CHAPTER 3.0 AFFECTED ENVIRONMENT

This chapter provides an overview of the existing environment within the planning area. The level of detail has been limited to that which is necessary to support, clarify, and provide context for (1) the issues listed in Chapter 1, (2) the goals and objectives and the alternatives presented in Chapter 2, and (3) the impact analysis provided in Chapter 4.

BLM uses the best available data when preparing a resource management plan (RMP). The data for this plan and Environmental Impact Statement (EIS) were provided by several sources: the Tucson Field Office of Bureau of Land Management (BLM); Federal, State, county, and local agencies, including the U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service (USFWS), Arizona Game and Fish Department (AGFD), other State agencies, and counties; and other public and private sources. The data include published and unpublished reports, maps, and data in digital format. Geographic information system (GIS) technology was used extensively to capture, manage, analyze, and display the geographic data for this plan. Acreages used for analysis purposes reflect the best available GIS data maintained by the BLM.

In accordance with the National Environmental Policy Act of 1969 (NEPA) regulations codified in Title 40, Code of Federal Regulations, Section 1502.15 (40 CFR 1502.15), this chapter discusses the existing condition of the human and natural environment that potentially could be affected, beneficially or adversely, by the management strategies presented in the alternatives. Many, though not all, of the sections within this chapter correlate with programs for which BLM intends to make management decisions through the planning process. The following aspects of the existing environment were considered:

Resources

Air quality

Geology and cave resources

Soil and water resources

Biological resources (including vegetation, non-native vegetation, wildlife and wildlife habitats, and special status species)

Fire ecology and management

Cultural resources

Paleontological resources

Visual resources

Wilderness characteristics

Resource Uses

Energy and minerals

Livestock grazing

Recreation

Lands and realty

Travel management

Special Designations

Areas of critical environmental concern (ACECs)

Tribal Interests

Social and Economic Conditions

Economic value

Social and demographic conditions

Public Safety

Active and abandoned mines and prospects

Unexploded ordinances

Wildcat dumping

3.1 RESOURCE CONDITIONS

3.1.1 Air Quality

For most of the planning area and locations in the surrounding region (the air quality study area), relatively complete information resources are available, in the form of air quality monitoring data, air permit data, and regional emission inventories. The existing conditions in air quality within the Ironwood Forest National Monument (IFNM) are characterized based on the following quantifiable indicators:

- Monitored ambient concentrations of the criteria air pollutants as defined by the National Ambient Air Quality Standards (NAAQS) identified in the Clean Air Act and regulated by the U.S. Environmental Protection Agency (EPA)
- Observed levels of visibility, as a measure of air quality, which is monitored in most Class I areas (i.e., areas meeting criteria for relatively pristine air quality designated as Class I areas under the Federal Clean Air Act).
- Visibility data from monitoring stations operated by the Cooperative Institute for Research in the Atmosphere
- Data from remote automatic weather stations (RAWS) that indicate prevailing wind patterns

The discussion below also identifies emission sources in the study area with potential to impact air quality within the IFNM.

3.1.1.1 NAAQS – Attainment, Nonattainment, and Unclassified Areas

The 1990 Federal Clean Air Act requires that air quality throughout the United States meet certain standards with respect to criteria air pollutants in order to protect public health and the environment. In compliance with that act, the EPA has set levels for six criteria air pollutants: sulfur dioxide (SO_2), particulate matter equal to or less than 2.5 microns in diameter and equal to or less than 10 microns in diameter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3). For each of these pollutants, there is a primary standard (set to protect public health) and a secondary standard (set to protect the environment). (The NAAQS standards, are presented in Table 3-1.) Geographic areas are designated as “attainment,” “nonattainment,” or “unclassified” with respect to each criteria pollutant. Areas where concentrations of criteria pollutants exceed the NAAQS are designated as nonattainment. An unclassified designation indicates that the status of attainment has not been verified through data collection. As a result of exceedances in the standards for PM_{10}, the Rillito nonattainment

area has been designated within Pima County; this nonattainment area for PM_{10} partially overlaps the IFNM (Map 3-1: Nonattainment Areas).

Table 3-1: National Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS	
		Primary	***Secondary***
Sulfur Dioxide (SO_2)	3-hour	—	0.5 ppm
	24-hour	0.14 ppm	—
	Annual	0.03 ppm	—
Particulate Matter less than or equal to 10 microns in diameter (PM_{10})	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$
	Annual	50 $\mu g/m^3$	50 $\mu g/m^3$
Particulate matter less than or equal to 2.5 Microns in Diameter ($PM_{2.5}$)	24-hour	65 $\mu g/m^3$	65 $\mu g/m^3$
	Annual	15 $\mu g/m^3$	15 $\mu g/m^3$
Carbon Monoxide (CO)	1-hour	35 ppm	—
	8-hour	9 ppm	—
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm	0.053 ppm
Lead (Pb)	Quarterly	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$
Ozone (O_3)	1-hour	0.12 ppm	0.12 ppm
	8-hour	0.08 ppm	0.08 ppm

SOURCES: U.S. Environmental Protection Agency 2003a, 2003b, 2003c, 2003d, 2003e, 2003f, 2003g, 2003h, 2003i
NOTES: ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards

3.1.1.2 Visibility in Class I Areas

Under the Federal Clean Air Act, areas meeting criteria for relatively pristine air quality may be designated as Class I areas. The Clean Air Act defines Class I areas as certain wilderness areas greater than 5,000 acres, national memorial parks greater than 5,000 acres, national parks greater than 6,000 acres, and international parks that were in existence on or before August 7, 1977. The planning area does not include any Class I areas. However, there is one Class I area located just east of the planning area, the Saguaro National Park (West Unit) Class I Area.

3.1.1.3 Visibility in the Region, as Indicated by IMPROVE Data

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 show that visible haze patterns measured in the Sonoran Desert are representative of arid sites in the Southwest, such as the IFNM. The monitoring results revealed the following (IMPROVE 2000):

- Fine and coarse particulate concentrations were the largest contributors to poor visibility in the spring, 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 lowest in the winter.
- The haziest days in the Sonoran Desert occur in the summer and the best visibility occurs in the winter.

There are no air quality monitors located within the IFNM, but there are numerous monitors located in several areas surrounding the IFNM for different criteria pollutants that are representative of conditions in the vicinity. The ambient air pollutant concentration data from 2001 for areas surrounding the planning area, as reported in Arizona Department of Environmental Quality's (ADEQ's) Fiscal Year (FY) 2002 Air Quality Report (ADEQ 2002), are summarized in Table 3-2.

3.1.1.4 Meteorological Conditions—Wind Patterns

The meteorological conditions of the planning area are typical of the Sonoran Desert areas of central Arizona with a dry, desert climate. The highest average humidity occurs during the winter months, and also are slightly higher during July and August, which are the months during which the monsoon season normally occurs (Western Regional Climate Center [WRCC] 2003a, 2003b) Similarly, the greatest average wet bulb temperatures, which represent the lowest temperature that can be obtained when evaporating water into air, occur during the months of July and August, which also correlates with the normal monsoon season (WRCC 2003c).

Data from three remote automatic weather stations (RAWS) monitors near the IFNM that best represent the prevalent wind patterns within the IFNM from areas such as the metropolitan Phoenix area, the metropolitan Tucson area, and the Mexican border (WRCC 2003d) were evaluated, with the following conclusions:

> ***Haley Hills RAWS Monitor:*** Based on wind patterns reported at the Haley Hills RAWS monitor, winds from the north/east directions (which occur approximately 30 percent of the year) may convey pollutants from Interstate 10 and isolated stationary sources toward the IFNM. In contrast, there are no substantive pollutant sources located west/southwest of the monitor (where wind blows from approximately 19 percent of the year).
>
> ***Saguaro RAWS Monitor:*** To the extent that the observed wind patterns at the Saguaro RAWS monitor may represent conditions on the east side of the IFNM, there would be relatively little transport of pollutants from industrial and mobile sources in the developed areas in Tucson, and generally only during periods when there are northeasterly winds. (There is a slight prevalence of winds from the north/east and south/west quadrants).
>
> ***Selles RAWS Monitor:*** The wind pattern observed at the Selles RAWS monitor (which is relatively dominant from the northeast sector about one-third of the time) would tend to transport pollutants to the planning area from the relatively less developed areas and major highways located southwest of the IFNM.

3.1.1.5 Emission Sources

There are no stationary industrial emission sources located within the planning area, but there are several near the planning area that are among the larger sources in Arizona.

Major and Minor Sources. There are no major sources in the planning area. However, a number of major sources encompassing many industrial categories—such as gas- and coal-fired power plants, natural gas pipeline compressor stations, landfills, and a portland cement plant—are located in the vicinity of the planning area. Minor sources located in developed areas outside the planning area include rock and construction-product industries (e.g., portable crushing and screening plants), hot-mix asphalt plants, and concrete batch plants. Stationary minor sources include manufacturing facilities, paint shops, and dry cleaners. Other minor sources located near the planning area include cattle feedlot operations, cotton gins, and miscellaneous manufacturing facilities.

Table 3-2: 2001 Air Quality Monitor Data from Monitors near the Planning Area

	CO (ppm)		NO_2 (ppm)			SO_2 (µg/m^3)			O_3 (ppm)		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)	
Identifier	***1-Hour Average***	***8-Hour Average***	***1-Hour Average***	***24-Hour Average***	***Annual Average***	***3-Hour Average***	***24-Hour Average***	***Annual Average***	***1-Hour Average***	***8-Hour Average***	***24-Hour Average***	***Annual Average***	***24-Hour Average***	***Annual Average***
IW1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89/77	33.6/26.0	N/A	N/A
IW2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	113/134	24.7/31.0	N/A	N/A
IW3	5.8	3.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IW4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	120	26.0	N/A	N/A
IW5	3.9	2.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IW6	2.9	1.7	0.060	0.031	0.015	N/A	N/A	N/A	0.084	0.071	N/A	N/A	17.5	6.8
IW7	3.7	1.9	0.058	0.031	0.017	16	8	3	0.089	0.075	115	22.8	N/A	N/A
IW8	5.6	2.7	N/A	N/A	N/A	N/A	N/A	N/A	0.083	0.071	N/A	N/A	N/A	N/A
IW9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	111	29.0	20.9	7.6
IW10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	125	33.0	N/A	N/A
IW11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	131	26.0	N/A	N/A
IW12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.078	0.069	81	17.0	N/A	N/A
IW13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	122	25.1	N/A	N/A
IW14	1.5	0.7	N/A	N/A	N/A	N/A	N/A	N/A	0.085	0.078	N/A	N/A	N/A	N/A
IW15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	104	29.2	18.1	7.7
IW16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	146	47.2	N/A	N/A
IW17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	73	32.0	N/A	N/A
IW18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	142	35.1	N/A	N/A
IW19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	103	26.7	N/A	N/A
IW20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	134	41.9	N/A	N/A

SOURCE: Arizona Department of Environmental Quality 2002

NOTES: N/A = Not Applicable

For CO, the following monitor is a seasonal monitor that is operational from January 1 to April 1 and September 1 to December 31: IW5.

For PM_{10}, the IW1 monitor shows data recorded at the monitor operated by the ADEQ followed by the data recorded at the monitor operated by Arizona Portland Cement Company.

For PM_{10}, the IW2 monitor shows data recorded at the monitor operated by the ADEQ followed by the data recorded at the monitor operated by the Pima County Department of Environmental Quality.

For $PM_{2.5}$, the following monitors collected data every third day: IW6 and IW10; and the following monitor collect data every sixth day: IW16 .

For $PM_{2.5}$, the IW6 monitor's data did not satisfy the U.S. Environmental Protection Agency's summary criteria, usually meaning less than 75 percent valid data recovery was available in one or more calendar quarters.

Units: µg/m^3 = micrograms per cubic meter; ppm = parts per million.

Pollutants: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; SO_2 = sulfur dioxide; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter.

Monitors: IW1 = Rillito; IW2 = South Tucson; IW3 = Tucson-Alvernon; IW4 = Tucson-Broadway and Swan; IW5 = Tucson-Cherry; IW6 = Tucson-Children's Park; IW7 = Tucson-Craycroft; IW8 = Tucson-Downtown; IW9 = Tucson-Orange Grove; IW10 = Tucson-Prince Road; IW11 = Tucson-Santa Clara; IW12 = Tucson-Tangerine; IW13 = Tucson-University of Arizona Central; IW14 = Casa Grande-Airport; IW15 = Casa Grande-Downtown; IW16 = Casa Grande-Eleven Mile Corner; IW17 = Coolidge-Maintenance Yard; IW18=Eloy-City Complex; IW19 = Pinal Air Park; IW20 = Stanfield.

Within the planning area, on-road vehicles represent the largest single air-pollutant-source category. Emissions from vehicles consist of NO_2, CO, and PM_{10}, which may warrant consideration in any assessment of ambient air quality. Since there are no major traffic routes located within the planning area, consideration of mobile source emissions in the vicinity of the planning area is limited to the Interstate 10 corridor and the public access routes that run throughout the IFNM. Vehicles traveling on unpaved roads are the largest sources of PM_{10} emissions within the planning area. Current fugitive-dust control measures, such as posted speed limits, reduce the amount of PM_{10} emissions generated.

Nonpermitted Sources. There are many small stationary emission sources that are not required to have an operating permit. These sources do not produce levels of air pollution that would substantially affect regional air quality. Agricultural operations are widespread throughout the study area, outside the IFNM, and represent a category of emission sources that are exempt from permitting and that likely affect local and regional air quality.

3.1.1.6 Global Climate Change

Ongoing scientific research has identified the potential impacts of climate changing pollutants on global climate. These pollutants are commonly called "greenhouse gases" and include carbon dioxide, CO_2; methane; nitrous oxide; water vapor; and several trace gas emissions. Through complex interactions on a regional and global scale, these emissions cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although climate changing pollutant levels have varied for millennia (along with corresponding variations in climatic conditions), recent industrialization and burning of fossil carbon sources have caused CO_2 concentrations to increase dramatically, and are likely to contribute to overall climatic changes, typically referred to as global warming. Increasing CO_2 concentrations also lead to preferential fertilization and growth of specific plant species.

Global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies 2007). Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of these "greenhouse gases" are likely to accelerate the rate of climate change.

The Intergovernmental Panel on Climate Change (IPCC) has recently completed a comprehensive report assessing the current state of knowledge on climate change, its potential impacts, and options for adaptation and mitigation. At printing of this PRMP/FEIS, this assessment is available on the IPCC web site at http://www.ipcc.ch/. According to this report, global climate change may ultimately contribute to a rise in sea level, destruction of estuaries and coastal wetlands, and changes in regional temperature and rainfall patterns, with major implications to agricultural and coastal communities. The IPCC has suggested that the average global surface temperature could rise 1 to 4.5 degrees Fahrenheit (°F) in the next 50 years, with significant regional variation. The National Academy of Sciences (2006) has confirmed these findings, but also indicated that there are uncertainties regarding how climate change may affect different regions. Computer models indicate that such increases in temperature will not be equally distributed globally, but are likely to be accentuated at higher latitudes, such as in the Arctic, where the temperature increase may be more than double the global average (BLM 2007c). Also, warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Vulnerabilities to climate change depend considerably on specific geographic and social contexts.

BLM recognizes the importance of climate change and the potential effects it may have on the natural environment. Several activities occur within the planning area that may generate emissions of climate changing pollutants. For example, recreation using combustion engines and wildfires can potentially generate CO_2 and methane. Other activities may help sequester carbon, such as managing vegetation to

favor perennial grasses and increase vegetative cover, which may help build organic carbon in soils and function as "carbon sinks."

3.1.2 Geology and Cave Resources

Within the IFNM, there are many geological resources of interest for scientific study, preservation, scenic observation, recreational enjoyment, and/or economic development. The discussion of geological resources in Section 3.1.2.1 is focused on those with scientific, historical, or scenic value. Caves are discussed in Section 3.1.2.2. Paleontological resources are discussed in Section 3.1.9. Geological resources that may have potential uses or economic value for development are discussed in Section 3.2.1.

3.1.2.1 Geology

The Arizona Geological Survey (Richard et al. 2000) has prepared a geologic map of Arizona, which includes the surface geologic resources of the IFNM. Scarborough (2002) prepared a report on the geologic aspects of the IFNM and compiled a detailed geologic map of the western portion of the monument that provides more geologic detail in select areas west of the Silver Bell Mountains.

The IFNM is located within the Basin and Range physiographic province, which is characterized by long, narrow, block-faulted mountain ranges oriented northwest-southeast that are separated by broad, relatively flat valleys containing several thousand feet of alluvial sediments.

The jagged mountaintops and steep cliffs, such as Ragged Top and Wildcat Peak, are composed of resistant Cretaceous to Tertiary volcanic plugs or necks, while the Samaniego Hills and Sawtooth Mountains consist of thick sequences of volcanic flows and sediments. The Silver Bell Mountains are formed from Laramide-age granitic and volcanic rocks that host a major porphyry copper deposit.

Scarborough (2002) identified three unusual geologic features of scientific interest in the IFNM:

- Rarely preserved relict bar and swale structures characteristic of alluvial fan deposition
- Relict sand dune fields
- A large expanse of desert varnish on several styles of desert pavement

The Sawtooth Mountains also contain various small stone windows, or arches, as well as natural rock shelters that have been formed by weathering and erosion over time. Ragged Top also contains at least four small arches.

3.1.2.2 Caves

There are memorandums of understanding (MOUs) between the National Speleological Society and the BLM (dated June 11, 1984) for caves throughout the United States. The MOUs will help carry out the responsibilities under the 1988 Federal Cave Resources Protection Act to preserve our Nation's significant caves, and to improve cooperation between cavers, cave researchers, and the Federal Government. Some of these MOUs may be applicable to any caves that may exist in the planning area.

No caves have been reported in the IFNM, but several have been noted in other portions of southern and eastern Arizona. There are two caves, Silver Bell and Rattlesnake, in the Waterman Peak area adjacent to the IFNM (Mount 2003; USDI, BLM 2003b).

Additional caves may occur within the Paleozoic sedimentary deposits or within some volcanic rocks in the IFNM. There may be other caves in the area that remain undiscovered or undisclosed. The scientific,

educational, and recreational value of potential caves is expected to be quite variable and would need to be assessed individually.

3.1.3 Soil and Water Resources

3.1.3.1 Soil Resources

Soils in the planning area are primarily the product of the climate, the underlying bedrock lithology, and the landscape. They are the subject of three Natural Resource Conservation Service (NRCS) Soil Surveys: Pinal County – Western Part (NRCS 1991); Pima County – Eastern Part (NRCS 2003); Tohono O'odham Nation – Parts of Maricopa, Pima, and Pinal Counties (NRCS 1999).

The soils of this region support some of the designated uses of public lands such as recreation, wildlife management, livestock grazing, and mining. The soil associations mapped by NRCS for the region are closely correlated to the various landforms of the planning area. Soils in the planning area are defined as sensitive and/or fragile if they are rated highly or severely erodible by wind or water (Map 3-2: Sensitive and Fragile Soils). The soils of greatest concern are those in the severe and mixed classes. These soils make up about half of the IFNM as shown in Table 3-3. Sensitive and/or fragile soils do not include biological soil crusts or desert varnish and pavement areas, as these soil features have not been comprehensively inventoried, nor mapped, within the IFNM. Problems with sensitive and fragile soils are compounded when they are close to surface water channels and sources. When eroded sediments flow directly into arroyos and stream channels, subsequent increases in sediment can be dramatic. These eroded soils can be deposited on the surface of active alluvial fans by mudflow, debris flow, and normal stream channel processes within the IFNM (Scarborourgh 2002). This is a concern because increases in sediment can make water unsuitable for beneficial uses, such as irrigation or livestock and wildlife watering.

Table 3-3: Acres of Erosive Soils

Wind Erodibility Group	Dust Prone Class	Acres	Percentage of BLM Lands
3	Severe	18,978	14.8%
4	Severe	588	0.5%
5	Severe	8,008	6.2%
6	Mixed	35,114	27.3%
	Total Severe	27,574	21.5%
	Total Sever and Mixed	62,688	48.8%
	Not Prone to Dust	65,712	51.2%

More than half of the planning area is composed of fan terraces. The soils in fan terraces are used primarily for rangeland; fan terrace landforms are relatively smooth alluvial fans that have been incised by drainages. Basin floors primarily form the perimeter of the planning area and areas between mountain ranges in the planning area, such as Avra Valley. Basin soils are very deep and well drained, with a moderately fine texture, formed in unconsolidated material or granite. Piedmont soils are prevalent in the rolling hills and mountains of the planning area, covering approximately one third of the planning area in Pima County. These soils are shallow and well drained, and often contain gravel.

Prime farmland is a distinction made by the U.S. Department of Agriculture as necessary for the preservation of the Nation's domestic food and other supplies, specifically the capacity to preserve high yields of food, seed, forage, fiber, and oilseed, with minimal agricultural amendment of the soil, adequate water, and a sufficient growing season. The planning area does not contain soils that qualify as prime farmland soils.

Biological soil crusts can be composed of cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria (Belnap et al. 2001). Biological soil crusts lie dormant most of the time but are physiologically "awakened" with rainfall, and these organisms typically remain active for only a day or two before the soil surface again dries. The properties of biological soil crusts make soils less susceptible to erosion; however, they are easily damaged and slow to recover (Phillips and Comus 2000). Functionally, biological soil crusts tend to fix nitrogen and contribute to the sparse nutrients available to desert plants. Biological soil crust occurrence in the planning area was noted in a geological survey performed for the BLM (Scarborough 2003). Biological soil crusts require considerable time to revegetate when disturbed—up to 56 years according to one study (Kade and Warren 2002). Damage caused by less-frequent and less-intensive disturbance may be more easily corrected. Vehicle tires are particularly destructive to biological soil crusts (Belnap et al. 2001; Kade and Warren 2002).

Desert pavement is a flat surface covered with a more or less complete layer of pebbles, gravel, or rocks that are varnished by a slow accumulation of black films and clear protein-rich coatings where exposed to air. Small patches of weakly varnished youthful desert pavement occur in the IFNM, but display very little true varnish effects. Varnished pavements occur in two areas: (1) on the bajada on the south side of the West Silver Bell Mountains and (2) on the west side of the Sawtooth Mountains, where the most extensive and interesting varnished pavements occur. The latter site has been disrupted by road and tower construction for the dual powerlines that cross Aguirre Valley (Scarborough 2003).

3.1.3.2 Water Resources

3.1.3.2.1 Groundwater

In the arid Southwest, most rural communities and individual residents rely entirely upon groundwater for domestic and other noncommercial water uses. The Groundwater Management Act of 1980 gives the State of Arizona authority to regulate the beneficial use of groundwater, as administered by the Arizona Department of Water Resources (ADWR). Under the Groundwater Management Act, specific groundwater management regions, or Active Management Areas (AMAs), were delineated, in which groundwater usage was to be managed such as to attain or preserve a "safe yield" of groundwater withdrawal. Safe yield is defined by the annual amount of water discharged, balanced by the amount of natural and engineered recharge to the AMA aquifer system. Two of these AMAs, the Pinal AMA and the Tucson AMA, are within the boundaries of the IFNM.

Groundwater within and around the planning area serves a variety of beneficial uses, including a number of other public land resources (Table 3-4). However, exclusive of irrigation, Pinal County is still primarily supplied by wells (78 percent). Irrigation in Pinal County consumes the highest percentage of groundwater (89 percent), even though surface water use is higher. About a quarter of the groundwater use in Pima County goes to irrigation; over half of the groundwater use in Pima County goes to domestic/municipal uses.

The abundance of soil moisture and shallow groundwater presence vary greatly from location to location. However, both of these water sources are essential to rangeland and ecological health. Therefore, the best assessment of the current conditions of soils moisture in the IFNM is through the existing allotment assessments. These allotment assessments are discussed in Section 3.2.2, Livestock Grazing.

In the Pinal AMA, ADWR recognizes five groundwater subbasins (ADWR 1999a). Groundwater-level lowering has caused subsidence, earth fissuring, and ground collapse in the region. The primary areas of subsidence in central Arizona include the Harquahala Plain, Luke Air Force Base area, the Stanfield area (11.8 feet in 1977), Eloy, Queen Creek/Apache Junction, and Picacho (Carpenter 1999). Subsidence in Avra Valley also has been postulated (ADWR 1999b). Based on computer models used by USGS, subsidence from groundwater pumping in portions of central Arizona could reach 12 feet by 2025 (ADWR 1998).

Table 3-4: Water Use in Pima and Pinal Counties

Water Resource Use Units are million gallons/day unless otherwise indicated	Counties		Subbasins		
	Pima	Pinal	Lower Santa Cruz	Brawley Wash	Aguirre Valley
Public Supply					
Total population, in thousands	752.43	131.21	51.40	29.95	0.98
Population served by groundwater, in thousands	726.08	101.71	44.81	19.61	0
Population served by surface water, in thousands	0	1.95	0	0	0
Per-capita withdrawal, in gallons per day	142.08	147.50	147.96	113.72	0
Commercial Water Use					
Total withdrawals, groundwater	9.28	3.20	3.95	0	0
Domestic Water Use					
Per-capita use, self-supplied, in gallons per day	110.82	140.47	139.61	110.25	112.24
Per-capita use, public-supplied, in gallons per day	82.77	82.19	65.61	68.84	0
Industrial Water Use					
Total withdrawals plus deliveries	20.29	1.18	4.88	7.12	0
Reclaimed wastewater	1.57	0	0	0	0
Thermoelectric Power Water Use (Fossil Fuel)					
Total withdrawals, groundwater	1.17	0.31	0.31	0	0
Power generation, gigawatt hours	564.44	98.91	98.91	0	0
Number of facilities	3	1	1.00	0	0
Thermoelectric Power Water Use (Nuclear)					
Power generation, gigawatt hours	0	0	0	0	0
Reclaimed wastewater	0	0	0	0	0
Number of facilities	0	0	0	0	0
Mining Water Use					
Total withdrawals, groundwater	35.39	21.87	1.03	0.19	0
Total withdrawals, surface water	1.11	0.17	0.00	0	0
Livestock Water Use (Total)					
Total withdrawals, groundwater	0.88	11.53	0.11	2.77	0.09
Total withdrawals, surface water	0.03	0.01	0	0	0
Irrigation Water Use					
Total withdrawals, groundwater	58.28	443.40	160.28	13.39	0
Total withdrawals, surface water	35.25	761.87	329.14	0	0
Consumptive use, total	60.83	605.05	252.68	8.62	0
Conveyance loss	13.15	180.77	73.41	2	0
Acres irrigated, total, in thousands	29.33	255.24	106.49	4.27	0
Reclaimed wastewater	7.41	2.86	3.77	0	0
Hydroelectric Power Water Use					
Instream water use	0	0	0.00	0	0
Power generation, total, gigawatt hours	0	0	0.00	0	0
Number of facilities, total	0	0	0.00	0	0
Wastewater Treatment					
Returns by public wastewater facilities	51.71	4.62	2.76	0.8	0
Reclaimed wastewater released by publicly owned treatment works	9.99	2.92	2.16	0	0
Number of wastewater facilities, total	26	68	22.00	2	0
Totals					
Total withdrawals, groundwater	227.37	499.84	178.08	26.76	0.20
Total withdrawals, surface water	36.39	762.33	329.14	0	0
Reclaimed wastewater	8.98	2.86	3.77	0	0
Conveyance losses	13.15	180.77	73.41	2	0

SOURCE: Solley et al. 1998

Issues related to the quality of shallow groundwater in areas throughout the planning area are primarily related to the infiltration of agricultural wastewater. The combination of irrigation seepage and dissolution and the high evaporation rates of central Arizona tend to concentrate salts in groundwater. Although not regulated, high total dissolved solids can make water unsuitable for certain uses. Nitrates from agricultural operations also might be migrating with groundwater.

The Tucson AMA report lists exceedance of the groundwater standard for nitrate from wells "northwest of Marana," which would be down slope of the IFNM boundary. Groundwater beneath the north end of Brawley Wash also is cited in the same report as high in nitrate and total dissolved solids (salt) concentration. The perched water bodies are the most likely source of agriculturally derived pollutants.

ASARCO Silver Bell Mining LLC operates three open-pit mines adjacent to and down gradient from the IFNM. The company has applied for an ADEQ Aquifer Protection Permit that requires the determination of baseline water quality for the aquifers most likely to be affected by the mine. Since the mine is hydrogeologically down gradient, there is little likelihood of any impact on the eastern and southern parts of the IFNM.

There are no wells located within the IFNM that are routinely monitored by either ADEQ or the USGS. Two wells near the east boundary that appear in the Environmental Protection Agency's STORET database were last sampled in January of 1998. Nitrate ranged from 3.5 to 9.6 milligrams per liter, below the Arizona Aquifer Water Quality Standard of 10 milligrams per liter, indicating there were no groundwater quality problems related to nitrate in the IFNM at that time.

3.1.3.2.2 Surface Water

Although perennial surface water is uncommon in central Arizona, ephemeral, intermittent, and effluent-dependent (including irrigation return flow) streams and standing water are common and essential components of surface water in desert washes. Desert washes primarily function as areas of overland flow collection and recharge for the surrounding watershed (Osterkamp 1994). Ephemeral pools, either in-channel or in the uplands (i.e., tinajas), are essential as to provide watering sites for wildlife and to support amphibians and aquatic invertebrates. There are parts of four USGS subbasins in the planning area (Map 3-3: Surface Water Basin). Surface water flows within the IFNM are entirely ephemeral. In addition to these naturally occurring intermittent flows, there are 59 developed livestock water sources maintained by ranchers and 15 developed wildlife waters maintained by the AGFD in the IFNM.

During the late 1800s, the Santa Cruz River underwent a period of pronounced arroyo entrenchment associated with changes in agricultural practices and land use. During that time, streamflows in the region were diverted by tribes in the area. Modifications to streamflow included dams and diversions of the Santa Cruz River to irrigate crops and the pumping of river water from wells near the banks (Minckley 1999).

3.1.4 Vegetation

Classification of the biological communities of the IFNM follows the Brown, Lowe, and Pace system (1979). Community descriptions are based on Brown (1994) and Dimmitt et al. (2003).

3.1.4.1 Upland Plant Communities

3.1.4.1.1 Sonoran Desertscrub

Shreve (1951) recognized two subdivisions of Sonoran desertscrub vegetation: the Arizona Upland and Lower Colorado River Valley. Transitional plant communities found in the planning area possess characteristics of both subdivisions. The subdivisions and their minor communities are discussed below and shown on Map 3-4: Vegetation.

Arizona Upland Subdivision: This subdivision, which occupies about one-half of the IFNM, is characterized by saguaros and legume trees growing on slopes and bajadas. Plants dominating the landscape are primarily a combination of paloverde and saguaro or paloverde and mixed cacti. There are two minor plant communities within this subdivision.

- *Paloverde-Cacti – Mixed Scrub*. This community is dominated by foothill paloverde (*Cercidium microphyllum*) with scattered cacti, mostly saguaro, and contains other associated species such as mesquite and ironwood. It occurs as patches of dense vegetation, with a well-developed canopy layer interspersed with open areas, and is suitable habitat for a wide variety of wildlife, especially birds.
- *Jojoba Chaparral*. This minor community is found only near the summit of Silver Bell Peak in the IFNM. The dominant plant, jojoba (*Simmondsia chinensis*), forms continuous stands that have the same form and structure as chaparral.

Lower Colorado River Valley Subdivision: This subdivision occupies about one-half of the IFNM. It is composed mostly of creosotebush and bursage, and is found in broad valleys between mountain ranges. Slopes are covered with low, open vegetation, with the lower bajadas and valley floors supporting scattered saguaros and ironwoods. This subdivision has one minor plant community:

- *Creosotebush–White Bursage*. This community consists of medium to low, open vegetation cover dominated by creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Scattered triangle-leaf bursage (*Ambrosia deltoidea*), ocotillo (*Fouquieria splendens*), and prickly pear (*Opuntia* spp.) are also present.

3.1.4.1.2 Riparian and Xeroriparian Plant Communities

Although the IFNM has no riparian areas (as defined by Technical Reference 1737-15: Riparian Area Management), xeroriparian communities exist. Xeroriparian areas are identified in the planning area are shown on Map 3-4. The term “xeroriparian” (dry wash) is used to describe this plant community within the IFNM because both riparian scrublands and riparian woodlands lack surface water most of the year. Washes have surface water only immediately following winter and summer rains, when runoff carries seeds and nutrients into the washes, resulting in increased soil moisture and greater densities of plant and animal life than adjacent lands. All washes are important as wildlife movement corridors and provide more habitat components for nesting, foraging, cover, and food than adjacent uplands. Vegetation in the xeroriparian areas is composed of a combination of low mesquite and catclaw. Some washes have mesquites; others are dominated by either blue paloverde or ironwood, or a combination of both.

3.1.4.2 Priority Plant Communities

Priority plant communities, identified and described by Dimmitt et al. (2003), occur on approximately 39,647 acres within the planning area. These communities were found to be sensitive because of their rarity, ecological diversity, or vulnerability to disturbance by human trampling, fire, or invasion by exotic plants. These communities, identified on Map 3-4 as Sensitive and Unique Vegetation Communities, include the following:

- *Dense Patches*. These areas support above-average densities of saguaro and ironwood trees, species that contribute to the uniqueness of the community as well as being important to the overall health of the ecosystems of which they are a part.

- *Large Ironwoods.* The largest individuals of this species occur in lower elevation valley drainages. They are also found in braided washes and non-channelized, sheet-flooded areas.
- *Jojoba Chaparral*. This community, described previously, is a rare occurrence in the planning area. It is undetermined whether this community is a true chaparral or an unusual association of the Arizona Upland Subdivision.
- *Xeroriparian.* Xeroriparian plant communities are dense ribbons of vegetation in washes supported by seasonal surface water. The dominant tree is typically mesquite, but paloverde or ironwood may also dominate, or a mixture of all three species may be present equally.
- *Cactus Dunes.* This unique community is located southwest of the Sawtooth Mountains where flat, loose, pinkish sand is densely vegetated with several cactus species and scattered foothill paloverde trees.
- *Curly-Mesquite Grassland.* This community, consisting of a large, nearly pure stand of curly-mesquite grass, is found in the Roskruge Mountains. Most lower elevation desert grasslands have been converted into desertscrub communities that include saguaros, foothill paloverde trees, and triangle-leaf bursage.
- *Cholla Forests.* These dense stands of cholla occur in several areas of the IFNM, with the largest such area in the Pan Quemado Mountains. An intermittent band of chainfruit cholla nearly encircles these mountains.
- *Creosote Rings.* Rings of creosotebush are found near the north end of the Silver Bell Mountains. Individual plants exhibit clone-like growth through new growth from the old base of old stems that then spread outward in the shape of a circular or elliptical ring. Generally, radiocarbon dating of old individuals is possible, and many have been dated as old as several thousand years (Robichaux 1999).
- *Ragged Top.* A total of 401 plant species have been found on Ragged Top, which is approximately 72 percent of the total flora found in the IFNM. The high diversity, structure, and composition of plants in this area support both a high abundance and high diversity of wildlife. Though not a vegetation community, Ragged Top is a sensitive and unique area.

In addition to these priority plant communities, there is value to dead and decaying plant material within all plant communities for the provision of nest sites and nest material, feeding sites, escape cover, habitat for ground-dwelling wildlife, and soil nutrients. A biological survey for the IFNM found that the production and decay rates of downed woody material are very slow in the Sonoran Desert. In the case of ironwood trees, the availability of dead and downed wood is low because this is a long-lived species and individual trees are typically widely spaced, although the decay cycle can take centuries, providing long-term value to certain wildlife species (Dimmitt 2000). In another study conducted in Sonoran Desert National Monument, researchers found that after mortality, foothill paloverde and saguaro were major contributors to increasing localized soil fertility during the decomposition process, whereas triangle-leaf bursage and creosote were low to moderate suppliers of soil nutrients and barrel cactus was an insignificant soil nutrient producer post-mortem. The differences may be due to biomass quality (Butterfield and Briggs 2008). There are also indirect values associated with dead and decaying plant material. The dead and downed wood of the IFNM provides habitat for a number of small mammals and reptiles which, in turn, provide prey for predators such as the cactus ferruginous pygmy owl.

3.1.4.3 Agricultural Lands

In addition to the native vegetative communities, approximately 1,200 acres of agricultural fields have been identified in the western portion of the planning area, located on both State Trust and private lands. These fields, which currently are being farmed, have few characteristics of natural plant communities,

except for incidental plants growing along the perimeter and along irrigation canals. Mostly non-native and other weedy species initially invade abandoned fields. Eventually a few native species from adjacent lands may become established. Agricultural lands are shown on Map 3-4.

3.1.4.4 Non-native Vegetation

Based on vegetation surveys conducted, 54 non-native plant species occur within the IFNM. Some of these species may be able to quickly invade areas and out-compete native species. Nine non-native species established in the monument are considered to pose the greatest threat, which include buffelgrass (*Pennisetum ciliare*), Sahara mustard (*Brassica tournefortii*) and Bermuda grass (*Cynodon dactylon*).

The potential for non-native species to become invasive is often difficult to predict. In a study conducted near Tucson, an approximately 800-acre natural area was surveyed for exotic (non-native) plant species in 1983 and the survey was repeated 22 years later in 2005. During that time, the proportion of ornamental exotics doubled even though eight species documented in 1983 were no longer found in the study area in 2005. Two of the species encountered in 2005 had become invasive since the 1983 survey, but three invasive species had declined, potential in response to climatic factors. Historical documents regarding the study site (which was founded as a biological research station in the early 1900s) indicate that the number of exotic flora increased from a total of 4 in 1909 to 52 in 1991 (Bowers et al. 2006). Studies such as these demonstrate the dynamic nature of non-native species and the challenges that they may represent in controlling or eradicating them.

3.1.5 Wildlife and Wildlife Habitat

The fauna of the IFNM include a diversity of game and nongame wildlife species, as well as migratory birds, typically found in the Sonoran Desert. Several species are restricted to certain locales within the biotic subdivisions; others occur widely in suitable habitats of both subdivisions described in Section 3.1.4. An example is the desert tortoise, which occurs in suitable habitat of both the Arizona Upland and Lower Colorado River Valley subdivisions. The ironwood-bursage habitat in the Silver Bell Mountains is associated with more than 674 species, including 64 mammalian and 57 bird species (BLM 2001). These species are typical of Sonoran desertscrub habitats in southern Arizona. Bird and wildlife species, in addition to those referenced, also may occur within the IFNM. Additional research and studies may also discover species as indicated in the Proclamation.

3.1.5.1 Game Species

Big game species known to occur in the planning area include desert bighorn sheep, mule deer, and javelina. Small game species that occur in the planning area include desert cottontails, jackrabbits, and quail.

The desert bighorn sheep prefer the rocky, mountainous habitats in the IFNM, primarily the Silver Bell Mountains. Sheep typically use the highest ridges of the mountains as a lookout. Desert bighorn sheep diet consists of shrubs, forbs, cacti and grasses. Globemallow, desert agaves, range ratany, buckwheat, foothill paloverde, prickly pear, desert ironwood, and elephant tree also are consumed by desert bighorn sheep (Tarango et al. 2002). Lambing areas are primarily selected to provide safety from predators as well as to provide distance from human disturbances. Individuals from the Silver Bell herd have been documented crossing valley floors from one mountain to another inside the IFNM. Several ewes were observed during the non-breeding season, browsing along the lower bajada of the Silver Bell Mountains (Jansen 2004).

According to 2004 data provided by AGFD, sheep lambing and female concentration areas are regarded as potential birthing sites depending on individual female preference, and are not considered discrete units. Travel corridors are used infrequently, and at times, a preference is shown by animals that make repeated and habitual movements from one mountain range to another (Jansen 2004).

BLM has a rangewide plan for managing desert bighorn sheep habitat on public land. Based on viability estimates, BLM has classified bighorn sheep habitat into three categories:

Category 1: Habitats where existing viable populations occur

Category 2: Habitats where remnant herds occur and are capable of supporting more than 80 individuals

Category 3: Unoccupied habitat that is capable of supporting more than 80 individuals.

The goal of BLM's rangewide plan for managing desert bighorn sheep is to maintain and/or enhance habitat for bighorn sheep in Category 1 areas, enhance habitat in Category 2 areas, and maintain and enhance habitat to allow reintroduction and reestablishment of viable populations in Category 3 areas (USDI, BLM 1988). The IFNM includes habitat within each of the three categories.

Mule deer are primarily browsers, with a majority of their diet composed of forbs (herbaceous plants excluding grasses) and browse (e.g., woody plants like shrubs). Across the xeric habitat of the IFNM where mule deer are found, which occurs throughout the IFNM, they rely on three key habitat components: cover, water, and available food year-round. Ideal habitat for mule deer includes components that are interspersed in such a way that they provide adequate nutrition and cover to reproduce successfully (Hoffmeister 1986).

Javelina are commonly found in the desertscrub, especially in thickets near or along streambeds or washes and along bajadas adjacent to rocky hillsides. These are used for cover and retreat from potential predators and human disturbances. Javelina travel in herds and typically utilize the washes to move from one location to another on a daily basis. Thick stands of cacti provide both food and moisture. Plants commonly found in javelina habitat include prickly pear, paloverde, mesquite, jojoba, catclaw, and ocotillo. In creosote-bursage-paloverde–mixed cacti communities, prickly pear made up 95 percent of their diet (Hoffmeister 1986).

Typically, small game species prefer habitats that provide thick, brushy vegetation mixed with grasses, forbs, and browse. Populations of small game species that occur on the IFNM include Gambel's quail (*Callipepla gambelii*), desert cottontail (*Sylvilagus audubonii*), eastern cottontail (*Sylvilagus floridanus*), white-winged dove (*Zenaida asiatica*), mourning dove (*Zenaida macroura*), blacktail jackrabbit (*Lepus californicus*), and antelope jackrabbit (*Lepus alleni*).

3.1.5.2 Non-game Species

Vegetation provides foraging, roosting, and nesting habitat for a vast array of non-game species including songbirds and raptors found in the IFNM. There is a strong correlation between bird species diversity and abundance, and density and structure of vegetation. In general, increased complexity of the ecosystem increases bird abundance and diversity. Migration and breeding periods change the abundance and types of birds that occupy the IFNM at any given time. Due to lack of permanent surface water, aquatic birds are not often found except as incidental occurrences. However, at least 70 upland bird species are known to occur in the Silver Bell Mountains alone. The most frequently observed resident bird species have been cactus wren (*Campylorhynchus brunneicapillus*), gilded flicker (*Colaptes chrysoides*), Gila woodpecker (*Melanerpes uropygialis*), curve-billed thrasher (*Toxostoma curvirostre*), and black-throated sparrow

(*Amphispiza bilineata*). Bird species within the monument use xeroriparian habitat and other areas with dense shrubby vegetation for breeding, foraging, and nesting.

One amphibian and 29 reptiles were observed in the IFNM during the 2002 desert tortoise survey (Averill-Murray and Averill-Murray 2002). The most frequently observed reptiles were western whiptail lizard (*Cnemidophorus tigris*), common side-blotched lizard (*Uta stansburiana*), and zebra-tailed lizard (*Callisaurus draconoides*). Several possible eastern fence lizards (*Sceloporus undulatus*) were observed in the desert flats in the southern portion of the IFNM. The Colorado River toad (*Bufo alvarius*) was an incidental occurrence found along the roadside.

In 2003, a total of 29 different species of reptiles and amphibians were observed in the IFNM (Rosen 2003). Rosen states in his report that the best populations of true desert reptiles occur in the Sawtooth Mountains region, and on valley floors. They include the desert iguana (*Dipsoosaurus dorsalis*), long-tailed brush lizard (*Urosaurus graciosus*), four species of desert horned lizards (*Phrynosoma* spp.) and spiny lizards (*Sceloporus* spp.), western shovel-nosed snake (*Chionactis occipitalis*), spotted leaf-nosed snake (*Phyllorhynchus decurtatus*- not confirmed), speckled rattlesnake (*Crotalus mitchellii*- not observed during survey), and chuckwalla (*Sauromalus obesus*). The lesser earless lizard (*Holbrookia maculata*) and the Sonoran spotted whiptail (*Cnemidophorus* [=*Aspidoscelis*] Sonoras) were found only in desert grassland habitats in the Roskruge Mountains area. In this desert grassland community, the plant composition is a blend of dry tropic scrub plants, typical Sonoran Desert plants, and perennial grasses. The only amphibian documented in the IFNM was the Colorado River toad (*Bufo alvarius*), which was found along the eastern bajada of the Roskruge Mountains and in Aguirre Valley (Rosen 2003).

3.1.5.3 Migratory Birds

Various species of migratory birds summer, winter, and/or migrate through the IFNM. The habitat diversity provided by the broad expanses of Sonoran Desertscrub vegetation zones (including paloverde-cacti-mixed scrub, jojoba chaparral, creosote-white bursage, and xeroriparian communities) support numerous species of migratory birds. The most characteristic species include turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), white-winged dove (*Zenaida asiatica*), elf owl (*Micrathene whitneyi*), lesser nighthawk (*Chordeiles acutipennis*), black-chinned hummingbird (*Archilochus alexandri*), ash-throated flycatcher (*Myiarchus cinerascens*), purple martin (*Progne subis*), Bell's vireo (*Vireo atricapillus*), Lucy's warbler (*Vermivora luciae*), and sage sparrow (*Amphispiza belli*). Species such as killdeer (*Charadrius vociferous*), great blue heron (*Ardea herodias*), mallard (*Anas platyrhynchos*), and black-necked stilt (*Himantopus mexicanus*) may be found where suitable habitat exists (Phillips 1964). BLM considers migratory birds to include those listed in 50 CFR 10.13 (Wildlife and Fisheries, List of Migratory Birds).

3.1.5.4 Habitat Connectivity and Fragmentation

Land use patterns on the IFNM influence wildlife habitat connectivity. Factors contributing to fragmentation of wildlife habitats within the IFNM include roads, residential development, mines, undocumented immigrant (UDI) traffic, and off-road driving. As a result of fragmentation, habitats which were once continuous become divided into smaller isolated patches of habitat.

The primary function of wildlife corridors is to connect fragmented habitat areas, which moderates some of the ecological effects of habitat fragmentation. All washes in the IFNM serve as corridors for wildlife. These corridors facilitate dispersal of individuals between patches of remaining habitat, allowing for both long-term genetic interchange and individuals to re-colonize habitat patches from which populations have been locally extirpated. Wildlife corridors could connect habitats between the Silver Bell Mountains, West Silver Bell Mountains, and Sawtooth Mountains. Regional and statewide habitat corridors that connect to the IFNM have been identified by Arizona's Linkages Workgroup (Arizona Wildlife Linkages

Workgroup 2006). This includes potential habitat corridors between the IFNM and Picacho State Park (Arizona Wildlife Linkages Workgroup 2006). Future efforts and reports from Arizona's Wildlife Linkages Workgroup could aid in a landscape-level, multijurisdictional approach to wildlife corridor conservation and management in the IFNM.

3.1.6 Special Status Species

Special status species include the following: (1) species currently listed or considered for listing as threatened or endangered by USFWS; (2) species listed as sensitive by BLM; (3) species listed as Wildlife of Special Concern in Arizona by AGFD; (4) Priority Vulnerable Species in Pima County; and (5) plants that have special protection under the Arizona Native Plant Law. Federally listed and proposed species and their designated or proposed critical habitats receive protection under the Endangered Species Act of 1973, as amended. The BLM Sensitive Species are those species that may or may not have Federal status (under the Endangered Species Act), but are designated by the BLM State Director for special management consideration. Pima County's list of Priority Vulnerable Species includes species addressed in the biological evaluation for the Sonoran Desert Conservation Plan. The Wildlife of Special Concern in Arizona are those species whose occurrence in Arizona is or may be in jeopardy, or those species with known or perceived threats or population declines, as described by the AGFD. The AGFD list is intended to guide management decisions that involve these species.

As identified by BLM, USFWS, AGFD, and Pima County's Sonoran Desert Conservation Plan, 122 special status species occur in Pima and Pinal Counties. Of this total, two species with Federal status have the potential of occurring in the planning area: lesser long-nosed bat and Nichol Turk's head cactus. Of those special status species that are not federally listed, 36 with potential of occurring in the planning area have been identified, and are included below in Table 3-5.

Table 3-5: Special Status Species that Occur or Have the Potential of Occurring in the IFNM

Name of Species	Status	Habitat Requirements
Amphibians		
Lowland leopard frog *Rana yavapaiensis*	SC, WSCA	Desert, grasslands, permanent pools of foothill streams, rivers, and permanent stock tanks.
Birds		
Abert's towhee *Pipilo aberti*	SC, PV	Sonoran riparian deciduous woodland and riparian scrubland with a dense understory of shrubs.
American peregrine falcon *Falco peregrinus anatum*	SC, S, WSCA	Found in Arizona wherever sufficient prey is found near cliffs. Optimum peregrine habitat is generally considered to be steep, sheer cliffs overlooking woodlands, riparian areas or other habitats supporting avian prey species in abundance. As Arizona's population grows, peregrines seem to be breeding in less optimal habitat; either small broken cliffs in ponderosa pine forest or large, sheer cliffs in very xeric areas. The presence of an open expanse is critical
Bell's vireo *Vireo belli*	SC, PV	Dense, low, shrubby vegetation in riparian areas. Typically found in dense shrubland or woodland along lowland stream courses with willows, mesquites, and seep willows.
Cactus ferruginous pygmy-owl *Glaucidium brasilianum cactorum*	S, WSCA	Streamside cottonwoods and willows and adjacent mesquite bosques, usually with saguaros on nearby slopes. Less often found along dry washes with large mesquite, paloverde, ironwood, and saguaro.

Name of Species	Status	Habitat Requirements
Crested caracara *Caracara cheriway*	WSCA	Open country, including pastureland, cultivated areas, and semidesert, in both arid and moist habitats but more commonly in the former. Habitat characterized by low-profile ground vegetation and scattered tall vegetation suitable for nesting. Scattered trees, poles, and fences with unimpeded view favored as perches, particularly near nest sites. In Arizona, inhabits paloverde-saguaro desert. They can frequently be found near stock tanks and *charcos* (puddles or natural pools), especially during the hot, dry summer.
Mississippi kite *Ictinia mississippiensis*	WSCA	Tall forest, open woodland, prairie, semiarid rangeland, shelterbelts, wooded areas bordering lakes and streams in more open regions, scrubby oaks and mesquite, and lowland/floodplain forests. Requires open areas near nesting sites for foraging. Breeding habitat in Arizona consists of riparian deciduous forests that border desertscrub upland habitats. Man-made habitat in central Arizona consists of pecan orchards.
Rufous-winged sparrow *Aimophila carpalis*	PV	Flat or gently hilly desertscrub. Grasses like tobosa grass are essential components. Territories typically include some riparian and xeroriparian habitat, farmland, and deep soil sites (mesquites with clumps of sacaton grass).
Swainson's hawk *Buteo swainsoni*	SC, PV	Open grasslands and desertscrub that sustains a grassland component.
Tropical kingbird *Tyrannus melancholicus*	WSCA	Areas with scattered trees, savanna, open woodland, forest edge, plantations, residential areas and agricultural lands. Occurs in lowlands near water in Arizona, often nests in cottonwoods.
Western burrowing owl *Athene cunicularia hypugaea*	SC, S, PV	Grasslands, pastures, desertscrub, and edges of agricultural fields and vacant lots.
Invertebrates		
Talus snails *Sonorella baboquivariensis berryi*	PV	Isolated, undisturbed areas of rocks, generally, or exclusively, limestone, mostly, but not exclusively, on north-facing or north-trending slopes, usually near hilltops or in rocky canyons. Located in Roskruge Mountains area.
Mammals		
Big free-tailed bat *Nyctinomops macrotis*	SC, S	Desertscrub, ponderosa pine, and piñon-juniper. Prefers to roost in rugged, rocky areas in desertscrub with vegetation components consisting of saguaro, creosotebush, and mesquite.
California leaf-nosed bat *Macrotus californicus*	SC, S, WSCA	Typically found in several habitats of desertscrub. Roosts in mines and caves. Feeds on insects. This species neither hibernates nor migrates, spending winters in warm, humid caves or mine tunnels.
Cave myotis *Myotis velifer*	SC, S	Mine shafts, tunnels, caves, and under bridges in desert areas of creosotebush, paloverde, brittlebush, and cactus. More commonly found in xeric areas, never more than a few miles/kilometers away from a water source. Forages low over vegetation in pursuit of moths and other insects.
Greater western mastiff *Eumops perotis californicus*	SC	Resident in Arizona year-round; it lives in manmade and natural crevices, typically in desertscrub. Feeds on insects. Long forage periods of up to 6.5 hours each night.
Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*	LE, S, WSCA	Mainly grasslands and shrublands, chaparral, and lower-elevation oak woodland and associated habitats. In Arizona, are found mostly in areas with flowering saguaros and organ pipe cactus at elevations below about 3,500 feet.

Name of Species	Status	Habitat Requirements
Mesquite mouse *Peromyscus merriami*	PV	Mesquite mouse is found almost entirely in mesquite forests or bosques in Pima, Pinal, and Santa Cruz Counties. It is rarely seen in dry brushland.
Mexican long-tongued bat *Choeronycteris mexicana*	SC, S, WSCA	Mainly in oak-pine communities but also found in saguaro-paloverde associations in desertscrub. Caves and abandoned mine shafts are typical roosts. Feeds on nectar and pollen, but occasionally insects.
Pale Townsend's big-eared bat *Plecotus townsendii pallescens*	SC	Typically roosts in caves, mines, and abandoned buildings through a range of elevations and vegetation communities. Found in the Arizona Upland and Lower Colorado River Valley subdivisions of Sonoran desertscrub. Feeds primarily on moths, but will also take insects off of vegetation while in flight.
Pocketed free-tailed bat *Nyctinomops femorosaccus*	S	Roosts in caves, buildings, and crevices along rocky cliffs in semiarid desert lands. Feeds mostly on moths and other insects.
Western red bat *Lasiurus blossevillii*	WSCA	Broadleaf riparian deciduous forests and woodlands. Occasionally roosts in saguaro boots and other cavities, but more commonly in dense clumps of foliage in riparian or wooded areas. Feeds mainly on flying insects.
Western small-footed myotis *Myotis ciliolabrum*	SC, S	Oaks, chaparral, and riparian areas, but not in desertscrub in the southwestern part of the state. Hibernates in caves and old mines; summers in crevices, cracks, holes, under rocks, and in buildings. Feeds on insects.
Western yellow bat *Lasiurus xanthinus*	WSCA	Not clearly understood; may be associated with Washington fan palm trees, other palms or other leafy vegetation such as sycamores, hackberries and cottonwoods which provide roost sites. Individuals have been found roosting about 15 feet above the ground in a hackberry (*Celtis reticulata*) and sycamores (*Platanus wrightii*).
Yuma myotis *Myotis yumanensis*	SC	In summer, found near water, where it forages for insects. Prefers to roost in old buildings and abandoned cliff swallow nests. Rarely roosts in caves or mines.
Plants		
Aravaipa wood fern *Thelypteris puberula* var. *sonorensis*	S	Moist soil in the shade of boulders in mesic canyons. Also found on riverbanks, seepage areas, and meadow habitats at elevations ranging from 2,200 to 4,500 feet. Substrates are exclusively granitic. Easily disturbed and can be affected by during collection for landscape use or by livestock grazing.
Arizona giant sedge *Carex spissa* var. *ultra*	S	Saturated soil near or in perennial seeps, streams, and springs at elevations between 2,500 and 6,000 feet.
Arizona Sonoran rosewood *Vauquelinia californica* ssp. *sonorensis*	S	Known from southwestern Arizona in the Ajo, Diablo, Mesquite, and Santa Rosa mountains of Pima County, and Sand Tank Mountains of Maricopa County. Desertscrub and desert grassland, in woodland or forest at base of cliffs, along canyon bottoms and on moderate to steep slopes from 2,328 – 3,720 feet.
Bartram stonecrop *Graptopetalum bartramii*	S	Known from Santa Cruz County: Patagonia, Santa Rita and Tumacacori Mountains; Pima County: Baboquivari, Dragoon, Mule and Rincon Mountains; Cochise County: Chiricahua Mountains. Occurs in cracks in rocky outcrops in shrub live oak-grassland communities along meandering arroyos on sides of rugged canyons from 3,650 - 6,700 feet. Usually found in heavy litter cover and shade where moisture drips from rocks, often with Madrean evergreen woodland.

Name of Species	Status	Habitat Requirements
California barrel cactus *Ferocactus cylindraceus* var. *cylindraceus*	SR	Found on gravelly or rocky hillsides, canyon walls, alluvial fans, and wash margins in the Mohave and Sonoran deserts, on igneous and limestone substrates.
Common fishhook cactus *Mammillaria tetrancistra*	SR	Known from Mojave and Sonoran Deserts, alluvium and outcrops, valley floors, hills, mountainsides.
Candy barrel cactus *Ferocactus wislizeni*	SR	Barrel cactus is primarily found in desert grassland and desert shrub habitats in the Sonoran and Chihuahuan deserts. It also extends into communities at higher elevations in interior chaparral and is found in the Madrean evergreen woodland in encinal woodlands with a mixture of evergreen oaks (*Quercus* spp.) and junipers (*Juniperus* spp.)
Dollarjoint pricklypear *Opuntia chlorotica*	SR	Desert grasslands, woodlands, chaparral, desert flats, rocky ledges, hills, canyons.
Emory's barrel cactus *Ferocactus emoryi*	SR	Known from hillsides, wash margins, alluvial fans, mesas, or flats, gravelly rocky or sandy soils, rocky slopes and adjacent bajadas, Sonoran desert scrub, igneous substrates
Engelmann's hedgehog cactus *Echinocereus engelmannii*	SR	Known from the Sonoran and Mojave deserts, chaparral, piñon-juniper woodlands.
Engelmann's pricklypear *Opuntia engelmannii* var. *engelmannii*	SR	Found on deserts, grasslands, woodlands, plains, sandy soils to rocky hillsides, lower to midslopes of mountains.
False grama *Cathestecum erectum*	S	Dry, rocky hills and plains, in tropical and subtropical communities. Populations associated with saguaro, goldenhills, and desert hibiscus. Ragged Top Mountain is the only location for this plant in Arizona.
Gentry indigo bush *Dalea tentaculoides*	SC, S, HS	Along canyon bottoms on primary terraces subject to occasional flooding. Possibly on rocky slopes at elevations between 3,600 and 4,000 feet.
Graham nipple cactus *Mammillaria grahamii*	SR	Chihuahuan and Sonoran desert scrub, grasslands, interior chaparral, oak woodlands, alluvial slopes, hills, canyons, silty, sandy, gravelly, or rocky soils of igneous or calcareous origin
Lemmon cloak fern *Notholaena lemmonii*	SC	Limestone cliff crevices, slopes, and cliffs of igneous rocks usually on granitic or volcanic substrates at elevations ranging from 2,840 to 6,000 feet. Associated species include desert grasslands and oak woodland species. Fairly restricted to Tucson Basin area, Santa Cruz River.
Magenta-flower hedgehog cactus *Echinocerus fasciculatus.*	SR	Three varieties of this species occur in Pima County: one occurs in sand, gravel, and rocks of hillsides and washes in the desert; one occurs mostly in desert grassland; the third overlaps desert and grassland. Elevations range from 2,000 to 6,000 feet collectively. *E.f.* var. *fasciculatus* and *E.f.* var. *boyce-thompsonii* have the potential of occurring in the IFNM.
Needle-spined pineapple cactus *Echinomastus erectocentrus* var. *erectocentrus*	SC, SR	Alluvial fans usually associated with limestone in upper desert grasslands at elevations ranging from 3,000 to 4,300 feet.
Nichol hedgehog cactus *Echinocereus nicholii*	SR	Known from Arizona Upland Subdivision of Sonoran Desert, exposed slopes, bajadas, hills, mountains, desert scrub, igneous and sedimentary substrates

Name of Species	Status	Habitat Requirements
Nichol Turk's head cactus *Echinocactus horizonthalonius* var. *nicholii*	LE, HS	Desertscrub on limestone outcropping and limestone-derived soils in incline terraces, saddles, and alluvial fans at elevations from 2,400 to 4,100 feet. The range of the Nichol Turk's head cactus is restricted to the Vekol and Waterman Mountains in Arizona.
Night-Blooming cereus *Peniocereus greggii*	SR	Desert flats and washes, often in the shade of desert shrubs like creosote.
Organ pipe cactus *Stenocereus thurberi*	SR	Widespread in Sonoran Desert, adjacent thorn forests mostly on hills and bajadas
Pima Indian mallow *Abutilon parishii*	SC, SR	Steep, rocky slopes and canyon bottoms in desertscrub and semidesert grassland at elevations between 2,477 and 4,856 feet. Found in the Silver Bell and Roskruge Mountains
Pima pineapple cactus *Coryphantha scheeri* var. *robustispina*	LE	Along ridges in semidesert grasslands and alluvial fans in the Arizona Upland subdivision of Sonoran desertscrub at elevations ranging from 2,300 to 5,000 feet. Occurs on flat ridgetops with little slope and in soils that are mostly rocky loams.
Purple pricklypear *Opuntia macrocentra*	SR	Desert uplands, grasslands, oak woodlands, sandy desert flats, rocky hills and valleys.
Saguaro *Cereus giganteus*	HS, SR	Saguaro cactus are known from rocky or gravelly soils located throughout the foothills, and canyons. The saguaro is generally located on the south-facing slopes where it is protected from the winter cold. Crested saguaro are listed Highly Safeguarded under the Arizona Native Plant Law.
Thornber fishhook cactus *Mammillaria thornberi*	SR	Known from Sonoran desert, grasslands, bajadas, valleys, washes, and alluvial fans.
Tulip pricklypear *Opuntia phaeacantha*	SR	Deserts, chaparral, surrounding mountains, plains, sandy to rocky soils.
Tumamoc globeberry *Tumamoca macdougalii*	S, SR	This species occurs in xeric situations, in the shade of a variety of nurse plants along gullies and sandy washes of hills and valleys in Sonoran desertscrub and Sinaloan thornscrub communities.
Reptiles		
Chuckwalla *Sauromalus ater*	S	Known from Western half of the state. An interior population is found south of the Gila and Salt Rivers including the Gila, Maricopa, Santan, and South Mountains, and the Tule Desert. Predominantly found near cliffs, boulders or rocky slopes, where they use rocks as basking sites and rock crevices for shelter from sea level to 6,000 feet. They can be found in rocky desert, lava flows, hillsides and outcrops. Creosote bush occurs throughout most of range.
Desert tortoise (Sonoran population) *Gopherus agassizii*	SC, S, WSCA	Paloverde–saguaro cactus communities in the Arizona Upland and Lower Colorado River Valley subdivisions of Sonoran desertscrub. Requires firm, but not hard, ground for construction of burrows or uses shelters among rocks and exposed, eroded caliche layers in walls of washes. Also requires adequate ground moisture for survival of eggs and young; and herbs, grass, cacti, and other plants for food. Frequents washes and rocky slopes. Populations of tortoises are documented within the IFNM.
Giant spotted whiptail *Cnemidophorus burti stictogrammus*	S, PV	Grassy portions of riparian areas, mountain canyons, arroyos, and mesas in arid and semiarid regions. Prefers dense, shrubby vegetation, often among rocks near permanent and intermittent streams. Feeds on insects and spiders.

Name of Species	Status	Habitat Requirements
Ground snake *Sonora semiannulata*	PV	Mostly near mountains with higher slopes and areas with poorly drained soils. Vegetation may be sparse or dense, from creosotebush to mesquite thickets. On the Tohono O'odham Reservation, the snake has been found in tobosa grass communities over silty, loamy clay soils. Diet includes eggs, adult vertebrates, and arthropods.
Mexican rosy boa *Charina trivirgata trivirgata*	SC, S	Rocky shrublands and desert. Attracted to water sources, but is not dependent on permanent water. Has been observed on blacktop roads in rocky canyons or along rocky buttes or lower mountain slopes. Diet includes small mammals, reptiles, amphibians, and birds.
Red-backed whiptail *Cnemidophorus burti xanthonotus*	SC, S	Portions of western Pima County from juniper-oak woodland down to desert edge, among dense shrubby vegetation near or on banks of semiarid permanent springs and arroyos, and in canyons. In Pima County, habitat also includes rocky slopes from 2,000 to 4,000 feet. Occasionally seen in semidesert grassland. Feeds on insects and spiders.
Texas horned lizard *Phrynosoma cornutum*	SC, S	In Arizona, Chihuahuan Desert and desert-grassland; sandy to gravelly flat ground with or without rocky cover, usually with scattered desert and grassland shrubs or on mesquite dominated flats. Often found in habitat with the round-tailed horned lizard (*Phrynosoma modestum*).
Tucson shovel-nosed snake *Chionactis occipitalis klauberi*	PV	Open sandy sites, flat and sparsely vegetated areas of xeroriparian communities of the Arizona Upland and Lower Colorado River Valley subdivisions of Sonoran desertscrub. Common associated vegetation includes creosotebush, desert grasses, forbs, cacti, and mesquite. It is absent or infrequent in rocky desert terrain.

SOURCES: The federally listed species list was obtained from the U.S. Fish and Wildlife Service, Arizona Ecological Service Field Office Website. Priority Vulnerable Species were obtained from the Pima County Sonoran Desert Conservation Plan. All other sensitive species lists were obtained from AGFD's Heritage Data Management System website and response to the AGFD coordination letter.

STATUS DEFINITIONS: LE= Federally listed as Endangered; LT= Federally listed as Threatened; PE= Federally proposed as Endangered; C= Federal Candidate; SC= Federal Species of Concern; S= BLM Sensitive; WSCA= Wildlife of Special Concern in Arizona (AGFD 1996); PV= Priority Vulnerable Species, Pima County's Sonoran Desert Conservation Plan; SR= Salvage Restricted under Arizona Native Plant Law; HS= Highly Safeguarded under Arizona Native Plant Law.

The following are special status species known to occur in the IFNM and are most pertinent to the goals and objectives and alternatives under consideration in this plan. They include two Federal endangered species (Nichol Turk's head cactus and lesser long-nosed bat), two wildlife species of concern in Arizona (Sonoran desert tortoise (Sonoran population) and cactus ferruginous pygmy owl), and one species considered as priority vulnerable under Pima County's Sonoran Desert Conservation Plan (Tucson shovel-nosed snake).

3.1.6.1 Federally Listed Species

3.1.6.1.1 Nichol Turk's Head Cactus (Echinocactus horizonthalonius var. *nicholii).*

The Nichol Turk's head cactus has been listed as endangered by the USFWS since 1979. It currently occupies two areas in south-central Arizona: the Waterman Mountains in the IFNM and the Vekol Mountains in southwestern Pinal County.

In the IFNM, it occurs in limestone-derived alluvium between 2,000 and 3,600 feet in elevation. The IFNM contains approximately 5,000 acres of suitable habitat (USDI, BLM 1986a). The cactus is patchily distributed within the IFNM; occurrence ranges from rare to locally abundant, with three major concentrations documented within the Waterman Mountains ACEC (Dimmitt et al. 2003). The Waterman Mountains ACEC contains approximately 1,900 acres of suitable habitat for the Nichol Turk's head cactus. A recovery plan for the plant, completed in 1986, identified the following threats: (1) mining, (2) off-highway vehicle (OHV) use, (3) collecting, and (4) other factors, such as damage from bullets when it is used for target shooting. The Nichol Turk's Head Cactus Habitat Management Plan, which was completed in 1986, identified the following management objectives: (1) protect the habitat, (2) provide optimum habitat for naturally occurring populations, and (3) assist in the recovery of the plant (USDI, BLM 1986a).

3.1.6.1.2 Lesser Long-nosed Bat (Leptonycteris curasoae yerbabuenae).

The lesser long-nosed bat was listed as endangered by the USFWS in 1988. It is a migratory species that migrates into northern Sonora, Mexico, and southern Arizona each spring to establish maternity roosts, or colonies, where female bats congregate and give birth to their young. While in southern Arizona, the bats occupy desertscrub, semidesert grassland, and oak woodlands, where they forage in areas of saguaro, ocotillo, paloverde, prickly pear, and (later in the summer) among agaves at elevations between 3,500 and 5,500 feet. The bat is capable of flying distances of 30 miles (48 kilometers) or more one way during a single night's foraging excursion. They roost in caves, mines, and occasionally in old buildings. Known maternity roost sites occur at four locations along the United States/Mexico border. In the planning area, occasional sightings have been reported, but no maternity roosts have been documented. The closest maternity roost site to the IFNM is at Old Mammon Mine, located approximately 10 miles (16 kilometers) southwest of the Sawtooth Mountains. Based on a report by the Arizona Sonoran Desert Museum, "historically, 10,000 bats were known to occupy this roost" (ASDM 2003). Estimated exit counts from 1991 to 2000 have varied from 3,600 to 6,000 bats (USFWS 1994).

Recent surveys have determined that nectar bats utilize the IFNM as night roosts and foraging areas (Averill-Murray and Averill-Murray 2002; Krebbs and Petryszyn 2003). Between December 2001 and May 2003, studies were conducted by Arizona Sonoran Desert Museum and the University of Arizona to determine presence of foraging and roosting bats inside the IFNM (Krebbs and Petryszyn 2003). Results showed that a night roost for nectar bats was located in the Waterman Mountains, and a nectar bat was heard and observed for two evenings in the Ragged Top area. According to the report, there could be more nectar bats utilizing the area, and the IFNM may be an important stopover area for migrating bats (Krebbs and Petryszyn 2003).

Disturbance of roost sites is often deleterious to lesser long-nosed bats. Lesser long-nosed bats often abandon roosts sites with minimal levels of human disturbance. The use of only a small number of communal roosts by lesser long-nosed bats makes them particularly vulnerable to adverse effects from disturbance. Additionally, lesser long-nosed bats are thought to be negatively affected by excess harvest of agaves and the conversion of habitat for agricultural uses, livestock grazing, wood-cutting, and other development uses. Excessive browsing on the flower stalks of agaves by wildlife and livestock has also been suggested as possibly decreasing foraging opportunities and thus contributing to declines among these bats (USFWS 1994). Within IFNM, biological surveys have found that the density of agave is extremely low, and there was no observed impact from livestock on the limited number of agave or on the recruitment of young saguaro into the population (Dimmitt et al. 2003). Though cattle grazing remains a potential threat to the welfare of habitat for the lesser long-nosed bat throughout its range where excessive browsing on the flower stalks occurs (by wildlife or livestock), this was not a documented threat in the IFNM.

3.1.6.2 Other Special Status Species

3.1.6.2.1 Desert Tortoise – Sonoran Population (Gopherus agassizii)

The Sonoran desert tortoise is listed by BLM as a sensitive species and by AGFD as a wildlife species of concern in Arizona. It is found south and east of the Colorado River, from locations near Pearce Ferry in Mojave County, to the south beyond the international border, and at many scattered locations in between. The tortoise occurs primarily on rocky slopes and bajadas of Sonoran desertscrub consisting of paloverde–mixed cacti associations at elevations up to approximately 5,400 feet. Mostly herbivorous, they consume grasses, cacti, composite flowers, forbs, succulents, and parts of trees and shrubs. They eat many of the same plants as cattle, burros, deer, and bighorn sheep, wherein there is some potential for competition if food sources are limited. Native plants tend to provide better nutrition for tortoise than exotics. Tortoises and their primary habitat (paloverde-mixed cacti of the Arizona Upland Subdivision of the Sonoran Desert) are not fire-adapted. Important habitat components include suitable shelter sites, suitable forage plants, and unfragmented habitat (AGFD 2001). BLM has categorized habitat in the IFNM for the Sonoran desert tortoise as shown on Map 3-5: Sonoran Desert Tortoise Habitat, based on the criteria listed in Table 3-6 below.

Table 3-6: Sonoran Desert Tortoise Habitat Within the IFNM

	Category 1	Category 2	Category 3
Criterion 1: Importance of the habitat to maintaining viable populations	Habitat areas essential to maintenance of large, viable populations	Habitat area may be essential to maintenance of viable populations	Habitat area not essential to maintenance or viable populations
Criterion 2: Resolvability of management conflicts	Conflicts resolvable	Most conflicts resolvable	Most conflicts not resolvable
Criterion 3: Perceived desert tortoise density	Medium to high density or low density contiguous with medium or high density	Medium to high density or low density contiguous with medium or high density	Low to medium density not contiguous with medium or high density
Criterion 4: Population status	Increasing, stable, or decreasing populations	Stable or decreasing populations	Stable or decreasing populations
Acres[1]	14,540	30,890	35,350

SOURCES: BLM 2003b; Averill-Murray and Averill-Murray 2002.
NOTE: [1] Acres based on BLM surface managed lands.

Sonoran desert tortoises are particularly vulnerable to human activities because of the limited nature of their population numbers and habitats. They can move long distances (more than 3 miles), and they need homes that include hillsides with boulders. Expansion of urban areas and encroachment of recreation, roads, grazing, mining, and fire have adversely impacted some areas (USDI, BLM 1988). Tortoises tend to get run over by vehicles, picked up, illegally collected, shot, attacked by dogs, and vandalized. The proliferation of vehicle routes can fragment their habitat and increase mortality, collection and vandalism. Loss of reproductive-aged adults is the most serious threat to their populations. Upper respiratory disease, cutaneous dyskeratosis (a fungal shell disease), and a herpes virus also are threats to the species in some areas (Brown et al. 1994). Tortoise populations tend not to bounce back from mortality events as they have a low reproductive potential. Subsidized predators such as unleashed or feral dogs can have serious impacts locally.

Currently, desert tortoises are found in eight mountain ranges within the IFNM: West Silver Bell Mountains, Sawtooth Mountains, Silver Bell Mountains (including Ragged Top), Samaniego Hills, Waterman Mountains, Pan Quemado, Roskruge Mountains, and near Malpais Hill (Averill-Murray and Averill-Murray 2002). According to AGFD, the population density of tortoises has been the highest in the West Silver Bell Mountains, Ragged Top (Silver Bell Mountains), and the Sawtooth Mountains. These

mountains may have more emigration and immigration. In addition, low-density areas (Samaniego Hills, Waterman Mountains, Roskruge Mountains, and Pan Quemado) may be more dependent on immigration for long-term stability (Averill-Murray 2004; Averill-Murray and Averill-Murray 2002).

3.1.6.2.2 Cactus Ferruginous Pygmy-Owl (Glaucidium brasilianum cactorum)

The cactus ferruginous pygmy-owl is listed by BLM as a sensitive species and by AGFD as a wildlife species of concern in Arizona. The historic range of the cactus ferruginous pygmy-owl in Arizona extends north from the U.S.-Mexico border to New River, to the Gila Box (East) and to the Cabeza Prieta Mountains (West). The current documented distribution of pygmy-owls is limited to Pima and Pinal counties. Within its range in Arizona, the cactus ferruginous pygmy-owl currently occupies riparian woodlands, mesquite bosques, Sonoran desertscrub, semidesert grasslands, and Sonoran savanna grassland communities below 4,000 feet (USFWS 2003). Their diet includes other birds, lizards, insects, and small mammals. In desertscrub communities, plant diversity, composition, and structure play a critical role in providing the most suitable habitat components for the owl. In addition, habitat connectivity between currently occupied areas in northwest Tucson and the Tohono O'odham Nation is important. Typically, riparian corridors are used for movement, protection, cover, and foraging.

The cactus ferruginous pygmy-owl is threatened by present and potential future destruction and modification of its habitat throughout a significant portion of its range in Arizona. The destruction of riparian woodlands played a role in the decline of pygmy-owls in Arizona. Current threats to the cactus ferruginous pygmy-owl in Arizona include the loss and fragmentation of upland and xeroriparian vegetation from large scale and commercial developments. Wildland fires alter desert habitat, destroying saguaro, trees, and other important habitat components. Dispersing pygmy-owls may avoid non-vegetated areas such as golf courses, residential developments, and roads. Human-caused mortality has been documented. Such incidents include collisions with windows and fences, shootings, and predation by domestic cats. Human activities near nests at critical periods of the nesting cycle may cause pygmy-owls to abandon their nest sites. Outdoor recreational activities such as OHV and motor bike use, firearm target practicing, and jeep tours may disturb pygmy-owls.

3.1.6.2.3 Tucson Shovel-nosed Snake (Chionactis occipitalis klauberi)

The Tucson shovel-nosed snake is listed by Pima County as a priority vulnerable species and the USFWS has issued a 90-day finding that the species may warrant listing as a threatened or endangered species protected by the ESA. The Tucson shovel-nosed snake is distributed from west of Tucson northward along Avra Valley to Pinal County. Its current range in the IFNM is poorly known. However, the area between the West Silver Bell Mountains and the Santa Rosa Mountains may have supported this species. It is believed to be eliminated from Avra Valley due to habitat loss and most of its range now lies in southern Pinal County.

The primary habitat is sandy-silty flats on valley floors and, sand dunes below 2,200 feet. This species also will frequent washes and rocky hillsides where there are sand gullies or pockets of sand among the rocks. There may be limited vegetation, consisting mostly of creosote, desert grasses, cacti, mesquite and other shrubs. The diet consists of cockroaches, crickets, spiders, scorpions, centipedes, buried moth larvae and other insects.

The Tucson shovel-nosed snake exists only in lowland valley floors which are rapidly diminishing due to clearing for agriculture and development. Preservation of this habitat is the biggest factor in halting the decline of this subspecies. Off-road vehicle activities could adversely impact this species. Road building could destroy and fragment habitat, while increased traffic could increase road kills. The species is being considered for protection under the Sonoran Desert Conservation Plan, currently being developed by Pima County.

3.1.6.3 Migratory Birds

Various species of migratory birds summer, winter, and/or migrate through the IFNM. The habitat diversity provided by the broad expanses of Sonoran Desertscrub vegetation zones (including paloverde-cacti-mixed scrub, jojoba chaparral, creosote-white bursage, and xeroriparian communities) support numerous species of migratory birds. The most characteristic species include turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), white-winged dove (*Zenaida asiatica*), elf owl (*Micrathene whitneyi*), lesser nighthawk (*Chordeiles acutipennis*), black-chinned hummingbird (*Archilochus alexandri*), ash-throated flycatcher (*Myiarchus cinerascens*), purple martin (*Progne subis*), Bell's vireo (*Vireo atricapillus*), Lucy's warbler (*Vermivora luciae*), and sage sparrow (*Amphispiza belli*). Species such as killdeer (*Charadrius vociferous*), great blue heron (*Ardea herodias*), mallard (*Anas platyrhynchos*), and black-necked stilt (*Himantopus mexicanus*) may be found where suitable habitat exists.

3.1.7 Fire Ecology and Management

The BLM categorizes historic/natural fire regimes current for fire conditions in Arizona based on the results of a nationwide coarse-scale assessment and mapping effort (Schmidt et al. 2002; USGS 1999). In Arizona, BLM lands fall into four of the five identified historic/natural fire regimes, ranging from Category I (0 to 35 year frequency and low severity) to Category IV (35 to 100+ year frequency, stand replacement severity). The IFNM is characterized as a Category III historic/natural fire regime (i.e., having a 35- to 100-year frequency with a mixed severity of fires).

The current condition classes include Class 1 (i.e., lands where vegetation species, composition, and structure are intact and functioning within historic range), Class 2 (i.e., lands where fire size, frequency, intensity, severity, and/or landscape pattern and vegetation have been moderately modified), and Class 3 (i.e., lands where fire size, frequency, intensity, severity, and/or landscape pattern and vegetation have been significantly altered from historical range). All of the lands within the IFNM Decision and planning areas are designated as current condition Class 1. The BLM's Arizona Statewide Land Use Plan Amendment for Fire, Fuels and Air Quality Management provides general direction for fire management to meet statewide goals (USDI, BLM 2003a). Fuels treatments would occur on a case-by-case basis, generally in areas where treatments would be necessary for removal of invasive or exotic species.

3.1.8 Cultural Resources

Research in the Tucson vicinity and southern Arizona has outlined the cultural history of the region (Reid and Whittlesey 1997). Human occupation of the area can be separated into six periods that represent changing adaptations and lifeways. These include the Paleoindian (circa 12,000–8000 B.C.), Archaic (circa 8000–1500 B.C.), Late Archaic/Early Agricultural (circa 1500 B.C.–A.D. 650), Formative (circa A.D. 650–1400), Ethnohistoric (aboriginal protohistoric and historic, circa A.D. 1400–1950), and Euro-American historic (circa A.D. 1500–1950) eras.

Paleoindian occupation began at least as early as 12,000 B.C. during the late Pleistocene era when expansive ice sheets were retreating from the North American continent. Paleoindians hunted species that became extinct at the end of the Ice Age, such as mammoths. Although significant Paleoindian hunting sites have been found in southeastern Arizona, evidence of the Paleoindian era in the vicinity of the IFNM is limited to isolated spear points (Agenbroad 1967; Ayres 1970; Doelle 1985; Huckell 1984).

The subsequent Archaic era, beginning at approximately 8000 B.C., represents an adaptation based on hunting wild game and gathering indigenous plant foods within a climatic regime similar to modern conditions (Sayles 1983; Sayles and Antevs 1941).

Several Late Archaic/Early Agricultural era sites have been discovered along the course of the Santa Cruz River southeast of the IFNM (Gregory and Mabry 1998; Mabry et al. 1997). Late Archaic/Early Agricultural sites on the Santa Cruz River include some of the oldest canal systems and oldest pottery vessels found in southern Arizona (Gregory 1999; Heidke 1997; Heidke and Ferg 1998; Mabry 1999).

Sites of the Formative era dominate the regional archaeological record. These sites reflect an adaptation focused on farming villages, although wild game and indigenous plant foods continued to be exploited. Around A.D. 500, a culture known as the Hohokam began to flourish and occupied much of what is today southern and central Arizona for approximately a millennium. Marine shell jewelry, obsidian flaked stone artifacts, turquoise, copper bells, and macaws indicate the Hohokam traveled well beyond their core area of settlement or traded with groups in surrounding areas.

The current condition of cultural resources is characterized by discussing three indicators: (1) inventory and evaluation, (2) threats to the historical integrity of resources and responses to those threats, and (3) public and professional interpretation of cultural resources.

3.1.8.1 Extent of Inventory and Evaluation

Cultural resource survey is labor intensive and costly, and simple inventory and evaluation is a major challenge for managing cultural resources. Archaeological sites reflecting both prehistoric and historic-era occupation of the region are abundant, and the sites that have been recorded represent only a small percentage of the cultural resources within the IFNM. Twenty-one documented surveys have, in the aggregate, inventoried approximately 21,194 acres (33.1 square miles) for cultural resources within the IFNM (Table 3-7). (Approximately 30 additional cultural investigations have been conducted in the IFNM, but are not well documented.) The surveys encompass about 12 percent of the public land and about 9 percent of the nonpublic lands within the IFNM.

Table 3-7: Summary of Cultural Resource Inventory Data

	State and Private Lands	Federal Public Lands (Surface Estate)	Planning Area (Entire IFNM)
Size (acres)	60,221	128,398	188,619
Size (square miles)	94	201	295
Surveyed for cultural resources (acres)	5,622	15,572	21,194
Surveyed for cultural resources (square miles)	8.8	24.3	33.1
Percentage surveyed	9.3%	12.1%	11.2%
Recorded cultural resources	64	279	343
Density (sites/square mile)	7	11	10
Projected number of resources	700	2,300	3,000

SOURCES: AZSITE 2003; Dart and Gibson 1988; Gibson 1987a, 1987b; Heilen 2004; U.S. Department of the Interior, Bureau of Land Management 2004a

NOTE: Numerous errors regarding site jurisdiction were noted in the AZSITE database. Jurisdiction was determined by overlaying a current geographic information system jurisdictional map onto the site locations. If any part of a site was on public land, it was treated as being within the decision area. BLM has no authority or responsibility to manage cultural resources on State Trust and private lands within IFNM.

The various surveys within the IFNM have recorded a total of 343 archaeological and historical sites. More than 80 percent of the recorded sites (279) are on BLM surface estate, and the other are on State Trust land (61) and private lands. The average density is about 11 sites per square mile on public land and about 7 sites per square mile on State and private land. The survey data suggest there could be approximately 3,000 sites within the IFNM (with about 2,300 on the BLM surface estate. The University of Arizona recently completed a more statistically rigorous sample survey that indicates that there could be about twice that many sites within the IFNM (Heilen and Reid 2006). The survey also recorded almost

3,400 isolated finds indicating that there could be on the order of 125,000 isolated artifacts and features within the IFNM.

About 89 percent of the 343 sites recorded within the IFNM reflect the aboriginal occupation of the region, and about 7 percent reflect historical Euro-American occupation. About 3 percent of the sites have both aboriginal and Euro-American components, and the cultural and temporal affiliations of the remaining sites are unknown.

The only possible evidence of Paleoindian occupation identified in the IFNM is a broken spear point found on sites with Archaic and Hohokam components. Five recorded sites have been identified as dating to the Archaic era and 19 other Archaic components have been recognized on other multicomponent sites.

Evidence of the Hohokam occupation of the region dominates the archaeological record of the IFNM; 201 of the recorded sties have been classified as Hohokam or probably Hohokam sites, and 34 other Hohokam components have been recorded at multicomponent sites. The cultural affiliations of 63 other recorded sites and 2 components at sites with historical Euro-American components have been classified as reflecting unidentified prehistoric occupation. Nine sites have been classified as reflecting protohistoric or historic period O'odham use of the IFNM, and 13 other O'odham components have been identified at multicomponent sites. Two components at sites with O'odham components have been tentatively identified as possibly reflecting affiliations with the Patayan culture, which was centered along the lower Colorado River west of the Hohokam territory, and a possible Apache component has been recorded on a Hohokam site.

About 25 to 30 of the sites recorded in the IFNM appear to represent Hohokam habitation sites, ranging from small farmsteads to large villages. Features noted at these sites include trash mounds, roasting pits, rock piles, rock alignments, and petroglyphs (rock art), along with numerous artifacts. A focus of Hohokam habitation that overlaps the northeastern corner of the IFNM has been designated as the Los Robles Archaeological District. About 130 archaeological sites have been recorded within the 20.7-square-mile district. Many of the sites within the district are on State Trust land, including the large villages known as Cerro Prieto and Pan Quemado. The Los Robles platform mound site at the core of the district also in on State Trust land north of the IFNM. Twenty-one of the significant sites within the Los Robles Archaeological District are located on BLM surface estate.

Another Hohokam habitation focus has been designated as the Cocoraque Butte Archaeological District. There are at least two Hohokam habitation sites and many petroglyphs in the district, which encompasses two large buttes, three smaller hills, and the surrounding flats on public and private land in the southeastern part of the IFNM.

Most of the other aboriginal sites appear to reflect seasonal habitation or camps, or temporary work locations where activities such as collection and processing of indigenous resources (such as cactus fruits) were pursued. These sites consist of scatters of artifacts such as broken pottery and pieces of flaked and ground stone. About one-third of the artifact scatters have archaeological features of various types, such as roasting pits, rock piles, rock alignments, clearings, check dams, petroglyphs, stone tool quarries, and bedrock grinding stones. About 45 of the recorded sites have petroglyphs.

A unique historic-period site is the Santa Ana de Cuiquiburitac Mission, which was the location of a *visita* (chapel served by a visiting priest) built in 1810-1811. The building is no longer extant, but artifacts and features are scattered across the site, which also has an O'odham component.

Twenty-four historic-period sites have been classified as having or probably having Euro-American affiliations. These sites include the Silver Bell Cemetery and the alignment of an abandoned railroad that

served the mining town of Silver Bell, located in the Silver Bell Mountains just outside the IFNM. Other Euro-American sites include a gravesite, a camp, three mining prospects, a road segment, and trash scatters. Two minimally recorded sites have yielded no clues about their cultural affiliations.

There is limited information pertaining to specific places within the IFNM identified as having traditional cultural significance, but an inventory study has not been conducted. Tribes with traditional cultural affiliations with the region are known to have concerns about treatment of human remains, funerary objects, sacred objects, and objects of cultural patrimony that are sometimes present within archaeological sites. Members of the Tohono O'odham Nation, which borders the IFNM, also might consider some places within the IFNM that were used traditionally, such as stands of saguaro where fruit was collected, as having cultural significance (Nabhan 1987, 1982). The Cocoraque Butte area is also known to have some significance as a traditional cultural place. BLM plans to work closely with the Tohono O'odham Nation and other concerned tribes to implement cultural resource management that accounts for the extensive historic use of the area by local tribes, and that acknowledges tribal knowledge of and concern for the cultural resources of the IFNM. Additional discussion of tribal interests is provided in Section 3.4.

Prior to the designation of the IFNM, which provides recognition and a measure of protection for all of the cultural resources within the IFNM, three historic properties had been recognized as having special significance by being listed in the National Register of Historic Places (Table 3-8). These include the Los Robles Archaeological District, Cocoraque Butte Archaeological District, and the Santa Ana de Cuiquiburitac Mission Site. The transfer of cultural resources eligible for the National Register is, by regulatory definition, an "adverse effect." BLM approval of the land exchange implies that overall it resulted in public benefits. In 1986, the Arizona State Legislature authorized development of a state park to preserve and publicly interpret the Los Robles Archaeological District, but development of the park was not pursued and it was declassified as a state park in 1988.

Table 3-8: National Register Status of Cultural Resources Recorded within the IFNM

National Register Status	Total Sites	%	Owner			
			BLM	%	Private/ State	%
Properties listed						
Los Robles Archaeological District						
Sites within IFNM identified as contributing properties	53	15%	21	40%	32	60%
Sites within IFNM identified as noncontributing properties	4	1%		0%	4	100%
Sites within IFNM not identified in nomination	1	<1%		0%	1	100%
Subtotal of sites within Los Robles Archaeological District in IFNM[1]	59	17%	21	36%	38	64%
Cocoraque Butte Archaeological District	1	<1%	1	100%		0%
Santa Ana de Cuiquiburitac Mission Site	1	<1%	1	100%		0%
Recommended eligible	175	51%	175	100%		0%
Recommended ineligible	22	6%	22	100%		0%
Unknown or unevaluated	86	25%	59	69%	27	31%
Totals	343	100%	279	81%	64	19%

SOURCES: AZSITE 2003; Dart and Gibson 1988; Gibson 1987a, 1987b; Heilen 2004; U.S. Department of the Interior, Bureau of Land Management 2004a

NOTE: [1] The Los Robles Survey assigned a total of 158 sites numbers. Some of these were combined when site numbers were assigned in the Arizona State Museum survey system. A total of 119 sites with Arizona State Museum numbers are classified as contributing sites in the Los Robles District, and 10 as noncontributing sites. Approximately 45 percent of the sites within the listed district are within IFNM.

The recorders of 175 other sites have recommended that they be considered eligible for the National Register, and 22 sites have been evaluated as ineligible. The eligibility of the remaining sites within the IFNM has not been evaluated.

Subsequent to the issuance of the draft EIS, two surveys inventoried cultural resources along 126.25 miles of selected roads within and adjacent to the INFM (Fischler and French 2007; Whitney and others 2008). The surveys covered 30-foot-wide corridors along approximately 111.5 miles of roadways on Federal public land managed by BLM within the IFNM, 7 miles of roadways on State Trust land within the IFNM, and 7.75 miles on Arizona State Trust land adjacent to the IFNM. With the completion of those surveys, all but about 15 miles that the proposed Alternative C designates as remaining open for motorized use have been inventoried for cultural resources.

The surveys found 10 previously recorded sites and discovered 80 other archaeological and historical sites (Table 3-9). (Thirty-five of the other previously recorded archaeological and historical sites are located along 21.4 miles of roads covered by prior surveys on public land within the INFM.) Fifty-seven of the discovered sites were along roads on public land managed by BLM within the IFNM. Nine of the sites are on State Trust land within the IFNM, and the other 14 sites are on State Trust land adjacent to the IFNM.

Table 3-9: Summary of Supplemental Cultural Resource Road Surveys

	Federal Public Land	State Land within IFNM	State Land adjacent to IFNM	Totals
Extent of Supplemental Survey				
Miles surveyed within IFNM	111.5	7.0	7.75	126.25
Sites Discovered				
Archaic	2	0	0	2
Hohokam artifact scatter	19	5	6	30
Hohokam habitation	3	0	3	6
Prehistoric (unidentified period)	9	0	3	12
Historical O'odham	11	1	0	12
Historical Euro-American	10	2	0	12
Prehistoric/Historic	3	1	2	6
Total Sites Discovered	57	9	14	80
National Register of Historic Places Evaluations				
Recommended eligible	50	9	14	73
Recommended potentially eligible	5	0	0	5
Recommended not eligible	2	0	0	2

The discovered sites were similar to those previously recorded on the IFNM. Fifty of the sites reflect prehistoric occupation of the area. Twelve of those could not be more precisely dated, but 2 were identified as dating to the Archaic period and 36 to the Hohokam period. Twelve sites were identified as historical Tohono O'odham sites, and 12 were identified as historical Euro-American sites. Six sites had both prehistoric and historical components.

Most of the prehistoric sites seem to reflect seasonal camps or temporary use locations, but six sites appear to be remnants of permanently occupied Hohokam habitations. The historical sites include trash dumps, camps, windmills, cairns, mine shafts and prospects, and other features associated with mining and ranching activities.

The BLM has not formally evaluated the National Register eligibility of the 80 discovered sites, but the recorders evaluated 73 of them as having potential to yield important information and recommended that they be considered eligible for the National Register under Criterion D. The recorders recommended that five of the historical Euro-American sites be considered potentially eligible pending the results of further

archival research, and they also concluded that two historical trash dumps had no values that warrant preservation, and recommended that they be considered ineligible for the National Register.

3.1.8.2 Extent of and Responses to Threats

Three factors threaten the integrity of cultural resources, including (1) disturbance or destruction by various types of development projects or land uses (including travel by undocumented immigrants and smugglers), (2) natural erosion, and (3) unauthorized excavating and artifact collecting by vandals or uninformed recreational users.

Review of potential impacts on cultural resources due to authorized uses of public land within what is now the IFNM began in the 1970s in response to the passage of the National Historic Preservation Act. Prior to that time, the most substantial use of the area was related to livestock grazing and prospecting and the most substantial impacts on cultural resources probably were due to development of roads. Projects or land uses reviewed since the 1970s have included electrical transmission lines, microwave communication sites, roads, mineral exploration, range improvements (such as fences, cattle guards, waterlines, and reseeding projects), and an ultralight airfield. The only approved project that has resulted in an adverse effect on cultural resources in the vicinity of IFNM was a land exchange with ASARCO for expansion of the Silver Bell Mine. Three prehistoric and eight historical sites immediately adjacent to IFNM were studied before they were transferred from Federal ownership (Slawson and Ayres 1994, 1992). Two sites on the National Register have sustained notable damage over the last few years. Petroglyphs within the Los Robles Archeological District on BLM land have been vandalized and defaced by imposter (new) petroglyphs. Other sites on State Trust land within the District have also been extensively damaged. BLM regularly monitors this site. The Santa Ana de Cuiquiburitac Mission site was damaged by the creation of an unauthorized immigration route through the foundation of the chapel. In collaboration with the Tohono O'odham Nation, BLM has placed a barrier of approximately 35 boulders around the chapel foundation to prevent vehicular travel across the site. This barrier has proven to be an effective protection measure. Both the BLM and Tohono O'odham Nation currently monitor the site. Additionally, BLM and the Tohono O'odham Nation intensively mapped the site and surface features as part of the stabilization process.

There are only meager data regarding the extent to which erosion is threatening the historic integrity of cultural resources within the IFNM. Responses to the threats of erosion include stabilization and restoration.

Unauthorized collection of cultural materials by persons uninformed of cultural resource protection laws and intentional vandalism, such as target shooting and graffiti, are the most serious threats to cultural resources on public land within the IFNM. However, there is little quantitative data about the extent of the problem. Current responses to the threat of vandalism include site monitoring, reconnaissance, and law enforcement. BLM cooperates with the State Historic Preservation Office in supporting a statewide site-steward program. Volunteers regularly monitor selected sites and report vandalism or other damage to appropriate land managing agencies. This has been one of the most successful strategies for protecting cultural resources on public land. The Tucson Field Office currently is working with approximately six volunteer site stewards and a local landowner who monitor archaeological sites within the IFNM. Sites are monitored throughout the IFNM with a special focus on the Los Robles and Cocoraque Butte Archaeological Districts and Silver Bell Cemetery. When vandal excavations and damaged or stolen cultural materials are noted, they are reported to BLM rangers for follow-up investigations.

Other protection measures include placing signs at sites to inform visitors of laws protecting cultural resources and penalties for unauthorized collection and excavation. The only signs, fences, and gates installed to protect cultural resources within the IFNM are in the vicinity of the Cocoraque Butte Archaeological District; but installation of signs to protect other sites is planned. Administrative measures

such as road closures or special management designations also can be used to protect cultural resources. Roads have been closed at Cocoraque Butte, but these closures have been difficult to enforce.

3.1.8.3 Interpretation of Cultural Resources

The primary motivation for protecting and preserving cultural resources is to enhance public and professional interpretation and appreciation of our cultural heritage. Public interpretation within the IFNM has been limited primarily to occasional guided tours of Hohokam petroglyph sites. Future opportunities for public interpretation include heritage publications, other media products, interpretive signs and kiosks, and visitor centers.

Professional interpretation of cultural resources within the IFNM has been more intensive. The IFNM has been used as an "outdoor laboratory" for training student and avocational archaeologists. University of Arizona faculty and students have conducted two major research investigations of archaeological resources within IFNM. One of these studies involved an extensive survey that documented the Hohokam Los Robles platform mound community and the Cerro Prieto trincheras site, and resulted in the listing of the Los Robles Archaeological District in the National Register (Downum 1993). The second study was a University of Arizona research project that surveyed 5,186 acres in sample parcels distributed throughout the IFNM in order to better understand the distribution of archaeological resources within the IFNM (Heilen 2005; Heilen and Reid 2006). The survey doubled the number of recorded sites within the IFNM. The third study involved an evaluation of the Santa Ana de Cuiquiburitac visita site (Reid and Heilen 2005).

3.1.9 Paleontological Resources

Paleontological resources constitute a fragile and nonrenewable scientific record of the history of life on earth. Once damaged, destroyed, or improperly collected, the scientific and educational values of these resources are reduced greatly or lost forever. In addition to their scientific, educational, and recreational values, paleontological resources can be used to understand interrelationships between the biological and geological components of ecosystems over long periods of time.

The fossils found on public lands are considered part of our national heritage and are therefore afforded protection. Vertebrate fossils or other noteworthy occurrences of invertebrate and plant fossils are considered significant by the BLM. Invertebrate and plant fossils are typically more abundant, and therefore, the BLM does not ordinarily consider them to be of significance.

Areas containing vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils are managed under one of four management classes:

> ***Class 1 (low sensitivity)***: Igneous and metamorphic geologic units and sedimentary geologic units where vertebrate fossils or uncommon nonvertebrate fossils are unlikely to occur
>
> ***Class 2 (moderate sensitivity)***: Sedimentary geologic units that are known to contain or have unknown potential to contain fossils that vary in significance, abundance, and predictable occurrence
>
> ***Class 3 (moderate sensitivity)***: Areas where geologic units are known to contain fossils but have little or no risk of human-caused adverse impacts and/or low risk of natural degradation
>
> ***Class 4 (high sensitivity)***: Areas where geologic units regularly and predictably contain vertebrate fossils and/or uncommon nonvertebrate fossils, and are at risk of natural degradation and/or human-caused adverse impacts

The IFNM is mainly Class 1 and Class 2, though there are a few Class 3 areas. Acres within each management class are summarized in Table 3-10.

Table 3-10: Classification of Lands within the IFNM for Fossil Sensitivity

Management Class	Approximate acres within the Planning Area	Approximate acres administered by BLM
Class 1	62,610	43,800
Class 2	107,050	71,630
Class 3	20,040	12,970

SOURCE: U.S. Department of the Interior, Bureau of Land Management 2005

Paleontological resources in southern Arizona are typically found in the Quaternary deposits. There are a few limited known occurrences of paleontological resources on the IFNM; however, no significant fossils are known to occur within the monument. Several neotoma (packrat) middens located in late Pleistocene and subrecent deposits have yielded various animal and plant species in the Wolcott Peak area of the IFNM (USDI, BLM 1980a). Vertebrate fossils in southern Arizona include remnants of early horses, elephants, dogs, gomphotheres, camels, mammoths, llamas, birds, fish, beavers, rats, foxes, weasels, squirrels, lizards, snakes, chipmunks, mice, gophers, tortoises, bats, marmots, wolves, bears, badgers, skunks, ground sloths, woodchucks, cats, donkeys, rhinoceros, peccaries, deer, elk, and bison. These are typically found in the unconsolidated silt, sand, and gravel deposits of the Quaternary (Holocene and Pleistocene), as well as the Tertiary sedimentary units. Some of these have been discovered during major earth-moving activities, such as during highway and building construction projects. Others have been discovered as ongoing erosional processes expose fossil remnants (Ratkevich 1993; Scarborough 2003; USDI, BLM 1980a). Some of the Jurassic-aged sedimentary units in southern Arizona have yielded fragments of dinosaur (believed to be tritylodontid) and crocodile (McCord and Tegowski 1996). Some Cretaceous-aged dinosaurs (stegosaurian or archosaurian) have been found in the Comobabi Mountains to the west of Tucson (McCord and Tegowski 1996). These older fossils are not abundant, but they may occur in some geologic units in the planning area. Mammal tracks have been reported in Tertiary volcanic sedimentary rocks in the Sawtooth Mountains (Scarborough 2002).

Various invertebrate fossils have been noted in southern Arizona and include corals, brachiopods, gastropods, foraminifera, holothurians, ostracods, bryozoans, crinoids, trilobites, cephalopods, pelecypods, echinoids, blastoids, and others.

The BLM has developed objectives for paleontological resources (BLM Manual H-8270-1, General Procedural Guidance for Paleontological Resource Management) to provide protection of the resources. It is the policy of BLM to manage paleontological resources for these values and to mitigate adverse impacts on them.

3.1.10 Visual Resources

The IFNM is a landscape of contrasts. Its broad, flat valleys are interrupted by rugged, steep-sloped mountains, and punctuated by isolated hills. The gently sloping bajadas that soften the transitions between jagged mountain and valley floor are dissected by dry, desert washes that nevertheless support a variety of colors. A variation of green-hued vegetation is found in abundance, and the reds and yellows of native flowers appear in their seasons. The richness of the ecosystem is manifest in the sometimes dramatic, sometimes subtle variations in colors and textures that cover, yet fail to obscure, the striking landforms that hint at the geological processes that formed this southwestern region of the United States. The sculptural forms of Sonoran Desert cacti add an almost museum quality to some of the landscapes within the IFNM.

The topography of the IFNM is a visually exciting variation of line and form, much of it visible from populated areas in the vicinity of the Monument, including Avra and Santa Cruz valleys, Tucson, Marana, Oro Valley, Casa Grande, and other nearby communities. The prominent landforms within the IFNM—including the Sawtooth, Waterman, Roskruge, Silver Bell, and West Silver Bell Mountains, Pan Quemado, the Samaniego Hills, and the Avra and Aguirre Valleys—vary in elevation from 4,261 feet in the Silver Bell Mountains to 1,800 feet in the valleys. Small hills rising a few hundred feet pleasantly dot the bajadas and valleys, looking like scattered piles of mountain-building material left behind by an untidy artist. Ragged Top is the most prominent landmark, visible from many places in the IFNM. The medium to dark grays of the weathered basalt-rock mountains and hills contrast with the underlying, lighter material exposed by erosion or excavations. Basalt desert pavement occasionally appears is patches on the light gray soils of the bajadas.

The textures and colors of vegetation in the IFNM contribute greatly to its scenic quality. Legumes (foothill paloverde, blue paloverde, and ironwood trees) and saguaros dominate the mountain ranges, and dense stands of ironwood trees populate the bajadas near the Ragged Top, Roskruge, Waterman, and Silver Bell Mountains. Exceptionally large ironwood trees are found in the bajadas north of the West Silver Bell Mountains and east of the Samaniego Hills. A rich understory layer of shrubs and cacti softens the landscape, occasionally joined by the many annuals that appear in abundance in wet years. High quality examples of large and dense dry-wash vegetation of both the Lower Colorado River Valley and Arizona Upland Subdivisions (described in Section 3.1.4) are found in bajadas and flats in Avra Valley, and in the lower elevations of Aguirre Valley. The light browns and neutral tones of the sand and cobble of the washes contrast with a density of greens along the corridors. Relatively vibrant wildflower displays occur seasonally throughout the IFNM, contrasting with the medium to dark browns of the mountains. Vegetation colors vary according to time of year and with rainfall amounts, and are characterized by light, muted green-yellow foliage, and the medium-to-dark grays and browns of branches when plants are out of leaf.

Existing landscape modifications on public land are mainly related to access roads, present mining and past minerals exploration, electric transmission lines and service (distribution) lines, buried pipelines, range improvements (fences, wells, water storage tanks and troughs, corrals, earthen dams, past vegetative treatments, salt licks, and livestock loafing areas), wildlife water developments, mountaintop communication sites, and OHV use tracks. Existing landscape modifications on lands adjacent to and within the planning area include residential development, agricultural fields, public utilities, and modifications related to mining operations. The Silver Bell and Happy Jack Mines in the mountains are the most noticeable landscape modifications within the IFNM. The strong color contrast of the cuts and fills can be seen from over 15 miles away.

3.1.10.1 Visual Resource Inventory

The visual resources of the planning area were inventoried in 2004 and classified in accordance with procedures outlined in BLM Handbook 8410-1 (USDI, BLM 1986b) and Technical Note 407 (USDI, BLM 2001b), as part of the preparation of this plan. The inventory identified the area's scenic quality, visual sensitivity, visibility, viewing distance, and visual resource inventory classes. All lands in the planning area were assigned to one of four visual resource inventory (VRI) classes (Map 3-6). These classes did not establish management direction, but provided information regarding the on-the-ground conditions for visual resources. VRI classes characterize the landscape's relative importance based on the combination of scenic quality, visual sensitivity and viewing distance. Scenic quality classes are used to describe the visual character, diversity, attractiveness and appeal of the landscape. Scenic quality is described in classes based on the landscape's landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modification features in the landscape. Much of the planning area has retained its scenic quality, even though numerous cultural modifications and changes to the landscape are evident

within the IFNM. A cultural modification is any human-caused change to landform, water features, or vegetation, or the addition of a structure that is in visual contrast to the natural landscape (including contrast in form, line, color, or texture) (USDI, BLM 1984). Manmade features do not necessarily detract from a landscape's beauty; some may even complement the natural landscape and enhance its scenic value (USDI, BLM 1986b). Views of cultural modifications on lands adjacent to the planning area may or may not be considered interesting (i.e., views of aircraft within the airpark), depending on the viewer. The Silver Bell mine in is the most noticeable cultural modification adjacent to the monument, with strong color contrast between disturbed earthwork areas and the surrounding land.

Class A scenery has the highest scenic quality, with many outstanding features, and Class C scenery has the lowest scenic quality. In the IFNM, the Ragged Top and Sawtooth Mountain areas have the highest scenic quality, and the creosote flats have the lowest scenic quality.

Table 3-11: Scenic Quality Classes for Public Lands in the IFNM

Scenic Quality Class	Sum (acres)
A	6,558
B	89,215
C	32,627
Total	128,400

SOURCE: VRI inventory 2005, BLM/URS

Visual sensitivity is the second factor considered in determining an area's VRI class. Visual sensitivity is primarily based on the type of viewer affected, the type and amount of viewing, and special considerations. Sensitivity levels range from low, moderate to high, and provide a measure of overall public concern regarding the area's scenery. The planning area receives high viewing volume, public interest, and is under a special area designation as a national monument. Therefore, visual sensitivity for all lands in the planning area is considered to be high.

Viewing distance is the third factor considered in determining an area's VRI class, and is classified as foreground, middle ground, and background. The details of landform and vegetation features are easily discerned in the landscape viewed in the foreground/middle ground distance, and visual impacts to the landscape are more noticeable. Because of the numerous public travel routes and populated areas within and adjacent to the monument and its surrounding area, most of the monument lands are viewed in the foreground/middle ground distance zone. Lands east of the mountain ranges are the most exposed to viewing from off-site travel corridors, communities, and recreational destinations in the valley along Interstate 10.

These three factors were considered in determining VRI classes in the IFNM, as shown in Table 3-12 below. VRI Class II areas include the most important visual resources values, and Class IV areas include the least important. No VRI Class I areas were identified in the monument; Class I is reserved for special congressional or administrative designations specifically mandating the preservation of the landscape, and is independent of scenic quality and visibility.

Table 3-12: Visual Resource Inventory Classes in the IFNM

VRI	Acres
II	95,656
III	32,744
Total	128,400

3.1.10.2 Visual Resource Management

This visual values derived from the visual resource inventory are taken into consideration along with other land use allocations and desirable outcomes when designating Visual Resource Management (VRM) classes. VRM classes may differ from VRI classes. They are used to identify visual contrast thresholds to preserve the visual quality of the landscape, and they establish objectives for managing visual resources on public lands, as described below:

Class I Objective: To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.

***Class II Objective*:** To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.

Class III Objective: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.

Class IV Objective: To provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

At present, the entire monument is managed as Class III under the existing land use plan.

3.1.11 Wilderness Characteristics

The BLM Land Use Planning Handbook (H-1601-1) provides guidance on considering wilderness characteristics in the land-use planning process. The Handbook states with regard to "Wilderness Characteristics":

> Identify decisions to protect or preserve wilderness characteristics (naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive and unconfined recreation). Include goals and objectives to protect the resource and management actions necessary to achieve these goals and objectives. For authorized activities, include conditions of use that would avoid or minimize impacts to wilderness characteristics.

The BLM received a wilderness proposal from the Arizona Wilderness Coalition (AWC) in September 2002 that included four areas in the IFNM. The proposal recommended the Sawtooth Mountains, Ragged Top, West Silver Bell Mountains, and Silver Bell Mountains for consideration as wilderness study areas.

BLM completed a wilderness characteristics assessment to determine if lands with wilderness characteristics are present in the planning area, including the areas proposed by the AWC. The assessment utilized data gathered for the plan in the visual, recreation, vegetation, ecological site, and wildlife habitat resource inventories.

The wilderness characteristics assessment confirmed the presence of the wilderness characteristics of size, naturalness and outstanding opportunities for solitude in the areas proposed by the AWC and in an additional area of the Roskruge Mountains. Based on this assessment, approximately 36,990 acres of BLM-administered land possess wilderness characteristics (refer to Map 2-10).

Outstanding opportunities for primitive recreation were not found in the IFNM due to the accessibility of the landscape and proximity to motorized travel routes. Existing fences, maintained and primitive roads, and developments somewhat confine dispersed recreation use, particularly movement by equestrian and foot traffic throughout the IFNM.

Areas that have the highest quality of naturalness, solitude, and semi-primitive recreation opportunities are found in the West Silver Bell Mountains and Roskruge Mountains.

3.2 RESOURCE USE CONDITIONS

3.2.1 Energy and Minerals

3.2.1.1 Renewable Energy Resources

3.2.1.1.1 Solar Energy

Solar energy is a renewable energy resource that has excellent potential for generating electricity in Pima and Pinal Counties. The region including the planning area has recently been identified as having a large total land area for high-potential concentrating solar power and/or photovoltaic sites (U.S. Department of Energy 2003). Installation of solar energy facilities on public land requires a right-of-way grant (rather than a lease).

Solar energy resources in the planning area are considered adequate for generating electricity using photovoltaic cells. Commercial solar generating stations have been constructed and operate in Arizona and other states, particularly in desert locations. Existing solar array technology can place approximately 125 to 150 kVs of photovoltaic cells per acre. Such an array will generate 250 to 300 megawatt-hours of electricity per year (Arizona Public Service 2002).

3.2.1.1.2 Wind Energy

Wind energy is a renewable energy resource with excellent potential for generating electricity. The National Renewable Energy Laboratory has mapped wind speed zones in the United States through development of a wind power classification system, based on annual average wind speeds. Class 1 areas have the lowest wind speed, Class 7 areas the highest. As in most of Arizona, the wind resources on the IFNM are limited. The planning area and vicinity is identified as a Class 1 wind power zone, which is generally not suitable for wind energy development (Duncan and Mancini 1991).

3.2.1.2 Mineral Resources

BLM manages Federal mineral estate (leasable, locatable, and salable minerals) regardless of surface jurisdiction. Map 3-7: Federal Mineral Estate shows the Federal mineral estate (approximately 149,360 acres) within the planning area. Generally, the Federal mineral estate lies under areas already managed by BLM. However, there are areas within the IFNM where Federal minerals underlie State Trust land (approximately 14,680 acres) or private land (approximately 3,220 acres); this is considered split estate, which is part of BLM's decision area. In areas of split-estate where BLM administers Federal mineral estate, management of the mineral development must be consistent with the surface management agency's land use plan. All of the lands and interests in lands (e.g., federal minerals) within the IFNM boundaries have been withdrawn from location, entry, and patent under the mining laws, and from disposition under all laws relating to mineral and geothermal leasing and mineral material disposal (Office of the President 2000). Thus, no new mining claims can be located on the Federal mineral estate within the IFNM. Mineral development can only occur on mining claims that BLM has determined are valid.

3.2.1.2.1 Leasable Minerals

Leasable Minerals are defined as: 1) all minerals other than salable minerals (see section 3.2.1.2.3 below) on acquired lands; 2) all minerals on the Outer Continental Shelf; 3) coal, phosphate; oil, gas, chlorides, sulphates, carbonates, borates, silicates or nitrates of potassium and sodium; sulphur in the states of Louisiana and New Mexico; native asphalt, solid and semi solid bitumen and bituminous rock including oil-impregnated rock or sands from which oil is recoverable only by special treatment after the deposit is mined; and 4) geothermal resources and associated by-products.

The only leasable minerals with potential for occurrence in the planning area are oil and gas, geothermal resources and sodium.

Oil and Gas. Oil and gas are fluid mineral resources that typically are discovered and exploited by drilling exploratory and development wells into oil- and/or gas-bearing sedimentary rocks. No oil or gas has been discovered in the decision area. However, the potential for discovery is rated as moderate because it is located within the Bisbee Basin and a portion of the Tucson Basin (Rauzi 2001).

Geothermal Resources. Geothermal resources are nonrenewable energy resources, derived from the natural heat of the earth. Geothermal resources are typically underground reservoirs of hot water or steam created by heat from the earth, but geothermal resources also include subsurface areas of dry hot rock.

Geothermal steam and hot water can naturally reach the earth's surface in the form of hot springs, geysers, mud pots, or steam vents, creating abnormally high heat flow from the ground (USDI 2008). These areas, known as geothermal anomalies, occur in areas of active or recent volcanism and in places where the earth's crust has been thinned by extensional stresses, such as the Basin and Range physiographic province, in which the planning area is located.

There are no official Known Geothermal Resource Areas in the planning area. However, Avra Valley, located in the eastern portion of the planning area, has been identified as having potential for the development of geothermal resources. There are no significant geothermal energy resources currently in use within the planning area. Potential uses include residential and commercial space heating, greenhousing, aquaculture, crop and food processing, and leaching of copper ore. However, geothermal resources in the planning area are not applicable for power generation because the temperatures are not high enough to produce steam.

Sodium. Sodium is a nonrenewable leasable solid mineral resource. Sodium typically occurs as salt (halite) in marine evaporite sediment sequences or continental closed basin evaporite sediment. One known salt deposit exists in the subsurface near the planning area: the Tertiary-age Picacho Basin, centered near the Town of Eloy in south-central Pinal County (Rauzi 2002). Potential subsurface salt deposits also may exist in the Red Rock Basin, centered approximately in the Town of Red Rock and extending north into Pinal County and south into Avra Valley.

3.2.1.2.2 Locatable Minerals

Locatable minerals are defined as: 1) uncommon varieties of sand, stone, gravel, cinders, pumice or pumicite and 2) all "valuable mineral deposits" that are locatable under the General Mining Law of 1872 except leasable and salable minerals. Examples might include both metallic minerals (e.g., gold, silver, lead, uranium) and nonmetallic minerals (e.g., gemstones, kaolin, fluorspar, perlite).

Metallic Minerals. The planning area has five locales historically designated as mineral districts, including the Sawtooth mineral district in Pinal County, and the Magonigal, Silver Bell, Waterman, and Roskruge mineral districts in Pima County (Map 3-8: Mineral Districts, Mining Claims, and Salable Mineral Material Source Areas). All of the mineral districts, with the exception of the Silver Bell District, have been mined historically but are no longer active.

A 2004 LR2000 report indicated a total of 225 existing mining claims exist within the IFNM boundaries (USDI, BLM 2004b). The USGS Mineral Resource Data System lists 33 mine sites in the planning area (USGS 1999). Mine sites are mining claims that have been developed. There are no active metallic mineral mines in the decision area. The only active mine near the IFNM (adjacent to the IFNM boundary) is the Silver Bell Mine, a copper mine.

Nonmetallic Minerals. Nonmetallic locatable minerals include barite, feldspar, gemstones, mica, perlite, silica (quartz), and industrial-grade limestone and clay. Nonmetallic locatable mineral locations and associated geologic deposits are reported by Phillips (1987). Barite has been found at two locations in the decision area, both in the Silver Bell Mountains. No production has occurred from either locality. Quartz, mica, and feldspar have been identified in pegmatites at the Tinker Bell and J & D Mines, both located within the decision area. One industrial-grade limestone property is located in the Waterman Mountains at the Happy Jack Mine. The mine is located within the decision area and has not been commercially developed. Currently there are no active nonmetallic mineral mines in the planning area.

3.2.1.2.3 Salable Minerals

Salable minerals include common varieties of sand, stone, gravel, cinders, pumice, pumicite and clay.

A search of Case Recordation files on the BLM Land and Mineral Records LR 2000 database identified four salable mineral pit permits in the decision area, only one of which was active. The Silver Bell Pit produced crushed granite and other decorative landscape rock. This pit lies off Silverbell Road, and inside, the decision area boundary. That pit is now closed and has been partially reclaimed; any additional reclamation would be completed by BLM.

3.2.2 Livestock Grazing

Livestock grazing on the IFNM is authorized at the levels presented in the Rangeland Program Summary (USDI, BLM 1987). Grazing leases are held for 11 allotments (Map 3-9: Grazing Allotments). Grazing use for each allotment is assigned in terms of Animal Unit Months (AUMs). An AUM is the amount of forage needed to sustain one cow, five sheep, or five goats, for a month. These allotments support 8,042 AUMs (670 cattle), of which an estimated 7,748 AUM (646 cattle), or 96 percent, are within the IFNM boundaries (Tersey 2004; USDI, BLM 2001a). All allotments within the IFNM are Section 15 leases, meaning they are located outside of an established grazing district and are administered in accordance with Section 15 of the Taylor Grazing Act of 1934.

As part of the land use planning and grazing management processes, BLM designates grazing allotments as ephemeral or perennial allotments, and classifies them into one of three selective management status categories. Table **3-13** presents the current designations and selective management category of the allotments in the IFNM. Two allotments are classified as *ephemeral*, indicating grazing is allowed only when special criteria are met and when forage is available in sufficient volume to support soil protection, browsing by wildlife, and wildlife or livestock grazing pressure. The remaining nine allotments are classified as *perennial/ephemeral*, indicating that a base level of grazing is allowed year-round. In a *perennial* or a *perennial/ephemeral* allotment, the lessee could request authorization to graze additional AUMs if criteria are met and forage is available in sufficient volume to support soil protection, browsing by wildlife, and wildlife or livestock grazing pressure (Appendix F). No ephemeral AUMs have been issued on BLM-administered land in the IFNM since 1995.

Based on recent guidance in BLM Instruction Memorandum 2009-018, the selective management status for each BLM allotment was reevaluated. This resulted in changes to the selective management status category of almost all allotments within the IFNM from when the Draft RMP was published in March 2007. All eleven allotments are now classified as *maintain*, indicating that land health standards are met on the allotments, or livestock grazing on public land is not a significant causal factor for not meeting the standards, and current livestock management is in conformance with Arizona Guidelines for Grazing Administration. The *maintain* classification is also used where an evaluation of land health standards has not been completed, but existing monitoring data indicates that resource conditions are satisfactory. While all allotments in the IFNM are currently classified as *maintain*, allotments can also be classified as *improve* (where current livestock grazing management or level of use on public land 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) or *custodial* (where public lands produce less than 10 percent of the forage in the allotment or are less than 10 percent of the land area; an allotment should not be designated *custodial* if the public land in the allotment contains critical habitat for a threatened or endangered species, or wetlands negatively affected by livestock grazing).

Table 3-14 presents information on the results of the most recent allotment evaluations for each allotment. All of the allotments have been evaluated against the Arizona Standards and Guidelines in the past few years, though some of the evaluation reports have not been completed to date. In all cases the allotment evaluations concluded that the standards were met and no substantial issues to be addressed were identified. In some cases, the range improvements on the allotments were identified as being in fair or poor condition. Condition of range improvements does not factor into whether standards are met; however, BLM can and will work with lessees to improve the condition of range improvements where necessary.

Table 3-13: Management Status of the Allotments within the IFNM

Name	No.	Expires	Selective Management Status Category[1]	Grazing Authorization Status[2]	Allotment acres (BLM)[3]	Active (Perennial) AUMs	2004 Actual AUMs
Agua Blanca	6183	02/28/2012	Maintain	Perennial/Ephemeral	14,419	1,356	1,352
Agua Dulce	6126	02/28/2020	Maintain	Perennial/Ephemeral	16,144	814	318
Blanco Wash	6010	02/28/2016	Maintain	Perennial/Ephemeral	2,278	195	195
Claflin	6029	02/28/2019	Maintain	Perennial/Ephemeral	6,036	437	234
Cocoraque	6020	02/28/2020	Maintain	Perennial/Ephemeral	9,181	527	527
Tejon Pass	6077	02/28/2019	Maintain	Ephemeral	11,494	0	0
King	6153	02/28/2019	Maintain	Perennial/Ephemeral	12,737	1,452	240
Morning Star	6060	02/28/2019	Maintain	Ephemeral	16,175	0	201
Old Sasco	6102	02/28/2010	Maintain	Perennial/Ephemeral	4,471	384	0
Sawtooth Mtns.	6068	02/28/2020	Maintain	Perennial/Ephemeral	32,127	2,328	2,328
Silver Bell	6203	02/28/2012	Maintain	Perennial/Ephemeral	4,835	350	350
Totals					**129,897**	**7,843**	**5,745**

SOURCES: Tersey 2010; U.S. Department of the Interior, Bureau of Land Management 2002a, 2001c, d, 2000a, b

NOTES:[1] Management Category

Maintain: Manage to maintain the current satisfactory condition of the resources in the allotment.

[2] Grazing Authorization Status

Ephemeral: Grazing is allowed only when precipitation patterns generate seasonal production of forage available for livestock.

Perennial/Ephemeral: Grazing is authorized on ephemeral forage above the grazing preference when precipitation patterns generate seasonal production of additional forage available for livestock.

[3] Acreages

Acreages are approximate. The IFNM contains 128,398 acres of public (BLM-administered) land; the grazing allotments contain public land outside of the IFNM boundary.

Table 3-14: Allotments Evaluated under Arizona Standards For Rangeland Health and Guidelines for Grazing Administration, Summary of Results

Allotment No.	Allotment Name	Total Acres	BLM Acres	Active AUMs	Evaluation Date	Condition of Range Improvements	Standards Met?			Grazing Management System
							1	2	3	
6183	Agua Blanca	16,784	14,419	1,356	5/9/01	Good	Y	N/A	Y	Deferred Rotation
6153	King	26,801	12,737	1,452	3/29/99	Fair to Good	Y	N/A	Y	Rest Rotation.
6060	Morning Star	8,646	6,035	0	5/20/09	Fair	Y	N/A	Y	Ephemeral.
6102	Old Sasco	43,074	4,471	384	3/22/00	Fair	Y	N/A	Y	Deferred Rotation.
6068	Sawtooth Mtns	178,886	32,127	2,328	3/22/00	Poor	Y	N/A	Y	Deferred Rotation.
6203	Silver Bell	7,683	4,835	350	5/9/01	Good	Y	N/A	Y	Deferred Rotation.
6077	Tejon Pass	21,010	11,591	0	5/20/09	Fair	Y	N/A	Y	Ephemeral.
6029	Claflin	8,646	6,036	437	2/15/09	Fair	Y	N/A	Y	Deferred Rotation.
6126	Agua Dulce	18,021	16,144	814	2/7/03	Fair	Y	N/A	Y	Rest Rotation.
6010	Blanco Wash	10,020	2,278	195	2/14/03	Good	Y	N/A	Y	Deferred Rotation.
6020	Cocoraque	13,783	9,181	527	2/7/03	Fair	Y	N/A	Y	Rest Rotation.

SOURCES: Tersey 2004; U.S. Department of the Interior, Bureau of Land Management 2002a; 2001a ,b; 2000a, b

NOTES: Standard 1 – Upland Sites
Standard 2 – Riparian-Wetland Sites
Standard 3 – Desired Resource Condition
Allot. = allotment
Y = meets standard
N = does not meet standard
N/A = not applicable

3.2.3 Recreation

The IFNM is easily accessible from both Tucson and Marana, and provides outstanding recreational opportunities to the residents of those urban areas. Visitors are able to enjoy the scenic beauty of the IFNM through a variety of authorized recreational activities, including camping, hunting, target shooting, horseback riding, hiking, biking, and touring by a variety of vehicles. BLM issues special recreation permits on a case-by-case basis for certain activities as a means to manage visitor use, and special stipulations can be attached to protect natural and cultural resources, prevent environmental impacts, and avoid conflicts with other uses.

Demand for commercial and organized group activities during the past five years has been light, limited to two commercial operations under special recreation permits within the IFNM – one for cattle drive/horseback riding activities and one for orienteering activities. One time use special recreation permits have been issued for OHV sightseeing and equestrian activities (USDI, BLM 2001a; Mendoza and Tersey 2004).

3.2.3.1 Recreation Opportunity Spectrum Existing Conditions

BLM uses a planning tool known as the Recreation Opportunity Spectrum (ROS) that inventories, classifies, and maps public lands according to their suitability for various types of recreational activity. Inventory results are then used to develop management decisions. The system defines six classes of recreation opportunity ranging from natural, low-use areas to highly developed, intensive use areas: these include Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Natural, rural, and urban. The classes are defined by setting, the types of recreational activities appropriate to that setting, and the types of recreation experience the setting offers to visitors. The primary factor is the setting. A 2004 ROS inventory identified three classes of recreation opportunity on public land within the IFNM: Semi-Primitive Non-Motorized, Semi-Primitive Motorized, and Roaded Natural, as defined below (URS Corporation 2004).

Semi-Primitive Non-motorized: The setting is predominantly a semi-remote natural landscape of moderate to large scale. The frequency of encounters with other users is low, and few management controls exist. Motorized-vehicle use is not allowed. Temporary primitive roads may be used for resource management on a limited basis, but use of such roads is restricted as incompatible with this recreational opportunity. The setting allows recreationists to experience solitude, isolation, challenge, and a high degree of interaction with nature through activities such as backpacking, camping, nature viewing, backcountry hunting, climbing, and hiking.

Semi-Primitive Motorized: This setting is a mostly natural landscape of moderate to large scale, within one-half mile of primitive roads and two-track vehicle trails. The setting offers a moderate degree of isolation from others; contact with others remains low to moderate and there are few management controls. The use of motorized recreational equipment is allowed. Recreationists can experience a high degree of interaction with the natural environment while enjoying activities such as hunting, climbing, vehicle trail riding, backcountry driving, mountain biking, and hiking.

Roaded Natural: The setting is generally an area of natural appearance near improved and maintained roads. The frequency of encounters between parties of visitors is moderate to high. Some modifications are evident and management controls and developments are visible. Motorized as well as non-motorized vehicles are allowed. The recreation experience includes activities such as picnicking, automobile touring, hang gliding, interpretive use, and vehicle camping. (Wood gathering for campfire use while camping on public lands is generally allowed on BLM land unless specifically prohibited. The RMP is the basis for restricting this activity as deemed necessary to protect monument objects.)

Areas where these opportunities are available have been mapped and are shown on Map 3-10: Recreation Opportunity Spectrum. This map describes the inventory of existing conditions within the monument and is not a designation denoting what is allowed and/or prohibited. The acreage for each classification is listed in Table 3-15.

Table 3-15: Existing ROS Inventory Acreage for Public Land Administered by BLM

ROS Category	Acres
Semi-Primitive Non-Motorized	31,450
Semi-Primitive Motorized	74,910
Roaded Natural	18,910
Other[1]	3,130

SOURCE: URS Corporation 2004
NOTE: [1] Includes agricultural, residential, and industrial uses with limited public recreational opportunities.

3.2.3.2 Recreational Use

A 2004 study conducted by the University of Arizona identified recreational use characteristics for the IFNM, including information on activities visitors engaged in, what they thought of the area, and the geographic pattern of use. Activities included (in order of expressed preference) hiking/walking/running, sightseeing, wildlife viewing, camping, vehicle touring, picnicking, target shooting, hunting, and horseback riding. The study identified the Ragged Top Mountain area as the primary destination within the IFNM for wildlife viewing (Gimblett 2004). Due to highly intermingled land ownership, recreational use occurs on monument lands in conjunction with use on Arizona State Trust lands, which are open to hunting, and other recreational use by the public under a permit required by the Arizona State Land Department.

The study also identified approximately 175 campsites on public land throughout the monument established by use over time. Sites exhibited varying intensity of use from reclaiming sites to heavily impacted, large sites (Gimblett 2004). These sites continue to be used, many having become more heavily impacted, and some new sites have been created. Many sites are used only seasonally, particularly during the various hunting seasons.

Recreational use on IFNM lands is subject to regulations at 43 CFR 8300 that provide for a variety of recreational opportunities as well as general rules for preventing conflicts with resource protection. In addition, State laws pertaining to hunting apply on IFNM lands, including restrictions on camping near wildlife waters and the discharge of firearms near occupied residences. Supplementary rules for public lands in Arizona generally limit camping to no more than a period of 14 days within any period of 28 consecutive days.

The 2004 study found that approximately 12,000 to 15,000 people visited the IFNM, primarily in the cooler months of November to April, with most of the use occurring on weekends). The average number of hunting permits issued by the Arizona Game and Fish Department in 2004 to 2005 for Game Management Unit 37B was 200 for mule deer, 800 for javelina, and one for bighorn sheep (IFNM lands represent approximately 12% of the unit). Hunting accounts for approximately 1,100 visitor days, and is typically targeted toward cottontail rabbit, dove, quail, javelina, mule deer, bighorn sheep, and predators. Recreation use related to hunting decreased by approximately 27% from 2004 to 2008. Recreation use appears to be increasing for most of the activities reported in 2004, particularly target shooting and OHV use. A majority of the visitation occurs at Ragged Top Mountain and the Waterman Mountains (Gimblett 2004). Most visitor use impacts are concentrated along the more easily accessible lands bordering Avra Valley.

Reasons for visiting the Monument reported by visitors in the 2004 study included enjoyment of nature, stress relief, and physical activity. Visitors in the study also indicated that they come to the IFNM to find peace and quiet or experience the feeling of remoteness, and to feel a part of the natural environment. Almost 19 percent of the visitors in 2004 reported bringing at least one dog with them. Most of the survey respondents were Arizona residents; only 9 of the 106 respondents reported that they were seasonal visitors to southern Arizona. More than 40 percent of the visitors to the IFNM use four-wheel-drive vehicles or other off highway vehicles (Gimblett 2004).

3.2.4 Lands and Realty

3.2.4.1 Land Tenure

BLM occasionally makes land tenure adjustments where public land is sold or exchanged, or nonpublic lands or interests are acquired. The BLM administers approximately 128,398 acres of public land (surface estate) in the IFNM. Management of minerals in subsurface estate is discussed in Section 3.2.1. BLM administers all of the Federal acreage with the exception of approximately 300 acres in the Waterman Mountains area, which were withdrawn by the Department of Defense in the 1960s (U.S Air Force 2004). Refer to Table 1-1 and Map 1-2 for additional information on surface management within the IFNM.

BLM adjustments to land tenure in the planning area occur or can occur under a variety of realty actions. Under the Proclamation, all land and interests in land (i.e., surface and subsurface estate) in the decision area will remain under BLM's administration (i.e., all will be retained) unless an exchange would further the protective purposes of the monument.

Acquisitions can occur through land exchanges, purchases, easements, and other land transfers.

3.2.4.2 Recreation and Public Purposes Act Leases

There is one Recreation and Public Purposes (R&PP) Act lease within the boundaries of the IFNM. The R&PP Act lease is issued to and allows for the operation of the Tucson Soaring Club on 182 acres, and will expire in 2013 (Bernal 2006; USDI, BLM 2001a).

3.2.4.3 Utility Corridors, Rights-of-Way, and Communication Sites

BLM manages existing corridors and the Pan Quemado and Confidence Peak communication sites in the IFNM to protect the objects of biological, scientific, and historical interest cited in the Proclamation. Title V of Federal Land Policy and Management Act (FLPMA) authorizes the Secretary of the Interior to issue right-of-way grants (i.e., authorizations to use specific pieces of public land for specific facilities for specific periods of time), over, upon, under, or through public lands (except land designated as wilderness). Section 503 of FLPMA (43 U.S.C. 1763) authorizes the formal designation of utility corridors, which are identified as the preferred routing for utilities. BLM has designated corridors to accommodate linear infrastructure/utilities (e.g., pipelines, roads, electrical transmission lines) that traverse the IFNM, as shown on Map 2-15: Utility Corridors and Right-of-way Authorizations – Alternative A. Three 1-mile-wide corridors cross the IFNM planning area.

The Proclamation allows existing rights-of-way to be maintained within the IFNM without being subject to the higher standard that may be applied to future right-of-way grants by virtue of the monument designation. At the time the Proclamation was signed, several rights-of-way for roads, pipelines, power lines, and communication facilities were in place. The type and number of rights-of-way within the IFNM are listed in Table 3-16.

Table 3-16: Existing Rights-of-Way

Type	Number
Road	10
Electric	8
Gas Pipeline	4
Communication Site/Telephone	4
Irrigation	1

3.2.5 Travel Management

This section addresses travel management, including access, within the IFNM for motorized and non-motorized surface travel and air transportation. The study area for this section extends beyond the planning area to include surface access routes that link the IFNM to major public roadways and to airspace considerations that originate outside of the planning area.

The existing route network is illustrated on Map 2-19: Travel Management–Alternative A. There are 347 miles of existing routes. Some of the routes illustrated on this map did not exist at the time of the 1989 Phoenix RMP and therefore were not authorized as open under that RMP. However, they have been created since that time, and are currently in use and serving existing access needs. As a result, they were identified during the route inventory and included in the route baseline. For more information on the IFNM route inventory, refer to Appendix G.

The majority of routes within the IFNM have a dirt surface. These are typically single-lane routes that are passable by two-wheel-drive, high-clearance vehicles, but not by passenger vehicles or larger vehicles, and that show no evidence of improvement or regular maintenance. Nine percent are light duty but maintained roadways; these travelways are improved and graded, and provide reliable access for school bus and passenger vehicles. Only six percent of the routes in the IFNM are primitive four-wheel-drive,

where surface conditions require four-wheel-drive vehicles, due to roughness, grade, or drainage crossings or other obstructions (Gimblett 2004).

Main public access roads, including Sasco, Avra Valley, Silverbell, Manville, Mile Wide, El Tiro, and Pump Station Roads, link the IFNM to Interstate 10. These roads are administered by Pinal County or Pima County. Gimblett's University of Arizona study (2004) notes that the majority of the roads in the planning area are not maintained to any standard. Almost all routes inventoried were in some state of rehabilitation or primitive condition, with vegetation encroaching on the side clearances and established in the travelways.

There are many access points into the IFNM, but the most heavily used include Manville Road, the Tohono O'odham Nation border near the Waterman Mountains, and Avra Valley Road.

Civilian aviation occurs at El Tiro Gliderport, which is located within the planning area. This facility is along the eastern boundary of the IFNM and is accessed by El Tiro Road. The Tucson Soaring Club is a private group that uses this facility regularly and holds an R&PP Act lease. Soaring activities occur in sailplanes that are designed for sustained flight without the use of a motor, although launches are by motorized tow planes.

3.3 SPECIAL DESIGNATIONS

BLM special designations include ACECs, backcountry byways, national recreation areas, national trails, wild and scenic rivers, lands with wilderness characteristics, and WSAs. The 3,342-acre Waterman Mountains ACEC (of which 2,240 acres are public land) is the only special designation within the IFNM. It was established in the 1989 Phoenix RMP primarily for the protection of the Nichol Turk's head cactus, and is one of the most popular destinations within the IFNM. Access routes provide entry to approximately 28 campsites within the ACEC (Gimblett 2004). Within the ACEC there are range improvements (i.e., livestock stock waters) located along existing roads within the Agua Dulce allotment, grandfathered mining claims (though there is no current mineral development activity), and regular traffic from UDIs. The current condition of the Nichol Turk's head cactus populations in the IFNM is addressed in Section 3.1.5.4. The ACEC is shown on Map 2-3: Special Status Species Management – Alternative A.

3.4 TRIBAL INTERESTS

This section describes interests of federally recognized Indian tribes potentially affected by the management alternatives for the IFNM.

Tribal interests in the RMP/EIS process can range from broad-scale concerns about management of landscapes, ecosystems, and viewsheds, to concerns connected with discrete locations on public lands. This includes issues such as reasonable access to ceremonial places and the freedom to collect, possess, and use natural resources. Tribal interests may align with general public interests, but they may vary in sociocultural context. Tribal interests include "traditional cultural properties," as described in Section 3.1.8.

Tribal interests that have been identified in the IFNM planning process to date are as follows:

- The Tohono O'odham Nation has interest in areas of the IFNM with indigenous plant resources used by the Tohono O'odham in the past (Steere 2005).
- Tohono O'odham ranchers have interest in retaining occasional access to the IFNM from the Schuk Toak District to retrieve cattle that have strayed off the reservation (Steere 2005).

- The Tohono O'odham have interest in protecting archaeological sites that reflect Tohono O'odham occupation and use of the land within IFNM (Steere 2005).
- There was a Tohono O'odham settlement around the Santa Ana de Cuiquiburitac Mission site. Tribal members have retained historical knowledge about this village and expressed concerns about protecting that site (Steere 2005).
- There is interest in protecting sites related to Tohono O'odham mining activities within and near the IFNM (Steere 2005).
- There is interest in preservation of sites related to historic (Territorial period) ranching as it relates to Tohono O'odham history (Steere 2005).
- The Tohono O'odham Nation is interested in coordination of the management of archaeological sites that overlap the boundary of the IFNM and the Tohono O'odham Indian Reservation.
- The Tohono O'odham Nation is generally concerned about the impacts of encroaching development and has suggested that Pinal and Pima Counties establish a no-development buffer zone up to a mile wide around the IFNM. The Nation is upset by the destruction of the unauthorized land clearing that occurred in 2004 for a development on the northeastern edge of the IFNM in the Los Robles Archaeological District, which is listed in the National Register (Steere 2005).

In addition to these specific concerns, tribes with traditional cultural affiliations with the region are known to have concerns about treatment of human remains, funerary objects, sacred objects, and objects of cultural patrimony that are sometimes present within archaeological sites.

3.5 SOCIAL AND ECONOMIC CONDITIONS

The social and economic context in which planning decisions occur is characterized by the needs, demands, and values of the local, regional, and national publics as well as the economic opportunities, benefits, and constraints that are represented by the IFNM. The programs with the strongest correlation between BLM management and social and economic conditions are the programs for energy and minerals, grazing, recreation, and lands and realty. The social and economic context is characterized through indicators of economic health (such as the economic value of commodities, employment and income, and economic diversity and stability) as well as fiscal benefits earned for local jurisdictions and markets due to economic activity on the IFNM. BLM management decisions with regard to economic programs also may affect social conditions, lifestyle, and quality of life. Conversely, current and projected demographic changes may affect the management of the IFNM in terms of the scope and volume of demands for different uses, and the perceived value of opportunities provided by the monument.

The area of potential effects for socioeconomics is further defined by the relationships between the BLM management decisions under consideration in this RMP/EIS and current and trends in uses of the IFNM. For example, changes to energy and mineral, grazing, recreation, and lands and realty programs could affect economic activity and/or social effects resulting from alterations to the ways in which people live, work, play, relate to one another; or cultural norms, values, and beliefs relative to the IFNM. The baseline for these economic and social variables are characterized herein to the extent possible using available data; however, the relatively minor magnitude and scale of economic activity at the IFNM are such that they often are not evident in baseline social and economic data sets for the study area. Input received during public scoping (see Section 1.7) and ongoing public involvement for this RMP/EIS provide some degree of context on the social importance of certain issues.

The baseline is defined by direct, indirect, and (in some cases) secondary effects of social and economic activity with the area of potential effect. In brief, direct effects are those that relate to direct use of IFNM lands and/or resources (e.g., grazing operations); in terms of economics, direct are typically tied to a single economic sector (e.g., agriculture). Indirect effects relate to use of IFNM lands and/or resources (e.g., recreation) but are somewhat removed from that direct use (e.g., purchase of services and equipment); in terms of economics they are specific to single economic sector (e.g., tourism). Secondary effects are those that disperse into the larger social and economic environment and include multiple economic sectors (e.g., professional services and utilities supporting mineral resource development). Economic trend analysis is presented for the most recent three decennial censuses (1970 to 2000). This is supplemented by more recently available data for specific economic sectors. Because there has been a marked resurgence in the copper-mining industry between the time that the baseline for the Draft RMP/EIS was prepared (2003) and the publication date for this Final RMP/EIS, appropriate updates to the mining sector were incorporated into the Final RMP/EIS. However, the mining industry continues to see fluctuations based on the price of metals.

The study area for social and economic conditions extends beyond the planning area to allow for evaluation of local factors in the immediate vicinity of the planning area and nearby communities. Data have been gathered for the following levels of analysis:

***United States**:* Provides a baseline for comparison to national trends

***State of Arizona**:* Provides a baseline for comparison to statewide trends

***Pinal and Pima Counties**:* Provides regional context of south-central Arizona

***City of Eloy, Town of Marana, and the unincorporated Avra Valley area*:** Provides local context for the planning area and highlights the communities most likely to be affected by RMP decisions, due to their proximity

***Tohono O'odham Nation*:** Provides information about tribal lands bordering the western and southern boundaries of the planning area

Overall, social and economic trends for the study area during the 30-year period between 1970 and 2000 indicate a shift among the dominant employment sectors and the major sources of personal income. As shown in Table 3-17 and Table 3-18, employment in Pima and Pinal Counties during this period has been characterized by a large increase in jobs in the services and professional sector, which generally are lower-paying jobs than other sectors. This trend is statewide; the services and professional sector has provided approximately 75 percent of new jobs in Arizona from 1970 to 2000. Conversely, employment in the mining sector declined (although a resurgence in the copper industry began in 2003). New job growth in the government sector has occurred over this 30-year timeframe in both counties. The farm and agricultural services sector remained flat in Pima County but declined in Pinal County.

Table 3-17: Pima County Employment by Industry: Changes from 1970 to 2000

	No. of Jobs in 1970	Percent of Total	No. of Jobs in 2000	Percent of Total	New Employment[1]	Percent of Jobs Gained[2]
Total Employment	**144,273**	**-**	**444,118**	**-**	**299,845**	**-**
Wage and salary employment	126,320	87.6	363,641	81.9	237,321	79.1
Proprietors' employment	17,953	12.4	80,477	18.1	62,524	20.9

	No. of Jobs in 1970	Percent of Total	No. of Jobs in 2000	Percent of Total	New Employment[1]	Percent of Jobs Gained[2]
Farm and agricultural services	**2,054**	**1.4**	**5,983**	**1.3**	**3,929**	**1.3**
Farm	1,087	0.8	955	0.2	-132	N/A
Agricultural Services	967	0.7	5,028	1.1	4,061	1.3
Mining	**6,972**	**4.8**	**2,410**	**0.5**	**-4,562**	**N/A**
Manufacturing (including forest products)	**9,295**	**6.4**	**35,144**	**7.9**	**25,849**	**8.5**
Services and professional	**78,120**	**54.1**	**297,840**	**67.1**	**219,720**	**72.1**
Transportation	5,872	4.1	14,504	3.3	8,632	2.8
Wholesale trade	3,514	2.4	12,581	2.8	9,067	3.0
Retail trade	25,342	17.6	73,947	16.7	48,605	16.0
Finance, insurance, and real estate	10,947	7.6	37,386	8.4	26,439	8.7
Services (health, legal, business, others)	32,445	22.5	159,422	35.9	126,977	41.7
Construction	**11,064**	**7.7**	**28,081**	**6.3**	**17,017**	**5.6**
Government	**36,768**	**25.5**	**74,660**	**16.8**	**37,892**	**12.4**

SOURCE: Bureau of Economic Analysis 2000
NOTES: [1] New employment includes new jobs minus job losses.
[2] The percentage of new employment for each sector is the proportion of new jobs added.
Numbers may not add up due to rounding.

Table 3-18: Pinal County Employment by Industry: Changes from 1970 to 2000

	No. of Jobs in 1970	Percent of Total	No. of Jobs in 2000	Percent of Total	New Employment[1]	Percent of Jobs Gained[2]
Total employment	**25,980**	**-**	**51,293**	**-**	**25,313**	**-**
Wage and salary Employment	23,040	88.7	42,890	83.6	19,850	78.4
Proprietors' employment	2,940	11.3	8,403	16.4	5,463	21.66
Farm and agricultural services	**3,978**	**15.3**	**3,451**	**6.7**	**-527**	**N/A**
Farm	3,426	13.2	2,391	4.7	-1,035	N/A
Agricultural Services	552	2.1	1,060	2.1	508	1.6
Mining	**6,086**	**23.4**	**1,423**	**2.8**	**-4,663**	**N/A**
Manufacturing (including forest products)	**1,482**	**5.7**	**3,476**	**6.8**	**1,994**	**6.4**
Services and Professional	**7,411**	**28.5**	**26,621**	**51.9**	**19,210**	**61.8**
Transportation	585	2.3	1,206	2.4	621	2.0
Wholesale trade	213	0.8	1,343	2.6	1,130	3.6
Retail trade	3,075	11.8	7,905	15.4	4,830	15.5
Finance, insurance and real estate	678	2.6	2,535	4.9	1,857	6.0
Services (health, legal, business, others)	2,860	11.0	13,632	26.6	10,772	34.7
Construction	**2,117**	**8.1**	**2,046**	**4.0**	**-71**	**N/A**
Government	**4,906**	**18.9**	**14,276**	**27.8**	**9,370**	**30.1**

SOURCE: Bureau of Economic Analysis 2000
NOTES: [1] New employment includes new jobs less job losses.
[2] The percentage of new employment for each sector is the proportion of new jobs added.
Numbers may not add up due to rounding.
N/A = Not available.

The employment figures in Table 3-17 and Table 3-18 generally correlate with income by industry figures for the labor categories. However, there are other sources of income from non-labor categories, including transfer payments (primarily related to retirement) and dividends, interest, and rent (money earned from investments). When evaluated in these terms, non-labor income is the fastest growing source of income in both counties, followed by the services and professional sector. The significant increase in non-labor income suggests that the area is attracting retirees.

3.5.1 Economic Value

Economic value associated with the IFNM is assessed differently for each resource and resource use managed by BLM (e.g., energy and minerals, grazing, recreation, and lands and realty). The direct market value of each activity in the planning area and determinants of this value, such as volume of the commodity or other factors, are estimated and placed in context of their larger market value.

3.5.1.1 Energy and Minerals – Current Conditions

Energy and minerals programs may include those that regulate locatable, leasable, and salable minerals, as well as permitting activity for renewable energy infrastructure. In accordance with the Proclamation, the IFNM is withdrawn from location, entry, and patent under the mining laws, and from disposition under all laws relating to mineral and geothermal leasing. There are 225 mining claims within the planning area that predate the establishment of the IFNM. However, there is no active metallic or nonmetallic mineral mining activity within the planning area.

ASARCO's Silver Bell Mine is located immediately outside the planning area boundary. Copper is the primary commodity produced at the mine, but lead, zinc, and other metallic minerals are also present in the mine. Table 3-19 provides copper production and the associated values for 2001 and 2006. The price of copper was at 77 cents per pound in 2001 and increased to $3.1475 per pound in 2006. In 2005, the Arizona copper industry had a combined direct and indirect impact of $3.5 billion on the Arizona economy and accounted for 62 percent of the U.S. copper production (Niemuth 2007a).

Table 3-19: Copper Production and Value (2001 and 2006)

	2001			2006		
	Copper Production (tons)	Value ($1,000s)	% of Total Value in Arizona	Copper Production (tons)	Value ($1,000s)	% of Total Value in Arizona
Planning Area	0	0	0	0	0	0
Silver Bell Mine (Asarco)	20,950	$32,263	2.2	23,450	147,618	2.1
State of Arizona	965,000	$1,470,000	100	784,900	6,900,000	100

SOURCE: Phillips et al. 2002 and Niemuth 2007b

There is currently no development of salable minerals, such as decorative rock, in the planning area, but four non-active salable mineral pit permits were identified. One of these pits, located near Silverbell Road and operated by the Jenott Mining Company, was active from 1996 through 2000. Approximately 47,820 tons of decorative rock was produced from this pit, which is now closed and has been partially reclaimed; any additional reclamation would be completed by BLM.

No leasing and development activity for fluid minerals or permitting activity for energy resources, such as solar and wind energy infrastructure, has occurred within the planning area.

A non-market social value is also attached to the mining industry in Arizona that is tied to the state's associated history, lifestyle, sense of place, and community values.

3.5.1.2 Livestock and Grazing

Statistics available from 2002 indicate that agricultural products generate more than $2.3 billion in Arizona. Pinal County provided approximately 17.7 percent of this total, and Pima County just 2.9 percent of State sales (U.S. Department of Agriculture [USDA] 2004c). In 2002, the market value of cattle and calves accounted for approximately $404 million of this revenue statewide, or about 16.9 percent. Pinal County accounted for almost 50 percent of the total State market value of cattle and calves, or about $199.1 million. Figures for the market value of cattle and calves in Pima County were not available for 2002, but in 1997 Pima County accounted for only two percent of the State total, or just over $7 million (USDA 2004b).

The University of Arizona (Mortensen 2004) has recently evaluated the economic impact of the entire agribusiness system (i.e., the primary agricultural sector plus the closely related industries that depend on agricultural activity) in Arizona. Value added (i.e., the production process owing to the combination of labor and property assets) was used as the basis for the analysis. In terms of value added, agribusiness's total economic impact was $3.0 billion in 2000, of which $1.7 billion was direct agribusiness activity. Indirect ripple effects added $0.5 billion (32 percent) to direct value added in agribusiness, while induced impacts added 49 percent. The total indirect and induced value added impact is 81 percent of the activity in agribusiness (Mortensen 2004).

On average, the estimated annual value added for livestock ranches in Arizona in 1997 was $17,000; the average annual sales receipts for ranches were $43,000; almost 75 percent of ranches had annual sales receipts under $25,000; and 8 percent of ranches had annual sales receipts exceeding $100,000. Other agribusiness in farms (feedlots, dairy farms, and crops) together averaged $3.1 million in value added per farm (Mortensen 2004).

In terms of jobs tied to agribusiness, it was estimated that, for every job in primary agriculture, more than 2.5 jobs in the rest of the economy were dependent on agricultural production. Although there were 20,600 jobs in agriculture, the total job impact of agribusiness was 72,900 in 2000. Of these, 8,300 jobs were caused by ripple effects from agribusiness and 16,900 jobs were generated by spending of incomes earned in agribusiness industries (Mortensen 2004).

Grazing on the IFNM is authorized at the levels presented in the Range Program Summary (USDI, BLM 1987). The grazing allotments in the vicinity of the planning area are able to support 8,042 AUMs (670 cattle), of which an estimated 7,748 AUMs (646 cattle), or 96 percent, are within the IFNM boundaries (USDI, BLM 2001a). Grazing permits and leases issued by BLM represent an important proportion of permits in Pinal and Pima Counties (Table 3-20). A majority of the permits are issued by the Arizona State Land Department. Of the current holders of grazing leases within the IFNM, only two also use allotments outside of the monument. The remaining permittees are wholly reliant on IFNM allotments.

Grazing fees per allotment are determined by AUM. In 2004, the grazing fee was $1.42 per AUM. Between 2001 and 2003, the fee was $1.35 per AUM. Table 3-21 provides the total grazing fees received from allotments on IFNM for the years 2001 through 2004.

Table 3-20: Farms with Grazing Leases or Permits

	Pinal County	Pima County	Arizona
Number of farms with cattle and calves	179	166	2,881
Number of farms with grazing leases or permits	63	91	1,372
Source of leases or permits			
Forest Service	18	23	466
Taylor Grazing (BLM)	28	38	533
American Indian lands	2	2	195
Other[1]	44	58	643

SOURCE: U.S. Department of Agriculture 1997

NOTE: [1] Many of the farms or ranches in Pinal and Pima Counties have been issued permits or leases from both the ASLD and BLM, which accounts for the number of permits not adding up to the number of farms.

Table 3-21: Grazing Fees Received from Allotment

	2001	2002	2003	2004
Total AUMs	3,222	5,493	5,921	5,745
Grazing fees received	$4,349.70	$7,415.55	$7,993.35	$8,157.90

SOURCE: Calculated from U.S. Department of the Interior, Bureau of Land Management 2001a

3.5.1.2.1 Social Value of Ranching

Ranching conveys value to local communities through the conservation of open spaces and the connection to historic ranching in Arizona or a "western" quality of life. Pima County's Sonoran Desert Conservation Plan highlights the protection of ranchlands to preserve western heritage and cultural resources, maintain a traditional industry, diversify the economy, and preserve unfragmented open space (Mayro 1999).

3.5.1.3 Recreation

Current visitation in the IFNM is estimated to be between 12,000 and 15,000 annually. Visitors typically come to the IFNM alone or with one other person, and most daytime visits occur on the weekends. Visitation peaks during the more temperate fall, winter, and spring seasons (Gimblett 2004). As noted in Section 3.2.3, recreation opportunities available on the IFNM (such as hiking, nature viewing, recreational driving, hunting, and target shooting) are available elsewhere in the region, but there are place connections to the IFNM.

3.5.1.3.1 Regional and Statewide Tourism

Tourism is an important part of the Arizona economy. Pollack (2002) estimates the overall economic impact of the 29.5 million domestic and international overnight visitors and the 19.3 million day-trip visitors to Arizona in 2000 to be nearly $30 billion. In addition, the fiscal impact (revenues from local, county, and State government taxes) totaled $1.3 billion. Tourist spending is considered "new" dollars injected into the economy each year because non-local dollars are used in spending on hotels, restaurants, retail shops, car rental agencies, and similar outlets. According to the Arizona Office of Tourism, tourism expenditures in 2000 were $15.8 billion for domestic, international, and day-trip travelers (Pollack 2002).

The south-central/east Arizona area, defined in the Statewide Economic Study to include the planning area, Tucson, and the southeastern corner of the State, receives 4.3 million visitors annually. It is estimated that more than 67 percent are from out of state. Generally, a large portion of tourism in rural communities originates in the Phoenix and Tucson metropolitan areas (Arizona Department of Commerce [ADOC] 2003).

3.5.1.3.2 Economic Impacts of Recreation

Several studies have reported the economic impact of recreational activity in the planning area. Expenditures associated with visitation may include lodging and food purchase, equipment purchase, and travel costs. Secondary impacts of visitation have the potential to be more significant than commercial impacts due to the high percentage of hikers and other primitive- or low-equipment–recreation users that do not require the commercial permitted services.

The National Survey of Hunting, Fishing, and Wildlife-Associated Recreation reported that in 2001, wildlife recreationists spent $108 billion on trips, equipment, and other items. In Arizona, 1.7 million resident and nonresident 16-year-old-and-older participants spent in excess of $1.6 billion for fishing, hunting, or watchable wildlife forms of recreation. Of that total, trip-related expenditures were $512.0 million and equipment purchases totaled $1.0 billion. The remaining $67.0 million was spent on licenses, contributions, land ownership and leasing, and other items and services (USFWS 2001).

A study conducted for AGFD found the total economic effect (including secondary effects) from 2001 watchable wildlife activities in Arizona to be $1.5 billion ($1.1 billion by residents and $434.7 million by nonresidents) (Southwick Associates 2003). (Watchable wildlife recreation is defined in the study as observing, photographing, and/or feeding fish and/or other wildlife.) Arizona resident expenditures for watchable wildlife recreation in 2001 totaled $594.5 million and nonresident expenditures totaled $226.2 million. In addition to this statewide data, this study provided county-based estimates of the economic impact of watchable wildlife recreation in 2001. Table 3-22 includes the county-level data applicable to the planning area.

Table 3-22: Economic Effects from All Watchable Wildlife Recreation in Arizona, by County, in 2001 (Participants 16 Years Old and Older)

	County Residents	Residents from Other Counties	Visitors from Other States	TOTAL[1]
Pinal County				
Retail sales	$20,687,736	$12,133,344	$18,075,961	**$50,897,041**
Total multiplier effect	$38,535,190	$22,694,280	$34,735,654	**$95,965,124**
Salaries and wages	$10,838,913	$6,407,698	$9,368,291	**$26,614,902**
Full- and part-time jobs	353	210	385	**949**
State sales and fuel tax revenues	$1,177,490	$683,445	$1,050,972	**$2,911,907**
State income tax revenues	$282,476	$166,580	$216,275	**$665,331**
Federal income tax revenues	$1,982,471	$1,168,656	$1,487,257	**$4,638,383**
Pima County				
Retail sales	$85,322,023	$36,240,245	$51,982,423	**$173,544,691**
Total multiplier effect	$158,809,428	$67,834,927	$99,891,973	**$326,536,328**
Salaries and wages	$44,645,190	$19,140,009	$26,941,109	**$90,726,309**
Full- and part-time jobs	1,454	635	1,107	**3,196**
State sales and fuel tax revenues	$4,856,514	$2,029,235	$3,022,361	**$9,908,109**
State income tax revenues	$1,150,771	$495,093	$621,958	**$2,267,822**
Federal income tax revenues	$8,072,475	$3,470,619	$4,277,017	**$15,820,112**

SOURCE: Southwick Associates 2003
NOTE: [1] Some totals may vary due to rounding.

In addition to watchable wildlife recreation, additional economic impact is generated by fishing and hunting has been evaluated in another 2003 study prepared for AGFD. This study found that fishing and hunting created a statewide impact of $1.34 billion, including secondary impacts. The breakdown of these impacts is shown in Table 3-23 for Arizona and Pinal and Pima Counties. A subset of these data focusing

on hunting trip expenditures (food, gasoline, lodging, etc.) is most relevant to economic activity that may occur as a result of hunting in the IFNM as a share of the county-wide activity. In Pima County, where hunting trip expenses totaled $9.4 million, an equal distribution of $3.6 million was attributed to Pima County residents and residents of other Arizona counties, and the remaining $2.3 million were from out of state. The $4.5 million in hunting trip expenditures in Pinal County was mostly spent by Arizonans traveling from another county ($3 million), followed by out of state hunters ($0.8 million), and then Pinal County residents ($0.7 million) (AGFD 2003).

Table 3-23: 2001 Economic Impacts of Hunting and Fishing (in $ millions)

	Fishing and Hunting Expenditures	Total Multiplier Effect	Full- and Part-Time Jobs	Salaries and Wages	State Tax Revenues
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 Arizona	**$958.5**	**$1,340.0**	**17,190**	**$314.0**	**$58.2**

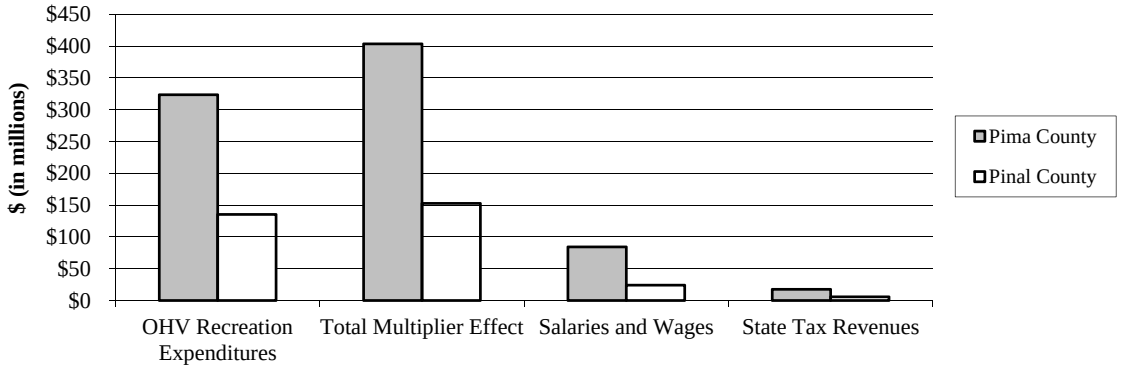
SOURCE: Arizona Game and Fish Department 2003

AGFD and Arizona State Parks (2003) estimated that OHV recreational activity in Arizona generated nearly $3 billion in retail sales during 2002. When secondary impacts are considered, the statewide economic impact is estimated at $4.25 billion, which is a much larger economic impact than reported for watchable wildlife recreation and hunting/fishing. Table 3-24 provides a breakdown of the estimated economic impacts.

BLM estimates that expenditures by hunters on BLM land in Arizona in FY 2002 totaled $41.8 million, expenditures by anglers totaled $16.2 million, and wildlife viewing and related expenditures totaled $145.1 million. These estimates were developed using the 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, and weighing the statewide estimates by the GIS-calculated proportion of BLM-managed lands in Arizona (USDI, BLM 2002b).

Table 3-24: 2002 Economic Impact of OHV Recreation Activity (in $ millions)

	OHV Recreation Expenditures	Total Multiplier Effect	Full- and Part-Time Jobs	Salaries and Wages	State Tax Revenues
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 Arizona	**$3,055.7**	**$4,252.0**	**36,951**	**$1,088.0**	**$187.0**



SOURCE: Arizona Game and Fish Department and Arizona State Parks 2003

3.5.1.3.3 Special Recreation Permit Program

The Special Recreation Permit program issues permits for commercial uses and services, organized group activities, competitive uses, and special individual uses where a decision is made to establish a special area permit system. Currently, commercial activities in the IFNM are not substantial. The IFNM supports two existing temporary use Special Recreation Permits for commercial recreational use or group activities; more information is provided on the specifics of these businesses in Section 3.2.3.

3.5.1.4 Lands and Realty

Within the IFNM, there are various authorized realty actions for leases, permits and rights-of-way, and one 20-year R&PP Act lease for a soaring club that was approved in 1993.

3.5.1.4.1 Rights-of-Way

Fees received by BLM for rights-of-way include fees for processing the application and monitoring compliance with the terms and conditions of the right-of-way grant and the annual rental, which is based on fair market rental value. Rental rates are based on land values in the area and are adjusted annually in accordance with an economic index.

3.5.1.4.2 Permits, Leases, and Easements

Minimum impact permits authorized under 43 CFR 2920.2-2 (2920 permits) provide for the issuance of permits without publication of notice of a realty action, when it is determined that the proposed use is in conformance with applicable BLM plans, policies, local zoning, and other requirements and will not cause appreciable damage or disturbance to public land or its resources or improvements. The current management guidance indicates that all new applications or those for renewal of Section 2920 permits will be reviewed on an individual basis. Film permits will be authorized when conducive for the values of the IFNM (USDI, BLM 2001a).

3.5.1.4.3 Potential Economic Impact of Large-Scale Open Space

Part of the economic value resulting from the presence and protection of a large open-space/recreation/natural area amenity such as the IFNM correlates to localized gains in property values and support of some resource-based industries such as ranching and tourism. Although these impacts are difficult to quantify, numerous studies have documented that open space can trigger local property value increases and other tangible economic benefits (Muro 2002). The open landscape, scenic vistas, and recreational opportunities represented by the IFNM may spur amenity benefits that boost economic development and quality of life gains for local communities.

3.5.1.5 Employment, Income, and Subsistence

This section characterizes each of the BLM programs in terms of direct and indirect employment and income. Some discussion of the diversity and stability of local economies is included where relevant to changes to BLM programs that might occur within the scope of this plan since these factors are tied to a community's capacity to respond to change. Measures of diversity and stability may include the diversity of and dependency of economic sectors, and the ability to respond to change (population density, local amenities, transferability of labor skills). Statistics are provided for the municipalities of Eloy (in Pinal County) and Marana (in Pima County); these are the closest incorporated communities to the IFNM. Figures also are provided for Pinal and Pima Counties, the Tohono O'odham Nation (as available), and the State of Arizona to allow comparison to larger regions.

The current economic base in Pima County includes the aerospace, optics, and other high-tech manufacturing industries, State and Federal Government, and the tourism and retirement industries. In

Pinal County, agriculture, government, tourism, and retirement are considered the current economic base (ADOC 2003). General trends statewide and in Pinal and Pima Counties suggest an economic shift from resource extraction (e.g., mining, agriculture) toward the services and professional and the government sectors. In both counties, new job growth between 1970 and 1999 was dominated by jobs in the services and professional and the government sectors. In 1999, these two sectors accounted for approximately 77 percent of total employment in Pinal County, and 83 percent of total employment in Pima County. Between 1970 and 2000, job growth in both counties was slower than the State but faster than the Nation (Bureau of Economic Analysis 2000).

Employment by industry for counties and the State is provided in Table 3-25 and for Eloy and Marana in Table 3-26. A greater percentage of employment in Pinal County is in the farm and agricultural services sector and the mining sector, as compared with employment in Pima County or the State. The Town of Marana has a comparable ratio of employment in services and resource-extraction related industries to the State and Pima County figures. Important services employers in Marana include retail trade, educational services, and health care and social services. The City of Eloy is more dependent on farm and agricultural employment, and less reliant on services and professional sector employment. Within the services and professional sector, the largest employers in Eloy are retail, educational services, health care and social services, and accommodation and food services.

Table 3-27 provides information on per capita and median household income, unemployment, and poverty. Whereas per capita income is calculated by dividing aggregate income by the total number of individuals in each geographic area, the median household income identifies the income level of the household in the middle of the income distribution for each area. Unemployment in Pinal County has been consistently higher than the State level between 1970 and 2000. The poverty rate and unemployment are higher in Pinal County than in Pima County and the State as a whole. The Town of Marana has a significantly higher household income than the other areas, and a lower poverty rate. Eloy is associated with a much higher poverty rate—about double the Pinal County and State rates—and relatively lower income.

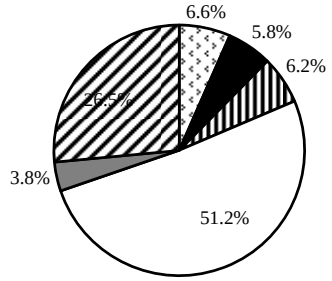
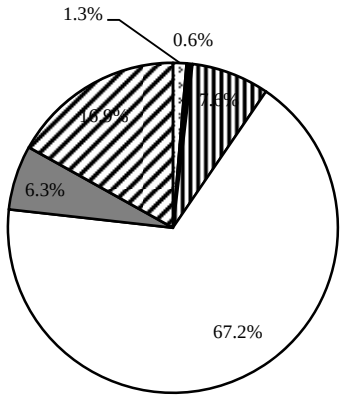
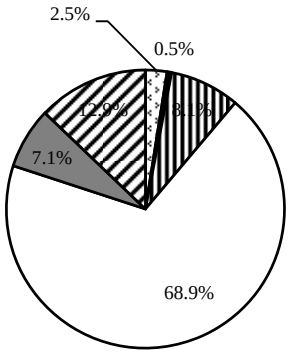
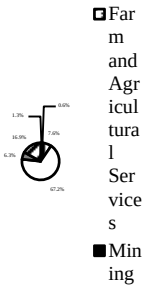
Per capita personal income in Pima County has been stable throughout the 1990s. In Pinal County, the per capita personal income averaged 79 percent of the rural U.S. per capita income and has been declining since 1993. The Statewide Economic Study concluded that possible reasons for this decline may include the larger than average proportion of retired residents and the shift of employment from higher-wage mining jobs to lower-paying jobs in services, trade, and government (ADOC 2003).

The median household income is more than twice the per capita personal income in Eloy, Marana, Pinal County, and the Tohono O'odham Nation. This is due to a number of factors including household size and sources of income. Average household size is notably larger in Eloy (3.6 persons) and the Tohono O'odham Nation (3.7 persons) as compared to the other geographic areas (2.5 persons in Pima County and 2.7 persons in Pinal County and Marana). The share of income from wages and salaries in Eloy (82 percent), Marana (78 percent), and the Tohono O'odham Nation (73 percent) is higher than Pima County (68 percent) and Pinal County (62 percent). Whereas 20 percent of Arizonan's personal income is from retirement, social security, or investments; these sources of income account for a lower portion of income in Marana (17 percent), the Tohono O'odham Nation (15 percent) and Eloy (10 percent) and a higher portion of income in Pinal County (29 percent) and Pima County (24 percent). In Eloy, 81 percent of individuals and 54 percent of households earned less than $30,000 in 1999. In Marana, 53 percent of individuals and 22 percent of households earned less than $30,000 the same year (U.S. Census Bureau 2000a).

Table 3-25: Employment By Industry (1999), County and State Level

Industry	Pinal County		Pima County		Arizona	
	No. of Jobs	Percent of Total	No. of Jobs	Percent of Total	No. of Jobs	Percent of Total
Farm and Agricultural Services	**3,482**	**6.6**	**5,699**	**1.3**	**68,266**	**2.5**
Farm	2,461	4.7	940	0.2	20,104	0.7
Agricultural services	1,021	1.9	4,759	1.1	48,122	1.8
Mining	**3,040**	**5.8**	**2,423**	**0.6**	**14,314**	**0.5**
Manufacturing	**3,266**	**6.2**	**32,832**	**7.6**	**222,473**	**8.1**
Services and Professional	**26,965**	**51.2**	**288,689**	**67.2**	**1,882,405**	**68.9**
Transportation and public utilities	1,236	2.3	14,427	3.4	119,674	4.4
Wholesale trade	1,383	2.6	12,225	2.8	120,510	4.4
Retail trade	8,340	15.8	71,612	16.7	471,176	17.2
Finance, insurance, real estate	2,409	4.6	35,627	8.3	273,404	10.0
Services (health, legal, business, etc.)	13,597	25.8	154,798	36.1	897,641	32.8
Construction	**1,977**	**3.8**	**27,188**	**6.3**	**194,244**	**7.1**
Government	**13,955**	**26.5**	**72,501**	**16.9**	**351,426**	**12.6**
Total Employment	**52,685**	**100**	**429,332**	**100**	**2,733,088**	**100**

Graphical Representation

Pinal County	Pima County	Arizona	Legend
			

SOURCE: Bureau of Economic Analysis 2000
NOTE: Numbers may not add up due to rounding.

The figures available for the Tohono O'odham Indian Reservation indicate a relatively low median household income, high unemployment, and high poverty rate (see Table 3-27). The largest employment sector on the Tohono O'odham Indian Reservation is government, while cattle-raising and related activities is second. Agriculture, retail-tourism, and utilities sectors are expected to grow as the tribe implements development plans (ADOC 2003).

Table 3-26: Employment By Industry (1999), Municipality Level

Industry	City of Eloy Pinal County		Town of Marana Pima County	
	No. of Jobs	Percent of Total	No. of Jobs	Percent of Total
Agriculture, Forestry, Fishing and Hunting	**289**	**9.7**	**81**	**1.3**
Mining	**27**	**0.9**	**79**	**1.3**
Manufacturing	**483**	**16.2**	**870**	**14.4**
Services and Professional	**1,493**	**50.2**	**4,064**	**67.3**
Transportation and utilities	56	1.8	351	5.8
Wholesale trade	74	2.5	182	3.0
Retail trade	306	10.3	684	11.3
Finance and insurance	32	1.1	248	4.1
Real estate and rental leasing	28	0.9	78	1.3
Professional, scientific, and technical	15	0.5	290	4.8
Information	35	1.2	133	2.2
Management of companies and enterprises	0	0	8	0.1
Administrative, support, and waste services	48	1.6	183	3.0
Educational services	256	8.5	546	9.0
Health care and social services	253	8.5	656	10.8
Arts, entertainment, recreation	51	1.7	105	1.7
Accommodation and food services	263	8.8	366	6.1
Other Services	**176**	**5.9**	**234**	**3.9**
Construction	**266**	**8.9**	**283**	**4.7**
Public Administration [Government]	**315**	**10.6**	**658**	**10.9**
Total Employment	**2,973**	**100**	**6,035**	**100**

SOURCE: U.S. Census Bureau 2000a
NOTE: Numbers may not add up due to rounding.

Table 3-27: General Income, Unemployment, and Poverty Characteristics

	City of Eloy	Town of Marana	Pinal County	Pima County	Tohono O'odham Indian Reservation	Arizona
Income						
Per capita personal income						
1999	$9,194	$22,408	$14,977	$23,911	6,998	$24,553
1989	$5,836[1]	$8,940	$9,228	$13,177	-	$13,461
1979	-	$4,777	$5,313	$7,147	-	$7,041
Median household income (1999)	$26,518	$52,870	$35,856	$36,758	$19,970	$40,558
Unemployment Rate						
2000	-	4.6%	8.1%	5.3%	24.0%	5.6%
1990	-	5.6%	9.2%	7.6%	22.5%	7.2%
1980	-	6.6%	7.7%	6.5%	-	6.2%
1970	-	-	5.0%	4.0%	-	4.2%
Poverty Rate						
Number of persons below poverty level						
1999	2,796	810	20,816	120,778	4,929	698,669
1989	2,631	388	26,152	111,880	-	564,362
1979	-	270	16,000	67,739	-	351,365
Poverty rate among individuals (%)						
1999	31.9%	6.2%	16.9%	14.7%	46.4%	13.9%
1989	36.7%	17.8%	23.6%	17.2%	65.0%	15.7%
1979	-	16.1%	18.2%	13.0%	-	13.2%

SOURCES: Arizona Department of Commerce 2003; U.S. Census Bureau 2000a, 1999, 1990
NOTES: [1] Income statistic not adjusted for inflation.

In 2005, the copper industry employed 6,900 in Arizona (Niemuth 2007a). The Silver Bell Mine, located outside but immediately adjacent to the planning area boundary, is currently operating. In the second quarter of 2007, Silver Bell Mining LLC employed 153 persons, which is the peak employment on record for this mine (Mine Safety and Health Administration 2007). Based on the last decennial census, mining provided approximately 106 jobs locally (i.e., in the City of Eloy and Town of Marana), or about one percent of employment in those municipalities. This is generally consistent with the State percentage of total employment in mining. Secondary effects of mining employment occur in proportion to the size of the labor force as incomes filter through the local economy. The presence of mining operations in the area also may result in indirect benefits due to dollars spent locally on businesses providing services to the sector, and tax payments to local governments.

Farm and agricultural services account for approximately 370 jobs locally, or about 10 percent of Eloy employment and 1 percent of Marana employment. Table 3-25 and Table 3-26 indicate that agricultural occupations provide a larger proportion of employment in Eloy and Pinal County than any other political jurisdiction. Personal income associated with agriculture in Pinal County in 1999 was $161.9 million, down 74.4 percent from 1991. Personal income in the agricultural sector in Pima County totaled $98.2 million in 1999, up 10 percent from 1990. For comparison, earnings in agriculture for the State of Arizona in 1999 totaled $1.5 billion (Bureau of Economic Analysis 1999). Although farming and agricultural services produce more jobs for the two counties, they generate less revenue than mining. This may be at least partly due to the occurrence of seasonal employment in the agricultural sector. As with all economic sectors, indirect and secondary economic growth occurs as a result of agricultural employment. With regard to agriculture, these secondary impacts may be present within the figures for retail and other categories.

Pollack (2002) estimated that the economic impact of domestic, international, and day-trip travelers to Arizona in 2000 supported more than 451,600 jobs, including direct, indirect, and secondary jobs associated with tourism. These jobs equate to 20 percent of total employment in the State. However, there are few jobs and wages directly supported by recreation in the IFNM. BLM's recreation program employs recreational planners, law enforcement personnel, park rangers, maintenance workers, and support personnel for recreation management in the decision area. Active commercial operations with BLM-issued special recreation use permits include cattle drives, horseback riding, and associated transportation to Cocoraque Ranch (two related permits). An orienteering club has another permit. One of the commercial operations is based on adjacent private property within IFNM (cattle drives and horseback riding to Cocoraque Ranch). The orienteering club is based in downtown Tucson. A four-wheel-drive sightseeing tour operation also was permitted in the area, but closed business due to depressed economic conditions prevailing in the area in 2001 through 2003.

3.5.1.6 Public Finance and Government Services

3.5.1.6.1 Regional Public Finance

Pima County's annual revenues total about $835 million, and Pinal County's total about $169.5 million. In both counties, the largest sources of revenue are charges for services and property taxes. The greatest expenditures are for general government, public safety, and health care (Pima County 2002; Pinal County 2003).

3.5.1.6.2 Payment in Lieu of Taxes Payments

One source of government revenues is Payment in Lieu of Taxes (PILT), which are Federal payments to local governments that help offset losses in property taxes due to nontaxable Federal lands within their boundaries. The Payment in Lieu of Taxes Act of 1976, as amended (31 U.S.C. 6901-6907), defines lands that are eligible for PILT including lands administered by BLM, and Federal lands in the national forest and national park systems. PILT payments are determined on a formula basis, with the number of Federal

acres constituting the principal determining variable. The logic behind PILT is that Federal lands within county boundaries are excluded from a county's tax base, and the county should therefore be compensated for lost revenue opportunities. PILT payments are computed based on the number of acres of Federal entitlement land, as defined in 31 U.S.C. 6902, within each county. The number of qualified acres is multiplied by a dollar amount per acre set by law. Payments are subject to limitations based on population. Congress sets annual PILT program funding limitations that also may affect the amount of the payments under the program. Examples of how PILT payments have been used include the improvement of local school, water, and road systems. Payment eligibility is reserved for local governments that provide services such as those related to public safety, environment, housing, social services, and transportation, and that contain nontaxable Federal lands (USDI, BLM 2002c). The 2003 entitlement acreage by agency is shown for Pinal and Pima Counties and the State in Table 3-28.

Table 3-28: BLM Portion of PILT by Share of Entitlement Acreage, 2003

Area	BLM	Forest Service	Bureau of Reclamation	National Park Service	Army Corps of Engineers	USFWS	Total	BLM (as percentage of total)
By Share of Entitlement Acreage								
Pinal County	273,373	223,155	21,312	473	0	0	518,313	52.7
Pima County	308,268	389,871	5,845	410,778	0	416,210	1,530,972	20.1
Arizona	**12,017,556**	**11,253,268**	**198,373**	**2,650,649**	**6,833**	**1,541,774**	**27,668,453**	**43.4**

SOURCE: U.S. Department of the Interior, Bureau of Land Management 2003e

In 2003, the total PILT payment in Arizona was $18,045,248 of which the BLM portion based on entitlement acreage was $7,831,638. The BLM portion of the total PILT payment for Pima County ($1,841,427) based on entitlement acreage was $370,127 and the BLM portion of the total PILT payment for Pinal County ($673,398) was $355,092. PILT payments in Pinal and Pima Counties increased steadily between 1999 and 2003. Over this time period, total PILT payments for all agencies in Pima County increased by $843,249, or approximately 84.5 percent. Total PILT payments for all agencies in Pinal County increased by $296,233, or approximately 78.5 percent. This compares with a statewide increase of $7.77 million, or approximately 75.6 percent.

In 2003, BLM-managed land accounted for 20.1 percent of all entitlement acreage in Pima County and 52.7 percent in Pinal County, as compared to the 43.4 percent of the BLM share statewide. BLM is the greater source of PILT payments in Pinal County, but the Forest Service, National Park Service, and the USFWS are a greater source of PILT payments in Pima County than BLM. These entitlement acreages have varied slightly over recent years, but the relative share of agency PILT payments has remained fairly constant.

Total county government revenue corresponding to the 2003 PILT payment data was $169.5 million for Pinal County and $835 million for Pima County (Pinal County 2003 and Pima County 2002). Therefore, the BLM portion of PILT payments in Pinal County, at $0.36 million, comprise -.21 percent of the total county revenues. Current PILT payments of $0.37 million in Pima County are about 0.04 percent of the total revenues for Pima County. Nationwide, BLM's PILT payments totaled $220 billion in 2003 (USDI, BLM 2003c, 2004d).

3.5.1.6.3 BLM Budget

Nationwide, actual treasury receipts generated by BLM in FY 2003 (excluding mining claim and helium collections) totaled $2.4 billion. These BLM-generated receipts are derived from activities and other revenue sources on public land, including mineral leasing, grazing, recreation, and rights-of-way across public lands. Treasury receipts exclude offsetting collections such as mining claim maintenance fees and

collections from the sale of helium (USDI, BLM 2004d). Nationwide, BLM has a workforce of some 10,000 full-time, permanent employees for the administration of 261 million surface acres and 700 million acres of subsurface mineral estate throughout the Nation (USDI, BLM 2004b). Budget for management of the IFNM is integrated with that of the BLM Tucson Field Office budget, which is a function of the overall USDI, legislative, and executive funding priorities.

3.5.2 Social and Demographic Conditions

3.5.2.1 Selected Demographic Information – Current Conditions

Understanding basic population trends is fundamental to community planning. To demonstrate the characteristics for the study area population, selected demographic data from the U.S. Census 2000 have been compiled and the results are presented in Table 3-29. The data presented include information about population, gender, age, and race and ethnicity.

The 2000 Census population densities in the two counties vary significantly, from 92 persons per square mile in Pima County to 33.5 in Pinal County. Pima County's population density of 92 persons per square mile is twice the statewide average of 45 persons. The population density of the Tohono O'odham Nation (2 persons per square mile), Marana (187 persons per square mile), and Eloy (145 persons per square mile) are notably lower than the 2,500-person per square mile density of the City of Tucson (U.S. Census Bureau 2000a, 2000b). These numbers are indicative of the urbanization in the Tucson metropolitan area as compared to Pinal County's more rural environment.

Gender distribution in the counties is similar: all areas have a relatively equal gender distribution of roughly half male and half female. The median age in both counties is slightly higher than the State median, and Eloy is noticeably younger than all other jurisdictions. The median age among the Tohono O'odham is 26.2, with 41.1 percent of the population under 20 years of age (ADOC 2003).

The city of Eloy also is distinguishable in terms of racial characteristics; the city population has fewer Whites (52.7 percent versus 70.4 percent in Pinal County and 75.5 percent statewide) and more Blacks (5.3 percent versus 2.8 percent in the county and 3.1 percent statewide). In Pinal County, the percentages of Whites (70.4 percent), Blacks (2.8 percent), and Asians (0.6 percent) are lower than those occurring in Pima County. The percentage of American Indian/Alaska Natives in Pinal County, at 7.8 percent, is significantly higher than in other jurisdictions in the study area.

Hispanic or Latino origin statistics represent ethnicity (not race) and include all persons who identify themselves as of Hispanic or Latino origin or descent. Pima and Pinal Counties have approximately the same percentage of persons of Hispanic or Latino origin at 29.3 percent and 29.9 percent, respectively. These percentages are somewhat higher than those found across the State (25.3 percent). The City of Eloy has a higher proportion of Hispanic residents (74.4 percent versus 29.9 percent in the county and 25.3 percent statewide) than the county or the State.

Table 3-29: Selected 2000 Census Demographic Information

	City of Eloy		Town of Marana		Tohono O'odham Nation		Pinal County		Pima County		Arizona	
Total Population	10,375		13,556		10,787		179,727		843,746		5,130,632	
Persons per Square Mile (excluding water)	145		187		2		2		91.8		45.2	
Gender	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Male	5,999	57.8	6,791	50.1	5,190	48.1	95,830	53.3	412,562	48.9	2,561,057	49.9
Female	4,376	42.2	6,765	49.9	5,597	51.9	83,897	46.7	431,184	51.1	2,569,575	50.1
Age												
Under 20 years	3,845	37.1	3,895	28.7	4,433	41.1	49,742	27.6	235,880	28.0	1,518,188	29.7
20 to 64 years	5,869	56.6	8,367	61.7	5,593	51.8	100,814	56.1	488,379	57.9	2,944,605	57.5
Age 65 and older	661	6.4	1,294	9.5	761	7.1	29,171	16.2	119,487	14.2	667,839	13.0
Median age	27.5	N/A	34.5	N/A	26.2	N/A	37.1	N/A	35.7	N/A	34.2	N/A
Race and Ethnicity												
White	5,468	52.7	11,094	81.8	873	8.1	126,559	70.4	633,387	75.1	3,873,611	75.5
Black or African American	552	5.3	392	2.9	11	0.1	4,958	2.8	25,594	3.0	158,873	3.1
American Indian/ Alaska Native	465	4.5	286	2.1	9,718	90.1	14,034	7.8	27,178	3.2	255,879	5.0
Asian	124	1.2	334	2.5	17	0.2	1,086	0.6	17,213	2.0	92,236	1.8
Native Hawaiian/ Other Pacific Islander		0.1	20	0.1	10	0.1	146	0.1	1,088	0.1	6,733	0.1
Some other race	3,266	31.5	1,014	7.5	54	0.5	28,149	15.7			596,774	11.6
Two or more races	489	4.7	416	3.1	104	1.0	4,795	2.7			146,526	2.9
Hispanic or Latino (any Race)	7,717	74.4	2,663	19.6	760	7.1	53,671	29.9	247,578	29.3	1,295,617	25.3

SOURCES: U.S. Census Bureau 2000a, 2000b
NOTES: N/A = Not applicable.
Numbers may not add due to rounding.

3.5.2.1.1 Environmental Justice

The identification of minority and low-income populations is relevant for this study because Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that Federal agencies make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

Minority and low-income persons are defined as follows:

- Minorities are persons of Hispanic or Latino origin of any race, Blacks, American Indian/Alaska Natives, and Asians or Pacific Islanders (without double-counting persons of Hispanic/Latino origin who also are contained in the racial groups).
- Low-income persons are those that live 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 poor. Based on this, the poverty level for a family of four in 2002, having two children under the age of 18, was $18,244 (U.S. Census Bureau 2003b). The 2000 census data, however, are based on 1999 data where the poverty level for the same family was $16,895 (U.S. Census Bureau 2002). This is the standard that was used in the following analysis.

The presence of environmental justice populations has been evaluated for the communities closest to the IFNM that are most likely to be affected by management decisions made regarding these lands. Data for the county and State levels provide comparison populations to determine whether minority and/or low-income populations occur disproportionately within the overall population. Census Tract 44.09, Block Group 2, represents the Avra Valley area. Table 3-30 summarizes the minority and low-income groups identified in this analysis.

Table 3-30: Minority and Low-Income Populations (1999)

Arizona (Comparison Population)	Minority Population = 36.2%			Low-income Population =13.9%		
		Minority Population			Low-income Population	
Geographic Area	Total Minority[1]	>50%	>36.2%	Poverty Rate[2]	Poverty Rate >50 %	Poverty Rate >13.9%
City of Eloy	84	Yes	Yes	32	No	Yes
Town of Marana	28	No	No	6	No	No
Pima County	38.5	No	Yes	14.7	No	Yes
Pinal County	41.2	No	Yes	16.9	No	Yes
Tohono O'odham Indian Reservation	95.6	Yes	Yes	46.4	No	Yes
Census Tract 44.09, Block Group 2	21.1	No	No	19.3	No	Yes

SOURCES: U.S. Census Bureau 2000a, b

NOTES: [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.

3.5.2.1.2 Housing

Table 3-31 shows the housing characteristics in the State of Arizona, the two counties, and Eloy and Marana. Although Pinal County has experienced notable growth in housing units since 1990, the growth in Marana has been exponential. Pinal County contains a relatively high percentage of housing units used for recreational, seasonal, or occasional use, and both Pinal County and the Town of Marana have high rental vacancy rates (U.S. Census Bureau 2000a).

Table 3-31: Housing Characteristics

Housing Characteristics	City of Eloy	Town of Marana	Pinal County	Pima County	Arizona
Total housing units 1990	N/A	850	52,732	298,207	1,659,430
Total housing units 2000	2,734	5,702	81,154	366,737	2,189,189
Percent change 1990 to 2000	N/A	570.8%	53.9%	23.0%	31.9%
Average household size of owner-occupied units	3.6	2.7	2.63	2.62	2.71
Average household size of renter-occupied units	3.5	2.5	2.86	2.21	2.48
Percent of housing units used for seasonal, recreational, or occasional use (2000)	N/A	3.9%	14.5%	2.9%	6.5%
Homeowner vacancy rate	2.5%	3.6%	4.0%	1.8%	2.1%
Rental vacancy rate	9.2%	21.7%	16.8%	9.2%	9.2%

SOURCE: U.S. Census Bureau 2000a
NOTE: N/A= not available.

Rental affordability may be measured by median gross percent of household income; this percent totaled 27 percent in Eloy and 25 percent in Marana. The affordability of owner-occupied housing may be measured through a housing affordability index. In both Eloy and Marana, this index suggests that the median family can afford the median house. Overall, housing in the area around the IFNM generally is affordable for the population (U.S. Census Bureau 2000a).

3.5.2.1.3 Migration and Residential Stability

The foreign-born population represented 13 percent of the total population in Arizona in 2000. From 1995 to 2000, Arizona (at 74.3 percent) had the second highest rate of net domestic immigration, and nearly one-third of this immigration was from California (U.S. Census Bureau 2003c). In addition, the U.S. Immigration and Naturalization Service estimates that 283,000 residents, or 5.5 percent of Arizona's 2000 population, were unauthorized immigrants. By comparison, the estimated 7 million unauthorized immigrants living in the United States in 2000 constituted 2.5 percent of the total U.S. population of just over 281 million (U.S. Immigration and Naturalization Service 2003).

Generally, the longer people have lived in a community, the greater is their connection to community and social groups as well as the land (Harp et al. 2001). In 2000, 77.3 percent of the residents in Pima County lived in the same house or same county as they did 5 years prior, compared to 66.5 percent in Pinal County. The rate for Arizona (at 74.9 percent) was lower than Pima County, but higher than Pinal County. The rate of residents of Marana who in 2000 lived in the same house as they did five years prior is 24 percent; 33 percent lived in a different state in 1995. For Eloy, 44 percent were in the same house in 2000 as they were in 1995, and 14 percent lived in a different state (U.S. Census Bureau 2000a). The more dramatic figures for the municipalities probably reflect the growth of initially small communities.

3.5.2.1.4 Educational Attainment

Educational attainment levels in a community may affect per capita income and other economic indicators. Rates of attainment of a high school education or above in 2000 were higher in Pima County (83.4 percent) than in Pinal County (72.7 percent). In comparison, the statewide average was 81.0 percent. The percentages of the population with a high school degree in Marana and Eloy are 22 percent and 24 percent, respectively. Similarly, but more dramatically, in 2000 Pima County had the highest percentage of the population with 4 years of college or a bachelor's degree or above (at 26.7 percent). The average in Pinal County was far below (at 11.9 percent), and the statewide average was 23.5 percent. In Marana and Eloy, 29 percent and 4 percent, respectively, held a bachelor's degree (U.S. Census Bureau 2000a). [Note: educational attainment figures are a percentage taken from individuals older than 25 years of age.]

3.5.2.2 Social Baseline and Sense of Place

The key social and cultural issues, interested parties, and potentially affected stakeholders related to this RMP/EIS are identified based on the scoping report (USDI, BLM 2004e) and continuing public and agency comment for this RMP/EIS effort. Others have been identified through the review and analysis of the proposed action and alternatives and social effects of land management decisions similar in scope.

With other land management issues throughout the U.S., the BLM has found that evaluation of sense of place issues provides a useful baseline for the social environment. Galliano and Loeffler (1999) define sense of place as a "link between social experiences and geographic areas." Understanding sense of place issues 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 individual people may develop a sense of place based on perceptions about amenities (such as recreational opportunities), historic or symbolic activities and places, or landscapes and scenic vistas.

The social baseline is summarized in the discussion that follows according to the following issue categories: (1) landscape/scenic/aesthetic issues, (2) activities/resource and land use issues, and (3) cultural/symbolic issues.

3.5.2.2.1 Landscape/Scenic/Aesthetic Issues

Protection of the ecological landscape (e.g., wildlife and habitat) was identified as a priority by many individuals throughout scoping. Urban sprawl, visitor facilities, and OHV use were identified as threats to the scenic values of the IFNM. The potential for conflict with livestock grazing and recreational activities such as motorized vehicle use and recreational shooting, among other concerns, is raised when wildlife and habitat protection are perceived as a top priority for public lands. Ranching activities also are supported in the area as a means to preserve open space and the area's western heritage, and to promote stewardship. This opinion was noted in the scoping report and is also prominently considered in the Sonoran Desert Conservation Plan for Pima County. Ragged Top is noted as a specific place of value in scoping comments due to its visual impact and habitat, particularly for bighorn sheep and desert tortoise.

3.5.2.2.2 Activities/Resource and Land Use Issues

There is some commonality amongst those stakeholders that directly use the IFNM for mining and ranching activities, those that live in the residential areas within and near the IFNM boundaries, and those that recreate on IFNM lands. These issues include strong people-place connections tied to where they live, work, and recreate; concerns about safety related to recreational shooting; and "backyard access" to IFNM lands. Among ranchers, there is often strong sense of place associated with long-standing

operations that are integrated into the social structure and the connection to the land associated with the livestock operations.

The social baseline for general public access for multi-purpose uses is mixed: there are those that value the protection of public access/use opportunities and continued opportunity for people-place connections and those that favor protection of resources over public access/use opportunities. Stakeholders range from those that live and work within or near the IFNM, those that visit and recreate at the IFNM often, to those that have never visited or recreated at the IFNM but value its existence and protection for future generations. These concerns are expressed in the particulars with regard to travel management and motorized access opportunities. A coalition of citizen groups submitted a proposal regarding which routes should be designated as open for public use and access.

A variety of recreation uses currently occur in the IFNM, sometimes resulting in conflict. Scoping comments highlighted potential compatibility issues between camping, recreational shooting, OHV use, mining (in and near the IFNM), and passive recreation such as hiking and wildlife viewing. The magnitude of sense of place issues with regard to changes in recreation access would be expected to correlate to areas that receive the highest visitor use in the IFNM, notably Ragged Top and the Waterman Mountains (Gimblett 2004).

With regard to use of IFNM lands for development of mineral and energy resources, there are those concerned about potential impacts to natural resources and those that support access and opportunities for mineral resource development within the IFNM and/or the surrounding area (e.g., Asarco Silver Bell Mine). No mining currently occurs within the IFNM, and long-term (30-year trends from 1970 to 2000) indicate that mining jobs are decreasing relative to other local employment. However, links to the current and former participation of mining in local communities still exist and have increased in recent years as the market value for copper has increased.

With regard to lands and realty, there are those that value the pursuit of acquisition of State Trust land and/or private lands within the IFNM boundaries. With regard to utilities and communication facilities, energy generating and transmission industries contingencies value access to the IFNM creates for energy distribution in southern Arizona. Others value limiting utility corridors to remote areas of the IFNM.

With regard to use of IFNM lands for grazing, there are stakeholders concerned about the impacts of grazing to the natural environment and there are stakeholders that use the land for active livestock grazing operations and value this continued use and associated people-place connections.

3.5.2.2.3 Cultural/Symbolic Issues

Various stakeholders hold social value for cultural resources within the IFNM and are concerned with the adequate protection of these resources. Tribes have a unique stakeholder status and social value for some of these resources, particularly the archaeological resources. Some stakeholder concerns regarding cultural resources are heightened with respect to cultural resources listed on the National Register. Within the IFNM, the Los Robles Archeological District and the Cocoraque Butte Archaeological District are listed on the National Register. The planning area also contains the remnants of the Mission Santa Ana de Cuiquiburitac site, which also has been listed on the National Register. Historical mining camps, ranch facilities, and other cultural resources that are eligible for listing on the National Register are present at the IFNM. As previously discussed, both ranching and mining are perceived by some scoping participants as an important part of the area's heritage and lifestyle.

Protection of ACECs, natural/cultural area allocations, and management of areas to protect wilderness characteristics are issues that have both local and regional/natural interest among various individual stakeholder and stakeholder groups. In that regard, the Waterman Mountains ACEC designation and areas

identified for management to protect wilderness characteristics may have some social value symbolic importance in addition to the resource value protection associated with these designations. To a lesser extent, there may be some who value the existing allocations at the monument, particularly the Silver Bell Desert Bighorn Sheep Management Area and Avra Valley Cultural Resource Management Area for protection of the resources for which they were designated. The Silver Bell RCA, Sawtooth Mountains CRMA, and Cocoraque Butte-Waterman Mountains Multiple Resource Management Area designations are more administrative-based than resource-protection-based and the public has not expressed particular interest in the protection of these designations.

3.6 PUBLIC SAFETY

3.6.1 Active and Abandoned Mines and Prospects

Currently available data show 33 mine sites and 225 existing mining claims in the IFNM (USDI, BLM 2004b). Some visitors find abandoned mines and prospects attractive to explore and may be exposed to, and unaware of, the following hazards at these sites:

- 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
- Hazardous or toxic materials

There are no data indicating the extent to which exploration of shafts, adits, drifts, tailings piles, or other excavations takes place within the IFNM. Reports of party sites next to deep shafts raise concern about safety issues. A 20-foot-deep, wide-mouthed shaft at the corner of the El Paso pipeline and Sasco Road (on State Trust land) is the site of numerous reported events. The Sheriff's Department is responsible for enforcement measures with respect to these unauthorized activities (Adler 2004).

Potential hazards from dumping of hazardous material in old mine shafts also exist; however, no official incidents have been recorded by BLM to date (Auby 2004). Mine tailings located at closed mine sites are potentially hazardous because chemicals in the tailing piles can potentially leach into soils and/or groundwater or become airborne hazardous wastes.

3.6.2 Unexploded Ordnance

The presence of known and potential unexploded ordnance (UXO) contamination exists in areas nearby the IFNM. In addition to being an explosive safety hazard, UXO is also a potential chemical hazard. Expended UXO, including both live and inert rounds, may contain chemical constituents with explosive, pyrotechnic, propellant, and incendiary components. In addition to the dangers of UXO, ordnance that detonated upon delivery may contain unburned residues of these chemical constituents and may have produced combustible by-products (U.S. Army Corps of Engineers 1995).

One such area where UXO exists is at the former Williams Field Bomb Target Range #13 located approximately 25 miles south of Casa Grande. The 638.2-acre site was established as a practice bombing range in support of Williams Field in Higley, Arizona in the early 1940s. Historical documents and evidence on the site indicate that M38A2 practice bombs were used during training. The M38A2 practice bomb consisted of a 100-pound, sand-filled bomb that contained a small amount of black powder known as a spotting charge. Generally, the black powder consists of approximately 74 percent potassium nitrate, 11 percent sulfur, and 15 percent charcoal. It is undetermined to what extent chemical by-products

produced by the firing and/or detonation of munitions is present. A number of previous investigations have been conducted on the BMGR, and these studies suggest that, while possible, contamination from these by-products is unlikely (U.S. Air Force 1997, 1996; U.S. Army Corps of Engineers 1998).

In addition to the above documented site, the remote potential exists for munitions to be lost from aircraft flying over the IFNM en route to the Barry M. Goldwater Range to the west or the Western Army Air National Guard Aviation Training Site to the northeast. In those cases, however, loss of munitions would be documented and investigated, and recovery would be accomplished by the responsible military entity.

3.6.3 Wildcat Dumping and Litter

Wildcat dumping of hazardous and non-hazardous waste on public lands ranges in severity from episodes of dumping household trash and appliances, to the discarding of personal items by UDIs traveling through the area. Some recreational shooters exacerbate the situation as they bring targets into the monument and then fail to clean up targets and shell casings afterwards. In addition, recreational shooters often use discarded objects found within the monument as targets. The shards of glass and fragments of metal make cleanup even more difficult. BLM rangers frequently patrol the lands and identify areas where dumping has occurred. In many cases, the rangers or volunteers remove the debris.

Typical examples of wildcat dumping can be seen along Pump Station Road near the Silver Bell Mountains and in the area along El Tiro Road in the northeastern portion of the IFNM. There is illegal dumping within the IFNM from this area despite the fact that the Tangerine Municipal Solid Waste Landfill is located only a short distance away. Most dumping occurs close to roadways and includes household items and sometimes petroleum waste. Cleanup of petroleum and hazardous waste spills receives priority over cleanup of solid waste sites. Evidence identifying the perpetrators is rarely found (Auby 2004).

3.6.4 Target Shooting

Target shooting activities occurring at dispersed sites established by use over time throughout the IFNM present safety concerns related to property, livestock and other persons in the area. In addition, target shooting has been documented as a cause of damage to monument objects, including saguaros and ironwoods. Repeated shooting activity occurs at numerous sites, some of which lack adequate target-shooting backstops. Roads with travelers, trails, residences, livestock watering facilities, and fragile resources are in the line of fire behind the targets at many sites. The debris left behind includes hazards related to jagged metal, broken glass, spent bullets, unspent or misfired cartridges/shotgun shells, which contribute to solid waste and create public health and safety concerns. The litter can attract wildlife that may carry disease and create a public health nuisance. In addition, items containing hazardous materials are often used as targets on the IFNM, as well as items whose remnants pose a risk to wildlife. Since 2001, more than 30,000 pounds of garbage have been removed from shooting areas during 15 trash cleanup events hosted by BLM. In addition, range improvement sites (livestock water tanks, troughs, corrals) are being damaged by shooters who are using them as targets or placing targets in front of them. Additional information related to target shooting in the IFNM is found in the Recreational Shooting Analysis in Appendix I, which was conducted during preparation of this RMP.

3.6.5 Illegal Immigration

Illegal immigration is prevalent throughout the Arizona-Mexico border region, including south of and through IFNM. BLM and U.S. Border Patrol personnel work together to minimize the impacts on IFMN resources by UDIs crossing into the United States. Years of illegal immigrant traffic has resulted in miles of foot trails running south to north. Vehicular traffic by smugglers transporting UDIs has left many more

miles of unauthorized two-track roads across the IFNM, resulting in significant ground disturbance, vegetative damage, and harm to cultural resources. BLM has rehabilitated more the 10 miles of roads that are believed to have been created by UDI and drug smuggler traffic; based on observed evidence of vehicle intrusions into washes and other areas that have not been quantified, the 10 miles of rehabilitated roads are just a fraction of the number of roads created within IFNM by this type of activity. In addition, BLM has documented the creation of more than 35 miles of foot trails that are attributed to UDI and drug smuggler traffic. The UDIs leave tons of litter, including clothing, food and water containers, and human waste within IFNM every year, with more than 71 tons of trash collected over 2.5 years during community cleanup projects. Additionally, many members of the public visiting IFNM are concerned about inadvertent encounters with armed and dangerous human smugglers (coyotes) transporting UDIs through the monument, as well as persons smuggling contraband. Cross-border traffic in Arizona reached a peak in Federal Fiscal Year 2005, but the number of apprehensions made in Fiscal Year 2007 has dropped to about one-third of the peak. The decline is expected to continue, and cross-border traffic is expected to remain at much-reduced levels for at least the near future as the result of (1) construction of barriers to pedestrian and/or vehicular traffic along the U.S.-Mexico border, which is nearing completion in Arizona; (2) intensified surveillance and security patrols by the U.S. Border Patrol; (3) a new Arizona law that sanctions employers that hire UDIs; and (4) the sharp economic decline in the United States, which has reduced job opportunities for UDIs.