Class.)

Table 3.14. Current Fire Regime Condition Classes by Vegetative Community

Vegetative Community by Condition Class	Acres and percent of Vegetative Community			
	Planning Area		Decision Area	
	Acres	Percent	Lower Sonoran	SDNM
Creosote bush-bursage – CC1	738,952	52.16%	564,965	173,987
Creosote bush-bursage – CC2	27,940	1.9%	25,713	2,227
Creosote bush-bursage – CC3	4,132	0.29%	4,132	0
Palo Verde-Mixed Cacti – CC1	583,870	41.22%	295,080	288,790
Palo Verde-Mixed Cacti – CC2	31,162	2.20%	16,718	14,444
Palo Verde-Mixed Cacti – CC3	98	0.01%	98	0
Apacherian-Chihuahuan Mesquite Upland – CC1	1,759	0.12%	1,433	326
Apacherian-Chihuahuan Mesquite Upland – CC2	1,987	0.14%	1,963	24
Apacherian-Chihuahuan Mesquite Upland – CC3	0	0%	0	0
Sonoran Mid-Elevation Desert Scrub – CC1	2,470	0.17%	1,395	1,075
Sonoran Mid-Elevation Desert Scrub – CC2	456	0.03%	272	184
Sonoran Mid-Elevation Desert Scrub – CC3	119	0.01%	119	0
Sonoran-Mohave Mixed Salt Desert Scrub – CC1	4,791	0.34%	2,426	2,365
Sonoran-Mohave Mixed Salt Desert Scrub – CC2	296	0.02%	287	9
Sonoran-Mohave Mixed Salt Desert Scrub – CC3	0	0%	0	0
Mogollon Chaparral – CC1	557	0.04%	528	29
Mogollon Chaparral – CC2	891	0.06%	823	68
Mogollon Chaparral – CC3	62	0%	62	0
Desert Grassland –CC1	0	0%	0	0
Desert Grassland –CC2	1,054	0.07%	0	1,054
Desert Grassland –CC3	0	0%	0	0
Riparian – CC1	1,299	0.09%	779	520
Riparian – CC2	6,681	0.47%	6,457	224
Riparian – CC3	1,563	0.11%	1,563	0

Vegetative Community by Condition Class	Acres and percent of Vegetative Community			
	Planning Area		Decision Area	
	Acres	Percent	Lower Sonoran	SDNM
Total BLM Land in Planning Area[1]	1,410,139	99.54%	924,813	485,326

Data Sources (Hann et al. 2008; National Interagency Fuels, Fire, and Vegetation Technology Transfer 2008).
[1]Riparian vegetation class combines the following plant communities: invasive southwestern riparian woodland and shrubland, North American warm desert riparian mesquite bosque, and North American warm desert riparian woodland and shrubland. This total only includes the vegetated land classes in the Planning Area and does not include some minor vegetation communities that are too small to be included in this list.

Landscape-level fire and fuels management strategies, including wildland-fire suppression, vegetation and fuel treatments, and prescribed fires, are used in the Planning Area to reduce the fire hazard and risk in the wildland and WUI areas. In general, actions related to fire and fuels management should reduce the amount of lands characterized as Fire Regime CC 2 and 3. Fuel hazard reduction may include prescribed fire, mechanical, biological, and chemical treatments or a combination thereof. The fuel treatment strategies reduce both existing fuel levels and risks of large, damaging wildfires.

Landscape-level fire and fuels management strategies are designed to limit wildland fire extent, modify fire behavior, protect values at risk, and improve terrestrial ecosystem conditions. Fire management and fuel treatment strategies allow land/resource managers to control fires and set priorities that protect fire fighters, public life and property, and natural resources.

3.2.13.4. Fire History

Wildfire history is closely related to vegetation and climatic patterns in terrestrial ecosystems. Patterns of fire frequency, season, size, severity, and uniformity are functions of existing vegetation conditions, weather, elevation, physiographic features, ignition sources, and fire-suppression activities.

Between 1989 and 2009, approximately 70 percent of the total number fires in the Planning Area occurred in the PHD Desert South of I-10 FMU, and approximately 98 percent of all fires in the Planning Area were human-caused. Most of these fires typically occurred along main travel corridors and rivers. An increasing portion of the fires within the Planning Area is associated with UDAs or drug trafficking operations.

Fire numbers vary from year to year and generally occur between the months of March and September. The 20-year average is four fires a year that burn approximately 4,610 acres in total. Multiple fire days, consisting of two or more fires per day, have occurred two times in the past 20 years. There were no historically significant fires within the Planning Area until the 2005 fire season, which was the result of above average fall and winter rains that caused an abundance of annual grass that fueled over 20 fires totaling over 80,000 acres. The largest single fire that has occurred in the Decision Areas was the Tracks Fire, which burned in the Maricopa Mountains of the SDNM during summer 1994 and grew to over 5,000 acres.

3.3. RESOURCE USES

3.3.1. LANDS & REALTY

The lands and realty program for the Planning Area consists of three distinct parts: (1) land use authorizations, which includes ROWs for utility-scale renewable energy development, (2) land tenure (disposal and acquisitions of lands), and (3) withdrawals. The lands and realty program processes applications related to solar, wind, and biomass energy. Geothermal proposals are managed by the minerals program and are discussed in ???. The lands and realty program administers public lands within a framework of numerous laws and mandates, which are discussed in Appendix B, *Applicable Laws, Regulations, and Policies* (p. 1003) and Section 2.8.1, "Lands & Realty (LR)" (p. 118).

3.3.1.1. Land Use Authorizations

The LUA segment of the lands and realty program focuses on requests for ROWs, permits, leases, and easements. The objective of the Lower Sonoran Field Office (LSFO) is to strive to meet the public's needs on public lands, while also attempting to minimize impacts on resources and meeting multiple use objectives. One way the LSFO meets these objectives is by allocating major linear utility facilities within utility corridors.

Rights of Way

Rights-of-way grants are LUAs used for a specific piece of public land for a specific use, for a specific period. Currently, the vast majority of ROWs granted are authorized under Title V of FLPMA (43 U.S. Code [USC] 1761-1771) and the Mineral Leasing Act (Section 28 of the Mineral Leasing Act of 1920, as amended, 43 USC 185). It is the policy of the BLM to authorize ROW applications at the discretion of the authorized officer in a responsible, efficient, and economical manner. Rights-of-ways under FLPMA are authorized for electrical power generation, transmission and distribution systems, systems for the transmission and reception of electronic signals and other means of communications, highways, railroads, pipelines (other than oil and gas pipelines), and other facilities or systems that are in the public interest. Mineral Leasing Act ROWs are for oil and natural gas gatherings, distribution pipelines and related facilities (not authorized by appropriate leases), and oil and natural gas transmission pipeline and related facilities (BLM 2003e).

The LSFO has collaborated with several cooperating agencies in developing formal MOUs in an effort to meet the management objectives of the BLM, while also accommodating the needs of the cooperating partner. The BLM in Arizona, which includes LSFO, currently participates in an MOU with the Federal Highway Administration and Arizona Department of Transportation (ADOT), related to authorizing ROWs across Federal lands.

Since 1988, the number of ROWs issued in the Decision Areas has remained constant at about nine per year. In general, ROW applications are for access across public lands to private parcels, other transportation routes, utility distribution systems, communication facilities (e.g. cellular towers), telephone lines, water facilities, and pipelines. In 1988, the BLM granted (including amendments) a relatively high number of ROWs for roads, power facilities, and water facilities, mainly due to a backlog of applications that the BLM was able to address that year. Roads received nearly double

the amount of ROWs grants than any other category, with water facilities and power facilities following with about half as many ROWs each since 1988 (Information drawn from LR2000, Case Recordation Reports Lands Year End Report, 2010). The trend in population growth in close proximity to public lands suggests that the average number of ROWgrants issued across public lands will likely increase each year. Increased urbanization of public lands in the Planning Area suggests continued authorizations of two to three ROWs per year within the designated corridors.

Utility Corridors

Utility corridors have been allocated and maintained since their adoption in previous planning documents. Major utility systems such as transmission lines greater than 230kV, pipelines greater than 10 inches in diameter, and primary paved roads, as defined by the BLM's Planning and Conducting Route Inventories technical reference guide 9113-1 have been authorized within these corridors. There are currently ten 1-mile wide corridors that cross public lands in the Planning Area, which are listed in Table 3.15, "Utility Corridors within the Lower Sonoran" (p. 308). The corridors are centered at the centerline of the major utility system in which the corridors are named after, unless otherwise stated within the table.

Table 3.15. Utility Corridors within the Lower Sonoran

Size and Legal Area of Utility Corridor	Active LUA Holders within Utility Corridor
El Paso Natural Gas (EPNG) Utility Corridor	
Length: 50.6 miles **Width:** 1 mile (half mile north and south of the centerline for EPNG LUA for a natural gas pipeline (when the utility corridor runs adjacent to the Monument's northern boundary (beginning in section 28 of T. 2. S., R 3. W.), the southern border of the utility corridor repositions to the Monument's northern border and extends 1 mile wide north)). **Legal Area (T/R):** *Outside of the Ajo Block* T.1.N., R.9.W.; T.1.N., R.8.W.; T.1.S., R.8.W.; T.1.S., R.7.W., T.1.S., R.6.W.; T.2.S., R.6.W.; T.2.S., R.5.W.; T.2.S., R.4.W.; T.2.S., R.3.W.; T.2.S., R.2.W; T.3.S., R.2.W.; T.3.S., R.1.W.; T.4.S., R.1.W; T.4.S., R.1.E; and T.5.S., R.1.E. *In the Ajo Block* T.12.S., R.6.W.; T.12.S., R.5.W., T.12.S., R.4.W.; T.11.S., R.4.W.; and T.11.S., R.3.W. **Geographic Area Description:** *Outside of the Ajo Block* This portion of the EPNG Utility Corridor travels southeast from the northeast corner of the Planning Area, north of the Gila Bend Mountains, and along the northern edge of the SDNM until it intersects with the TEP Utility	*Outside of the Ajo Block* **EPNG:** holds several perpetual and non-perpetual LUAs for a 50' to 52.5' wide underground natural gas pipelines (approximately 30" in diameter) and operation and maintenance facilities, including cathodic protection stations, test wells, access roads, and storage facilities. **Southwest Gas Corporation** holds a 20' wide perpetual LUA for an underground natural gas pipeline and related facilities, which run south (perpendicular to the utility corridor) from the EPNG pipeline in section 1 and 12 of T.1.S., R.8.W. and four 40' wide LUAs for underground natural gas pipelines which intersect the utility corridor in section 28 of T.2.S., R.4.W., section 3, T.3.S, R.2.W., and section 20, T.3.S, R.1.W. **Private Property Owner** holds a 33' wide LUA for an existing road, which runs parallel to the Southwest Gas Corporation's LUA mentioned above (perpendicular to the utility corridor) (AZA-18271). *APS* holds six 40' wide LUAs for 12 kV and 69 kV transmission lines, which intersect the utility corridor in section 16 of T.1.S., R.7.W., section 27 of T. 2. S., R.6.W., section 28 of T.2.S., R.4.W., and section 27 of T.2.S., R.6.W., section 26 of T.2.S., R.4.W., and section 25 of T.2.S., R.4.W. APS also holds five LUAs for 15' to 20' wide 12 kV transmission lines, which run parallel to the utility corridor for less than half a mile in section 26 of T.2.S., R.4.W, section 36 of T.2.S., R.3.W., section 30 of T.2.W., R.2.W., section 30, T.3.S, R.2.W., section 11, T.3.S, R.2.W., and section 13, T.3.S, R.2.W. **Transwestern Pipeline Corporation** holds a 50' wide LUA for an underground natural gas pipeline and access

Size and Legal Area of Utility Corridor	Active LUA Holders within Utility Corridor
Corridor, just south of Mobile, AZ) (refer to Map 2-5a: Land Use Authorizations). *In the Ajo Block* This portion of the EPNG Utility Corridor travels east-northeast from Ajo, AZ towards the Batamote and Sauceda Mountains, until the utility corridor ends at the Tohono O'odham Nation in the east (refer to Map 2-5a: Land Use Authorizations).	road, entering the utility corridor in section 11 of T.2.S., R.6.W., then traveling southwest within the utility corridor. **APS, EPNG, Public Service Company of New Mexico, and SRP** jointly holds a 200' wide LUA for a 525 kV transmission line and access roads, entering the utility corridor in section 11 of T.2.S., R.6.W., then traveling southwest within the utility corridor. **Maricopa County Department of Transportation** holds a 130' LUA for Agua Caliente Road, which intersects the utility corridor in section 11 of T.2.S., R.6.W., a 65' LUAfor Riggs Road, which intersects the utility corridor at section 30, T.2.S, R.2.W., and another 65' wide LUA for a road which intersects the utility corridor at section 28, T.3.S, R.1.W. **Gila Bend Power Partners LLC** holds a 200' wide LUA for a 500 kV transmission line. Paloma Ranch Investments holds a several LUAs for a reservoir, canal, and Gillespie Dam, which encroaches into the utility corridor in section 28 of T.2.S., R.5.W. **Maricopa County Flood Control** holds a non-linear LUA (less than 1 acre) for flood control purposes in section 28 of T.2.S., R.5.W. **Enterprise Land and Water** holds a 100' perpetual LUA for a canal, which intersects the utility corridor in section 28 of T.2.S., R.5.W. **Deep Rainbow Valley Community and other private property residents** hold a LUA for a road, which intersects the utility corridor at section 30, T.2.S, R.2.W. **Lufthansa German Air** holds a 2-acre LUA for an instrument landing facility, which encroached into the utility corridor in section 27, T.3.S, R.1.W. **Salt River Project (SRP)** holds a 330' wide LUA for a transmission line that intersects the utility corridor in section 7, T.7.S, R.1.E. **Southern Pacific Railroad** holds a perpetual LUA for a rail line, which intersects the utility corridor at section 18, T.4.S, R.1.E. *Within the Ajo Block* **EPNG** holds a 50' wide perpetual LUA for a natural gas pipeline and related facilities. **Freeport—McMoran** holds a 50' LUA for a transmission line, which runs parallel to the utility corridor in section 19, T.12.S, R.5.W.

Size and Legal Area of Utility Corridor	Active LUA Holders within Utility Corridor
	APS holds a 15' wide LUA for a 12 kV transmission line, which runs parallel to the utility corridor and a 30' LUA for a 69 kV transmission line, which also runs parallel to the utility corridor. *Note: The San Diego Gas and Electric, Liberty -Gila Bend, Palo Verde-Kyrene, Santa Rosa-Gila Bend, and TEP Utility Corridors all intersect this utility corridor. The LUA that lie within these utility corridors are not described here.*
Palo Verde-Devers Utility Corridor	
Length: 8.8 miles **Width:** 1 mile (half mile north and south of the centerline for APS's LUA for a 500 kV transmission line). **Legal Area (T/R):** T.2.N., R.7.W., T.1.N., R.8.W.; T.1.N., R.7.W.; T.1.S., R.7.W.; T.1.S., R.6.W.; and T.1.S., R.5.W. **Geographic Area Description:** This utility corridor travels southeast through the Saddle Mountain area of BLM land towards Arlington, AZ to connect with the San Diego Gas and Electric Utility Corridor, which connects to the Palo Verde Nuclear Facility (refer to Map 2-5a: Land Use Authorizations).	**APS** holds a 200' wide, LUA for a 500 kV transmission line. **Southern California Edison** holds one 160' wide LUA for a transmission line. **Maricopa County Department of Transportation (MSDOT)** holds a 1,000' by 1,000' site LUA for a materials production facility and access road. *Note: The Interstate 10 and San Diego Gas and Electric Utility Corridors all intersect this utility corridor. The LUAs that lie within these utility corridors are not described here.*
San Diego Gas and Electric Utility Corridor	
Length: 21.8 miles **Width:** 1 mile (half mile north and south of the centerline for San Diego Gas and Electric Company/APS's LUA for a 500 kV transmission line). **Legal Area (T/R):** T.4.S., R.9.W.; T.4.S., R.8.W.; T.3.S., R.9.W.; T.3.S., R.8.W.; T.2.S., R.8.W.; T.2.S., R.7.W.; T.1.S., R.7.W.; and T.1.S., R.6.W. **Geographic Area Description:** This utility corridor travels east-northeast from the western border of the Planning Area northeast through the Gila BendMountain towards the Palo Verde Nuclear Station, just north of the Signal Mountains Wilderness (refer to Map 2-5a: Land Use Authorizations).	**San Diego Gas and Electric Company / APS** holds a 200' LUA for a 500 kV transmission line. **Santa Fe Pacific Pipeline Company** holds a 50' wide LUAs for a natural gas pipeline and other LUAs for related facilities, which run parallel or intersect the utility corridor. **Southern Pacific Railroad** holds a perpetual LUA for railroad and station grounds. **Arizona Eastern Railroad** holds a 200' LUA for a railroad line, which runs parallel to the utility corridor. **MCDOT** holds a 130' LUA for Agua Caliente Road, which intersects the utility corridor in section 11 of T.2.S., R.6.W. *Note: The EPNG, Palo Verde-Devers, Interstate 10, and Liberty-Gila Bend Utility Corridors intersect this utility corridor. The LUAs that lie within these utility corridors are not described here.*
Palo Verde-Kyrene Utility Corridor	

Size and Legal Area of Utility Corridor	Active LUA Holders within Utility Corridor
Length: 7.6 miles **Width:** 1 mile (half mile north and south of the centerline for APS's, EPNG, Public Service Company of New Mexico and SRP's LUA for a 525 kV transmission line). **Legal Area (T/R):** T.2.S., R.3.W.; T.2.S., R.2.W.; and T.1.S., R.3.W. **Geographic Area Description:** This utility corridor travels northeast from the northern border of the Monument from the EPNG Utility Corridor until it intersects with the TEP Utility Corridor near Liberty, AZ (refer to Map 2-5a: Land Use Authorizations).	**APS, EPNG, Public Service Company of New Mexico, and SRP** jointly holds a 200' wide LUA for a 525 kV transmission line and access roads. *Note: The EPNG and TEP Utility Corridors intersect this utility corridor. The LUAs that lie within these utility corridors are not described here.*
Liberty-Gila Bend Utility Corridor	
Length: 9.6 miles **Width:** 1 mile (1 mile west of the centerline of APS's LUA for a 20' wide transmission line). **Legal Area (T/R):** T.1.S., R.4.W.; T.1.S., R.3.W.; T.2.S., R.4.W.; T.2.S., R.3.W.; T.3.S., R.4.W.; and T.4.S., R.4.W. **Geographic Area Description:** This utility corridor travels directly south from the Interstate 10 Utility Corridor towards Gila Bend, AZ, on the east side of State Route 85 (refer to Map 2-5a: Land Use Authorizations).	**APS** holds two LUAs for a 230 kV (120' wide LUA) and 69 kV (20' LUA) transmission line which both run parallel to the utility corridor. **Gila Bend and Water Company** holds an LUA for a water irrigation canal, which intersects the utility corridor in section 19 of T.1.S., R.3.W. **AZ SHWY** (also referred to as the Arizona Department of Transportation (ADOT)) holds perpetual LUAs for State Route 85, along with several other LUAs for highway related facilities (such as dykes and pull-offs). **Bureau of Reclamation** holds a 100' LUA for an access road, which intersects the utility corridor at section 26, T.3.S., R.4.W. **BLM** holds three 100' LUAs for access roads, which intersect the utility corridor at section 2, 14, and 23 of T.4.S., R.4.W. **Qwest Corporation** holds an 8' wide LUA for an underground fiber optic line which runs parallel to the utility corridor. *Note: The Interstate 10, EPNG, Santa Rosa-Gila Bend, and Interstate 8 Utility Corridors intersect this utility corridor. The LUAs that lie within these utility corridors are not described here.*
Gila Bend-Ajo Utility Corridor	
Length: 0.9 miles **Width:** 1 mile (half mile east and west of the centerline of APS's LUA for a 20' wide transmission line). **Legal Area (T/R):** T.11.S., R.6.W. **Geographic Area Description:** The majority of this utility corridor lies within the Barry M. Goldwater Air Force Range. The utility corridor travels south from Gila	**APS** holds a 20' LUA for a 69 kV transmission line, which runs parallel to the utility corridor and a 15' LUA for a 21 kV transmission line which intersects the utility corridor at section 21 of T.11.S., R.6.W. **AZ SHWY** holds a 200' perpetual LUA for State Route 85, which runs parallel to the utility corridor. **Table Top Telephone Company** holds a 20' wide LUA for an above ground telephone line, which runs parallel to the utility corridor.

Size and Legal Area of Utility Corridor	Active LUA Holders within Utility Corridor
Bend, AZ until it arrives at Ajo, AZ (refer to Map 2-5a: Land Use Authorizations).	*Note: The Interstate 8 Utility Corridor intersects this utility corridor. The LUAs that lie within this utility corridor are not described here.*
Santa Rosa-Gila Bend Utility Corridor	
Length: 0.1 miles **Width:** 1 mile (half mile north and south of the centerline of Southern Pacific Railroad's LUA for a rail line). **Legal Area (T/R):** T.5.S., R.4.W. **Geographic Area Description:** This portion of the utility corridor travels northeast from Gila Bend, AZ until the utility corridor enters into the Monument (refer to Map 2-5a: Land Use Authorizations).	**MCDOT** holds one 110' wide LUA for operating and maintaining State Route 238. **Southern Pacific Railroad** holds a perpetual LUA for a 200' wide rail line and storage facilities, which run parallel to the utility corridor. **Qwest Corporation** holds one 20' wide LUA for an above ground telephone line and another 25' LUA for an underground fiber optic line, which both run parallel to the utility corridor. *Note: The Liberty-Gila Bend, EPNG, and TEP Corridors intersect this utility corridor. The LUAs that lie within these utility corridors are not described here.*
Interstate 8 Utility Corridor	
Length: 21.7 miles **Width:** 1 mile (half mile north and south of the Interstate 8 Highway LUA centerline). **Legal Area (T/R):** T.7.S., R.10.W.; T.6.S., R.10.W.; T.7.S., R.9.W.; T.6.S., R.9.W.; T.6.S., R.8.W.; T.6.S., R.7.W.; T.6.S.; R.6.W.; T.6.S., R.5.W.; T.5.S., R.5.W.; T.6.S., R.4.W.; T.7.S., R.1.E.; T.7.S., R.2.E.; T.7.S., R.3.E.; and T.7.S., R.4.E. **Geographic Area Description:** This utility corridor divides the Planning Area and runs from the Yuma County line in the west until it reaches Interstate 10 to the east (refer to Map 2-5a: Land Use Authorizations)	**AZ SHWY** holds several LUAs for operating and maintaining the major 300' wide LUA for the Interstate 8 Freeway. These additional LUAs include fencing, access roads, drainage sites, and sand and gravel production and storage facilities. **Qwest Coporation** holds one 20' wide LUA for an above ground telephone line and another 10' wide LUA for a buried telephone line, both LUAs run parallel to the utility corridor. **APS** holds a 6' wide LUA for a short 12 kV transmission line which lies within the utility corridor. **Southern Pacific Railroad** holds several perpetual LUAs for a 200' wide rail line and storage facilities, which run parallel to the utility corridor. **BLM** holds a perpetual LUA for an access road, which intersects the utility corridor at section 10, T.6.S., R.4.W. *Note: The Gila Bend-Ajo, Liberty-Gila Bend, and TEP Utility Corridors intersect this utility corridor. The LUAs that lie within these utility corridors are not described here.*
Tucson Electric Power (TEP) Utility Corridor	

Size and Legal Area of Utility Corridor	Active LUA Holders within Utility Corridor
Length: 30.6 miles **Width:** 1 mile (1 mile east of the centerline of TEP's LUA for a 500 kV transmission line). Within the Ajo Block, the utility corridor is 1 mile wide (half mile north and south of APS's LUA for a 69 kV transmission line, until the corridor reaches section 5 of T.12.S., R.5.W., where the utility corridor heads south and extends one mile wide, east from the LUA's centerline. **Legal Area (T/R):** Outside the Ajo Block T.2.S., R.1.W.; T.2.S., R.1.E.; T.3.S., R.1.E.; T.4.S., R.1.E.; T.4.S., R.2.E.; T.5.S., R.1.E.; T.5.S., R.2.E.; T.6.S., R.2.E.; T.7.S., R.2.E.; and T.7.S., R.3.E. In the Ajo Block T.11.S., R.6.W.; T.11.S., R.5.W.; T.12.S., R.6.W.; T.12.S., R.5.W.; and T.13.S., R.5.W. **Geographic Area Description:** *Outside the Ajo Block* This utility corridor travels southeast towards Tucson, AZ from Buckeye, AZ, just east of the Monument and exits the Planning Area when it enters the Tohono O'odham Nation (refer to Map 2-5a: Land Use Authorizations). *In the Ajo Block* This utility corridor begins where the Gila Bend-Ajo Utility Corridor ends, just north of Ajo, AZ. The utility corridor bypasses Ajo, AZ to the north and east and heads southeast towards Why, AZ, parallel to State Route 85 (refer to Map 2-5a: Land Use Authorizations).	*Outside the Ajo Block* **TEP** holds two major LUAs for a 500 kV and a 345 kV transmission line (220' and 210' wide respectively). **Pinal County Department of Transportation** holds one 50' LUA for Hidden Valley Road, which runs parallel to the utility corridor. *In the Ajo Block* **APS** holds a 30' wide LUA for a 69 kV transmission line, which runs parallel to the utility corridor. **AZ SHWY** holds a perpetual 200' wide LUA for State Route 85, which connects Ajo, AZ to Why, AZ and runs parallel to the utility corridor **Tucson Cornelia Railroad** holds a 200' wide LUA for a rail line, which intersects the corridor at section 35 of T.11.S., R.5.W. **Freeport-McMoran** holds a 50' wide LUA for one 44 kV transmission line and two water pipelines, which intersect the corridor at section 35 of T.11.S., R.5.W. *(ADEQ)* **Arizona Department of Environmental Quality (ADEQ)** holds a 35' by 35' LUA for a air monitoring station, which lies within the corridor in section 1 of T.12.S., R.5.W. **Table Top Telephone Company** holds a 20' wide LUA for an above ground telephone line and another 10' wide LUA for an underground fiber optic line, both of which runs parallel to the utility corridor. *Note: The Palo Verde-Kyrene, Santa Rosa-Gila Bend, EPNG, TEP, and Interstate 8 Utility Corridors intersect this utility corridor. The LUAs that lie within these utility corridors are not described here.*
Interstate 10 Utility Corridor	
Length: 1 mile **Width:** 1 mile (1 mile south of the Interstate 10 Highway LUA centerline). **Legal Area (T/R):** T.2.N., R.8.W. **Geographic Area Description:** This utility corridor runs directly south and parallel to Interstate 10, and is the northern boundary of the Planning Area until Interstate 10 reaches Phoenix, AZ.	**AZ SHWY** holds an LUA for operating and maintaining the 450' wide LUA for the Interstate 10 Freeway. **Sprint Communications** holds a 15' wide LUA for an underground fiber optic line, which runs parallel to the utility corridor. **APS** holds a 15' wide LUA for a 12 kV transmission line, which intersects the utility corridor at section 7 of T.2.N, R.8.W.
*All data was collected from BLM Master Title Plats (March 2011)	

Table 3.16. Existing Utility Corridors within the SDNM

Size and Area of Utility Corridor	Active LUA Holders within Utility Corridor
Interstate 8 Utility Corridor	
Length: 22.4 miles **Width:** 1 mile (half mile north and south of the Interstate 8 Highway LUA centerline). **Legal Area (T/R):** T.6.S., R.4.W.; T.6.S., R.3.W.; T.6.S., R.2.W.; T.6.S., R.1.W.; T.7.S., R.1.W.; T.7.S., R.1.E.; T.7.S., R.2.E.; and T.7.S., R.3.E. **Geographic Area Desciprtion:** The portion of the Interstate 8 utility corridor within the Monument travels eastward from Gila Bend, AZ through the Monument (south of the South Maricopa Mountains Wilderness), towards Casa Grande, AZ (refer to Map 2-5a: Land Use Authorizations). *Note: Portions of the north half of the utility corridor does encroach into the South Maricopa Mountain Wilderness, however, no LUAs have been authorized within that portion of the utility corridor and no new authorizations would be entertained.*	**AZ SHWY** holds several LUAs for operating and maintaining the major 300' wide LUA for the Interstate 8 Freeway. These additional LUAs include fencing, access roads, drainage sites, and sand and gravel production and storage facilities. **BLM** holds one 30' wide LUA for an access road (called Vekol Valley Road), which intersects the Interstate 8 Utility Corridor and travels south towards a private land in-holding within the Vekol Valley portion of the Monument. **Western Farm Credit** holds one LUA for a legal road access on Vekol Valley Road, in order to access a private land inholding in the Vekol Valley portion of Monument. *Note: The TEP Utility Corridor intersects this utility corridor at T.7.S, R.3.E. The LUAs that lie within the TEP Utility Corridor are not described here.*
Santa Rosa-Gila Bend Utility Corridor	
Length: 18 miles **Width:** 1 mile (beginning at the western edge of the Monument, the utility corridor is a half mile north and south of the centerline of Southern Pacific Railroad's LUA for a rail line, until APS's LUA for a transmission line begins at section 23, in which this LUA's centerline becomes the midpoint of the utility corridor. At section 5 of T.5.N, R.1.W, the utility corridor aligns with the centerline of ADOT's LUA for SR-238 until the route exits the eastern side of the Monument). **Legal Area (T/R):** T.5.S., R.4.W.; T.5.S., R.3.W.; T.5.S., R.2.W.; T.5.S., R.1.W.; and T.4.S., R.1.W. **Geographic Area Description:** This portion of the Santa Rosa to Gila Bend Utility Corridor within the Monument travels northeast from Gila Bend, AZ through the northern portion of the Monument (between the North and South Maricopa Mountains Wildernesses) along SR-238 towards Mobile, AZ (refer to Map 2-5a: Land Use Authorizations). *Note: Portion of the south half of the utility corridor does encroach into the South Maricopa Mountain Wilderness, however, no active LUAs are within that portion of the utility corridor and no new authorizations would be entertained for that segment of the utility corridor.*	**APS** holds one 30' wide LUA for a 69 kV transmission line that travels from Gila Bend, AZ to a hazardous waste facility near Mobile, AZ. **MCDOT** holds one 110' wide LUA for operating and maintaining State Route 238, which also includes portions of a fence and a bridge. The road travels from the western side of the Monument until it reaches section 5 of T.5.N., R.1.W. **AZ SHWY** holds one 100' wide LUA for operating and maintaining State Route 238, which begins at section 5 of T.5.N, R.1.W., until the road exits the eastern side of the Monument. **Southern Pacific Railroad** holds several perpetual LUAs for a 200' wide rail line and storage facilities. **ADEQ** holds one 50' to 100' wide LUA for an access road to a hazardous waste facility, just north of the utility corridor. **Arizona Department of Administration** holds one 50' wide LUA for an underground water pipeline to service a hazardous waste facility. **Qwest Corporation**holds one 20' wide LUA for an above ground telephone line and another 25' LUA for an underground fiber optic line, which both run parallel to the utility corridor.

Size and Area of Utility Corridor	Active LUA Holders within Utility Corridor
Tucson Electric Power (TEP) Utility Corridor	
Length: 7 miles **Width:** 1 mile (1 mile east of the centerline of TEP's LUA for a 500 kV transmission line). **Legal Area (T/R):** T.7.S., R.3.E. *Geographic Area Description:* **Geographic Area Description:** This portion of the TEP Utility Corridor clips the far east side of the Monument and travels southeast after intersecting with the Interstate 8 Utility Corridor and runs directly north along the Table Top Wilderness boundary (refer to Map 2-5a: Land Use Authorizations). *Note: Portions of the west half of the utility corridor do encroach into the Table Top Mountain Wilderness, however, no active LUAs are within that portion of the utility corridor and no new authorizations would be entertained for that segment of the utility corridor.*	**TEP** holds two major LUAs for a 500 kV and a 345 kV transmission line (220' and 210' wide respectively). **AZ SHWY** holds one LUA for an access road, drainage easements (at varying widths), and sand and gravel production site) which encroaches into the utility corridor. **APS** holds one 110' wide LUA for a 230 kV transmission line which intersects the utility corridor in section 25. *Note: The Interstate 8 Utility Corridor intersects this utility corridor at T.7.S, R.3.E. The LUAs that lie within the Interstate 8 Utility Corridor are not described here.*

Permits, Leases, and Easements

Applications for leases, permits, and easements are processed under the guidance of FLPMA and other applicable laws and regulations pursuant to 43 CFR 2900. Issuance of leases and permits (such as apiary permits and film permits) is a discretionary action. These authorizations may include but are not limited to airport leases, Recreation and Public Purposes Act (R & PP) leases, special-use permits and leases under 43 CFR 2920, permits, or easements (agricultural leases/permits, film permits, apiary permits, concession leases, etc.). Approximately two permits are authorized each year. Apiaries have been the most common permits issued in the Planning Area. No leases (excluding R & PP leases) or easements have been authorized within the Lower Sonoran since 1988. Approximately ten R & PP leases have been authorized since 1989. Approximately seven R & PP patents have been completed in the Planning Area since 1989.

Communication Sites

The Planning Area has one designated communication site that is managed through the Oatman Mountain Communication Site Plan. This site is located in the Gila Bend Mountains in Section 25 of T. 4 S. R. 9 W, Gila and Salt River Meridian. Since 1988, six facilities have been constructed within the site. Currently the site is near capacity because the unique topography of the area and limited developed space make it difficult to locate new facilities. However, co-location into existing facilities where leaseholders are willing remains a viable option.

Utility-scale Renewable Energy Development

While utility-scale renewable energy developments were not specifically addressed as a part of the lands and realty program in previous land-use plans, recent advancements in renewable energy technology and increased interest in this type of land use authorization have changed this. The BLM's general policy has been to facilitate environmentally responsible commercial development of solar energy projects on public lands and to use solar-energy systems on BLM

facilities where feasible. Responding to increased interest in solar-energy development, the BLM issued national guidance to facilitate the processing of ROW applications for solar-energy projects on public lands. All applications for renewable energy projects are processed as major, site-specific ROWs under FLPMA.

As of spring 2011, there were seven pending applications for utility-scale solar-energy developments in the Lower Sonoran. The BLM and the U.S. Department of Energy (DOE) have prepared a joint programmatic environmental impact statement (PEIS) to provide guidance in facilitating environmentally responsible utility-scale solar energy development by establishing policies and best management practices. The Draft PEIS was released to the public in December 2010. The focus is on BLM administered lands in Arizona, California, Colorado, Nevada, New Mexico, and Utah because those states have the highest potential for solar energy production. The preferred alternative within the PEIS analyzed 24 "solar energy zones" in those states, including three that are in Arizona. One study area is within the Planning area and is located north of the Gila Bend Mountains and directly south of the El Paso Natural Gas Utility Corridor. It is referenced as the Gillespie SEZ in the Solar Energy Development Draft PEIS. More information on the PEIS, including the draft and final documents, are available on the website http://solareis.anl.gov/documents/maps/studyareas/Solar_Study_Area_AZ_Ltt_6-09.pdf when they are available.

The BLM Arizona State Office is currently in the process of developing a Draft EIS (called the Restoration Design Energy Project – EIS), which aims to build off of the agency wide Programmatic EIS, by allocating additional areas and sites for renewable energy development within Arizona BLM administered lands (with an emphasis on allocating suitable areas on previously disturbed sites and areas with low resource conflicts). A draft of this EIS is projected to be released in the fall of 2011.

Market trends have been focused around the development of solar energy (having nine applications for solar) with the assumption that there is little potential for biomass or wind energy on public lands in the Planning Area. As a result, no applications for biomass or wind energy development have been submitted or authorized.

3.3.1.2. Withdrawals

Withdrawals are formal lands actions that set aside, withhold, or reserve Federal land by statute or administrative order for public purposes. A withdrawal creates a title encumbrance on the land. Withdrawals are established for a wide variety of purposes such as power site reserves, military reservations, administrative sites, recreation sites, national parks, reclamation projects, and wilderness areas. Withdrawals are most often used to preserve sensitive environmental values and major Federal investments in facilities or other improvements, to support national security, or to provide for public health and safety. Withdrawals can be designated by Congress through a public land order or statute, or processed by the BLM administratively through FLPMA and 43 CFR 2300.

Classification of lands is the process of determining whether the lands are more valuable or suitable for transfer or use under particular or various public land laws than for retention in Federal ownership for management purposes. The classification process is currently used for potential disposals under the R & PP Act. The segregation of lands is an action such as a withdrawal or allowed application (e.g. R & PP) that suspends the operation to entry under all or portions of the public land laws, which includes the mining and mineral leasing laws.

Existing withdrawals where the BLM does not retain any management authority are limited to the BGR for military purposes. The BLM retains specific management responsibilities, such as fire management or grazing, based on the specific legislation guiding withdrawals to other Federal agencies such as the Bureau of Reclamation and the Army Corps of Engineers for dams, reservoirs, and canals, or the USFWS for wildlife-management purposes.

Lands within congressionally designated wilderness areas also are withdrawn from all forms of appropriation under the mining laws and from disposition under mineral leasing laws. Prior existing claims or leases with valid existing rights may be developed, though mineral development within wilderness areas is rare. Within the Planning Area, 249,500 acres have been withdrawn under the Wilderness Act of 1964, as amended. Withdrawn lands (with surface estate not currently managed by the BLM) are displayed on land use authorization maps 2-5a to 2-5e.

3.3.1.3. Land Tenure

Land tenure refers to actions that result in the disposal of public lands or the acquisition of non-Federal land or interests.

The existing surface-management pattern within the Planning Area is shown on Map 1-1: Surface Management. The BLM administers approximately 1,416,600 acres of surface estate in the Decision Areas, which includes 486,400 acres in the SDNM and 930,200 acres in the Lower Sonoran. The current land-tenure pattern can be difficult to manage in areas where there are scattered and isolated parcels or where there is split estate (where the subsurface estate owner is not the surface owner). Larger blocks of land generally allow for management that is more efficient.

Land Disposals through FLPMA Exchanges and Competitive Sales

Bureau of Land Management adjustments to land tenure can occur under a variety of realty actions, exchanges, and sales. Public lands selected for disposal typically meet the following criteria:

- Isolated and fragmented from larger tracts of BLM-managed lands,
- Adjacent to urbanizing private and State lands subject to future development,
- Currently leased under the R & PP Act and eligible to be patented,
- Present an economic and management challenge to retain under public ownership,
- Not within designated wildlife corridors,
- Not occupied by species listed or proposed as threatened or endangered under the ESA,
- Not designated or proposed critical habitat for listed or proposed threatened or endangered species,
- Not supporting listed or proposed threatened or endangered species if such transfer would conflict with recovery of the listed or proposed species, and
- Not supporting Federal candidate species if such action would contribute to the need to list the species as threatened or endangered.

Under the authority of FLPMA, the BLM can sell public lands through competitive sales and exchange lands with other land management agencies and private landowners. Federal lands can only be sold at fair market value, that is, at a price comparable to private land sales.

There have been no land exchanges and only one competitive sale within the Planning Area since the Lower Gila South RMP Amendment was signed in 2005. The competitive sale was for a 160-acre parcel south of the City of Goodyear. Since September 2008, real estate values and sales have decreased significantly in the Planning Area; therefore, the LSFO is not anticipating growth in competitive land sale proposals in the foreseeable future.

Subsurface Estate Disposals

The BLM regulations establish procedures under section 209 of FLPMA for conveyance of mineral interests owned by the United States where the surface is or will be in non-Federal ownership. The objective is to allow consolidation of surface and subsurface or mineral ownership where there are no "known mineral values" or in those instances where the reservation interferes with or precludes appropriate non-mineral development and such development is a more beneficial use of the land than the mineral development.

Land Disposals through R & PP Act Patent

Land Disposals through the R & PP Act provides for the transfer, at a reduced cost, of public lands to a state, state agency, political subdivision of a state or a qualified non-profit organization for recreation such as a park, or a public purpose such as a fire station (BLM 1996a). R & PP actions have resulted in the transfer (i.e. patent or lease) of approximately 2,005 acres out of public surface estate in the Planning Area; however, 130 acres were returned to BLM management when the Arizona State Parks Department relinquished an R & PP patent at Painted Rocks State Park. Approximately 7,687 acres of public land eligible for patent or lease is pending application.

Most R & PP applications come from government agencies, especially the State of Arizona or local jurisdictions. A majority of the acreage transferred to date under the R & PP Act was by the State of Arizona (this does not include pending leases or patents). Cities are receiving nearly double the number of patents and leases compared to the State; however, the acreage transferred to cities is less. Of the issued and pending leases and patents, which make up the majority of the R & PP actions, approximately 90 percent of the acreage has been related to parks and recreational facilities, while fewer acres have been requested for other public purposes (e.g. municipal facilities) (BLM 2004b).

Since the adoption of the Phoenix RMP (BLM 1989), Lower Gila North Management Framework Plan (BLM 1983), and Lower Gila South RMP (BLM 1989), as amended, surface-estate changes within the Planning Area have been minimal, with only 9,952 acres disposed. As indicated by the acreages of land transferred, minimal changes in land status have occurred since previous plans were adopted. The two main factors that have caused a decrease in land status changes were a legal determination that the Arizona State Land Department did not have the authority to exchange lands under the Arizona Constitution and the Planning Area's location in a volatile market with land prices that were above the national average.

Land Acquisitions

Acquisitions can occur through purchases, exchanges, easements, and other land transfers. Acquired land is always designated for retention. Disposed land is no longer under BLM's surface management and no longer classified for retention or disposal. Purchases, easements, exchanges, and directed sales are completed based on appraised market value. Competitive sales are completed based on a minimum of appraised fair market value, but may exceed that value based on competitive bidding.

No land acquisitions have taken place within the Planning Area since the adoption of the Phoenix RMP (BLM 1989), Lower Gila North Management Framework Plan (BLM 1983), and Lower Gila South RMP (BLM 1989), as amended.

3.3.2. LIVESTOCK GRAZING

Livestock grazing in Arizona is managed under Title 43 of the CFR, section 4100, and is based on the Taylor Grazing Act (43 USC 315, 315a-315r), FLPMA (43 USC 1701 et seq.), the Public Rangeland Improvement Act (43 USC 1901 et seq.), and other executive and public land orders. Grazing leases and permits are issued according to CFR 4130.2(d) and generally last 10 years. The BLM can change allotment schedules, stocking rates, classes of livestock, or other grazing practices if a resource concern arises. When leases or permits are scheduled for renewal, the BLM evaluates resource conditions within the allotments consistent with the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (S & Gs). Approved in 1997, the S & Gs are now also referred to as Land Health Standards and Arizona Guidelines for Grazing Administration (See Appendix L, *Guidelines for Grazing Administration* (p. 1253), and Appendix W, *Land Health Standards* (p. 1339)). Grazing practices are managed to achieve resource and grazing objectives, as described in the terms and conditions of the grazing permit or lease.

3.3.2.1. Rangeland Health and Condition

The overall objective of the Planning Area's rangeland management program is to manage soil and vegetation communities to meet land health standards and multiple-use objectives. The purpose of the S at 43 CFR 4180 is to provide a measure (i.e. standard) to determine land health and methods (i.e. guidelines) to improve the health of public rangelands. The BLM's job is to maintain the health of the land or make appropriate changes on the ground where land health standards are not being met. The standards help the BLM, public land users, and others to focus on a common understanding of acceptable resource conditions. The standards communicate current and desired resource conditions among the various groups. Guidelines describe or communicate techniques for managing activities to achieve those desired conditions. Guidelines for grazing management emphasize multiple use by incorporating needs for wildlife habitat, soil, watershed, riparian areas, and recreation.

The specific program goals and objectives are accomplished through activity-level planning, with attention given to proper season of use; suitable grazing systems; plant and animal requirements; kind, class, and distribution of livestock; and placement of rangeland improvements. Together with livestock operators, other affected agencies, and interested publics, the BLM examines the indicators addressed by the standards, and assesses whether or not they are being achieved through the evaluation process. If resource monitoring shows standards are met or progress is being made towards meeting them, existing management can continue. Resource monitoring can include the collection of vegetation and soil attributes (i.e. cover, frequency, and species composition, etc.),

utilization levels of key forage plants, actual livestock use, and climate data from permanently established plots within allotments. If progress is not being made towards achieving standards and current livestock grazing is determined to be a significant causal factor, then appropriate actions including changes to permits, grazing systems and practices can be implemented in order to ensure progress towards achievement of standards. Appropriate actions can consist of:

- Actions taken pursuant to 43 CFR 4110, 4120, 4130, and 4160 that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with the guidelines (43 CFR 4180.2(c)).

- Implementing and issuing a final decision pursuant to 43 CFR 4110, 4120, 4130, and 4160 upon determining that existing grazing management needs to be modified to ensure that the Fundamentals of Rangeland Health exist (43 CFR 4180.1).

Historic Livestock Use

Livestock grazing in the Planning Area began in the late 1700s, based out of American Indian rancherias along the Gila River. At that time, livestock were confined to the flood plains of the Gila River, the only available and reliable water source to support livestock year-round. It is likely that the mountains and bajadas adjacent to the river would have received some livestock use, particularly during wetter periods when temporary waters were available in potholes, tinajas, or the few springs in the area.

Settlers began to move into the area along the Gila River in the 1860s and started farming operations. Livestock from these farms also were likely confined to the river floodplain and the adjacent bajadas. In addition, livestock brought in by miners and prospectors would have been scattered throughout the Planning Area.

More widespread livestock use of the drier valleys and mountains in the Gila Bend, Tonopah, and Ajo areas did not occur until the widespread use of dirt stock tanks began in the late 1800s, followed by well drilling in the early 1900s. In the Ajo area, the first dirt stock tanks were established in the 1890s. The first dirt stock tank close to the Monument was built around 1900 in the Little Rainbow Valley, just north of the present boundary. The first wells in the area were drilled in Rainbow Valley from 1910 to 1912. At that time, the only waters in the Vekol Valley area consisted of a couple of dirt pools that provided temporary water for cattle for the Tohono O'odham people. The Vekol Valley was not developed for additional livestock use until the 1920s and 1930s.

At the beginning of the 20th century, ranching in the Planning Area consisted of yearlong cow-calf operations, with herds limited only by climatic conditions, water, and available forage. Management limitations on livestock numbers did not occur until 1934 with the passage of the Taylor Grazing Act. During the following years, regulations were established pertaining to operators, allotments, kind and number of livestock, and season-of-use on public lands. Although such regulations were prescribed in 1934, it was not until after WWII that large numbers of steers were brought in to utilize the ephemeral forage from a wet winter and/or spring. Sheep grazing has occurred in the past, but was limited to occasional ephemeral authorizations on a few allotments.

Current Livestock Use

In Arizona, BLM grazing allotments are classified as perennial, ephemeral, or perennial-ephemeral. Perennial means the allotment consistently produces enough forage to support a livestock operation year-round and has an established forage limit, based on the quality and quantity of perennial plants for a defined period, stated in animal-unit months (AUMs). An AUM is a measure of forage that will support a cow and its calf for one month. The amount and length of grazing use, on ephemeral allotments and allotments with ephemeral forage, is based on vegetation production and determined prior to authorizing use. In addition, grazing allotments are assigned in three management categories (improve, maintain, or custodial) based on the present resource condition, management needs, ecological potential, conflicts with other resource values, and economic potential for improvement.

Livestock operations in the Planning Area on allotments not classified as ephemeral only are generally yearlong cow-calf operations and involve raising calves for market from a base cattle herd. These operations usually encompass a mixed ownership of private, Arizona State Trust, and public lands within allotment boundaries. Although the operations are yearlong, they may only use the Federal rangelands seasonally. Ephemeral, perennial, and perennial-ephemeral allotments that utilize ephemeral authorizations may turn out large numbers of steers to take advantage of annual grass and forb species that can produce significant forage amounts for several months during winter and spring. These livestock can have high weight gains, up to several hundred pounds, during particularly wet years before being shipped back to summer ranges in the northern U. S. or to feedlots. Currently, no sheep or goats are authorized on any allotments in either Decision Area.

Three allotment management categories define the management level needed to properly administer grazing lands in accordance with BLM Washington Office IM 2009-018. As allotments are evaluated, the categories, in consultation with affected operators, are reviewed and revised, where needed, to respond to changing resource conditions. All allotments are placed into these categories according to management needs, resource conflicts, potential for improvement, and BLM funding/staffing constraints. The allotment categories and management are defined as:

- Category I (Improve): Category I allotments are those where the current level of livestock grazing or use on public lands is or is expected to be a significant causal factor in the non-achievement of land health standards, or where a change in mandatory terms and conditions in the grazing authorization is or may be necessary. Identifying Category I allotments requires a review of critical habitat conditions and whether projects have been proposed specifically for implementing the Healthy Lands Initiative.

- Category M (Maintain): Category M allotments are those where land health standards are met, where livestock grazing on public land is not a significant causal factor for not meeting the standards, and where current livestock management is in conformance with guidelines developed by the state directors in consultation with Resource Advisory Councils. It also covers allotments where an evaluation of land-health standards has not been completed, but where existing monitoring data indicates that resource conditions are satisfactory.

- Category C (Custodial): Category C allotments are public lands that produce less than 10 percent of the forage in the allotment or are less than 10 percent of the land area. An allotment should generally not be designated Category C if the public lands in the allotment contain critical habitat for a threatened or endangered species or wetlands negatively affected by livestock grazing.

Livestock Permits

The Lower Sonoran Decision Area currently has 45 permitted grazing allotments, 21 of which are ephemeral only, with a perennial permitted capacity of 17,541 AUMs. Portions of six LS allotments, one of which is ephemeral only, are also located within the SDNM. These allotments have a perennial permitted capacity of 8,703 AUMs. Appendix P, *Grazing Allotment Information* (p. 1281) shows allotment names and numbers, permitted AUMs, and livestock numbers and types for both Decision Areas. Also see Map 3-15: Grazing Allotments.

The number of AUMs in the SDNM and Lower Sonoran for the 10-year period from 1998 to 2007 is shown in Table 3.17, "Animal Unit Months 1998–2007" (p. 322). This table is based on the permittees' billed amount for each year during the period. During several of the listed years, AUM amounts are substantially below permitted use levels, reflecting years when permittees elected non-use in anticipation of, or response to, drought conditions or times Animal Unit Months 1998 to 2007 when additional livestock were unavailable for restocking due to livestock markets. The ephemeral AUM column indicates years with exceptionally wet winters when ephemeral permits were issued, in addition to the perennial permits, to take advantage of additional available forage.

Table 3.17. Animal Unit Months 1998–2007

Year	Lower Sonoran Decision Area			SDNM Decision Area		
	Perennial AUMs	Ephemeral AUMs	Total AUMs	Perennial AUMs	Ephemeral AUMs	Total AUMs
1998	2,995	4,594	7,589	17,244	5,713	22,957
1999	6,168	0	6,168	10,887	0	10,887
2000	5,325	393	5,718	20,298	5,287	25,585
2001	7,556	1,054	8,610	14,550	24,920	39,470
2002	1,928	11	1,939	6,110	0	6,110
2003	5,049	162	5,211	15,192	6,334	21,526
2004	4,801	379	5,180	16,323	3,254	19,577
2005	5,929	4,861	10,790	16,309	21,870	38,179
2006	8,178	1,719	9,897	16,309	0	16,309
2007	6,747	1,781	8,528	13,900	1,488	15,388
Note: SDNM allotments include portions of the allotment outside SDNM boundaries						

Drought conditions in the mid 1990s and again in 2002 reduced perennial and ephemeral forage production. When this occurs, livestock use is reduced in Decision Area allotments, or temporarily reallocated, which allows allocation of the remaining available forage specifically for wildlife use. Overall, livestock use in the Planning Area has decreased over time, although the actual number varies yearly. Grazing and grazing management is dependent on precipitation and corresponding improvement in the abundance and vigor of forage, as well as non-forage species that support the general health and condition of soil and plant communities.

3.3.2.2. Grazing in the SDNM

The Monument Proclamation allowed Federal grazing on five allotments south of I 8 to continue until the existing permits expired. Four of these permits expired Feb. 28, 2008, and one expired Feb. 28, 2009, at which time livestock grazing in these areas ended. The public lands south of I-8 (155,900 acres), will remain unavailable for livestock use and the grazing preferences (7,884 AUMs) for permitted use on these allotments have been cancelled. These acres exclude the additional 78,000 acres south of I-8 located in the Sand Tank Mountains area, formerly withdrawn to BGR and known as Area A. These acres will remain unavailable to grazing as well resulting in a total of 233,900 acres being unavailable to grazing south of I-8. In addition, the proclamation stated, "grazing on Federal lands north of Interstate 8 shall be allowed to continue only to the

extent that the Bureau of Land Management determines that grazing is compatible with the paramount purpose of protecting the objects identified in this proclamation." A draft livestock grazing compatibility analysis (Appendix E, *Draft Compatibility Analysis: Livestock Grazing on the Sonoran Desert National Monument* (p. 1039)) for the public lands currently available for livestock grazing within SDNM north of I-8 has been completed. The results of the analysis indicate that livestock grazing on 8,498 acres of the 252,500 acres of the public lands are not compatible with protection of the Monument objects and will be considered unavailable for livestock grazing in the range of alternatives.

3.3.2.3. Range Improvements

A number of range improvement projects were constructed for both the enhancement and protection of watershed and wildlife values and the management of domestic livestock grazing. These projects consist of water developments (windmills, pipelines, stock ponds) and fences. All projects were authorized under cooperative agreements or permits, depending on overall benefits, objectives, and private investment levels. Under most alternatives, the construction of range improvement projects would continue where the project benefits watershed, wildlife, and livestock grazing. The disposition of existing range improvements will depend upon the alternative selected (see Chapter 4, *Environmental Consequences* (p. 371) for details). Regulations pertaining to range improvements can be found at 43 CFR 4120.

3.3.3. MINERALS MANAGEMENT

The BLM mineral resources within the Planning Area include both federally owned mineral estate underlying BLM-managed surface lands, and those minerals under lands where the Federal Government has disposed of the surface rights but retained the minerals. The latter are called "split estate". There are also lands where BLM manages the surface but a different entity (e.g. the State of Arizona) owns the mineral estate. This also is referred to as split estate and presents other surface-management challenges because the mineral estate has primacy over the surface estate.

Although the Planning Area encompasses nearly 9 million surface and mineral estate acres, the BLM manages both the surface and mineral estate on only 15 percent (1,338,300 acres; see Table 3.18, "BLM Mineral Estate Acreage" (p. 323)). Approximately 713,300 acres of BLM-managed minerals under BLM-managed surface are currently open to mineral activities, along with 139,000 acres of BLM mineral estate under non-federal surface (Map 3-16: Mineral Estate).

Table 3.18. BLM Mineral Estate Acreage

Mineral Estate	Acres	Percent
Planning Area		
Total Acres (All Owners)	8,868,300	100%
BLM Mineral Estate BLM Surface	1,338,300	15%
BLM Mineral Estate – Non-Federal Surface	210,000	2%
All other owners, including other Federal (Park Service, Forest Service, Fish & Wildlife Service, Bureau of Reclamation, Department of Defense), tribal communities, State, counties, cities, and private	7,320,300	83%
Lower Sonoran & SDNM Decision Areas		
Total Acres	1,558,300	100%
BLM Mineral Estate BLM Surface	1,338,300	86%
BLM Mineral Estate – Non-Federal Surface	220,000	14%

Approximately 366,300 acres of Arizona State Trust lands are within the Planning Area, and are generally open to mineral exploitation, but subject to different requirements and restrictions than Federal lands. Private mineral estate is open to mineral development by the owner under regulations issued by various state and Federal agencies. Therefore, within the Planning Area, about 15 percent of the total mineral estate is available for exploration and development under Federal mining/mineral laws and regulations, and 2 percent under State of Arizona rules and regulations. (See Table 3.18, "BLM Mineral Estate Acreage" (p. 323) and Table 3.19, "Acreage Open to Minerals Activity" (p. 324).)

Table 3.19. Acreage Open to Minerals Activity

	Acres	Percent
BLM Surface with BLM-Managed Mineral Estate		
Total (BLM-managed mineral estate under BLM surface)	1,338,300	100%
Currently closed to minerals activity (includes SDNM, wilderness, and other mineral withdrawals)	625,000	47%
Currently open to minerals activity	713,300	53%
Non-Federal Surface with BLM-Managed Mineral Estate		
Total (BLM-managed mineral estate under non-Federal surface)	210,000	100%
Currently closed to minerals activity (primarily parks)	71,000	34%
Currently open to minerals activity	139,000	66%

By presidential proclamation, 461,000 acres of BLM mineral estate in the SDNM are closed to the location of new mining claims, mineral leasing, and mineral materials disposals. There are no existing locatable minerals rights as all previous mining claims have lapsed. Nor are there any existing mineral leases, mineral materials sales, or free use permits. For this reason, minerals will not be discussed further for the SDNM.

On public lands within the Lower Sonoran, there are approximately 210,000 acres of split-estate lands with BLM-owned mineral estate and non-Federal surface owners, including Arizona state lands, county and city parks, and private lands (see Map 3-13: Wildfire Regime Groups). Of those, approximately 71,000 acres (34 percent) are already withdrawn from mineral entry, with the remaining land open to mineral activities under the various mining and minerals laws.

3.3.3.1. Categories of Minerals on BLM Lands

By legal statute, three categories of mineral resources have been established on public lands: locatable, leasable, and salable. Federal laws, regulations, and legal decisions define these categories (BLM 1997).

Locatable Minerals

Locatable minerals include both metallic minerals such as gold, silver, and copper and nonmetallic minerals such as gemstones, silica, and perlite. Locatable minerals rights are established by staking a mining claim in accordance with Federal and State laws and regulations. Related mining operations are governed by Federal, State, and local environmental and safety laws and regulations, including BLM's regulations at 43 CFR 3802 (Exploration and Mining, Wilderness Review Program), 43 CFR 3809 (Surface Management), and 43 CFR 3715 (Use and Occupancy under the Mining Laws).

Surface-management regulations currently define three levels of mining operations: 1) casual use, 2) notice-level use, and 3) plan-level use. Casual use involves minor activity requiring only hand

tools, with no explosives or mechanized earth-moving equipment. No permit is required for these activities. Notice-level operations involve exploration activities using explosives or mechanized earth-moving equipment and a total annual unreclaimed surface disturbance of less than 5 acres. Plan-level use requires a plan of operations, along with a full environmental analysis. Bonding is required for both notice-level and plan-level operations. Both notice-level and plan-level mining require permits. Operators currently do not pay royalties on the production of locatable minerals.

Various mineral resources have been mined to different extents throughout the Planning Area for hundreds of years. Evidence suggests that Native Americans as well as early Spanish explorers prospected and mined within the region. With the entry of Europeans into the area, those activities increased tremendously. Virtually all of the mountains within the Planning Area exhibit evidence of some level of activity in search of minerals. Few of the mines ever had the quantity or quality of ore to sustain a viable operation for any period of time, but two areas containing large metal deposits, primarily copper, were discovered near Ajo and in the Globe-Miami area. These major districts began as large underground mines and eventually evolved into massive open-pit operations, along with their attendant milling and smelting facilities. Levels of activity at these sites have varied over the years, primarily as a reaction to fluctuations in the market price of metals. Most of the lands within these two areas are no longer in Federal ownership, having been patented through processes established through the 1872 Mining Law. Other patented individual claims and small groups also exist at scattered locations throughout the Planning Area.

There are 65 metallic mineral districts in five Arizona counties: 25 in Pima; 23 in Pinal; 11 in Maricopa; 5 in Gila; and 1 in Yuma. Many established mining districts within the Planning Area contain metallic or nonmetallic mineral resources or both. All of the districts historically have been explored and mined to varying extents; many still host active mining claims, but activity on the ground is infrequent.

In June 2009, the most notable active operations in the Planning Area were three copper mines in the Globe-Miami area of Gila County: BHP Billiton's Pinto Valley/Miami Mine, Quadra's Carlota Mine, and Freeport-McMoRan Copper & Gold's Miami Complex. These operations are located on a mix of private and Forest Service lands. In some places, they adjoin public lands, suggesting the possibility of additional mineral deposits on public lands. Other locatable minerals activities are comparatively small.

Some mineral districts historically were mined for nonmetallic minerals, including asbestos, barite, feldspar, mica, quartz, silica, and gypsum; gemstones such as amethyst and turquoise; and industrial-grade limestone and clay deposits. The most notable active nonmetallic mines are Tolleson Mine (clay, Clinton-Campbell Contracting Inc.); Superior Perlite Mine (perlite, Harborlite Corporation); Copper Hill Mine (silica, Kessen and Kessen); and Sleeping Beauty Mine (turquoise, Sleeping Beauty Turquoise) in Gila County.

Table 3.20, "Locatable Mineral Potential in Lower Sonoran & SDNM Decision Areas" (p. 326) describes mineral potential for locatable minerals in the Lower Sonoran on BLM mineral estate. Moderate- and high-potential areas are located primarily in the mountain ranges, with known mineral occurrences in the Ajo area, Gila Bend Mountains, and Buckeye Hills, and on public lands in northeast Pinal and Gila counties, primarily around Superior and Globe-Miami (BLM 2004). See Map 3-17: Locatable Minerals Potential.

Table 3.20. Locatable Mineral Potential in Lower Sonoran & SDNM Decision Areas

Potential	Total Acres	Percentage of Total BLM Land
Open to Minerals Activity		
Low	506,000	71%
Moderate	194,600	27%
High	12,200	2%
Closed to Minerals Activity		
Low	368,100	42%
Moderate	251,100	56%
High	5,800	2%
Acres and percentages are for the BLM mineral estate under BLM-managed surface estate within the Decision Areas, which excludes BLM-managed minerals under subsurface owned by other Federal agencies and non-Federal jurisdictions, such as State land, parks, county land, and private land.		

Over the past 25 years, the trend in locatable minerals has been toward a reduction of mining activity. Rising mining costs have led to a decrease in the number and size of mining operations, particularly for metallic minerals. However, increases in metal prices have resulted in increased interest in opening new or inactive copper mines near Superior, Globe-Miami, and Ajo.

Leasable Minerals

Leasable minerals include fluid minerals such as oil, gas, and CO_2; solid minerals such as coal and sodium; and geothermal resources. There has been no leasable-minerals development within the Planning Area during the last 20 years. (See Maps 3-18, 3-19, and 3-20.) Since 1913, 33 exploratory oil or gas wells have been drilled. Although some of these found indications of oil and gas, they were not present in economic quantities. No exploration or lease activity, planned lease sales, or drilling activity for fluid minerals such as oil, gas, CO_2, helium, or geothermal resources have taken place in or near the Planning Area in at least 20 years.

Leases for mineral development are allocated through competitive bid on lands open for leasing. If there is not competitive interest in a parcel, an interested party can get a noncompetitive lease. A successful lessee is required to pay rent on the leased parcel plus royalties on the sale of mineral resources produced from it.

Oil and Gas: Oil and gas are nonrenewable, fluid mineral resources typically discovered by drilling exploration wells into "targets" defined from prior geophysical and geological exploration. If exploitable resources are discovered, additional development wells are drilled for efficient production from the oil or gas field.

An economically exploitable resource is found in reservoir rock with adequate permeability and porosity, petroleum source rock such as organic-rich shales or coal in the vicinity, a stratigraphic or structural trap under which the oil or gas can accumulate, and a recent geologic environment to provide adequate geothermal heat flux to mobilize the liquid hydrocarbon fractions (but not so much that all of the volatiles are driven off and leave a tarry residue).

As discussed in the Energy and Mineral Resource Potential Report (URS 2004), there is moderate potential for oil and gas resources in approximately 40 percent of the Planning Area. Table 3.21, " Leasable Mineral Potential Lower Sonoran & SDNM" (p. 327) describes the acres and percentages of various leasable mineral potentials for lands with BLM mineral estate within the Lower Sonoran (See Map 3-18: Oil & Gas Potential.) Moderate potential exists in two regional geologic structures: the Chihuahua Trough/Bisbee Basin in eastern Pima County, and the

Arizona-New Mexico Trough in northeastern Pinal and Gila counties. There also is moderate potential in the Tertiary alluvial basins between the mountain ranges (URS 2004).

Table 3.21. Leasable Mineral Potential Lower Sonoran & SDNM

Mineral Resource Potential	Oil and Gas		Geothermal		Sodium	
	Acres	Percent	Acres	Percent	Acres	Percent
Open to Minerals Activity						
Low	607,700	85%	157,000	22%	629,000	88%
Moderate	105,600	15%	517,000	72%	84,000	12%
High	0	0%	39,300	6%	300	<1%
Closed to Minerals Activity						
Low	573,500	92%	199,300	32%	577,000	92%
Moderate	51,500	8%	417,400	67%	47,200	8%
High	0	0%	8,300	1%	800	<1%

Acres listed are BLM mineral estate under BLM-managed surface within the Decision Areas. This excludes BLM-managed minerals under surface owned by other agencies and non-Federal jurisdictions such as State land, parks, county land, and private land. Percentages are the proportion of low, moderate, and high potential for each mineral.

CO_2 and Helium: Carbon dioxide and helium are nonrenewable, fluid mineral resources typically discovered during the drilling of exploratory oil and gas wells that encounter natural gas or nonflammable gas in sedimentary rocks. Three of the 33 exploratory wells drilled in the Planning Area reported the presence of gas, but there is no information on whether the gas was tested for CO_2 or helium. Consequently, there are no known occurrences and low potential for CO_2 and helium in the Planning Area.

Coal: Coal is a nonrenewable, solid mineral resource. It is typically exposed in outcrops of coal-bearing sedimentary rocks. No coal-bearing sedimentary formations or coalfields are known to exist in the Planning Area.

Sodium: Sodium is a nonrenewable, solid mineral resource that typically occurs as salt beds in deep-basin sediments. There is high potential for sodium in the Luke, Higley, Tonopah, and Picacho basins in the Planning Area; however, little of this potential exists on public lands (see Map 3-19: Sodium Potential). There is moderate potential for sodium in the remaining alluvial basins. The majority of these potential areas are within the Lower Sonoran (URS 2004). There is no leasing or development activity for this in the Planning Area; however, sodium is being extracted from the Luke Basin to the north.

Geothermal: Geothermal resources are nonrenewable, fluid mineral resources. Geothermal energy sources include artesian hot springs and wells that tap into groundwater or dry rock at elevated temperatures resulting from high heat-flow gradients in the earth's crust. They typically are discovered by drilling exploratory wells in areas of known or suspected high temperature gradients or by coincidence during water drilling.

There are 15 geothermal energy resource regions in the Planning Area ranging in temperature from 35 degrees to 120 degrees Celsius (95 degrees to 248 degrees Fahrenheit). These are considered low-temperature resources suitable only for residential or commercial space heating, greenhouse use, aquaculture, or heated swimming pools and spas. (See Map 3-20: Geothermal Resources Potential) Table 3.21, " Leasable Mineral Potential Lower Sonoran & SDNM" (p. 327) describes geothermal potential on the BLM mineral estate within the Lower Sonoran. High- and moderate-potential areas are located in deep alluvial basins, including the

Picacho, Maricopa-Stanfield, Rainbow, Luke, Harquahala, and western Higley basins (URS 2004). There is low potential for geothermal resources in the mountain ranges.

Salable Minerals (Mineral Materials Disposal)

Salable mineral resources (mineral materials disposals) have high potential throughout most of the Planning Area (URS 2003). (See Map 3-21: Mineral Materials Potential.) They include common varieties of sand, gravel, aggregate, clay, limestone, cinders, and decorative rock, as well as building or dimensional stone including granite, decomposed granite, basalt, and other volcanics. Large volumes of salable minerals are used in commercial, residential, and infrastructure construction within the Planning Area. Salable minerals within the Lower Sonoran are predominantly sand, gravel, and decorative (or crushed) rock.

Federal, State, and local environmental and safety laws and regulations govern mining-related operations, including the BLM's regulations at 43 CFR 3600 (Mineral Materials Disposal). The mineral materials disposal regulations require that commercial operators obtain a sale contract from the BLM prior to beginning operations. Sales are conducted through competitive bid or, when appropriate and when certain criteria are met, on a noncompetitive basis. Commercial operators pay the BLM a royalty based on the amount of materials taken from public lands. Government agencies and non-profit organizations can obtain mineral materials from public lands at no cost by obtaining a BLM free-use permit.

Within the Lower Sonoran, there are seven active commercial salable-mineral pits (crushed rock/decorative stone/aggregate): Arizona Pacific Materials, Bush Sand and Gravel, Chandler Rock, Kilauea Crushers (two locations), Red Mountain Mining, and Treasure Chest Granite Pit. Sand and gravel come from pits in Quaternary and Tertiary alluvial deposits in active or former stream channels, washes, floodplains, and alluvial fans. Decorative rock and building stone are mined or quarried from granitic, metamorphic, and volcanic rock outcrops. Mineral material pits and quarry locations are common throughout the Planning Area and usually are located close to cities and primary transportation arteries such as roads and railways.

The general trend for salable minerals during most of the past 25 years has been toward increasing development and production. On all public lands around metropolitan Phoenix, total salable-minerals production increased from 1.29 million short tons in fiscal year (FY) 2003 to 2.4 million tons in FY 2007 before falling to 2 million tons in FY 2008 during the recent economic downturn. Production for FY 2009 fell to about 1.3 million tons. (LR2000, BLM records)

Within the Lower Sonoran itself, salable-minerals production increased from 0.81 million tons in FY 2003 to 1.38 million tons in FY 2007 before falling to 1.01 million tons in FY 2008. (See Figure 3-1.) Production for FY 2009 fell to about 0.5 million tons (LR2000, BLM records).

There are many large, active sand and gravel pits in the Planning Area; however, sand and gravel production is not a significant activity within the Decision Area because most operations are on private or State lands. Consequently, the majority of the mineral materials production within the Decision Area is decorative rock.

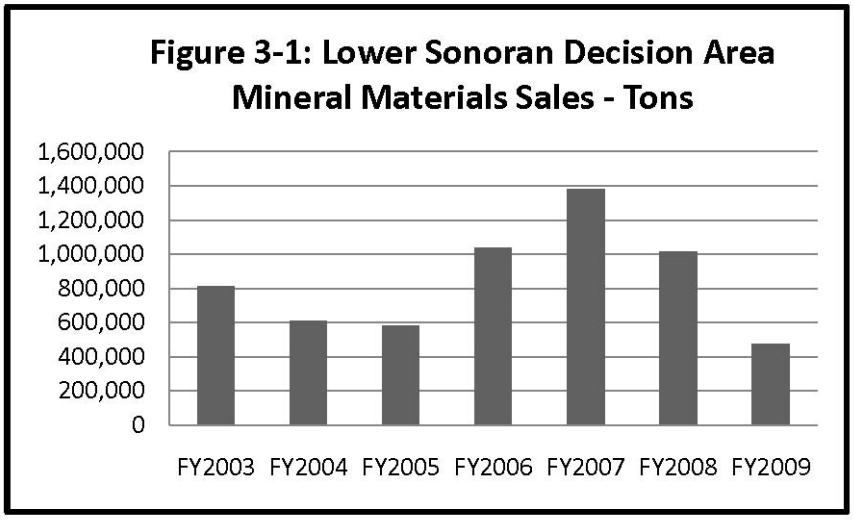

Table 3.22, "Mineral Materials (Salable) Potential Lower Sonoran & SDNM" (p. 329) below and Map 3-21: Mineral Materials Potential show the available mineral estate with potential for certain salable products. Areas for salable minerals are unranked and only designated as having potential based on being either bedrock or alluvial materials and sediments. In reality, almost any material can be mined and produced as salable minerals, though the quality and level of processing needed vary greatly. The primary factors determining which sites are of interest for salable minerals are market factors and transportation costs, with physical properties being dominant only for exceptional situations.

Table 3.22. Mineral Materials (Salable) Potential Lower Sonoran & SDNM

	Acres	Percent of Total[1]
BLM mineral estate with BLM surface currently open to minerals activity	713,300	100%
Areas with potential for crushed stone, decorative rock, boulders, aggregate, and related products	364,400	51%
Areas with potential for sand and gravel, aggregate, fill material, and related products	348,900	49%
Acres and percentages are for the BLM mineral estate under BLM-managed surface estate within the Decision Areas, which excludes BLM-managed minerals under subsurface owned by other Federal agencies and non-Federal jurisdictions, such as State land, parks, county land, and private land.		

3.3.3.2. Mineral Potential Maps

The various potential areas shown for locatable minerals (Map 3-17: Locatable Minerals Potential), oil and gas (Map 3-18: Oil & Gas Potential), sodium (Map 3-19: Sodium Potential), geothermal resources (Map 3-20: Geothermal Resources Potential), and mineral materials, i.e. salable minerals (Map 3-21: Mineral Materials Potential), are based on existing data (URS 2004). Boundaries between areas of different potential are considered general in nature, as the data is not sufficiently detailed to draw the divisions more precisely, the exception being small areas of high potential based on known commodity occurrences. Accordingly, acreage totals in the preceding tables are estimates rounded to the nearest 100 acres. Inaccuracies and inconsistencies in geographic information system (GIS) database layers contribute to variability in the numbers and can result in differences between equivalent acreages. These problems arise during data analysis and normally result in maximum errors of only a few percent.

3.3.4. RECREATION MANAGEMENT

The dramatic increase in population within and surrounding the Lower Sonoran and SDNM since the last planning effort was completed has brought increased demands for outdoor recreational opportunities. Much of this demand has fallen on public lands adjacent to new residential communities in Maricopa, Tonopah, and Gila Bend and the rapidly growing cities of Goodyear and Buckeye. There also is widespread, lower-density residential development on private land throughout the Decision Areas. Increased OHV sales and new technology have resulted in a rising demand for motorized trails and recreational areas. Community demand for parks, open spaces, and non-motorized trails, both on a local and regional basis, has increased in Maricopa and Pinal counties.

The process used to allocate public lands for the provision and management of recreation and visitor services has changed substantially during recent years. Integral to both prior and current recreation planning processes is the use of a tool called the recreation opportunity spectrum (ROS). This is a system used to inventory and classify public lands according to physical and social settings, which combine to offer specific types of recreational opportunities. As the name implies, such settings range across a spectrum of opportunities from primitive and primitive non-motorized, where motorized use does not occur and facilities are non-existent or minor in extent, to rural and urban, where opportunities are vehicle-dependent and facilities may be extensive.

In an approach known as benefits-based management, the BLM now integrates perceptions of visitor demand with ROS to produce market-based strategies that provide for recreational opportunities and visitor services. The result is that public lands are allocated to special recreation-management areas (SRMAs) in which structured recreation opportunities are offered or to extensive recreation management areas (ERMAs) in which management is of a custodial nature. The major way this approach differs from one using only ROS is that SRMAs now are targeted to demonstrated recreation-tourism markets (destinations); locales dependent on public lands for recreation (communities); or to dispersed, frontier-like opportunities dependent on the natural characteristics of the landscape (undeveloped).

3.3.4.1. Recreation Management in the Decision Areas

The Lower Sonoran and SDNM are used by visitors for a multitude of outdoor recreation activities, with the numbers of visitors to both areas increasing more than the increase in population experienced by adjacent communities. The principal activities of the two Decision Areas are OHV use, recreational target shooting, and non-motorized activities such as hiking and equestrian uses. Surveys of motorized and non-motorized trail users in Arizona, conducted by Arizona State Parks in 2003 and 2008, show that both types of trail use increased statewide as a percentage of the total population over the intervening period (see Table 3.23, “Types of Trail Users as a Percentage of Population, 2003-2008” (p. 331)). Additionally, the percentage of non-trail users among respondents declined, indicating that demand for motorized and non-motorized recreation opportunities has increased as a relative proportion of the population (Arizona State Parks 2009).

Table 3.23. Types of Trail Users as a Percentage of Population, 2003-2008

Locale	Primarily Motorized		Primarily Non-motorized		Non-User	
	2003	2008	2003	2008	2003	2008
Arizona	7.0%	10.7%	56.5%	57.9%	33.6%	31.4%
Maricopa County	5.6%	9.6%	55.1%	59.2%	36.2%	31.2%
Pima County	5.3%	7.9%	66.9%	63.5%	26.5%	28.7%
Pinal County	8.6%	13.8%	48.9%	48.3%	40.2%	37.9%
Source: (Arizona State Parks 2009)						

Route proliferation and off-road recreation areas were observed north of SR 238 in the SDNM, in Haley Hills, Rainbow Valley, Buckeye Hills, Saddle Mountain, parts of the Gila Bend Mountains, and in all areas near urban development in the Lower Sonoran.

The BLM does not have comparable data illustrating demand placed on the Decision Areas for recreational target shooting; however, this use has increased dramatically during the past five years. No improved or facilitated target shooting sites are managed by the BLM; most are informal gathering places adjacent to vehicle routes that commonly exhibit shooting damage to dominant vegetation, such as saguaro or trees, rock outcrops, and regulatory or informational signs. Large quantities of litter often are present, including spent shells and target debris, including broken bottles, cans, wooden pallets, appliances, computers, TVs, cardboard boxes, propane bottles, and abandoned vehicles.

Hiking and backpacking occurs throughout both Decision Areas, particularly in the mountain ranges. There are four designated, non-motorized trails within the Monument (Lava Flow, Table Top, Margie's Cove, and Brittlebush all within wilderness areas), and two within the Lower Sonoran (Quartz Peak in the Sierra Estrella Wilderness and Painted Rock Interpretive Trail). Designated non-motorized trails within the Monument and wilderness areas are minimally maintained, primitive, and in average condition.

Horseback riding is a relatively minor use within the Decision Areas but has been occurring for many years. Equestrian use occurs on most non-motorized trails except Quartz Peak Trail, which is inaccessible to horses. Most rides have taken place near Gap Well along the Butterfield Stage Route and from camp areas along Vekol Wash.

Generally, recreation settings are remote and access is by unmaintained, primitive roads that require high-clearance, often four-wheel-drive, vehicles. Facilities are small and primitive, recreation use is dispersed over the landscape, and BLM staff rarely makes contact with visitors. Area allocations managed for recreation uses are indicated in Table 3.24, "Recreation Land Use Allocations in the Decision Areas" (p. 331). Recreation facilities managed by the BLM are available only in the ERMA at Painted Rock Petroglyph Site and Campground and at Quartz Peak Trailhead in the Lower Sonoran. In the SDNM, small, primitive recreation facilities (trailheads) are available in the Gila Trail SRMA adjacent to the North Maricopa Mountains Wilderness, and in the ERMA adjacent to Table Top Wilderness. See Map 3-22: Special Recreation Management Areas & BLM Recreation Sites.

Table 3.24. Recreation Land Use Allocations in the Decision Areas

Allocation	Area (acres)	Area (% of Decision Area)	Goals
Lower Sonoran			
Ajo SRMA	175,200	19%	Provide facilities and maintenance; protect resource values; visitor safety

Allocation	Area (acres)	Area (% of Decision Area)	Goals
Saddle Mountain SRMA	46,300	5%	Emphasize interpretation of geologic, cultural, and wildlife resources; protect scenic landscapes and vistas; promote recreational opportunities
Sentinel Plain SRMA	20,800	2%	Provide facilities and maintenance; protect resource values; visitor safety
Gila Trail SRMA (part)	137,100	15%	Provide facilities and maintenance; protect resource values; visitor safety
ERMA	550,800	59%	Provide primitive facilities for resource protection, visitor safety, and /or improvement or increase of recreational opportunities
Total	930,200	100%	
SDNM			
Gila Trail SRMA (part)	143,900	30%	Provide facilities and maintenance; protect resource values; visitor safety
ERMA	342,500	70%	Provide primitive facilities for resource protection, visitor safety, and/or improvements or increase of recreational opportunities
Total	486,400	100%	

Table 3.25, "Recreation Opportunity Spectrum Classes of the Lower Sonoran Decision Area" (p. 332) shows ROS classes identified for the Decision Areas. Approximately 87 percent of the Lower Sonoran is allocated to ROS classes that accommodate or emphasize vehicle-dependent, recreational opportunities ranging from semi-primitive motorized to urban. Illustrative of the remote, unmaintained, and dispersed qualities in the Lower Sonoran, 69 percent of the area is allocated to a single ROS class: semi-primitive motorized. Only 9 percent is allocated to the non-motorized classes of primitive and semi-primitive non-motorized, which occur in wilderness. In comparison, approximately 32 percent of the SDNM is allocated to ROS classes that emphasize non-motorized, recreational opportunities. Although these areas exist principally in wilderness, substantial areas of semi-primitive, non-motorized settings are offered in the Sand Tank Mountains area. Nearly 54 percent of the SDNM is allocated to semi-primitive, motorized opportunities.

Table 3.25. Recreation Opportunity Spectrum Classes of the Lower Sonoran Decision Area

ROS Class	Lower Sonoran (acres)	SDNM (acres)
Primitive	10,154	14,951
Semi-primitive non-motorized	71,812	142,391
Semi-primitive motorized	639,117	262,041
Roaded natural	141,067	49,355
Rural	24,919	17,347
Urban	979	0
Public lands not allocated*	23,694	316
Total	930,200	486,400
*Private and State Trust Land in holdings		

With the exception of a specific prohibition against off-road travel by motor vehicles, Presidential Proclamation 7397 did not refer to the provision and management of recreation and visitor services on the Monument. Nevertheless, since an intrinsic result of such a designation is to encourage visitation, it is expected that curious visitors would be interested in seeing, learning about, and experiencing the natural objects for which the Monument was designated. Since designation, visitation has increased on the Monument, and lack of facilitated recreational opportunities resulted in degradation of certain portions. In June 2008, approximately 54,817 acres adjacent to the North Maricopa Mountains Wilderness were closed to motor vehicles

after off-road travel became rampant. Other areas of concentrated visitation include the three wilderness areas incorporated into the Monument, the Juan Bautista de Anza NHT, and areas used extensively for recreational target shooting adjacent to the Monument's northern boundary.

Portions of the Decision Area contiguous with the BGR, Sentinel Plain, and a part of the SDNM were re-conveyed to BLM by the National Defense Authorization Act for Fiscal Year 2000 from the Department of Defense. Due to unique safety concerns posed by previous military training exercises on these lands, entry is managed through a permitting process that requires visitors to view a brief safety video and sign a document acknowledging awareness of safety concerns. Combined, the U.S. Air Force, Marine Air Corps, USFWS, and BLM annually issue approximately 9,000 free-access permits to the BGR and adjacent areas, including Sentinel Plain. The BLM issues approximately 150 of these free-access permits annually. Commercial and competitive recreational use is limited, with BLM issuing approximately seven new special recreation permits annually.

SDNM Recreation Site Inventory

From 2003 to 2005, researchers under the direction of Dr. Pam Foti, a professor in Northern Arizona University's Geography, Planning, and Recreation Department, determined the extent of recreation impacts to the SDNM with a comprehensive inventory of all recreation sites visible from the vehicle-route network. At each of the 410 sites identified, impacts were assessed for a variety of impact variables and sites were categorized into five levels of relative impact based on the presence of these impacts. Approximate area size of each site was also noted with 276 sites (81 percent) having minimal area disturbance area (less than 1,000 sq. ft.) and 64 sites (19 percent) being larger than 1,000 sq. ft. in size. Map 3-23: SDNM Inventoried Recreation Impact Sites depicts all known recreation impact sites. Sites also were categorized as "non-shooting sites" or "shooting sites," based primarily on the presence of shooting-related litter such as spent ammunition casings and clay pigeons (Foti and Chambers, 2005). Approximately one-half of the total sites were identified for follow-up monitoring at three-year intervals to determine temporal changes in impacts, with the long-term objective to determine if impacts from recreation activities on SDNM resources were increasing, decreasing, or remaining relatively stable.

3.3.5. TRAVEL MANAGEMENT

3.3.5.1. Regional Travel Routes

Motorized vehicle travel is the dominant form of transportation throughout the Planning Area. The principal highways used to reach public lands in the Planning Area include I-8, I-10, SR 85, and State Route 86 (SR 86). (See Map 3-24: Travel Management.) Old U.S. Highway 80 (U.S. 80) is another key secondary highway accessing the Gila Bend Mountains area, and US 60 is the main highway for the BLM East Valley parcels. Maricopa Road/SR 238 is an important secondary highway frequently used to access the Monument.

The main transportation trend affecting the Planning Area is an expected continued increase in demand. Current RMPs governing travel in the SDNM and Lower Sonoran were written in the 1980s and 1990s. The Phoenix metropolitan area has experienced explosive growth since then, and seen considerable expansion of its freeway, arterial, and local street infrastructure. More importantly, from the perspective of public lands surface transportation, population growth has pushed road infrastructure into previously undeveloped areas near the Decision Areas. The

number of high-standard, regional roads has increased in recent years to accommodate community growth in Mobile, Vekol Valley, Rainbow Valley, Goodyear, Tonopah, Buckeye, Maricopa, and Gila Bend. Numerous existing roads have been widened and paved, and new roads built throughout the Planning Area. In addition, the Maricopa Association of Governments (MAG), Maricopa and Pinal counties transportation departments, and ADOT all are studying additional freeway, parkway, and arterial connectors throughout the Planning Area. Many of these would bisect public lands.

The introduction of ATVs and other vehicles with the capability to travel into more remote areas has led to increased use of public lands for recreational vehicle use. New routes and extension of existing ones have emerged in the Decision Areas as vehicles with more technical capability (such as rock crawlers) become common. These trends are likely to continue into the future.

Transportation network changes on and around public lands include upgrades to existing roads traversing the Planning Area; new ROWs for freeways, arterials, and streets; access elimination in some areas and expansion in others due to new roads; and increasing demand for motorized vehicle access to public lands as population grows. Changes to the Planning Area road system are detailed in the *MAG's Draft Regional Transportation Plan 2010 Update (MAG 2010)*.

The following is a description of planned highway and road projects expected to affect public lands:

Loop 202 (South Mountain Freeway): A new ROW that wraps around the southern and western edges of South Mountain Park will not only allow for easier access to the Lower Sonoran, it will increase demand for recreation and travel on public lands by encouraging residential and commercial development south and west of metro Phoenix's current boundaries.

Loop 303 (Estrella Freeway): A new ROW running west of the White Tank Mountains will connect U.S. 60 to the north with Goodyear to the south, encouraging further urban growth in these areas and speed access. Both of these developments are likely to drive up demand for recreational uses of public lands.

State Route 801 (I-Reliever): New ROW planned to run parallel to I-10 in southwestern part of metropolitan Phoenix could increase the amount of traffic passing near the Lower Sonoran.

CANAMEX Corridor: Segments of I-8 and SR 85 that pass through the SDNM and Lower Sonoran are planned to be part of the CANAMEX Corridor, an international highway designed to promote commerce throughout North America (MAG 2003). The minimum duty rating for the CANAMEX Corridor is a four-lane, divided highway.

Arterial roads: An expansion of the arterial and local street system is expected in the SR 85 corridor between Buckeye and Gila Bend over the next 20 years. Agua Caliente Road, northwest of Gila Bend, is experiencing increased use, and a connection with Harquahala Valley may be requested by Maricopa County in the future. MAG has outlined a plan to expand SR 238 to a four-lane, arterial connector linking the communities of Gila Bend, Mobile, and Maricopa. Similarly, the Gas Pipeline-Komatke Road, linking Mobile to SR 85 and U.S. 80, is planned to become four-lane, arterial connector, along with a one-mile square street grid to be developed in Rainbow Valley south of Buckeye and Goodyear. Although these road expansions would not be limited-access highways, they likely would affect existing, public motorized and non-motorized access to the Lower Sonoran and SDNM in Buckeye Hills East and Rainbow Valley

3.3.5.2. Motorized Vehicle Access to Public Lands

Motorized vehicle access to each of the major areas within the Planning Area is possible via routes that include primary and secondary highways, improved (though often unmaintained) roads from adjacent BLM and other Federal lands, and county or municipal roads and streets. The existing collection of access routes includes a limited number of legally established public ROWs and non-public routes. While some of these routes cross State trust or private lands where public vehicle travel is not authorized, access is not physically barred or denied by posted notice. This situation, however, can change at any time, cutting off critical access points for visitors and administrative personnel to reach the Monument.

Legal public access is minimal in several key geographical areas and continued access is dependent on other landowners or jurisdictional agencies. Obtaining legal public access is necessary to ensure future access to the areas. These areas are identified as:

Buckeye Hills West: Currently, the only legal vehicle access to Buckeye Hills West is available from SR 85 at Robbins Butte Wildlife Area, managed by the AGFD, and Buckeye Hills County Park, managed by Maricopa County. On the west side of the area near Gillespie Dam, physical access exists by using a canal road beginning two miles south of public lands, which then connects to the main access road on public lands.

Gila Bend Mountains: Legal access to the southeastern boundary of this area is limited. Citrus Valley Road, formerly a county- maintained road along its length on public lands, provides access except when interrupted by Gila River flows from Painted Rock Reservoir. Access to Citrus Valley Road north of the Gila River is possible from AGFD land accessed from Painted Rock Road and Sisson Road, but the road is in poor condition and crosses private land. The Enterprise Road borders the eastern boundary of the Gila Bend Mountains, but is posted for private use only. While another primitive road exists that would allow access to the area, it traverses the San Lucy Indian Reservation and is gated and locked.

Saddle Mountain: Legal access is available to the northern part of the area from Courthouse Road at several junctions. Access to the south part of the area is available from Dobbins Road and Elliot Road at several junctions as it crosses public lands.

Sentinel Plain: Legal vehicle access to the Sentinel Plain, south of the Union Pacific Railroad, is only available from I-8 at Exit 87, which provides an at-grade public railroad crossing. Exit 78 (I-8) at Spot Road, located about one mile west of the Planning Area boundary, is used to access the Sentinel Plain area from the west. This access route, however, requires the use of a private crossing over the Union Pacific tracks.

SDNM: Currently, most of the public lands within the Monument north of SR 238 are closed to motorized use due to ongoing restoration work. When the area is re-opened, it may be reached from several routes highways, roads, and primitive roads. The area south of SR 238 is accessed from I-8 with limited legal vehicle access provided into the area from the interstate. This area can also be physically accessed from SR 238 under the railroad track at one concrete box culvert and two trestles. The nearest legal crossing of the railroad is 83rd Ave in Mobile several miles away from the Monument, although it involves crossing private and state land.

3.3.5.3. Existing Travel Management Situation in the Decision Areas

There are currently 2,283 miles of motorized vehicle routes and 39 miles of non-motorized trails that cross public lands in the Planning Area. (See Map 3-23: SDNM Inventoried Recreation Impact Sites.) Existing RMP decisions have designated public lands in the Lower Sonoran and SDNM as either limited to existing or designated routes, or closed to vehicle use. There are no open areas for cross-country vehicle use within the decision areas. An inventory of existing routes was completed for this planning process (see Section 3.3.5.4, "Non-Motorized Travel" (p. 336)), which will be used to designate individual routes as open, limited, or closed to vehicle use during travel management planning. Routes within the SDNM will be formally designated in this RMP, and routes within the Lower Sonoran will be designated within 5 years of approval of the ROD.

In the Lower Sonoran, 1,670 miles of existing routes are currently open for vehicle use and 15 miles are closed. The areas designated as closed include the South and North Maricopa Mountains and Table Top Wildernesses (157,600 acres) and the Vekol Valley Grasslands ACEC (3,500 acres). In all other parts of the Monument, vehicles are limited to existing or designated routes. Scattered parcels east of Phoenix in the Florence, Miami, and Globe areas have not been inventoried for routes at this time. Inventory in these areas will take place as staff time and resources become available.

In the SDNM, 567.9 miles of existing routes currently are open for vehicle use and 6.6 miles are closed. Hiking and equestrian trails, totaling 37 miles are designated in the North Maricopa and Table Top mountains. The areas designated as closed include the South and North Maricopa Mountains and Table Top Wildernesses (157,600 acres) and the Vekol Valley Grasslands ACEC (3,500 acres). In all other parts of the Monument, vehicles are limited to existing or designated routes.

Interim Monument management requires that the inventoried route system in SDNM become the interim travel network. Currently, 63 miles of primitive roads were inventoried in sand washes. There are 971 miles of sand washes, of which only 63 were inventoried as being a primitive road. Of those 63 miles, 19 are currently closed due to their location inside the BGR Sand Tank Mountain area (formerly known as Area A), where driving in washes was prohibited by rules established by the military.

A temporary emergency closure to restore damaged lands is currently in place in the SDNM. The closure area is located north of SR 238 in the vicinity of the Anza NHT and extends north along the eastern edge of the North Maricopa Wilderness to the Gas Pipeline Road. No vehicle use is permitted on 54,817 acres, including 89 miles of existing primitive roads. This temporary closure began on June 13, 2008 and will remain in effect until the completion of this land use plan.

Visitors are required to obtain an annual safety briefing and access permit prior to entering the Sand Tank Mountain area (Area A). The ongoing access permit program informs visitors about both the military training activities at the BGR, and prohibitions on public travel from the Monument into restricted areas of the military range. Permit requirements include the use of licensed vehicles only within Area A.

3.3.5.4. Non-Motorized Travel

Non-motorized travel includes pedestrian, equestrian, and bicycling activities. Public access to the Decision Areas by pedestrian or equestrian travel, from external areas cross-country, is permissible

wherever public use of adjacent lands is legally authorized. A number of non-motorized trails are designated for hiking and equestrian use. Bicycle use is limited to existing or designated vehicle routes, so such use is limited. Pedestrian and equestrian activities are permitted within the wilderness areas in both Decision Areas, while all mechanized modes of travel, including bicycles, are prohibited. Non-motorized, wheeled carriers may be used for cross-country game retrieval anywhere in the Decision Areas, except in wilderness areas where they are prohibited. There has been an increase in demand for non-motorized travel in the Decision Areas as more people move into new developments nearby. Use of designated trails has grown along with increases in dispersed hiking, backpacking, and equestrian use. Little change in bicycle use has occurred.

In the Lower Sonoran, hiking is permitted in the Sierra Estrella Wilderness, although horse and pack-stock use is not recommended for the steep and narrow three-mile Quartz Peak Trail. A 0.2-mile designated, interpretive trail is available at the Painted Rocks Petroglyph Site. Development of private property and State trust land adjacent to or in the vicinities of the Decision Areas has reduced physical, and possibly legal, access for motorized and non-motorized use. Four existing designated trails are located in the Monument. Two trails, the nearly nine-mile Margie's Cove Trail and the six-mile Brittlebush Trail, are located in the North Maricopa Mountains Wilderness. The other two trails are within Table Top Wilderness. These trails include the 7.25-mile Lava Flow Trail and 3.5-mile Table Top Trail.

Five designated hiking trails were created in wilderness areas following wilderness designation in 1990. No other trails have been developed, although user-created trails have been identified in Saddle Mountain, and are likely to occur in other areas. In the Planning Area, Phase III of the Maricopa County Regional Trail System Plan (Maricopa County 2004) identifies a primary, county trail loop that incorporates Estrella Mountain and Buckeye Hills regional parks, and Phoenix's South Mountain Park. This trail traverses the East Buckeye Hills area. Options to link other parts of the Lower Sonoran or SDNM to the regional trail system have also been identified. Buckeye and Goodyear have identified potential trail corridors within the Decision Areas that could connect to neighborhoods in these cities.

3.3.5.5. Visitor Use & Travel Modes by Geographic Area

Area use by local and destination visitors is not equally distributed across public lands. Some areas are more popular for motorized or non-motorized travel modes. Table 3.26, "Primary Use and Current Settings for Existing Travel Routes" (p. 337) represents an overview of the geographic areas and a general classification of the primary travelers.

Table 3.26. Primary Use and Current Settings for Existing Travel Routes

Geographic Area	Primary Use and Origin of Visitor and Current Settings
Ajo Block	*Primary travelers:* Local visitors use four-wheel drive and ATVs to access all areas. Day use is popular for recreational pursuits. Access to adjacent jurisdictions, such as BGR Area B and Cabeza Prieta NWR, is popular seasonally. *Current Settings:* Local visitors use four-wheel drive and ATVs to access areas. Recreational day use is popular. Most users enjoy informational and route signs and maps. Access to adjacent jurisdictions, such as BGR Area B and Cabeza Prieta NWR, is popular seasonally.
Buckeye Hills and Rainbow Valley	*Primary Travelers:* In Buckeye Hills local and destination visitors use four-wheel drive, OHVs, horses, bicycles or hike in to access the area. Travelers use existing roads for camping, sightseeing, trail riding, and hunting. In Rainbow Valley, local and destination visitors use four wheel-drive vehicles, primarily to access designated wilderness areas for hunting and sightseeing.

Geographic Area	Primary Use and Origin of Visitor and Current Settings
	Current Settings: In Buckeye Hills, easily accessed areas and routes make day use of trails and areas popular by local visitors. Access points are limited and visitation is relatively low, yielding remote experiences near the city. A mix of motorized vehicle use and non-motorized use is common. In Rainbow Valley, areas near Phoenix and adjacent towns are easily accessed, where interaction with few people is desired. Vehicle access is necessary to reach popular hiking, sightseeing, and hunting destinations.
East Valley and Globe-Miami	*Primary Travelers:* Local and destination visitors drive passenger cars to access San Tan Regional Park and other easily accessible areas for trail-based, non-motorized travel. Visitors access scattered public lands using four-wheel drive vehicles for non-motorized activities. Local visitors drive four-wheel drive vehicles to access remote backcountry near Globe and Miami. Hunting and camping are primary uses of these areas. *Current Settings:* Structured, non-motorized travel with informational and trail signs and maps are emphasized at San Tan Regional Park. Other scattered public land parcels exhibit unstructured travel opportunities for non-motorized and motorized uses. In the Globe-Miami area, self-directed experiences are desired by locals, although some existing signing and maps are available. Four-wheel drive is usually required to access popular hunting, recreation, and other interesting sites.
Gila Bend Mountains and Sentinel Plain	*Primary travelers:* Destination visitors use four-wheel drive, ATV, and motorcycles to access the core area. Hiking and equestrian users visit designated wilderness areas and remote, unroaded areas. Local visitors, generally from Gila Bend, are day users accessing the area by four-wheel drive vehicles, ATVs, and motorcycles. In the northern portion of the Gila Bend Mountain area, including the Fourth of July Wash area, use is increasing by west valley visitors seeking day use and overnight OHV riding experiences. In Sentinel Plain, destination visitors predominately use four-wheel drive for sightseeing, stargazing, and overnight camping. *Current Settings:* Remote settings for traditional outdoor activities are enjoyed by many visitors. Vehicle access is required due to remoteness. Most visitors are self-directed and require little, if any, support. In the Sentinel Plain area, dark-sky areas are desired with easy access from a major highway or road.
Saddle Mountain	*Primary travelers:* Local visitors use four-wheel drive and ATVs to access the core area. Hikers primarily visit the area mountains for day use, but also for long-distance touring. Destination visitors drive two-wheel drive and four-wheel drive vehicles for camping, rock hounding, and sightseeing. *Current Settings:* Easy access for camping and passage through the area for sightseeing is available. Most users require informational and route signs and maps. Experiences are remote and self-directed, with only route signs and entry information kiosks.
Sonoran Desert National Monument	*Primary Travelers:* Destination visitors use four-wheel drive vehicles to visit the SDNM. Local visitors access it through Rainbow Valley and adjacent lands near Mobile, using four-wheel drive, ATVs, motorcycles, and horses for sightseeing and trail riding. *Current Settings:* A temporary closure is in effect, which causes some visitors to seek new areas for camping, exploring, and Monument tourism. Out of town and local visitors receive guidance through signs and maps to visit popular Monument locations, including historic places and scenic areas. Vehicle access is required, yet primary uses are designated wilderness hiking, exploring, hunting, and camping.

3.3.5.6. Data Collection and Analysis for Travel Planning

All routes in the Decision Areas were inventoried on-the-ground using global positioning system technology. Conditions were noted and basic information about each route was gathered, using a statewide standard data dictionary. Later, routes were reviewed by an interdisciplinary team, using a standardized methodology or "route evaluation process," to systematically identify resource

concerns, values, and legal requirements associated with each route. This method allowed for the identification of both area-wide and site-specific issues. Each numbered route has a corresponding route report and database entry detailing the findings from the evaluation process (see the detailed, large-scale SDNM Route Designations map on the accompanying CD version of the RMP). This database was used to gather specific details for the impact analysis.

After the route evaluation process was completed in 2004, new guidance was issued directing field offices to designate roads and trails as specific types of travel-management assets. Asset types include road, primitive road, and trail and are established by the Roads and Trails Terminology Report issued with IM 2006-173. These definitions are contained in the glossary of terms. Roads under BLM management are maintained to specific standards, while primitive roads are not necessarily compliant with any engineering standards. The asset type primitive road fills the gap between roads and trails. The significance of the guidance for this plan revolves around the prohibition of off-road travel in the SDNM proclamation. The BLM interprets this to mean that travel off designated routes is cross-country travel, which is thus prohibited.

Additional guidance pertinent to the route designations was issued in 2009. Washington Office guidance, IM 2009-132. Characteristics will be identified in a transportation inventory as a "route". These routes will not be classified as a transportation asset and will not be entered into FAMS unless one of the following conditions are met:

a. Congress designates the area as Wilderness, or

b. RMP decision is made to not protect the area for wilderness characteristics, or

c. Congress releases the area from Wilderness consideration.

3.4. SPECIAL DESIGNATIONS

3.4.1. NATIONAL LANDSCAPE CONSERVATION SYSTEM

In June 2000, the BLM responded to growing concern about the loss of open space by creating the National Landscape Conservation System (NLCS). Congress codified the NLCS in 2009 through Public Law 111-11. The NLCS brings into a single system some of the BLM's premier designations. By putting these lands into an organized system, the BLM hopes to increase public awareness of these areas' scientific, cultural, educational, ecological, and other values. Inclusion in the NLCS does not create any new legal protections for these lands, but it does provide field offices with overall guidance and direction for management of the system. Components of the NLCS include public lands that have been specially designated by presidential or congressional action. These designations include national monuments, national conservation areas, wilderness areas, wilderness study areas, wild and scenic rivers, and national historic and scenic trails.

Each type of special designation (presidential and congressional) has been used to establish special management areas on public lands within the Planning Area (see Table 3.27, "Special Designations Within the Planning Area" (p. 340). Four special designations are located within the Lower Sonoran, including Sierra Estrella, Signal Mountain, and Woolsey Peak wildernesses and Juan Bautista de Anza NHT. Five special designations occur within the SDNM, including the Monument itself; the North Maricopa Mountains, South Maricopa Mountains, and Table Top wildernesses; and Juan Bautista de Anza NHT.

Table 3.27. Special Designations Within the Planning Area

Designation	Decision Area		Size (BLM Acres/Miles)	Designating Authority	Date Designated
	LS	SDNM			
Presidential Designations					
Sonoran Desert National Monument		SDNM	486,600 acres	Presidential Proclamation No. 7397 by President William J. Clinton	2001
Congressional Designations					
North Maricopa Mountains Wilderness		SDNM	64,228 acres	Arizona Desert Wilderness Act of 1990 (Public Law 101-628)	1990
Sierra Estrella Wilderness	LS		13,926 acres (excluding 640-acre State inholding)	Arizona Desert Wilderness Act of 1990 (Public Law 101-628)	1990
Signal Mountain Wilderness	LS		13,468 acres	Arizona Desert Wilderness Act of 1990 (Public Law 101-628)	1990
South Maricopa Mountains Wilderness		SDNM	60,424 acres	Arizona Desert Wilderness Act of 1990 (Public Law 101-628)	1990
Table Top Wilderness		SDNM	34,308 acres	Arizona Desert Wilderness Act of 1990 (Public Law 101-628)	1990
Woolsey Peak Wilderness	LS		64,456 acres	Arizona Desert Wilderness Act of 1990 (Public Law 101-628)	1990
Juan Bautista de Anza NHT	LS		10 miles	Juan Bautista de Anza NHT Act (Public Law 101-365)	1990
Juan Bautista de Anza NHT		SDNM	17 miles	Juan Bautista de Anza NHT Act (Public Law 101-365)	1990
Administrative Designations					
Coffee Pot Botanical ACEC	LS		8,900 acres	Record of Decision (ROD) for Lower Gila South RMP	1988
Vekol Valley Grasslands ACEC		SDNM	3,500 acres	ROD for Lower Gila South RMP	1988
Fred J. Weiler Green Belt Resource Conservation Area	LS		45,978 acres	Public Land Order 1015, Classification of Public Lands for Multiple Use Management, Designation of Fred J. Weiler "Green Belt" Resource Conservation Area	1954, 1967, 1970

3.4.2. CONGRESSIONAL DESIGNATIONS

3.4.2.1. Wilderness Areas

The Decision Areas include six wilderness areas designated by the Arizona Desert Wilderness Act of 1990. These areas total 249,450 acres: 91,750 acres are in the Lower Sonoran and 157,700 acres are in the SDNM.

Each wilderness area has its own management plan (BLM Manual 8560). Management guidance is provided under the Woolsey Peak Wilderness and Signal Mountain Wilderness Management Plan (BLM 2003) and the Maricopa Complex Wilderness Management Plan (BLM 1995) for the North Maricopa Mountains, Sierra Estrella, South Maricopa Mountains, and Table Top Wildernesses.

A five-year evaluation of the Maricopa Complex Wilderness Management Plan, completed in 2005, made the following observations:

> *Motorized use of the Maricopa Complex was authorized 91 times, principally for the inspection, maintenance, and redevelopment of rainwater catchments for wildlife, and such authorizations have decreased substantially as the catchments were upgraded. Monitoring for naturalness, solitude, and visitor encounter standards was attempted by several visitor-tracking methods; however, monitoring of standards for vegetation, trail width, and depth, frequency of manure on trails, grazing of vegetation, and plant density was not accomplished as planned. Of the 70 planned 'special project' wilderness management activities, 2 of 18 vehicle routes identified for active reclamation were completed; 23 of 26 planned vehicle barriers were completed; all 6 trail and trailhead development projects were completed; and 9 of 20 'other special projects' were completed, including 4 wildlife water catchment redevelopments. In total, 57 percent of planned 'special projects' were implemented, and largely represented high-priority vehicle and people management projects intended to ensure compliance with the Wilderness Act. ... Visitation data indicate that the visitor standards adopted by the Plan have adequately met public expectations. The Plan was amended twice to provide for the use of mechanized equipment for vehicle way rehabilitation and the capture and removal of desert bighorn sheep for release in other areas of the state. (BLM 2005)*

Although unauthorized activities that do not conform to wilderness values (e.g. unauthorized entry by motor vehicles) occur on an occasional basis, the above summary of the five-year plan evaluation indicates that the four wildernesses of the Maricopa Complex (North Maricopa Mountains, Sierra Estrella, South Maricopa Mountains, and Table Top wildernesses) have been successfully managed as envisioned by the Maricopa Complex Wilderness Management Plan (BLM 1995).

At the time that the Woolsey Peak Wilderness and Signal Mountain Wilderness Management Plan was written (BLM 2003), these two wilderness areas also were meeting all standards envisioned

by that plan. No significant threats to wilderness values have been detected by occasional staff field visits to these wilderness areas.

Recent regional trends in general population growth, public demand for outdoor recreation, emerging conflicts between types of outdoor recreation activities, and impacts resulting from illegal immigration pose the potential for substantial impacts to the wilderness values of the six wilderness areas in the Decision Areas. This is anticipated to be particularly true for impacts resulting from the unauthorized use of motor vehicles in wilderness areas associated with recreation activities and illegal immigration and smuggling.

Visitation data collected in the Maricopa Complex indicates yearly increases in trailhead visitation; however, visitation remains low in comparison to wilderness areas in closer proximity to urban areas.

3.4.2.2. Juan Bautista de Anza National Historic Trail

The Juan Bautista de Anza NHT is a 1,200-mile historic trail corridor commemorating the 1775–1776 land route that Spanish commander Juan Bautista de Anza took from Mexico through Arizona to California in an effort to establish a mission and presidio on San Francisco Bay. Although historians have researched the diaries and journals of the people that followed this trail in the 18th century, only a few segments can be tied to a specific topographic feature. Although this trail has no known surviving trail signature on the ground, several other historic trails lie within the NHT corridor that crosses through SDNM and in certain segments in the Lower Sonoran, which means portions are considered a multi-component historic trail with associated sites. These historic trails have a trail signature due to the use of wagons and stagecoaches of the mid-nineteenth century. Where this trail signature coincides with the NHT corridor results in a natural fit for identifying and interpreting all of these trails together. While the Anza NHT is a historic trail corridor, the later trails have artifacts, features, and associated historic sites that are more obvious, as well as contain more visible trail signature and corridor area to interpret and protect. Certain segments of the NHT that traverse the Planning Area are considered to be among the best-preserved corridor segments and most representative of the historic trail corridor conditions.

Since the NHT's designation in 1990, Anza friends groups, NPS, other agencies, and the BLM have worked collaboratively to develop and mark segments of the historic trail. The BLM marked a 12.5-mile segment of the trail through the Maricopa Mountains in SDNM during the late 1990s. The vision for the NHT is that the trail will gradually become a long-distance recreational trail that the public can access, and that some private developers will incorporate the trail and surrounding landscape into their development plans.

The prevailing conditions of the Juan Bautista de Anza NHT through the Lower Sonoran and SDNM have been generally maintained since the NHT's designation in 1990. Current management guidance for the entire length of the NHT is provided by the Comprehensive Management and Use Plan for the Juan Bautista de Anza NHT (NPS 1996). This plan was prepared by the NPS and cooperating agencies, which included the BLM. A Long Range Interpretive Plan for the Juan Bautista de Anza NHT also has been prepared by the NPS (NPS 2003). These plans are still in place and actively form the basis for collaborative implementation of trail segment identification, protection strategies, and interpretive projects.

Designation of the SDNM placed an additional layer of protection upon the NHT segment through the Monument. The NHT and other underlying historic trails (e.g. the Butterfield Overland Stage Route and the Mormon Battalion Trail) are all named Monument Objects and all follow the same corridor.

Threats to the NHT include increasing recreational use, particularly near urban areas, and removal of historic artifacts. These threats were realized in 2008 when the NHT and the access routes leading to it became unacceptably degraded by damage due to improper OHV use. A temporary closure in the fall of 2008 was followed by intensive restoration and repair work to address the excessive damage to the historic trails, vegetation, soils, and historic trail corridor setting.

Over the long-term, there will continue to be the challenge of protecting the trail from visitor over use and unauthorized visitor activities. The dramatic population growth projected for the Phoenix metropolitan area and the urban development expected in the vicinities of various NHT segments in the Planning Area indicates that this challenge will become increasingly complex. The population growth will lead to increased pressure to access the trail for recreational visitation. Moderate to high levels of use are expected over the life of the plan.

In the Planning Area, an additional threat is the loss of opportunity to protect the trail corridor as private and state trust lands are developed. Collaborative projects with Anza NHT friends groups and local communities will be the avenue through which additional pieces of the trail might be certified as official NHT segments. This might involve acquisition of easements and lands by local groups or Federal agencies.

3.4.3. ADMINISTRATIVE DESIGNATIONS

3.4.3.1. Fred J. Weiler Green Belt Resource Conservation Area

The Fred J. Weiler Green Belt along the Gila River was established as a resource conservation area in 1970 and allocated for management of wildlife, recreation, and cultural resources. The parts of the green belt that fall within the Planning Area include 45,978 acres of the Gila River channel and floodplain from Sierra Estrella Park on the east to the Planning Area boundary on the west. Approximately 20,000 additional acres fall within the BLM's Yuma Field Office for a total of approximately 63,000 acres in the green belt. Only the acres that fall within the Planning Area will be discussed further in this document. Following is a brief history of land use within this area.

Within the area now known as the green belt, Public Land Order 1015 withdrew 6,896 acres of land from the Department of the Interior (DOI) to the USFWS in 1954. At this time, the USFWS entered into a cooperative management agreement with the AGFD to manage these withdrawn lands for wildlife, notably waterfowl and migratory birds. These lands were segregated from all forms of appropriation under the public land laws, including the mining laws but not the mineral leasing laws. Grazing and existing withdrawals for power purposes were specifically exempted from the segregation.

In 1967, approximately 63,000 acres in the Gila River floodplain were studied, including the 1015 lands, and it was determined that they would be retained under the Classification for Multiple Use Act of 1964. A classification for multiple use was placed on the subject lands, segregating the 63,000 acres from appropriation under the public land and mining laws. Mineral leasing, however, was not excluded. The multiple-use classification was established to allow for the

management of nesting areas for white-winged dove, mourning dove, and songbirds; public recreation; historical significance; and flood and erosion control.

In 1970, the 63,000 acres were designated as the Fred J. Weiler Green Belt Resource Conservation Area. This designation was designed chiefly to draw public attention to the area and explicitly did not change existing land uses. The green belt qualified as a Class VI recreation area under the Bureau of Outdoor Recreation system of classification (the Bureau of Outdoor Recreation has since been incorporated into the National Park Service) due to its Native American habitation sites of "major historic or cultural significance" (43 CFR 2071.2 1971).

3.4.3.2. Areas of Critical Environmental Concern

Coffepot Botanical

The Coffeepot Botanical ACEC consists of approximately 9,600 acres located in the Ajo Block of the Lower Sonoran. It protects primarily botanical resources. The Sonoran Desert scrub community in this area is diverse and includes more than 285 plant species, many with limited distributions in the U.S. Among these is the Acuña cactus, a candidate for listing under the ESA.

Livestock grazing in the Coffee Pot ACEC is limited due to a lack of livestock watering facilities, and no mining activity has occurred in the ACEC.

In general, the Coffeepot Botanical ACEC is meeting the intent of the ACEC, although illegal drug and people smuggling do adversely affect the area. The ACEC is bisected by an improved road used for access to a gas pipeline, making closure impractical; however, the area is less impacted by illegal uses than other border areas and generally remains in good condition.

Vekol Valley Grassland

The Vekol Valley Grassland ACEC consists of approximately 3,500 acres located in the southeastern corner of the SDNM. It consists of mostly valley bottom with creosote bush, mesquite, and 300 acres of remnant tobosa grassland.

A spreader-dike system and watershed fence were built in the late 1940s to reduce soil erosion. Many of the spreader dikes are currently in disrepair, thus leading to localized erosion and reduction in hydrologic function. The dike system also provides valuable resting areas for migrating waterfowl and shorebirds. Mesquite thickets provide nesting and roosting habitat for non-game and small game birds (e.g. dove and quail) and escape cover for mule deer and javelina.

The deep clay/loam soil and grass cover provide a relatively mesic environment for Sonoran green toads (*Bufo retiformis*), green toads (*Bufo debilis*), and Great Plains narrow-mouthed toads (*Gastrophryne olivacea*) (Jones et. al. 1983). It is extremely rare to find these toad species occurring together, and it is the only known occurrence of the Sonoran green toads on public lands. Toad species with more widespread distribution, such as the Sonoran Desert toads (*Bufo alvarius*) and Couch's spadefoot toads (*Scaphiopus couchii*), are also present.

Authorized livestock grazing ceased in the Vekol Valley Grassland ACEC in 2008 after the grazing permits expired; however, boundary-fence cutting in the Vekol Valley related to illegal border activities has resulted in trespass-livestock use.

The Vekol Valley Grassland ACEC has been impacted by off-route motor vehicle use and heavy foot and bicycle traffic propagated principally by illegal drug and people smuggling. In general, it is heavily used by drug and people smugglers, which largely negates efforts to close the area to OHV or off-route use, which has remained stable or decreased over the years.

3.4.4. OTHER SPECIAL DESIGNATIONS

No national conservation areas, national recreation areas, cooperative management and protection areas, outstanding natural areas, forest reserves, wilderness study areas, wild and scenic rivers, byways, national recreation trails, watchable wildlife viewing sites, wild horse and burro ranges, or other special designations exist in the Decision Area.

The Gila River was evaluated for wild and scenic river eligibility and suitability. The portion of the river to the east of the Planning Area (commonly known as the Middle Gila) and other portions to the east were evaluated for suitability in the Final Arizona Statewide Wild and Scenic Rivers Environmental Impact Statement (EIS; 1997). The remaining lengths of the Gila River, approximately from Winkleman to the junction with the Colorado River, were not deemed eligible during the development of BLM resource management plans prepared before 1993 and were not evaluated as part of the EIS. The portion of the Gila River in the Lower Sonoran Planning Area, from the east boundary of the Planning Area to the west boundary of the Planning Area, was re-evaluated in 2005 (BLM, 2005) and determined not to meet the eligibility criteria outlined in Appendix D, *Wild and Scenic River Eligibility Assessment* (p. 1027), Wild & Scenic Rivers Eligibility Assessment.

3.5. TRIBAL INTERESTS, PUBLIC SAFETY & SOCIAL AND ECONOMIC CONDITIONS

3.5.1. TRIBAL INTERESTS

While tribal interests in the Decision Areas are as diverse and wide-ranging as those of non-Indians, tribes also have special concerns about cultural resources that are part of their tribal heritage.

The frequency of BLM cultural resources consultations with tribal groups has increased considerably over the last decade; however, no extensive inventories of traditional cultural resources have been completed. Assumptions have sometimes been made by Federal agencies that all tribal members know significant, traditional cultural information, but, unfortunately, this is not factual. Considerable effort is often required to obtain information about traditions that are fading with the passing of each generation. Collecting such data can be difficult as some traditional cultural information is so confidential that discussing it with non-tribal members is considered inappropriate, and some traditional knowledge is not even widely shared within tribes.

Virtually all tribes are concerned about preserving archaeological sites regarded ancestral and the disturbance of human remains associated with some of them. Some tribal groups continue to collect natural resources, such as plant materials traditionally used for food, medicine, ceremonies, or crafts and are concerned about public lands access to collect such items. The BLM has involved tribes by conducting formal consultations on certain projects and during RMP development efforts.

Several tribes have traditional cultural affiliations with the Planning Area. Formal consultation letters and follow-up telephone calls were used to contact the Ak-Chin Indian Community, Fort McDowell Yavapai Nation, Fort Sill Apache Tribe of Oklahoma, Gila River Indian Community, The Hopi Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'odham Nation, Tonto Apache, White Mountain Apache Tribe, Yavapai-Apache Nation, and Yavapai-Prescott Indian Tribe. More recently, three tribal communities (Fort Mohave Indian Tribe, Fort Yuma-Quechan Tribe, and Colorado River Indian Tribes) were identified for consultations, as well.

Four O'odham (Piman) groups, closely related linguistically and culturally, continue to reside on reservations in the Planning Area. These are the Ak Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and Tohono O'odham Nation. Spanish explorers encountered these peoples when they entered southern Arizona in the late seventeenth century. These indigenous groups consider themselves descendents of the prehistoric groups who occupied the region.

The Maricopa, an amalgam of groups that traditionally lived along the lower Gila and Colorado rivers, moved up the Gila River in the nineteenth century to live with the O'odham. Other groups living along the lower Colorado River (Cocopah, Quechan, and Mohave) occasionally traveled into the Planning Area.

Consultations with the Yavapai-Prescott Indian Tribe and the Yavapai-Apache Nation indicated that those groups have interests in the traditional territory of the Yavapai, which was primarily north of the Salt and Lower Gila rivers. The Fort McDowell Yavapai Nation's reservation is in the Planning Area's northeastern section. The Fort McDowell Yavapai Nation indicated that they have an interest in the management of public lands near their reservation and would like to acquire public lands available for disposal.

The territories of various Apache groups were primarily east of the Planning Area. The San Carlos Apache Tribe, White Mountain Apache Tribe, Tonto Apache Tribe, and Fort Sill Apache Tribe of Oklahoma were consulted. Proposed developments in areas traditional Apaches regard as sacred have been controversial (e.g. telescope construction on Mount Graham), but no such conflicts have been identified in the Decision Areas.

Traditional histories of some Hopi Tribe clans indicate they came from the south and have traditional cultural affiliations with the prehistoric occupants of southern Arizona. The Hopi have expressed interest in the cultural resources in the entire state of Arizona, including the Planning Area.

The Pascua Yaqui Tribe originated in northwestern Mexico and began to move into the United States about 125 years ago. Communities of Yaquis are found near Tucson where they have a small reservation, as well as a reservation in the Salt River Valley. Consultations with the Pascua Yaqui identified no special concerns.

The Mojave and Quechan peoples' traditional territories were centered primarily on the Colorado River. The Ft. Mojave Indian Tribe, Ft. Yuma-Quechan Tribe, and Colorado River Indian Tribe are currently located along the Colorado River and its confluence with the Gila River. Places important to these groups include areas along the Gila River, and may extend into the far western portion of the Planning Area.

3.5.2. HAZARDOUS MATERIALS & PUBLIC SAFETY

Government records document known and recognized sites of reported hazardous materials and wastes. These sites include facilities that handle hazardous materials and, in some cases, produce hazardous wastes. Most of the facilities in the Planning Area successfully manage the use of these products and wastes, but activities at some can contaminate soil, water, and air.

Although many facilities using hazardous materials, housing underground storage tanks, and producing hazardous wastes are located within the Planning Area, no contaminated sites on public lands within the Lower Sonoran or SDNM are privately owned. There is one State-owned site on State property adjacent to the SDNM where millions of discarded tires are stored. The State currently is attempting to remediate the site.

The BLM is assessing hazardous-waste contamination resulting from past mining activities within the Planning Area. As risks to human health and the environment are determined, the BLM will take appropriate action to remove the contamination and remediate, as appropriate and feasible.

In addition to hazardous materials and waste risks, other issues affecting public safety are natural and human-made hazards. These hazards include abandoned mines, motor vehicles operated on roads and primitive BLM roads, unsafe target shooting practices, and cross-border smuggling activities. In general, abandoned mine-related public safety trends are static. For other hazards, associated risks may increase over time because more people are visiting and using public lands.

3.5.2.1. Landfills and Wildcat Dumping

Seven active landfills are located within the Planning Area. They include the Butterfield Station Landfill in Mobile; the Southwest Regional Landfill, located east of SR 85 and north of the SDNM; the Salt River-Pima-Maricopa Indian Community Regional Landfill, located north of SR 87; the Allied Waste Landfill, located in Queen Creek; the Waste Management Seventh Avenue Landfill, located in south Phoenix; the Weinberger Landfill, located in south Phoenix; and a new facility, the SR 85 Landfill, located along the western side of the SDNM within Buckeye's municipal boundaries. There are no landfills located directly within the Decision Areas.

"Wildcat dumping" occurs frequently on public lands and is a significant hazardous and non-hazardous waste issue. This refers to trash left by individuals in areas other than regulated landfills and most commonly occurs near urban-interface areas. Occurrences range in severity and volume, and discarded items include, but are not limited to, construction debris, household trash, appliances, tires, oil and waste fluids, paper goods, and other unwanted items. It is likely that, as the population grows and urban encroachment increases, this trend also will increase.

Wildcat dumping occurs near the Lower Sonoran's urban-interface (e.g. Ajo, Saddle Mountain, southern Rainbow Valley, Haley, and Buckeye Hills). Wildcat dumping also occurs near the northern part of the Monument near established recreational-use sites, especially along roadways. Many of these sites also are associated with littering by people engaged in recreational activities (Foti and Patterson 2003). Undocumented immigrants and drug smugglers also produce copious amounts of trash concentrated along roads, in staging and pick up/drop off areas, and dispersed throughout the SDNM. Similar smuggling-related problems occur in the Ajo Block and Sentinel Plains.

Another form of waste involves litter from visitors recreating on public lands. Such litter can include target-shooting debris, trash, and human waste and is found in the highest concentrations at campsites, trailheads, and other high-use areas. Incidences of littering from recreational users have increased, with further increases likely.

3.5.2.2. Active and Abandoned Mines

Abandoned mines are found throughout the Lower Sonoran and SDNM. Data gathered by the Office of the Arizona State Mine Inspector in the early 1990s and the Bureau of Mines in 1995 show that more than 180 active and abandoned mines are located in the Decision Areas. Five abandoned mines have been found within the Ajo Block and at least eight in the Sand Tank Mountains (Arizona State Department of Mineral Resources 1979).

Mining activities may have historically included the use or presence of mercury, cyanide, arsenic, acids, and/or base metals as a component of the ore being mined. Another source of contamination sometimes occurs when hazardous materials are dumped into old mine shafts. In addition, mine tailings located at active and closed mine sites pose potential hazardous effects, including leaching of chemicals into the soil and/or groundwater and airborne hazardous wastes.

Visitors often find abandoned mines and prospects attractive to explore, but entering abandoned mining sites may expose them to hazards including open and unstable shafts, adits, drifts, pits, tailings piles, wells, or other excavations; dilapidated and unstable buildings or other structures; collapsed buildings or other structures; mining implements or construction debris; and the presence of hazardous or toxic materials. Injury can occur when entering or exploring features at abandoned mining sites. No specific data documents the extent to which this recreational activity is pursued within the Decision Areas.

While hazardous situations are corrected when found, there are numerous historical mines in the Decision Areas not thoroughly investigated or documented. The BLM is researching and ranking the human health and safety risks from known abandoned mine sites in order to develop long-term reclamation, remediation, and restoration projects.

The BLM has developed an inventory of high-risk, abandoned mine lands to prioritize funding requests for the restoration and reclamation of these sites. Over time, these actions are expected to decrease their numbers, thus decreasing both the hazardous waste and public safety risks.

3.5.2.3. Military Operations and Unexploded Ordnance

The Sand Tank Mountains and Sentinel Plain are adjacent to aviation weapon ranges in the BGR used to train military aircrews in the delivery of air-to-ground bombs, rockets, missiles, and gunnery. Unexploded ordnance refers to military munitions that have been prepared for action and remain unexploded by either malfunction, design, or any other cause. Entry into the range is prohibited because of ongoing military operations; however, signs and fences typically are inadequate or absent. Visitors to the Sand Tank Mountains area of the SDNM are required to obtain an annual BGR visitor permit, which includes an explanation of the risks of unexploded ordnance and guidance on avoiding them, as well as a warning not to enter the active training range.

Known and potential unexploded ordnance contamination exists in and around the Sand Tank Mountains (formerly known as Area A) and the Sentinel Plain due to the longtime inclusion of

these areas in the BGR. Unexploded ordnance also possesses a potential chemical hazard due to explosive, pyrotechnic, propellant, and incendiary components (U.S. Army Corps of Engineers 1995).

Most of the fired and detonated munitions are eliminated during clearances; however, some likely remain. Also undetermined is the extent to which chemical byproducts produced by the firing and/or detonation of munitions are present in the area. Studies suggest that, while possible, contamination from these byproducts is unlikely (U.S. Army Corps of Engineers 1995; U.S. Air Force 1996, 1997). Unexploded ordnance represents an immediate public safety hazard. Unspent munitions may be located on the ground's surface or buried beneath due to the momentum of impact. In addition, recent studies on the Sentinel Plain have identified large numbers of parachute flares, and such flares are continuing to drop into the area from military activities. The BLM and the Air Force also will continue to work together to identify other procedures, such as required visitor entry permits, to protect the public from such hazards.

The BGR has removed and cleaned up unexploded ordnance in the Sand Tank Mountains and is inventorying lands formerly part of the BGR in the Sentinel Plain area. When addressing unexploded ordnance elsewhere in the Decision Areas, the BLM works closely with the U.S. Army Corps of Engineers to monitor the remediation of unexploded ordnance sites. As a cooperating agency, the BLM participates in regular discussions with the Corps.

3.5.2.4. Recreational Target Shooting

Shooting activities including "target shooting," "shooting practice," "plinking," "sporting clays," "skeet," and "sighting-in" have been occurring in the Decisions Areas since firearms were introduced to the region. Target shooting commonly occurs on lands at the edge of private property, on the outskirts of communities, or in remote areas offering unstructured settings. Such settings are attractive because they accommodate a typically desired experience, and the participant is free to shoot whatever firearm is available in whatever manner desired, usually without fear of harming or interfering with the interests of other people.

With the population growth and subsequent urbanization of the American West in the 21st Century, the edges of property have become closer, the outskirts of communities more crowded, remote areas fewer, shooting closures more common, and "downrange" target sites both larger and more numerous. Target shooters are being pushed farther out from metropolitan areas seeking lands (private, State, and Federal) for target shooting. Urban growth and development have made it increasingly difficult for target shooters to find unstructured areas without affecting other users or natural resources. It is harder yet to find settings that can absorb continued deposition of destroyed and abandoned targets without becoming eyesores with an associated and perhaps an irretrievable loss of natural or heritage resources, Monument objects, and wildlife habitat.

Challenges for management of recreational shooting are clearly related to increased urbanization adjacent to public lands, the need for public safety, and the protection of Monument objects and natural resources. In and of itself, larger populations bring higher percentages of irresponsible people to these public landscapes. Commonly, other recreational visitors are displaced when target shooters occupy an area. Initially, this displacement is a result of the sights and sounds of shooting; later the lands are too littered and denuded to attract visitors seeking a non-shooting recreation experience.

Increasingly, Arizona's broad public demand for places to shoot is being shifted to public lands managed by the BLM. Continued demographic changes in Arizona are straining the limits of where and how recreational target shooting can be accommodated. For example, the Arizona State Lands Department has closed all their lands to all target shooting, the Tonto National Forest has closed 80,000 acres of USFS lands in the Phoenix proximity to shooting, and various Phoenix communities do not or no longer allow target shooting within incorporated limits.

Arizona's BLM recreation management staff was internally canvassed to identify issues arising from recreational shooting activities (BLM 2007). At that time, staff noted the following, which are in order of priority:

- A concern for the health and safety of visitors engaged in non-shooting activities and residents adjacent to public lands.
- Accumulation of abandoned household refuse used as targets, causing spending for regular cleanups in the Lower Sonoran and SDNM. Such cleanups drain fiscal, labor, and volunteer resources and supplant other program priorities.
- The gradual degradation or destruction of natural resources, such as intentional shooting of saguaro cactus, and Monument objects in protected landscapes, such as the SDNM.
- Vandalism to SDNM and Monument signage and structures, from the use of signage for targets and "drive-by" shotgunning to damage to remote infrastructure such as restroom doors and slump block walls being shot through.
- Damage to natural resources or Monument objects downrange of target sites, such as visible depletion of plant cover over time on slopes, delimbing of downrange trees, damage to trees or saguaros used to hang targets, and permanent pockmarking of rock outcrops due to gunfire.

The extent of recreation impacts to the SDNM were analyzed during a comprehensive inventory of all recreation sites visible from the vehicle route network (Foti and Chambers, 2005). Site impacts were assessed for a variety of impact variables and categorized as "non-shooting sites" or "shooting sites," based primarily on the presence of shooting-related litter such as spent ammunition casings and clay pigeons.

The inventory identified 243 recreation sites predominantly used for activities other than target shooting and 63 sites predominantly used for target shooting. Impacts at the two types of sites were analyzed to determine if significant differences existed between non-shooting and shooting sites with respect to management of Monument objects and natural resources. The major types of impacts relevant to this analysis were defined as follows: (1) damage to saguaro cactus, (2) damage to rock formations, (3) damage to trees, (4) damage to shrubs, (5) presence of litter, (6) presence of off-road vehicle impacts, and (7) number of 400 square foot barren cores. Every recreational target-shooting site had damage to one or more of these seven impact elements, while such impacts were significantly less prevalent at non-shooting sites.

Since designation of the SDNM in 2001, impacts from recreational target shooting have increasingly become a management concern. Such impacts commonly include damage to protected plants, particularly saguaro; areas denuded of vegetation, both at sites from which shooting occurs and at target areas; and accumulation of debris used as targets, such as discarded appliances, propane bottles, glassware, furniture, automobile tires, paint cans, computers, TV and video displays, plywood, sheet metal, insulation form cans, and numerous other types of trash.

Computer displays and electronics can be full of lead and other toxic materials. The safety of other visitors, particularly with regard to inadequate backstops, is a concern as well.

Recreational target shooting is dispersed throughout the SDNM; however, the activity is concentrated at locations adjacent to its northern boundary along the El Paso Natural Gas Company pipeline road and smaller sites adjacent to SR 238 and Vekol Valley Road. During October-November 2008, the BLM removed 12,000 pounds of debris from recreational target shooting sites adjacent to the northern boundary of the Monument.

Field observations by resource managers and law enforcement officers indicate target-shooting activities have become increasingly popular, especially near the growing fronts of the greater Phoenix metropolitan area (Hanson and Mahoney; 2010), even in summer. New and more powerful firearms used by target shooters may increase the public safety risk due to the distance that bullets can travel. In addition, more frequent and widely spread recreational use of automatic weapons has also been noted. Although there have been no reported incidents of specific harm to people, these activities remain largely unregulated and pose potential public safety risks.

Further discussion of target shooting on the SDNM can be found in Section 3.3.4, "Recreation Management" (p. 330) and in Appendix G, *Sonoran Desert National Monument Recreational Target Shooting Analysis* (p. 1183). From a hazardous materials standpoint, popular recreational-shooting sites may have minor potential for lead contamination in the soils derived from spent bullets. Recreational shooting tends to be less frequent and more widely dispersed than on an established shooting range where lead levels can exceed regulatory guidelines and cause potential impacts to humans and wildlife. In addition, based on the composition of the hard, rocky soil of the Sonoran Desert, it is unlikely that much of the lead has penetrated the surface (U.S. Air Force et al. 2003).

3.5.2.5. Motor-Vehicle Operations

Hazardous wastes associated with motor-vehicle operations are generally limited to vehicle abandonment and spills of oil and other fluids. While historically a small concern on public lands, rock-crawling activities dramatically increase the risks of oil/fluid spills, often in sensitive washes where waste movement via water flow is more likely. In addition, dumping and burning vehicles is a common occurrence on public lands, leaving various hazardous wastes.

Safety issues associated with the use of paved public highways, unpaved backcountry roads, and off-road areas may have implications for the management of or access to public lands. Available data indicate that the highest numbers of accidents on public highways and roads in the Decision Areas occur on I 8, SR 85, and SR 238/Maricopa Road. The lack of entrance or exit ramps or crossovers to support safe traffic interchanges on I-8 and SR 85 indicates that there is at least some elevated public safety risk associated with accessing public lands from these roads. Excessive speed is the most common contributor to accidents on major roadways traversing public lands.

Four-wheel drive, ATV, and dirt bike use is common in the Decision Areas, and BLM law-enforcement officers report that accidents among such users are a safety issue, although no data quantifying the extent of such accidents in the Decision Areas are available. While vehicles are required to stay on roads, illegal off-road travel does occur and increases user risk.

Regional population growth and increased awareness of public lands for recreational activities has and will continue to provide more opportunities for transportation-based recreation in the Decision Areas. As a result, dumping and burning of vehicles, abandonment associated with

illegal border activities, and use, particularly associated with rock crawling activities, increases the likelihood of small hazardous spills and wastes. Use of ATVs and other recreational vehicles has increased, proportionately, increasing the risk to public safety. This trend is expected to continue as population growth increases.

3.5.2.6. Other Permitted Uses

Utility maintenance, livestock grazing operations, and other permitted uses appear to present minimal risk to visitors on public lands, but potentially could influence public safety. Mishaps could result from collisions between livestock and vehicles, increased travel by large maintenance vehicles, or encounters with agitated livestock. Visitor mishaps could also occur at utility sites (e.g. communication or utility line towers) or range improvements (e.g. stock ponds, fences, or wells). No known hazardous conditions associated with other permitted uses within the Decision Areas have been identified.

3.5.2.7. Illegal Drug Production

Due to the remote nature of the Decision Areas, illegal drug production occurs across public lands. While occurrences of these activities are rare, it is a major problem when they are discovered. Byproducts from these illegal drug labs can include lye, acetone, red phosphorous, iodine crystals, ephedrine, and other chemicals. In addition, the perpetrators sometimes abandon or bury their supplies, including glassware and utensils. Materials left on site can present a public safety hazard to visitors and employees, as well as impact natural resources. When encountered, these areas typically are cleared by a BLM contractor hired for solid-waste cleanup (Kershaw 2003).

While the BLM does not have trend information regarding illegal drug production, the potential exists for illegal laboratories to be established on public lands, most often in washes and other low-lying areas and within abandoned mines. Specifically, production of illegal drugs has been noted in 2005 and 2006 in areas with abandoned mines. The vast expanse of remote desert lands with access through dry washes and off-road trails provides opportunities for such uses.

Within the SDNM, production of illegal drugs, including methamphetamine, has seen an increase near SR 238. Waste from the production of this drug especially presents health hazards through exposure and physical danger to visitors and BLM staff. There is a high risk of explosive combustion in methamphetamine labs when materials are exposed to normal atmospheric pressure. An increase in dumping of materials related to drug production was noted during late spring 2009 near SR 238 and Tijeras Road. Field observations suggest that it is now spreading to other BLM parcels within the vicinity of SR 238 and the Gas Pipeline road.

3.5.2.8. Drug Smuggling and Undocumented Immigrant Traffic

Illegal immigration and drug smuggling continue to be issues on public lands in the southwestern border of the United States with Mexico. Illegal activities affect public lands within 100 miles of the international boundary in the Lower Sonoran and SDNM.

The BLM collaborates with DOI agencies and state, tribal, and local governments to resolve issues caused by illegal borderland activities. Partnership efforts include:

- Coordinating with the Department of Homeland Security to provide needed support and coordination for deployment of border security infrastructure,

- Providing a leadership role in the mitigation of environmental impacts caused by illegal immigration and smuggling,
- Strengthening communication and intelligence sharing with other law enforcement agencies, particularly the U.S. Border Patrol, and
- Sharing funding with partner agencies, tribes, and organizations who manage lands within 100 miles of the U.S.-Mexico border.

Between FY 2003 and 2010, the BLM allocated $7 million toward these borderlands mitigation efforts, including the removal of trash, waste, and abandoned vehicles; road and trail restoration; and repair of damaged landscapes. Volunteer organizations participate in these critical efforts to remediate and restore public lands.

Border security for BLM employees and visitors continues to be a challenge. Escalation of drug-smuggling activities has created concerns for both the Lower Sonoran and SDNM. The BLM has posted travel caution signs, increased interactions with visitors, and is providing additional information at public access points and on websites.

Various areas of the Lower Sonoran and SDNM are used as travel routes by drug and UDA smugglers and independent parties of UDAs. Regular use by human and drug smuggling traffickers has become apparent over the last decade, with summertime lulls; however, over the past two years, traffic has been intense year-round with no respite during the heat of summer.

The most heavily traveled routes for smuggler and UDA traffic are in the SDNM south of I-8, where traffic is widespread and heavy. The Ajo Block and Sentinel Plain areas also have received smuggler and UDA traffic. Law-enforcement activity in the Decision Areas typically include the recovery of stolen vehicles abandoned by or confiscated from smugglers, recovery of weapons, drug interdictions involving the seizure of illegal drugs, and the apprehension of UDAs (Hanson 2010).

Law enforcement officers report that smugglers are often armed (Brasington 2010). Additionally, UDAs are themselves very much at risk from exhaustion and exposure to the elements as they attempt to walk considerable distances to reach pick-up points along I 8, SR 238, or other locations. The increased risk to the UDAs lives and health, from climatic exposure and other environmental hazards of the Decision Areas, has been clearly demonstrated by the number of people dying trying to cross the Sonoran Desert in recent years.

Smuggler and UDA traffic through the Decision Areas has increased within the last decade, while traffic in other regional areas has declined. This trend is due to the Decision Area's proximity to the United States/Mexico border (Brasington 2010), remote unpopulated terrain, and strong interdiction efforts elsewhere, such as in California, New Mexico, and other parts of Arizona. Increases in illegal and armed cross-border trafficking, coupled with increases in public visitation to these areas, intensifies related public safety concerns.

3.5.2.9. Wildfires and Fire Management

Wildfires endanger people and property. Normally, the vegetative cover in the Decision Areas is too sparse to carry wildland fires effectively or to generate fires with sufficient heat to be self-propagating. Over the past decade, however, a long drought coupled with a few exceptionally wet winters made atypical moderate to large wildland fires more common. There have been two

moderately sized fires in the SDNM since establishment in 2001, and one extremely large fire on the adjacent BGR. The potential for large fires may increase if fire adaptable invasive weeds make further intrusions into the two Decision Areas. Additionally, changes in the ecosystems, due to invasive species and long-term drought, may also increase the likelihood of fire, resulting in larger areas being burnt, and thus more risks to the public.

3.5.3. SOCIAL AND ECONOMIC CONDITIONS

This section provides information on the social and economic conditions of the Planning Area, particularly as it relates to resource issues addressed in the current planning effort. Management decisions, specifically those relating to energy and minerals, grazing, recreation, and lands and realty, have the potential to affect social and economic conditions of communities and individuals, negatively or positively.

This socioeconomic assessment considers the national, regional, and local levels identified below:

- United States: provides a baseline for comparison of national trends,
- State of Arizona: provides an indication of statewide trends,
- Tri-county region (Maricopa, Pima, and Pinal counties): provides an overview of the counties that encompass the majority of Planning Area. In addition, a small portion of the northeastern-most section of the Planning Area is located in Gila County.
- Local communities (Arlington, Buckeye, Gila Bend, Goodyear, Mobile, Palo Verde, Tolleson, Tonopah, Casa Grande, Florence, Maricopa, Stanfield, Ajo, Why, Globe, and Miami): provides specific information on communities located near the Decision Areas.

Indicators of the social and economic environment include population and demographic data represented by population size, density, and growth; income levels; employment rates; ROWs and other realty use of public lands; and attractiveness.

Four dominant social and economic trends in the socioeconomic study area include:

- Rapid population growth (though the rate of growth has slowed or even stopped since 2008);
- A decline in natural resource-based, extractive industries between the 1970s and 1980s and an increase in high-tech, knowledge-intensive services since the 1990s;
- Retirement as an increasingly important source of non-labor income in the local economy; and
- A higher intensity of changes in employment and income trends in small, rural communities compared to larger, urban areas.

3.5.3.1. Demographics

Population Growth

While the population of the United States has increased by 38 percent from 1970 to 2000, the population of Arizona increased by 190 percent (U.S. Census Bureau 2003d; Arizona Department

of Economic Security 2006). In this period, Maricopa County increased by 217 percent, Pinal County increased by 165 percent, and Pima County increased by 140 percent.

Based on the July 2008 American Community Survey, the population of the tri-county region was nearly 5.3 million, with nearly 4 million (75 percent) residing in Maricopa County, which represents nearly 60 percent of the total population of Arizona Between 2000 and 2009, the region's population grew by 1,290,172 people.

Local population estimates, available for incorporated cities and towns, indicate that the City of Maricopa had the fastest growth rate of any city or town in the State between 2000 and 2005, while Buckeye and Goodyear had growth rates ranked sixth and seventh, respectively. Some communities showed extremely slow population growth, such as the Gila County communities of Globe and Miami. Population estimates and trends for eight communities near public lands in the Planning Area are shown in Table 3.28, "Population Growth 2000 to 2008, Six Cities and Towns near the Decision Area" (p. 355).

Table 3.28. Population Growth 2000 to 2008, Six Cities and Towns near the Decision Area

Geographic Area	Population		Percent Increase, 2000-2008
	2000	2008 (estimate)	
Maricopa County			
Buckeye	8,497	47,261	623%
Gila Bend	1,980	1,831	-7.5%
Goodyear	18,911	59,508	214.7%
Tolleson	4,974	7,199	44.7%
Pinal County			
Maricopa City	1,482	45,571	4,281.8%
Casa Grande	25,224	41,152	63.1%
Gila County			
Globe	7,486	7,197	-3.9%
Miami	1,936	1,778	-8.2%
Source: American Community Survey 2009			

Population Density

The most densely populated portion of the Planning Area is its northern edge, from Phoenix west to Goodyear and from South Phoenix east nearly to the Maricopa County border. Portions of Phoenix and other cities are close to "build-out" and have urban densities of about 2,500 people per square mile. Nearby suburban areas are less densely populated (ranging down to about 1,000 people per square mile), with larger residential lot sizes and more pockets of vacant land.

Based on the 2009 American Community Survey, the population density in the three counties varies significantly, from 430 people per square mile in Maricopa County to 61 in Pinal County (see Table 3.29, "Selected 2008 Demographic Information" (p. 356)). Maricopa County's population density is more than seven times that of the State's, while Pima County's population is nearly twice as dense as the State's, while Pinal County's population is about the same as the State. These numbers are indicative of the focus of the three counties, with Maricopa County being strongly metropolitan and Pinal County being rural in many areas (American Community Survey 2009; Arizona Department of Commerce 2003b). Overall, each of the three counties has a much lower density than the urban centers due to large, undeveloped areas that are largely comprised of BLM-administered and other Federal lands as well as state trust lands within their borders.

Table 3.29. Selected 2008 Demographic Information

Demographic Category	Maricopa County		Pima County		Pinal County		Arizona	
Total Population	3,954,598		1,012,018		327,301		6,500,180	
Area (square miles)	9,203		9,186		5,370		113,635	
People per Square Mile	429.7		110.2		60.9		57.2	
	Number	%	Number	%	Number	%	Number	%
Sex								
Male	1,993,117	49.6	495,889	49.0	170,524	52.1	3,256,590	50.1
Female	1,961,481	49.6	516,129	51.0	156,777	47.9	3,243,590	49.9
Age								
Under 18 Years	1,083,560	27.4	240,860	23.8	84,444	25.8	1,083,560	26.3
18 to 64 Years	2,432,078	61.5	621,379	61.4	198,999	60.8	3,952,109	60.8
Age 65 and Older	438,960	11.1	149,779	14.8	43,858	13.4	838,523	12.9
Median Age	33.7	N/A	36. 7	N/A	34. 0	N/A	34.8	N/A
Race and Ethnicity								
White	3,251,355	82.2	895,636	88.5	284,097	86.8	5,655,157	87.0
Black or African American	170,460	4.3	36,433	3.6	12,765	3.9	260,007	4.0
American Indian/ Alaska Native	73,474	1.9	34,409	3.4	19,965	6.1	305,508	4.7
Asian	114,414	2.9	26,312	2.6	5,237	1.6	162,505	2.5
Native Hawaiian/ Other Pacific Islander	7,152	0.2	2,024	0.2	327	0.1	13,000	0.2
Hispanic or Latino (any Race)*	1,224,005	31.0	330. 930	32.7	96,881	29.6	1,924,053	29.6

SOURCE: American Community Survey 2009

NOTE: N/A = not applicable

*Hispanic or Latino heritage includes people of other races, so percentages will not tally to 100 percent.

The city of Maricopa in Pinal County and the Rainbow Valley area of Maricopa County border the Decision Areas. Both have privately owned land available for development. The collapse in the Arizona housing market and the nationwide recession have slowed growth in these areas since 2007, but development is expected to pick up again once the economic situation improves. Maricopa eventually plans to house 125,000 residents with a predominantly high-density development pattern (Maricopa 2006). Buckeye and Goodyear annexed the Rainbow Valley area, and similar growth rates and housing densities are expected there in the coming decades. Other areas, including Avondale, Buckeye, Goodyear, Casa Grande, and areas currently part of unincorporated Maricopa County, are also expected to experience significant growth over the next few decades (MAG 2003).

Population Composition

There are slight differences in racial distribution among the counties, primarily in the form of differences in the proportion of American Indians due to the locations of American Indian reservations. Further discussion of the Planning Area racial and ethnic profile is discussed in Section 3.5.3.4, “Environmental Justice” (p. 367).

Individuals who are foreign born represented 12.8 percent of the total population in Arizona in 2008, while 24 percent of the population in Phoenix was foreign-born (American Community Survey 2009). This ranked the city sixth in the nation among other large cities in terms of the percentage of foreign-born population.

3.5.3.2. Employment, Income, and Subsistence

The economy, in general, is shifting away from reliance on natural resources, as indicated in the decrease in the proportion of employment in the agriculture, forestry, fisheries, and mining industries. In the tri-county region, declines in the mining industry dominate this trend.

Employment

Over the past several decades, services, which include many of the knowledge-based professions, were the largest employment sector in the tri-county region. The service sector made up 53.9 percent of total employment in Maricopa, Pima, and Pinal counties in 2007, with a total of 1,604,453 jobs. Service jobs as a share of total jobs increased 32.3 percent from 2001 to 2007 for the tri-county region, especially in the areas of educational services (85.2 percent of total tri-county employment in 2007); real estate (79.8 percent); business management (36.7 percent); health care and social assistance (34.9 percent); and arts, entertainment, and recreation (28.7 percent). By comparison, farm employment in the tri-county region grew by 4.6 percent from 2001 to 2007 (employing 12,529 people in 2007), while forestry, fishing, and related sectors shrank by 19.9 percent from 2001 to 2007 (employing 4,243 people in 2007). Farm proprietor employment also shrank 4.7 percent from 2001 to 2007, further exemplifying the shift away from natural resource-related employment in the Planning Area. Key employment figures for each county in the tri-county region are presented in Table 3.30, " Key Employment Statistics: Changes from 2001 to 2007, Tri-County Region" (p. 357).

Table 3.30. Key Employment Statistics: Changes from 2001 to 2007, Tri-County Region

	TOTAL EMPLOYMENT			EMPLOYMENT BY INDUSTRY*			
	Wage and Salary Employment	Proprietors' Employment	Total	Forestry, fishing and related	Mining	Farming	**Services and Professional**
MARICOPA COUNTY							
2001	1,617,329	298,363	1,915,692	3,824	3,165	8,395	978,147
% of Total	84.4%	15.6%	100.0%	0.2%	0.2%	0.4%	51.1%
2007	1,924,699	452,812	2,377,511	3,160	4,360	8,671	1,293,557
% of Total	84.4%	15.6%	100.0%	0.1%	0.2%	0 4%	54.4%
PIMA COUNTY							
2001	362,427	82,041	444,468	499	2,505	1,173	218,400
% of Total	81. 5%	18. 5%	100.0%	0. 1%	0. 6%	0. 3%	49. 1%
2007	406,446	122,404	528,850	373	2,616	1,135	284,136
% of Total	76.9%	23.1%	100.0%	0.1%	0.5%	0.2%	53.7%
PINAL COUNTY							
2001	43,101	9,115	52,216	972	1,348	2,415	15,948
% of Total	82.5%	17.5%	100.0%	1.9%	2.6%	4.6%	30.5%
2007	56,411	14,252	70,663	710	1,342	2,723	26,760
% of Total	79.8%	20.2%	100.0%	1.0%	1.9%	3.9%	37.9%

SOURCE: Bureau of Economic Analysis 2010

*Employment by industry figures are by place of residence.

Between 1980 and 1990, employment in the agriculture, forestry, fisheries, and mining sector decreased by 14.2 percent in Pinal County, 14.1 percent in Ajo, 7.4 percent in Casa Grande, and 7.2 percent in Gila Bend. At the same time, the services sector share of local employment increased 32.2 percent in Sells, 17.6 percent in Ajo, and 6.8 percent in Buckeye. By comparison, the services sector share of local employment only increased by 4.9 percent in Maricopa County, 4.6 percent in Pima County, and 2.6 percent in Pinal County (Sonoran Institute 2003a).

Overall, key employment figures (see Table 3.30, " Key Employment Statistics: Changes from 2001 to 2007, Tri-County Region" (p. 357)) indicate large gains in employment in the tri-county region for the period between 1970 and 2000. Both wage and salary employment and the establishment of new businesses by proprietors have generally kept pace with the increases in population, land development, and housing. There have been shifts, however, in the dominant employment sectors. The services and professional sector has grown faster than other sectors. The regional trend matches the statewide trend whereby this sector provided approximately 75 percent of the new jobs in Arizona. In the tri-county region, and in each individual county and the state, unemployment increased each decennial period between 1970 and 1990 (Sonoran Institute 2003a). However, unemployment rates in Maricopa and Pima counties have generally been lower than the state national rates since 2000, while unemployment rates in Pinal County have remained consistently higher than that of the state and nation (see Table 3.31, "Unemployment Rates, Annual Averages 2000-2005" (p. 358)).

Table 3.31. Unemployment Rates, Annual Averages 2000-2005

Area	2000	2001	2002	2003	2004	2005
National	4.0	4.7	5.8	6.0	5.5	5.1
Arizona	4.0	4.7	6.0	5.7	4.9	4.6
Maricopa	3.3	4.2	5.6	5.2	4.4	4.1
Pima	3.7	4.3	5.6	5.3	4.6	4.6
Pinal	4.6	5.3	7.2	6.8	5.7	5.4
SOURCE: State of Arizona, Department of Economic Security 2006						

Typically, Pinal County has had the highest unemployment rates; however, over the last several years, its economy has become more robust and its unemployment rates are now more similar to those of the other two counties. There are rural areas far from employment centers in all three counties with chronically high unemployment rates.

Income

In 2008, Maricopa was the only county in the tri-county region with a median family income value ($66,752) higher than that of the state of Arizona ($60,426). The median family income was $57,972 for Pima County and $53,308 for Pinal County. The median family income, adjusted for inflation, has risen in each county in the tri-county region since 1970.

In 2006, non-labor income constituted 40 percent of total personal income in Pima County, 38 percent of personal income in Pinal County, and 28 percent of total personal income in Maricopa County Non-labor income includes transfer payments (primarily related to retirement) and dividends, interest, and rent (money earned from past investments) (see Table 3.32, "Key Income Statistics: Changes from 2001 to 2007, Tri-County Region" (p. 359)). The median value for non-labor income as a percentage of total personal income in all U. S. counties was 37.4 percent in 2006. High levels of non-labor income have important implications for the management of public lands because much of the income in this sector is brought in by individuals who are not tied to a specific job or industry and have flexibility in where they choose to live. Examples of

people contributing this type of income include retirees and second- and vacation-home owners. These groups tend to be attracted to areas with natural and scenic resources and the presence of public lands, which offer recreational opportunities and a desirable setting in which to live. As a percentage of new income from 1970 to 2006, non-labor income grew faster than labor income in all three counties that comprise the Planning Area. From 1970 to 2006, non-labor sources of income as a percentage of new income grew 5.5 percent a year in Maricopa County, 5.0 percent a year in Pima County, and 6.6 percent a year in Pinal County.

Table 3.32. Key Income Statistics: Changes from 2001 to 2007, Tri-County Region

	MARICOPA COUNTY			PIMA COUNTY			PINAL COUNTY		
INCOME	2001	2007	% Change	2001	2007	% Change	2001	2007	% Change
Per Capita Personal Income	$29,238	$36,135	23.6%	$24,706	$31,755	28.5%	$19,082	$22,975	20.4%
Per Capita Non-labor Proportion*	28%	30%	32.3%	39.8%	41.6%	34.2%	36.9%	37.9%	23.7%
SOURCE: Bureau of Economic Analysis 2010 *Non-labor Income Proportion of Per Capita Personal Income									

In 2001, 6,744 workers in the tri-county region were employed in the mining North American Industry Classification System sector (which includes mining, oil and gas extraction, and support activities for mining) and derived $355.3 million in personal income (U.S. Bureau of Economic Analysis 2004). See Table 3.33, "Employment and Income in the North American Industry Classification System" (p. 359) for employment and personal income numbers at the county and state level. While Gila County's active mines were in or near the Planning Area, data concerning the county's mines were undisclosed (U.S. Bureau of Economic Analysis 2004).

Table 3.33. Employment and Income in the North American Industry Classification System

Area	Total Mining Employment	Personal Income (in millions)
Maricopa County	2,984	$195.4
Pima County	2,426	$92.4
Pinal County	1,334	$67.5
Tri-County Region		$355.3
Arizona	12,573	
Source: U. S. Bureau of Economic Analysis 2004		

Mining Income

Mining yields secondary employment and income impacts on the economy. For example, it is estimated that the jobs of nearly 23,000 Arizona residents resulted indirectly from the copper industry's presence in Arizona in 2002. About 2,600 of those jobs were in state and local government, including public education. Another 8,300 were in trade and service businesses. In 2002, the personal income indirectly received by Arizona residents because of copper industry spending in the State amounted to more than $560 million (Arizona Mining Association 2002). Since 1910, Arizona has been the nation's top copper producer, producing more copper than all the other 49 states combined.

In the Planning Area, the Ajo and Globe/Miami areas have been most affected by the long-term trends in mining. The mining industry supported the development of Ajo, which arose from the Ajo Phelps Dodge copper mine and operated from the early 1930s until 1985. In 1980,

manufacturing of durable goods and agriculture, forestry, fisheries, and mining were the largest SIC employment sectors in Ajo, but decreased greatly over the next 20 years while the service sector increased greatly. By 2000, just 3.3 percent of employment in Ajo was in the agriculture, forestry, fisheries, and mining (Sonoran Institute 2003a). An increased focus on tourism and retirement industries in Ajo was, in part, responsible for the shifting of the workforce to the services sector. The Globe/Miami area has also realized reductions in mining employment, but community leaders are reviewing ways to enhance the tourism market and diversify their economy (Arizona Department of Commerce 2003a).

Locatable Minerals. Locatable minerals, particularly copper and silver, have historically been very important to both Arizona's and the Panning Area's economy (Niemuth 2006). Arizona's total mineral production from operating all 160 mines in the state valued at $2.8 billion in 2000 and $2.2 billion in 2001 (Arizona Department of Mines and Mineral Resources 2003). The value of non-fuel mineral production per capita in 2000 was estimated at $474 for Arizona, compared to the $139 national average, making Arizona sixth in the nation for mineral production per capita.

Active locatable mineral mines in Arizona employed 11,676 workers in Arizona in 2002 (Arizona State Mine Inspector 2002). Of these, approximately 1,100 workers (9.4 percent) were employed in or near the Decision Areas, mainly in Gila County, where 1,012 workers were employed by locatable mineral mines. Over two-thirds of those working in the Gila County mines were primarily employed within or near the Decision Areas. Sixty-three workers were employed at active mines within or near the decisions areas in Pinal County, which represented only 5.3 percent of all workers employed at active mines in Pinal County.

Salable Minerals. Salable mineral development is active in the Decision Areas, where the predominant mineral materials are decorative rock and building stone (e.g. granite, weathered granite, basalt and other volcanics, and cinders). In Arizona, approximately 10 million tons of decorative rock was produced in 2006, of which approximately 1 million tons, or 10 percent, were produced in the Lower Sonoran. Decorative rock is also an important commodity in Arizona, with production value increasing from approximately $48 million in 2000, with a high of $76 million in 2004. Non-industrial sand and gravel has become increasingly important in Arizona. Its production value has increased from approximately $300 million in 2000 to $560 million in 2006. In addition, from 1991 to 2001, the production value of non-industrial sand and gravel has quadrupled (Arizona Department of Mines and Mineral Resources 2002) and continued to increase yearly through 2004 (Niemuth 2003, 2005). See Table 3.34, "Comparison of National, State, and Decision Area Trend in Decorative Rock Values" (p. 360) for national and local comparisons in value. Sand and gravel operations in the Planning Area occur primarily on private, Native American, and Arizona State Land Department lands, with lands in the Decision Areas being only a minor component. Total mineral production value in the Lower Sonoran has increased in parallel with the regional trend, growing from approximately $6.9 million in 2003 to $7.6 million in 2006, ranging from 6 percent to 14 percent of the total decorative rock production value in the State.

Table 3.34. Comparison of National, State, and Decision Area Trend in Decorative Rock Values

Year	United States	Arizona	Lower Sonoran	% of AZ value produced in Lower Sonoran	Lower Sonoran Royalties Produced
2000	$8,290,000,000	$48,200,000	N/A	N/A	N/A
2001	$8,870,000,000	$49,600,000	N/A	N/A	N/A
2002	$8,650,000,000	$51,500,000	N/A	N/A	N/A
2003	$9,060,000,000	$49,100,000	$6,900,000	14. 1%	$689,061. 74

Year	United States	Arizona	Lower Sonoran	% of AZ value produced in Lower Sonoran	Lower Sonoran Royalties Produced
2004	$9,890,000,000	$75,900,000	$4,900,000	6. 5%	$490,192. 82
2005	$12,100,000,000	$69,300,000	$4,800,000	6. 9%	$479,710. 46
2006	$12,900,000,000	$60,000,000	$7,600,000	12. 7%	$760,506. 97
Sources: USGS Survey Minerals Yearbooks 2002-2005 for Crushed Rock and Sand and Gravel/Construction; USGS Mineral Industrial Survey 2007; LR2000, BLM records					

Livestock Grazing and Agriculture Income

Grazing permits issued by the BLM in the Planning Area constitute about one-third of the grazing permits issued in the tri-county region, including those issued by the Arizona State Land Department, USFS, American Indian communities, and others (U.S. Department of Agriculture [USDA] 1997).

The acreage of land in ranches and farms continues to decline in the tri-county region. Increasing population growth and urbanization have correlated with a decline in traditional, rural-oriented industries such as ranching and farming. This may be due largely to the consumption of land for urban development and an overall shift towards a service-oriented economy. In the tri-county region, income in the agricultural services, forestry, fishing, and other sector has remained relatively flat over the past 30 years, although there has been a slight increase since the late 1980s.

Between 1997 and 2002, there was an overall increase in the market value of agricultural products sold throughout Arizona. Data for the tri-county region show the greatest increase in Pima County (40 percent, to $68.9 million), and the least in Maricopa County (9.1 percent, to $740.2 million). The livestock market value increase was greatest in Pinal County (41.7 percent, to $247 million) and increases in both Maricopa and Pima counties were at rates greater than the statewide average (USDA 2004).

In 2000, farm and agricultural services accounted for 0.9 percent (16,184 jobs) of employment in the tri-county region: 6.3 percent (3,841 jobs) in Pinal County, 0.9 percent (3,192 jobs) in Pima County, and 0.6 percent (9,151 jobs) in Maricopa County. In 1999, earnings associated with the agricultural services, forestry, fishing, and other sector were $82.0 million or 0.9 percent of total earnings in Pima County, and 439.4 million or 0.8 percent of total earnings in Maricopa County. By comparison, total earnings in this sector in Arizona were $773.0 million or 1.09 percent of total earnings for the state (Sonoran Institute 2003a).

Recreation Income

Much of the recreational activity on public lands qualifies as tourism, which is one of Arizona's leading industries and is the dominant industry in most communities (U.S. Department of Commerce 2003a). In 2000, an estimated 29.5 million domestic and international overnight visitors to Arizona and 19.3 million day-trip visitors spent 15.8 billion in tourism dollars (Pollack 2002). The overall economic impact from these tourism dollars is estimated to be nearly $30 billion. In addition, the fiscal impact (revenues from local, county, and state government taxes) totaled $1.3 billion and supported more than 451,600 jobs in Arizona, including direct, indirect, and induced jobs created by the industry. These jobs equate to about 20 percent of total employment in the State. Based on averages of jobs per household and people per household, the tourism industry supported about 382,000 households, or an estimated population of 1 million.

Key reasons cited for tourism in Arizona are outdoor recreation opportunities and open space, which are prevalent assets in the Planning Area. The Planning Area extends over four of Arizona's seven tourism regions identified by the Arizona Office of Tourism: the Metro Phoenix Region, which includes the SDNM as well as Lower Sonoran lands surrounding the Monument; the West Coast Region, which includes the Gila Bend Mountains and Saddle Mountain area; the South Central/East Region, which includes the Ajo Block; and the East Central Region, which includes the Globe/Miami Area. Annual visitation in these four regions is 19.4 million, while annual visitation in Arizona is 25.1 million. A large portion of tourism in the rural communities originates from the greater Phoenix and greater Tucson areas (Arizona Department of Commerce 2003a).

While all forms of recreation affect the current economic climate of the Planning Area and Decision Areas, only a few have been closely examined for their economic influence. These include wildlife-related recreational activities (i.e. hunting, fishing, and wildlife viewing), OHV use, and visiting cultural and historic sites.

In 2001, there were 1.7 million Arizona residents and non-residents (16 years old and older) that fished, hunted, or viewed wildlife in Arizona and spent in excess of $1.6 billion in the State: $512 million on trip-related expenditures; $1.0 billion on equipment purchases; and $67 million on licenses, contributions, land ownership and leasing, and other items and services (USFWS and U. S. Department of Commerce; U.S. Census Bureau 2001a). According to BLM estimates, $203 million was spent on wildlife-related recreation on public lands in Arizona in 2002, with $41.7 million being spent by hunters, $16.2 million by anglers, and $145.1 million by wildlife viewers (BLM 2002c). See Table 3.35, "2001 Economic Impacts of Wildlife Viewing (in $ millions)" (p. 362) for a quantification of the economic impacts of wildlife viewing.

Table 3.35. 2001 Economic Impacts of Wildlife Viewing (in $ millions)

	Expenditures	Total Multiplier Effect	Full- and Part-Time Jobs	Salaries and Wages	State Tax Revenues
Maricopa County	$368.3	$690.4	6,603	$192.8	$25.8
Pima County	$173.5	$326.5	3,196	$90.7	$12.2
Pinal County	$50.9	$96.0	949	$26.6	$3.6
Total for Tri-county Region	$592.7	$1,112.9			$41.6
Total for Arizona	$820.7	$1,542.9	15,058	$429.4	$57.6
SOURCE: Southwick Associates 2003					

In comparison, consumptive wildlife-related recreation (i.e. hunting and fishing) created a total statewide impact of $1.34 billion, based on $958.5 in direct expenditures and an estimated 17,190 jobs in Arizona.

The tri-county region accounted for $642.9 million of the statewide impact and 6,865 jobs. Table 3.36, "2001 Economic Impacts of Hunting and Fishing (in $ millions)" (p. 362) shows the breakdown in economic impacts of hunting and fishing for each county in the tri-county region.

Table 3.36. 2001 Economic Impacts of Hunting and Fishing (in $ millions)

	Expenditures	Total Multiplier Effect	Full- and Part-Time Jobs	Salaries and Wages	State Tax Revenues
Maricopa County	$409.1	$515.0	5,382	$103.0	$21.1
Pima County	$84.5	$105.0	1,187	$18.3	$5.4
Pinal County	$20.0	$22.9	296	$3.8	$0.9
Total for Tri-county Region	$513.6	$642.9	6,865	$125.1	$27.4
Total for Arizona	$958.5	$1,340.0	17,190	$314.0	$58.2
SOURCE: AGFD Department 2003					

The AGFD and Arizona State Parks (2003) estimated that recreation activities involving OHV use in Arizona created a statewide impact of $4.25 billion, including secondary impacts (see Table 3.37, "2002 Economic Impacts of OHV Recreation Activity (in $ millions" (p. 363)) and supports an estimated 36,951 jobs. About 60 percent of the total economic benefit and slightly less than half of the jobs occurred in the tri-county region.

Table 3.37. 2002 Economic Impacts of OHV Recreation Activity (in $ millions

	Expenditures	Total Multiplier Effect	Full- and Part-Time Jobs	Salaries and Wages	State Tax Revenues
Maricopa County	$1,358.1	$1,787.1	13,113	$428.9	$3.3
Pima County	$323.6	$403.5	3,307	$84.3	$17.7
Pinal County	$135.3	$152.7	1,099	$24.2	$5.9
Total for Tri-county Region	$1,817.0	$2,343.3	17,519	$537.4	$26.9
Total for Arizona	$3,055.7	$4,252.0	36,951	$1,088.0	$187.0
SOURCE: AGFD Department and Arizona State Parks 2003					

One of the fastest growing segments of the tourism industry in Arizona is cultural heritage tourism. An estimated 59 percent of the visitors to Arizona tour historic sites, and 28 percent visit historical museums. A study by the National Trust for Historic Preservation found that nationally, heritage tourists stay on average a half-day longer and spend $62 a day more than typical tourists. In Arizona, cultural heritage tourists spent $1,534 during their stay (as compared to $389 for typical travelers) in 1997, and their propensity to shop was 20 percent greater (Arizona Humanities Council 2000). Cultural heritage tourism sites in the Decision Areas include the Juan Bautista de Anza/Butterfield Stage Trail, Painted Rocks petroglyph site, Sundad, historic mining sites, historic ranching sites, and various other cultural sites.

Economic Impact of Lands and Realty

Indicators of social and economic conditions as they relate to the BLM lands and realty program are drawn from land tenure adjustments and ROWs, permits, leases, and easements that have economic activity. The trend in land tenure adjustments, either acquisitions or disposals, has been a decrease in activity over the last 20 years. Only a few land tenure adjustments had occurred since the mid 1980s compared to years prior.

Rights of Way, Permits, Leases and Easements

The ROWs currently accommodated in the Planning Area support several large utility companies providing power, telephone, and natural gas service to the southwestern United States. These include El Paso Natural Gas, Southwest Gas, SRP, Arizona Public Service (APS), U. S. West Communication, Tucson Electric Power, as well as Arizona Water Conservation District, which is the State of Arizona's entity responsible for operating, maintaining, and repaying the Federal government for the Central Arizona Project). The ROWs for roads, railroads, and associated transportation facilities support the flow of commerce in southern Arizona and northwestern Mexico. These include I-8, I-10, SR 85, SR 238, and Southern Pacific Railroad. These links also connect people as they support multiple forms of communication and travel and support a wide range of commercial, industrial, and residential uses. Data are not readily available to quantify the economic value of these relative to the Decision Areas; however, the aggregate social and economic ties to these ROWs are recognized as significant.

Renewable Energy Resources

There is high potential for the development of solar energy throughout the Planning Area. Development of solar sites has accelerated considerably within Arizona between 2000 and 2006 (APS 2006; Tucson Electric Power 2006); however, no sites are present in the Decision Areas. Due to high energy demands that are on the increase and climatic conditions that are conducive to solar energy, the trend for solar energy development the Planning Area involves increases in employment and income generated from solar energy production. However, nine applications for renewable energy development sites in the Lower Sonoran Decision Area are pending. There is little or no potential for industrial development of wind energy or biomass in the Decision Areas, and there is no trend for their use.

Renewable energy facility development on public lands, including collection or processing, generation, and transmission requires an ROW grant. Currently there are no approved ROW grants for solar, wind, or biomass energy development within the Decision Areas. The Planning Area has potential for solar development due to contiguous large land masses, high solar radiation, and relatively flat ground (Map 3-16: Mineral Estate). There are several solar sites that may be in operation by 2014 in the Planning Area on private land, but none in the Decision Areas (Arizona Public Service [APS] 2006; Tucson Electric Power 2006). Historically, solar energy production has not been a large source of employment or income in Arizona, but with the recent interest in solar development, some manufacturing plants have located to the Phoenix area.

Economic Impact of Public Finance and Government Services

Payment-in-Lieu-of-Taxes (PILT) payments are Federal payments to local governments that help to offset losses in property taxes due to nontaxable Federal lands within county and municipal boundaries. These payments are used for services including education, water, and transportation and are based on a formula whose principal criterion is the number of Federal acres within the locality. The number of qualified acres is multiplied by a dollar amount per acre set by law. Payments are subject to certain population-size-based limits and annual congressional program funding limits. The entitlement acreages have varied slightly over recent years, but the relative share of agency PILT payments has remained constant. See Table 3.38, “2009 PILT Entitlement Acreage by Federal Agency ” (p. 364) for PILT payments in the tri-county region for 2009.

Table 3.38. 2009 PILT Entitlement Acreage by Federal Agency

Area	BLM	USFS	Bureau of Reclamation	NPS	Army Corps of Engi-neers	USFWS	Total	BLM as % of Total
Maricopa County	1,749,122	657,723	30,832	11	2,478	0	2,440,166	71.68 %
Pima County	377,496	389,871	5,933	410,821	0	416,210	1,600,331	23.59 %
Pinal County	382,231	222,889	19,095	358	0	0	624,688	61.19 %
Arizona	12,201,796	11,255,164	234,528	2,666,418	7,192	1,567,498	27,932,596	43.68 %
SOURCE: Department of the Interior 2010								

Overall, revenues and expenditures in the tri-county region have been increasing in proportion with population growth. PILT payments have been increasing steadily from 1999 to 2009. See Table 3.39, “ PILT Payment and Entitlement Acreage” (p. 365).

Table 3.39. PILT Payment and Entitlement Acreage

Year	Area	Payment	Total Acres	BLM Portion*
1999	Maricopa County	$969,069	2,309,656	$675,441
	Pima County	$998,178	1,527,086	$201,632
	Pinal County	$377,565	516,901	$199,732
	Arizona	$10,275,296	27,580,348	$4,469,754
2000	Maricopa County	$1,019,264	2,299,643	$713,485
	Pima County	$1,061,362	1,527,386	$214,395
	Pinal County	$396,290	516,581	$209,637
	Arizona	$11,005,635	27,562,016	$4,798,457
2001	Maricopa County	$1,465,414	2,299,602	$1,025,790
	Pima County	$1,529,516	1,527,956	$308,962
	Pinal County	$568,264	516,581	$300,612
	Arizona	$16,057,080	27,566,920	$7,000,887
2002	Maricopa County	$1,539,003	2,299,624	$1,077,302
	Pima County	$1,618,859	1,528,206	$327,010
	Pinal County	$599,120	516,581	$295,774
	Arizona	$16,928,055	27,582,635	$7,380,632
2003	Maricopa County	$1,725,495	2,307,190	$1,202,670
	Pima County	$1,841,427	1,530,972	$370,127
	Pinal County	$673,798	518,313	$355,092
	Arizona	$18,045,248	27,668,453	$7,831,638
2004	Maricopa County	$1,775,295	2,456,262	$1,272,531.46
	Pima County	$1,901,776	1,599,417	$448,628.96
	Pinal County	$842,978	626,905	$515,818.24
	Arizona	$18,698,143	27,890,328	$8,167,348.86
2005	Maricopa County	$1,813,162	2,458,021	$1,299,674.52
	Pima County	$1,930,009	1,599,452	$455,289.12
	Pinal County	$861,637	626,902	$527,235.68
	Arizona	$19,233,714	27,885,022	$8,401,286.28
2006	Maricopa County	$1,858,155	2,457,360	$1,331,925.50
	Pima County	$1,925,348	1,600,332	$454,189.59
	Pinal County	$868,239	627,294	$531,275.44
	Arizona	$19,023,415	27,869,615	$8,309,427.67
2007	Maricopa County	$1,844,364	2,457,368	$1,322,040.12
	Pima County	$1,902,625	1,600,331	$448,829.24
	Pinal County	$858,776	627,294	$525,485.03
	Arizona	$19,098,223	27,872,586	$8,342,103.81
2008	Maricopa County	$2,915,379	n/a	$2,089,743.67
	Pima County	$3,003,013	n/a	$708,410.77
	Pinal County	$1,374,260	n/a	$840,909.69
	Arizona	$30,674,473	n/a	$13,398,609.81
2009	Maricopa County	$2,997,005	2,440,166	$2,148,253.18
	Pima County	$3,073,106	1,600,331	$724,945.71
	Pinal County	$1,403,450	624,688	$858,771.06
	Arizona	$31,662,123	27,932,596	$13,830,015.33

SOURCE: Department of the Interior 2010

NOTE: *The BLM portion is based on entitlement acreage; refer to Table 3.21, " Leasable Mineral Potential Lower Sonoran & SDNM" (p. 327)

3.5.3.3. Attractiveness of the Decision Areas

Open Space

During this planning process, there were many public comments regarding the role of public lands for recreation and open space. The value of open space often is cited as a non-market value of public lands. A study conducted in 2000 reported the loss of open land, including agricultural and desert lands, in the metropolitan Phoenix portion of the study area. In the same study, the Sonoran Desert was identified as a major part of what makes metropolitan Phoenix unique and gives it a special character. Losing huge tracts of land threatens the region with the loss of its most famous lifestyle and environmental assets (Morrison Institute for Public Policy 2000).

There is a perception that the public lands will help insulate communities from growth and provide open space and related modest economic growth. There is also support for planning and policy decisions to control growth to be made in collaboration with the BLM and the broader context of neighboring communities and the county. Strong sentiment was expressed in the communities to maintain BLM ownership of the lands to limit growth and provide open space (Sonoran Institute 2003b)

Across the nation, parks and protected open space have been increasingly recognized as vital to the quality of life that fuels economic health. As the nation moves toward a mixed economy based on services, light industry, consumer goods, and new technologies, businesses and their employees are no longer tied to traditional industrial centers. Businesses looking to relocate or expand prefer communities with a high quality of life, which includes an abundance of open space and nearby recreation. The economic value of parks and green space has long been established and demonstrated by increased demand and pricing of park-side properties (Trust for Public Lands 1999).

The effect on property values of a location near open space has been the subject of several studies. Studies have attempted to isolate the effect of open space from other variables that can affect property values, such as age, square footage, and condition of homes. Isolating the effect of open space can be difficult and results have been varied. Nevertheless, many studies have revealed increases in property values in instances where the property is located near or adjacent to open spaces (NPS 1995). Relative property values were found to be higher near South Mountain Park, an area similar in character to much of the Decision Areas but located more closely to the Phoenix Metropolitan Area (Maricopa County 2002b).

While the trend in the Planning Area has been a loss of open space, the Decision Areas have been maintained as natural desert landscapes. To accommodate increased population growth, development in Arizona is occurring in the form of planned communities in former rural areas, creating needs for goods and services and placing demands on public services. These new communities are also replacing agricultural lands and open spaces. Between 1960 and 1990, Phoenix' urbanized area grew 199 percent while the population increased 263 percent. Calculations from aerial photographs show that between 1975 and 1995, some 40 percent of all agricultural land and 32 percent of all undeveloped desert land was lost to urbanization (Morrison Institute for Public Policy 2000).

Sense of Place

Galliano and Loeffler (1999) define sense of place as a "link between social experiences and geographic areas." Through association and interaction with geographic areas, whether physically, spiritually, or through various media, people form values that are attached to geographic places. Place attachment is customarily passed down through generations (Galliano and Loeffler 1999).

The assessment of place-based values helps to identify and understand the values that people attach to the lands and resources within the Decision Areas. Understanding issues regarding the sense of place assists land managers in understanding resource and land use conflicts and how to approach them most effectively. Things that contribute to sense of place may include personal memory, community history, physical landscape appearance, and emotional attachment (Galliano and Loeffler 1999). Sense of place is subjective, and individuals or groups of people may develop a sense of place based on perceptions about amenities (e.g. recreational opportunities), historic or symbolic activities and places, or landscape and scenic vistas.

The identification of sense of place issues associated with the study area is based on continuing public and agency comment. Five community socioeconomic workshops that occurred in November and December of 2003 were held in Ajo, Buckeye, Gila Bend, Mobile, and Tonopah to discuss values people associate with their community and how they, in partnership with the BLM, can protect these values based on current and predicted trends in population growth. The vision the communities described for themselves during the workshops was consistent: they all expressed the desire to maintain their current quality of life and general rural character while gaining additional amenities in their communities (e.g. better jobs, restaurants and movie theatres, and community services). They all included some values about the natural environment, their communities, and the role of public lands for recreation and open space. Some of the commonly expressed values among all the communities included wildlife, flora and fauna, rural character, solitude/peacefulness/quiet/ remoteness, "small town" character, and open space. Many expressed the values of accessing public lands for a wide range of uses (Sonoran Institute 2003b).

Protection of the ecological landscape (e.g. wildlife and habitat) was identified as a priority by many individuals throughout scoping. The potential for conflict with livestock grazing and recreational activities such as motorized vehicle use and recreational shooting, among other concerns, was raised when wildlife and habitat protection were perceived as a top priority for public lands. Some people also supported ranching activities in the area as a means to preserve open space and the area's Western heritage, and to promote stewardship.

Many of the sites visited by tourists also contribute to Planning Area residents' sense of place. Local residents also value many prehistoric and historic sites that are not formally designated. Some scoping participants characterized both ranching and mining as an important basis of the area's sense of place. The complex cultural issues that contribute to a sense of place include issues of site protection, issues of tribal and family history, in addition to issues involving public access and education.

3.5.3.4. Environmental Justice

Bureau of Land Management environmental justice policy calls for the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental

consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies.

Fair treatment also means that the BLM cannot cause a disproportionately high and adverse human health or environmental effect during implementation of its programs, policies, and activities on minority populations, low-income populations, and Native American tribes. The BLM performed the following analyses to identify populations to be considered for environmental justice issues. After identification of the populations eligible for consideration under environmental justice guidelines, the BLM then considered what effects, if any, agency actions might have on specific populations.

For purposes of this analysis, minorities and low-income populations are defined as:

- "Minorities" describes people of Hispanic or Latino origin of any race, Blacks, American Indian/Alaska Natives, and Asians or Pacific Islanders (without double-counting people of Hispanic/Latino origin who also are contained in the racial groups).
- "Low-income" describes people living below the poverty level. The U.S. Census Bureau uses a set of income thresholds that vary by family size and composition to determine who is below the poverty level. The most recent detailed income information is from Census 2000, in which questionnaires gathered information on respondents' incomes for 1999. The poverty level for a family of four having two children under the age of 18 was $16,895 (U.S. Census Bureau 2002a).

A community is considered to have a concentration of minority and/or low-income residents if the proportion of such people in the community exceeds their proportion in a larger geographic area of reference. Communities located near the Decision Areas and those most likely affected by management decisions made regarding these lands were analyzed to determine their minority and low-income status. Census data are tabulated for incorporated communities and Indian reservations. The informal boundaries of several unincorporated communities were approximated by one or more census tracts and block groups (subgroups within census tracts). Such unincorporated communities were Arlington, Tonopah, Mobile, Palo Verde, Sentinel, Why, Stanfield, the area east of SDNM, the Rainbow Valley area, and the area surrounding Florence. Table 3.40, "Minority and Low-Income Populations, 2003" (p. 368) summarizes the minority and low-income status of communities within the Planning Area.

Table 3.40. Minority and Low-Income Populations, 2003

Geographic Area	Total Minority[1]	Minority Population		Poverty Rate[2]	Low-Income Population Poverty Rate	
		>50 %	>36.2%		>50 %	>13.9%
Arizona (comparison population)	**Minority Population: 36.2%**			**Low-income Population: 13.9%**		
Maricopa County	33.8%	No	No	11.7%	No	No
Buckeye	42.7%	No	Yes	18.8%	No	Yes
Gila Bend	65.3%	Yes	Yes	24.8%	No	Yes
Goodyear	30.2%	No	No	6.1%	No	No
Tolleson	81.0%	Yes	Yes	13.7%	No	No
Ak Chin Village, Ak Chin Indian Reservation	98.1%	Yes	Yes	26.8%	No	Yes
Gila River Indian Community[3]	96.7%	Yes	Yes	52.1%	Yes	Yes
Census Block Group 0506021 (Arlington)	36.7%	No	Yes	12.3%	No	No

Geographic Area	Total Minority[1]	Minority Population		Poverty Rate[2]	Low-Income Population Poverty Rate	
		>50 %	>36.2%		>50 %	>13.9%
Arizona (comparison population)	**Minority Population: 36.2%**			**Low-income Population: 13.9%**		
Census Block Group 0506032 (Tonopah)	36.7%	No	Yes	25.9%	No	Yes
Census Block Group 7233022 (Mobile)	65.7%	Yes	Yes	19.4%	No	Yes
Census Block Group 0506011 (Palo Verde)	49.7%	No	Yes	12.5%	No	No
Census Block Group 7233023 (Sentinel)	86.5%	Yes	Yes	19.4%	No	Yes
Census Block Group 7233021 (Rainbow Valley Area)	32.8%	No	No	19.4%	No	Yes
Pima County	38.5%	No	Yes	14.7%	No	Yes
Ajo	45.6%	No	Yes	22.3%	No	Yes
Tohono O'odham Nation	95.6%	Yes	Yes	46.4%	No	Yes
Census Block Group 0049001 (includes Why)	35.6%	No	Yes	7.0%	No	No
Pinal County	41.2%	No	Yes	16.9%	No	Yes
Apache Junction	12.1%	No	No	11.6%	No	No
Casa Grande	49.6%	No	Yes	16.0%	No	Yes
Florence	50.3%	Yes	Yes	7.0%	No	No
Maricopa	79.1%	Yes	Yes	23.4%	No	Yes
Census Block Group 0002021 (Florence and surrounding area)	32.0%	No	No	12.2%	No	No
Census Block Group 0017002 (Stanfield)	69.4%	Yes	Yes	19.0%	No	Yes
Census Block Group 0017003 (eastern border of SDNM)	58.0%	Yes	Yes	19.0%	No	Yes
Gila County	31.1%	No	No	17.4%	No	Yes
Globe	38.5%	No	Yes	11.4%	No	No
Miami	57.6%	Yes	Yes	21.5%	No	Yes

SOURCES: U.S. Census Bureau 2003f, 2003g, 2003h

1 The total minority population includes individuals of Hispanic/Latino origin, but those that are also Black/African Americans, American Indian/Alaska Natives, Asians, and Native Hawaiian/Other Pacific Islanders are not included in the total in order to avoid double counting.

2 Poverty rate among individuals, based on poverty status in 1999.

3 The Gila River Indian Community includes lands in both Maricopa and Pinal counties but is listed only under Maricopa County in this table.

From 2006-2008, out of Arizona's average yearly population of 6,343,952, 32.3 percent were minorities. Pima and Pinal counties each have a proportion of minority population that exceeds that of the State, while Maricopa and Gila Counties have a smaller share of minority population than does the State. All of the American Indian reservations are considered minority communities. Most of the individual incorporated and unincorporated areas analyzed are minority communities as well. About half of the communities considered reported minority populations greater than 50 percent, with most being small communities or are Native American lands. All but one of the communities studied exceed the statewide average of minority residents (see Table 3.40, "Minority and Low-Income Populations, 2003" (p. 368)).

The low-income and minority communities in the Planning Area were, for the most part, historically agricultural or mining communities. The forces currently affecting these communities are not closely related to any BLM action and are instead more related to worldwide market

conditions and the urbanizing area around Phoenix. Fluctuating mineral prices worldwide is the primary reason for the downturn in the economy of mining communities. The conversion of agricultural lands to housing developments has been the primary reason for the loss of income in agricultural communities. Some of these communities, however, have been directly and indirectly affected by current BLM actions. For example, Ajo is currently aiming to convert its economy primarily from mining to retirement, recreation, and art. The Lower Sonoran, Organ Pipe Cactus National Monument, and Cabeza Prieta NWR are all important components of the quality of life and tourism economy Ajo is building. The community of Mobile has been affected by a disproportionate number of projects, including landfills, power lines, and pipelines through the community.

Historically, several of the high minority/low income communities have had relatively robust economies and diverse populations, particularly the mining communities during periods when the mines were open and producing; however, in recent decades, these communities have been identified as environmental justice communities. Over the last several years, many of these communities are experiencing rapid changes due to urbanization and an influx of large numbers of new residents. These trends may eventually change the demographics of these communities such that they no longer consist of primarily minority or low income populations. While this trend is largely unrelated to BLM actions, in some cases, past BLM actions have affected these communities. Ajo and Miami-Globe in particular have had economies driven by local mineral resources, resulting in several boom-bust cycles. These communities are currently attempting to diversify their economies; however, public lands in the vicinity hold the potential for future mineral discoveries that could cause mines to open, providing high paying jobs and drawing additional people to the Ajo and Miami-Globe areas.

The community of Mobile has also been historically affected by BLM-related management actions, particularly involving development of utility lines through the community. Three utility corridors that cross the Lower Sonoran and SDNM converge at Mobile and currently include one power line, with two more planned, and several gas pipelines, with one additional planned. In addition, this community has been affected by the location of several landfills on private lands and a railroad. The community was successful recently in stopping an oil refinery from being built in the area. In 2007, Mobile was annexed into the City of Goodyear and much of the private land in the community was purchased by a developer for a master-planned community, displacing many local residents.