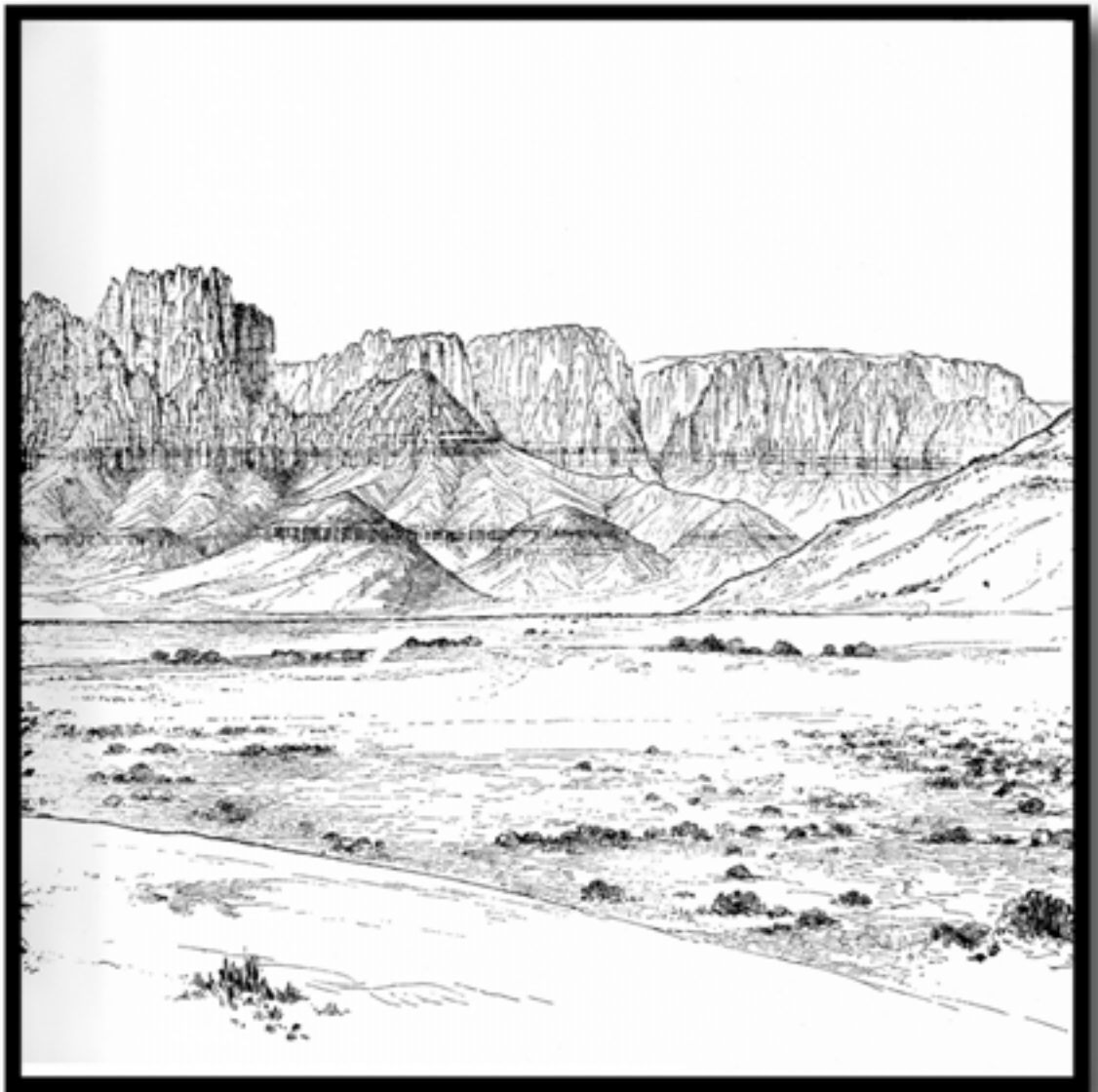
Chapter 3
Affected Environment



"There is more to a place than what you see."

Evening on the Arizona Strip
Lyman Hafen, 2001

CHAPTER 3. AFFECTED ENVIRONMENT 1
RESOURCES 1
AIR 1
Overview 1
Parashant Air 2
Vermilion Air 2
Arizona Strip FO Air 2
WATER 3
Overview 3
Parashant Water 6
Vermilion Water 8
Arizona Strip FO Water 9
SOILS 10
Overview 10
Parashant Soils 22
Vermilion Soils 23
Arizona Strip FO Soils 24
GEOLOGY AND PALEONTOLOGY 26
Overview 26
Parashant Geology and Paleontology 28
Vermilion Geology and Paleontology 31
Arizona Strip FO Geology and Paleontology 32
VEGETATION 32
Overview 32
Parashant Vegetation 44
Vermilion Vegetation 46
Arizona Strip FO Vegetation 48
FIRE AND FUELS MANAGEMENT 50
Overview 50
Parashant Fire and Fuels Management 54
Vermilion Fire and Fuels Management 54
Arizona Strip FO Fire and Fuels Management 54
FISH AND WILDLIFE 54
Overview 54
Parashant Fish and Wildlife 59
Vermilion Fish and Wildlife 62
Arizona Strip FO Fish and Wildlife 62
SPECIAL STATUS SPECIES 64
Special Status Animals 64
Special Status Plants 81
WILD BURROS 88
Overview 88

Parashant Wild Burros ... 89
CULTURAL RESOURCES ... 89
Overview ... 89
Parashant Cultural Resources ... 95
Vermilion Cultural Resources ... 95
Arizona Strip FO Cultural Resources ... 96
VISUAL RESOURCES ... 96
Overview ... 96
Parashant Visual Resources ... 98
Vermilion Visual Resources ... 100
Arizona Strip FO Visual Resources ... 101
SOUNDSCAPES ... 102
Overview ... 102
Parashant Soundscapes ... 104
Vermilion Soundscapes ... 104
Arizona Strip FO Soundscapes ... 104
WILDERNESS CHARACTERISTICS ... 105
Overview ... 105
Parashant Wilderness Characteristics ... 105
Vermilion Wilderness Characteristics ... 107
Arizona Strip FO Wilderness Characteristics ... 107
RESOURCE USES ... 107
VEGETATION PRODUCTS ... 107
Overview ... 107
Parashant Vegetation Products ... 108
Vermilion Vegetation Products ... 109
Arizona Strip FO Vegetation Products ... 109
Overview ... 111
Parashant Lands and Realty ... 115
Vermilion Lands and Realty ... 117
Arizona Strip FO Lands and Realty ... 119
LIVESTOCK GRAZING ... 123
Overview ... 123
Parashant Livestock Grazing ... 128
Vermilion Livestock Grazing ... 129
Arizona Strip FO Livestock Grazing ... 129
MINERALS ... 130
Overview ... 130
Parashant Minerals ... 144
Vermilion Minerals ... 145
Arizona Strip FO Minerals ... 145
RECREATION AND VISITOR SERVICES/INTERPRETATION AND ENVIRONMENTAL EDUCATION ... 146

Overview ... 146
Parashant Recreation and Visitor Services/Interpretation and Environmental Education ... 153
Vermilion Recreation and Visitor Services/Interpretation and Environmental Education ... 156
Arizona Strip FO Recreation and Visitor Services/Interpretation and Environmental Education ... 158
TRAVEL MANAGEMENT ... 161
Overview ... 161
Parashant Travel Management ... 164
Vermilion Travel Management ... 165
Arizona Strip FO Travel Management ... 166
SPECIAL DESIGNATIONS ... 167
CONGRESSIONAL DESIGNATIONS ... 167
Wilderness Areas ... 167
Wild and Scenic Rivers ... 174
National Historic Trails ... 178
ADMINISTRATIVE DESIGNATIONS ... 179
Areas of Critical Environmental Concern ... 179
Resource Conservation Areas ... 183
SOCIAL AND ECONOMIC CONDITIONS ... 184
SOCIOECONOMICS ... 184
Overview ... 184
Parashant Socioeconomics ... 185
Vermilion Socioeconomics ... 185
Arizona Strip FO Socioeconomics ... 186
ENVIRONMENTAL JUSTICE ... 186
Overview ... 186
HEALTH AND SAFETY ... 190
Abandoned Mines ... 190
Hazardous Materials ... 191

LIST OF FIGURES

Figure 3.1: Generalized Geologic Section of Parashant and Western Arizona Strip FO ... 29
Figure 3.2. Generalized Strata of Vermilion and Eastern Arizona Strip FO ... 30

LIST OF TABLES

Table 3.1: Sub-basins in the Planning Area ... 4
Table 3.2: Acres by Soil Groupings ... 11
Table 3.3: Acres by Soil Groupings in Parashant ... 22
Table 3.4: Acres by Soil Groupings in Vermilion ... 23

Table 3.5: Acres by Soil Groupings in the Arizona Strip FO 24
Table 3.6: Minor Plateaus and Their Bounding Features in the Planning Area 26
Table 3.7: Dominant Plant Species by Ecological Zone..... 34
Table 3.8: Priority Riparian Areas 39
Table 3.9: Wildland Fires and Acres Burned in the Planning Area..... 51
Table 3.10: Acres of Fuels Treatment Projects in the Planning Area, 1998-2003 51
Table 3.11: Fire Regime/Condition Class Definitions (Schmidt et al. 2002)..... 52
Table 3.12: Historic Fire Return Intervals, Mean FRCC, and Fire Management Allocations for each Ecological Zone 53
Table 3.13: Dominant Animal Species by Ecological Zones 55
Table 3.14: Special Status Animal Species..... 65
Table 3.15: Special Status Plants 82
Table 3.16: American Indian groups with Cultural and Historical Ties to the Arizona Strip 92
Table 3.17: Scenic Quality Ratings and VRI Classes in the Planning Area..... 97
Table 3.18: Scenic Quality Ratings and VRI Classes in Parashant 100
Table 3.19: Scenic Quality Ratings and VRI Classes in Vermilion 101
Table 3.20: Scenic Quality Ratings and VRI Classes in the Arizona Strip FO 102
Table 3.21: Lands with Wilderness Characteristics in Parashant 107
Table 3.22: Current and Implemented Allotment Grazing Systems in the Planning Area..... 125
Table 3.23: Parashant Allotment Categorization Summary 129
Table 3.24: Vermilion Allotment Categorization Summary..... 129
Table 3.25: Arizona Strip FO Allotment Categorization Summary 130
Table 3.26: Mineral Resource Potential Ratings 130
Table 3.27: Recreation Visits..... 151
Table 3.28: Interagency Visitor Center Visitation (ASIA)..... 151
Table 3.29: Number of Active Permits by Use Type (9/1/2002)..... 153
Table 3.30: Miles of Roads, Primitive Roads and Trails in the Planning Area by Route Type . 162
Table 3.31: Total Miles of Routes by Responsibility 163
Table 3.32: Miles of Roads, Primitive Roads, and Trails in Parashant by Route Type 164
Table 3.33: Miles of Roads, Primitive Roads, and Trails in Vermilion by Route Type..... 165
Table 3.34: Miles of Roads, Primitive Roads, and Trails in the AZ Strip FO by Route Type... 166
Table 3.35: Existing Wilderness Areas..... 168
Table 3.36: Suitable Wild and Scenic Rivers in the Planning Area 175
Table 3.37: ACECs Currently Existing in the Planning Area 180
Table 3.38: Estimated Economic Contributions of Grazing in the Planning Area..... 185
Table 3.39: Race and Persons of Hispanic or Latino Origin 188
Table 3.40: Parashant Mines with Suspected Public Safety and/or Environmental Concerns... 190
Table 3.41: Vermilion Mines with Potential Public Safety and/or Environmental Concerns.... 191
Table 3.42: Mines with Potential Public Safety and/or Environmental Concerns 191

LIST OF MAPS

Map 3.1: Hydrology Sub-basins & Watersheds 5
Map 3.2: Riparian Areas, Springs, Seeps, & Water Wells 7
Map 3.3: Soil Productive Potential 12
Map 3.4: Saline Soils 14
Map 3.5: Microbiotic Soil Crusts 15
Map 3.6: Compactable Soils 16
Map 3.7: Water Erosion Potential 18
Map 3.8: Floodplain Soils 20
Map 3.9: Wind Erosion Potential 21
Map 3.10: Geological Formations on the Arizona Strip 27
Map 3.11: Ecological Zones on the Arizona Strip
Map 3.12: Noxious Weeds 35
Map 3.13: Major Vegetation Types on the Arizona Strip 36
Map 3.14: Fire History 37
Map 3.15: Pronghorn Antelope Habitat 57
Map 3.16: Bighorn Sheep Habitat 58
Map 3.17: Mule Deer Habitat 60
Map 3.18: Merriam's Turkey & Kaibab Squirrel 61
Map 3.19: Desert Tortoise Habitat 71
Map 3.20: Southwestern Willow Flycatcher and Fishes Habitat 75
Map 3.21: Threatened &Endangered Plant Species 83
Map 3.22: Visual Resource Management Inventory 99
Map 3.23: Airports, Airstrips, and Overflight Areas 103
Map 3.24: Lands with Wilderness Characteristics 106
Map 3.25: Potential Wood Harvesting Areas 110
Map 3.26: Active Mining Claims 131
Map 3.27: Oil and Gas Resource Potential 133
Map 3.28: Metallic Mineral Resource Potential 136
Map 3.29: Uranium Resource Potential 139
Map 3.30: Non-Metallic Mineral Resource Potential 140
Map 3.31: Salable Mineral Resource Potential 142
Map 3.32: Recreation 148
Map 3.33: Proposed Wild and Scenic Rivers: Paria River 176
Map 3.34: Proposed Wild and Scenic Rivers: Virgin River 177

CHAPTER 3. AFFECTED ENVIRONMENT

RESOURCES

AIR

Overview

The existing air quality in the Planning Area is typical of undeveloped regions in the western U.S. The entire Planning Area has been designated as either attainment (i.e., it has met national air quality standards) or unclassified for all pollutants and has been designated as Prevention of Significant Deterioration (PSD) Class II, as defined by the Clean Air Act. Grand Canyon National Park to the south of the Planning Area is a PSD Class I area.

Air quality in the Planning Area is generally good, although regional haze can impair vistas, and ozone levels are above natural levels. Exceptions include short-term pollution resulting from vehicular traffic, mining operations, and wildland fires. Regional haze is most common in the summer, blown in from metropolitan areas south and west of the Planning Area, such as the San Joaquin Valley and Los Angeles, California; Las Vegas, Nevada; and Phoenix, Arizona. In the winter, northerly airflows transport clear, clean air into the Planning Area. Emissions from prescribed burns, wild fires, and the burning of vegetation on private lands cause localized air pollution due to the release of particles and gases. Fugitive dust is generated by the erosive force of winds blowing across the area, mainly coming from disturbed areas such as roads. Fugitive dust is not included in air quality evaluations.

In 1976, the Navajo Generating Plant was completed in Page, Arizona. This coal-fired electricity generating station consists of three, 750 MW units which burn a maximum load of 25,000 tons of coal per day. The plant used to be a major point source of airborne sulfur compounds; however, by 1999 the plant had installed three wet limestone scrubbers, removing 90 percent of the sulfur dioxide from the emission plumes of the plant.

Currently, air quality is not being monitored within the Planning Area, although several special studies have been conducted adjacent to it. Routine monitoring is carried out in Grand Canyon National Park and recently began in Meadview (Lake Mead National Recreation Area (NRA)) and Zion National Park. Existing practices for managing air quality consist mainly of conducting prescribed burns during favorable wind conditions (e.g., when winds are blowing away from Class I lands) and using dust control on roads and mining operations.

Parashant Air

The proclamation establishing Parashant cites the area's "engaging scenery" and its "remote and unspoiled" character. Maintaining these qualities requires clean and clear air, allowing visitors to see and appreciate the rugged, colorful panoramas, and protecting the Monument's flora and fauna from the injurious effects of air pollution. Air quality in Parashant is normally very good. Localized air pollution in the form of fugitive dust occurs in minor amounts from travel on small dirt roads. Most fugitive dust occurs in the lowest and driest part of the Monument, such as the Pakoon Basin. Smoke from wildfires and prescribed burns are occasionally emitted in the Monument. Haze is also blown into the area from major metropolitan areas, mainly Las Vegas and Los Angeles. Limited ozone monitoring conducted in the summer of 2003 found elevated ozone levels immediately south of the Pakoon Basin at Meadview, but lower ozone levels were detected further east at Tuweep. The pattern and concentrations at Meadview seem to follow those measured in Las Vegas and suggest concentrations high enough to injure sensitive plant species in the Pakoon Basin. However, the Tuweep data suggest fewer impacts in the east and/or at higher elevations of the Shivwits and Uinkaret plateaus.

Vermilion Air

The "remote and unspoiled" nature of the Monument is cited as a condition to be preserved in its enabling proclamation. Air quality in Vermilion is normally excellent. Localized air pollution occurs in minor amounts from travel on small dirt roads. During the summer, regional haze enters the area from the south and west, although visibility is generally remains very good. In general, winters are clean and clear, although local inversions may trap pollutants in the House Rock Valley and Wahweap Basin. The Paria Plateau is generally above these haze layers, although vistas can be degraded by these hazes.

Arizona Strip FO Air

Air quality in the Arizona Strip FO is normally good. Localized air pollution consists mainly of fugitive dust from travel on large dirt roads such as Clayhole and Quail Hill roads, and from operations of a gypsum mine in the Planning Area, south of St. George, Utah. Occasional wildfires and prescribed burns emit smoke into the area. Air quality in the St. George basin, including the Arizona segment, has been deteriorating with the increase in the city's population and traffic on I-15. Air pollution is especially noticeable during winter inversions. Regional haze is also blown into the area from major metropolitan areas, mainly during the summer.

WATER

Overview

Water Rights

Arizona law divides water rights for surface water and groundwater into distinct legal regimes. Surface water is subject to the Doctrine of Prior Appropriation (Public Water Code Title 45, Chapter 1, Article 5). Arizona courts have interpreted appropriable water to include "waters of all sources, flowing in streams, canyons, ravines, or other natural channels, or in definite underground channels, whether perennial or intermittent, flood, waste or surplus water, and of lakes, ponds, and springs on the surface." Water in definite underground channels is distinguished from percolating groundwater. Appropriation of water occurred before 1919 by simply putting water to beneficial use and recording the use. The Public Water Code was enacted in 1919 to create a uniform permit system of rights. Groundwater not subject to appropriation, (i.e. percolating groundwater, is governed under the Doctrine of Reasonable Use: Public Water Code Title 45, Chapter1, Article 5). The overlying landowner's right is based on the amount of water captured and used. Wells in the Planning Area are subject to registration requirements.

Rights to surface waters, springs, and stock ponds in the Planning Area are held by private landowners, grazing permittees, or by federal land managers. Official water right records are available through the Arizona Department of Water Resources. Some information may also be found in individual grazing allotment files.

Applications for in-stream flow rights for fisheries protection on the Virgin River and Beaver Dam Creek are currently being processed by the Bureau of Land Management (BLM) state office. The BLM has asserted rights on 72 waters withdrawn under Public Water Reserve (PWR) 107 for purposes consistent with and identified in the withdrawal. Six waters are asserted under other PWRs.

Surface Water Resources

Four perennial streams of more than a half-mile in length flow across the Planning Area: Kanab and Beaver Dam creeks and the Virgin and Paria rivers. Other, shorter streams include Badger and Cottonwood creeks. There are also approximately 1400 stock ponds, 365 springs and seeps, three playettes or "mini-playas," and many small potholes scattered throughout the Planning Area. Most springs flow less than a few hundred feet from their source at rates of 0.5 to 3 gallons per minute (gpm) and have been developed for livestock, wildlife, recreation, and/or administrative use.

A network of ephemeral washes that only run during major rainfall events characterizes much of the Planning Area. During the fall and winter, rainstorms are usually gentle and the water soaks

into the ground, resulting in minimal stream flows. Snowmelt in the higher elevations can result in stream runoff in the spring after wet winters. The greatest possibility of ephemeral washes to flow occurs after summer rainstorms, which are often intense but of short duration and can cause erosion and flash flooding. The present drainage pattern was primarily produced by these intense summer storms.

The Planning Area is portioned hydro-geographically into parts of nine sub-basins according to U.S. Geological Survey (USGS) standards (see Map 3.1). All of the sub-basins in the Planning Area drain into the Colorado River via their main tributaries as listed in Table 3.1

Table 3.1: Sub-basins in the Planning Area

Sub-basin	USGS HUC Number	Main Tributary in Planning Area
Lower Lake Powell	14070006	Ferry Swale Canyon
Paria	14070007	Paria River
Lower Colorado – Marble Canyon	15010001	House Rock Wash
Grand Canyon	15010002	Parashant Canyon
Kanab	15010003	Kanab Creek
Lake Mead	15010005	Colorado River
Grand Wash	15010006	Grand Wash
Fort Pearce Wash	15010009	Fort Pearce Wash
Lower Virgin	15010010	Virgin River

The BLM's management objective for surface water quality ensures that all waters on public lands meet or exceed federal and state water quality standards for specific uses (e.g., drinking, swimming, fishing, etc.). These standards are regulated by the State and include acceptable levels for variables in surface water quality such as turbidity, pH, trace metals, salinity and other total dissolved solids (TDS), bacterial levels, and sediment loads. Salinity levels due to sulfate salts and suspended sediment concentration are the main water quality concerns in the Planning Area. The Colorado River Basin Salinity Control Act of 1974 mandates the reduction of salt contributions to the Colorado River.

The Arizona Department of Environmental Quality (ADEQ) is responsible for water quality in Arizona. The ADEQ conducts biennial statewide surface water quality assessments, producing a report that lists streams that are not meeting state water quality standards for their designated uses. The Virgin River below Littlefield and a stretch of the Colorado River just below the mouth of Parashant Canyon are listed by the ADEQ as impaired water bodies for having too high of a concentration of suspended sediments, exceeding the states Total Maximum Daily Load (TMDL) standards. The ADEQ started water quality studies on the Paria River in 2001, but no data is currently available.

The most significant sources of non-point source pollution (i.e., pollution sources that are diffuse and do not have a single point of origin nor originate from a specific outlet) affecting Arizona's waters are grazing, hydrologic/habitat modification, recreation, and resource extraction. Pollutants of concern are increased sediment and salt loads due to runoff events.

Map 3.1: Hydrology Sub-basins & Watersheds

Ground Water Resources

There are approximately 62 wells in the Planning Area (see Map 3.2). Most of the communities in the Planning Area get their potable water from springs or wells less than 500 feet deep. Deep drilling for uranium on the south end of the Uinkaret Plateau revealed a possible deep regional groundwater table, most of which is deeper than 2,500 feet below the surface in the Redwall/Muav limestone contact. The water is too deep for a pumping system to be economically viable. Most functioning wells have been drilled into shallow and small, perched aquifers, but little is known about the total amount of available water in each aquifer. The source of recharge for these perched aquifers is probably from runoff into the alluvium of usually dry washes after large precipitation events, or seepage through basalts, sandstones, limestones, and other permeable rock layers.

Groundwater from shallow aquifers is generally high in salinity and commonly does not meet state drinking water standards, although it is considered acceptable for livestock and wildlife use. Groundwater quality varies widely throughout the Planning Area depending on the type of aquifer and geologic formation from which it originates. In general, the Navajo Sandstone, Shinarump Conglomerate, and Virgin Limestone tend to produce water low in dissolved salts. Aquifers in the Moenkopi Formation, Kaibab limestone, and drainage alluvium tend to have salty waters.

Parashant Water

Water Rights

The Parashant proclamation "does not reserve water as a matter of federal law nor relinquish any water rights held by the Federal Government existing on this date." Consequently, the creation of the Monument has not altered valid existing water rights. However, the proclamation does state, "The federal land managing agencies shall work with appropriate state authorities to ensure that water resources needed for Monument purposes are available."

Surface Water Resources

The Parashant proclamation notes that the "Monument encompasses the lower portion of the Shivwits Plateau, which forms an important watershed for the Colorado River and the Grand Canyon." Almost all of the Monument's watersheds drain into the Grand Canyon or Lake Mead portions of the Colorado River. The fact that the Colorado River exceeds the state's TMDL standards just below the mouth of Parashant Canyon suggests that latter's watershed may contribute to such impairment through accelerated erosion and suspended sediments flowing into the Colorado River. Saline soils in the Pakoon Basin may also be responsible for salt contributions to the Colorado River.

Map 3.2: Riparian Areas, Springs, Seeps, & Water Wells

The Parashant proclamation also notes the "lack of natural waters" within the Monument's boundaries. While there are no rivers, creeks, or lakes, the Monument does contain 127 springs and 275 stock ponds. Most of the springs have been developed for use by livestock and wildlife, with much of the water piped away from the source. These springs are discussed in more detail later in this chapter under the section on Vegetation (Riparian Ecological Zone). Numerous washes are also filled during summer rainstorms, but dry up soon after the rain events cease.

Ground Water Resources

There are approximately 17 wells inside the Monument, with a majority of them owned by ranchers. One exception is the Mociac well, which is owned by the BLM. It was hand-dug in drainage alluvium and supplies a minimal amount of potable water to the BLM's Parashant administrative site. The well relies on intermittent seepage and occasionally goes dry during summer droughts. Another BLM well is at the Pakoon Airstrip Fire Station. It is in deep regional alluvium and is currently under development. Government Well, owned by the NPS, will be developed to support the NPS Dellenbaugh administrative site.

Vermilion Water

Water Rights

The Vermilion proclamation "does not reserve water as a matter of federal law." The proclamation continues to affirm that "Nothing in this reservation shall be construed as a relinquishment or reduction of any water use or rights reserved or appropriated by the U.S. on or before the date of this proclamation." Consequently, the creation of the Monument has not altered valid existing water rights. However, the proclamation does state, "The Secretary shall work with appropriate State authorities to ensure that any water resources needed for Monument purposes are available."

Surface Water

The Paria River originates in Utah and flows south for 30 miles, from the Utah border through Paria Canyon, to its terminus at Lee's Ferry on the Colorado River. It has been considered as suitable for inclusion into the National Wild and Scenic Rivers system.

The river is turbid much of the year and has large amounts of suspended sediment. The Paria, along with the Little Colorado River, currently contributes the majority of the sediment in this section of the Colorado River through the Grand Canyon, and paints the Colorado River red even during relatively low runoff. The runoff is high in TDS, mostly sulfates.

Its perennial flow (or base flow) from the Buckskin Gulch confluence to its mouth at the Colorado River is maintained by springs that discharge from the Navajo Sandstone. According

to the Paria Canyon-Vermilion Cliffs Wilderness Management Plan (BLM 1986), the average release of these springs is from 2 to 7 cubic feet per second (cfs) of generally potable water with low TDS. Peak flows from storm events can be very high in this narrow canyon, resulting in flood depths in the tens of feet. In 1980, a 50-year storm caused a peak flow of 8,520 cfs.

There are 87 springs and 51 stock ponds within the Monument. The springs in Paria Canyon are free flowing and have not been developed. Most springs along the Vermilion Cliffs have been partially piped to troughs and residences. A majority of springs emerge from the contact between the Navajo Sandstone aquifer and the less permeable Kayenta or Moenave Formations below. The water quality in the Navajo Sandstone is good. The three largest springs along the cliffs (Soap, Badger, and Lowrey) are shared as water sources by three lodges, many residences, and a few ranches in the valley below them.

Ground Water Resources

There are approximately five wells inside the Monument used for stock watering. Most of them are on the Paria Plateau, which is underlain by the Navajo Sandstone, which is a thick, excellent aquifer as it is very porous and can supply large quantities of potable water.

Arizona Strip FO Water

Surface Water Resources

The Virgin River flows for 39 miles through the northwest corner of the area, entering from just south of St. George, Utah, and exiting near Mesquite, Nevada. Parts of it have been considered as suitable for inclusion into the National Wild and Scenic Rivers system. During much of the year, the river is turbid, having large amounts of suspended sediment. Runoff is high in TDS, mostly sulfates. The river is habitat for two endangered fishes, the woundfin minnow and the Virgin River roundtail chub. The Virgin River is also the main source of water for bighorn sheep in the Virgin River Gorge area.

Its perennial flow from Utah is regulated by a mandatory minimum flow rate of 50 cfs to protect the endangered fishes. An additional 50 cfs is contributed by springs in the narrows portion of the Virgin River Gorge. Petrified Springs contributes another 4 cfs further downstream near Littlefield. Beaver Dam Creek adds an additional 3 cfs. At the Littlefield gauge, monitored by the USGS, average yearly discharge is 238 cfs with peak flows of over 5,000 cfs. A flow of 35,200 cfs was recorded in 1966. When Quail Dam broke in 1989, the river's peak flow reached 61,000 cfs.

Kanab Creek enters from Utah at Fredonia, Arizona, and flows for 10 miles across state and private lands, then across 9 miles of the Kaibab Indian Reservation, then through 22 miles of the Arizona Strip FO, finally exiting into U.S. Forest Service (USFS) lands. Upstream users in Utah reduce flows for municipal and irrigation purposes, leaving it almost dry in the summer. A short

stretch of less than 0.5 miles, where Clear Water Spring flows into Kanab Creek about 14 miles south of Fredonia, is perennial.

Beaver Dam Creek enters from Utah and flows underground through approximately 1 mile of public land and 8 miles of state and private lands. It surfaces into perennial flows on private land near the Interstate 15 bridge at the community of Beaver Dam. The creek flows across 0.25 miles of public land to its confluence with the Virgin River. It has potable water and is a habitat for speckled dace.

There are 151 springs, approximately 1077 stock ponds, 8 detention dams, dozens of dikes and check dams and many potholes within the Arizona Strip FO. Most of the springs are piped for livestock and wildlife use. Sullivan's Spring, on Black Rock Mountain, is fenced, has good water quality, and a lush riparian area.

Ground Water

Many aquifers underlying the Planning Area contain groundwater that is high in TDS and considered non-potable according to state standards. The exception is at Beaver Dam Wash where approximately 15 domestic wells are located in the alluvial aquifer. There are 25 wells across the rest of the area that are mainly used for wildlife and livestock purposes.

SOILS

Overview

Soils types in the Planning Area are variable, reflecting the differences and interactions between topography, elevation, parent material, and time. Topography ranges from nearly level valley bottoms to vertical cliffs. Elevation in the area ranges from 1,247 feet above sea level near Lake Mead to 8,029 feet on top of Mt. Trumbull. The dominant parent materials in the Planning Area are sedimentary rocks such as limestone, mudstone, shale, gypsum, and sandstone. Igneous rocks, such as basalt, basalt cinders, and granite are also prevalent, and metamorphic rocks such as gneiss are present. Many alluvial soils have formed from mixes of these various parent materials.

The National Resources Conservation Service (NRCS) has completed and published soil surveys for all of the Planning Area. These surveys are referenced by number and include:

- Number 623: everything west of the Hurricane Cliffs (NRCS 1994)
- Number 625: lands east of the Hurricane Cliffs to Kanab Creek (NRCS 1992)
- Number 629: the rest of the Strip east of Kanab Creek (NRCS 1991)
- Number 701: the National Park Service (NPS) portion of Parashant (NRCS 1999)
- Number 608: the Virgin River Valley from the Nevada State line to Littlefield (NRCS 1980)

In the past, heavy grazing and roads in the Planning Area have adversely affected much of the soils through compaction and decreased ground cover (BLM 1979; BLM 1980). Subsequent grazing cuts, implemented to counter these impacts, were generally successful as they reduced compaction and increased ground cover, resulting in increased water infiltration, reduced runoff, and decreased erosion over much of the Planning Area. Several roads were moved or closed to prevent erosion on sensitive soils. Some areas of valuable soils (see below) continue to have accelerated erosion rates and require further restoration and stabilization assessments.

Soils are placed into specific groups based on physical, chemical, and mechanical characteristics important to proper watershed management, such as soil productivity, soil salinity, soil compactability, water erodibility, and wind erodibility. These groups are used to assess impacts on soils from various uses, to evaluate the potential for restoration of ecological sites, to set the parameters for watershed management, and to determine the benefits and prioritization of restoration projects. The acres of soils under each rating in the Planning Area are presented in Table 3.2.

Table 3.2: Acres by Soil Groupings

Productivity Rating			
Very High	**High**	**Medium**	**Low**
21,570	462,559	768,132	2,064,212

Salinity	
Saline	**Not Saline**
512,687	2,810,382

Compactability	
Compactable	**Slightly Compactable to Not**
979,670	2,343,249

Water Erosion Potential			
Severe	**Moderate**	**Slight**	**Can Gully**
1,401,201	1,501,900	244,763	168,567

Wind Erosion Potential		
High	**Moderate**	**Slight**
663,274	759,767	1,893,422

Soil Productivity

The productivity grouping rates the soils according to inherent soil values based upon the amount of genetic development, fertility, organic matter, and leaching (See Map 3.3).

As the potential for soil productivity increases, so does the potential for ecological diversity. The soils rated as having very high productivity are mollisols with very thick and dark mollic epipedons. Epipedons are simply the uppermost soil horizons. These mollisols are mainly found in the moist landscapes of higher elevations and riparian areas, as well as other areas that receive extra moisture from upland runoff. Increased soil moisture allows for more plant production and increased organic carbon. In addition to having the highest productive potential rating and the

Map 3.3: Soil Productive Potential

greatest potential for ecological biodiversity, these soils also readily respond to restoration and management efforts.

Other mollisols in the Planning Area are rated as having high productivity. These soils typically form underneath good grass cover, are normally leached free of soluble salts for more than a foot of depth, have well developed soil horizons when present, and have near neutral pH values. The only difference between the mollisols with high productivity and those with very high productivity is the quality and thickness of the mollic epipedons. When considering fertility and productive potential, all mollisols have the highest value, pound for pound, for the greatest depth, and are considered top priority for use in erosion protection or restoration projects. Such soils usually occur in areas that receive greater than 14 inches of effective precipitation per year.

The soils rated as having medium productivity have ochric epipedons. These soils have moderate amounts of carbon and fairly developed, but thin, epipedons. These soils can be slightly to moderately alkaline with soluble salts leached free to shallow or moderate depths.

Soils rated as having low productivity have very thin or no epipedons and are very light in color due to minimal organic carbon. These soils tend to be moderately to strongly alkaline with only slight leaching of salts.

Soil Salinity

The salinity grouping rates the soils according to inherent concentrations of soluble salts or salt-forming minerals, primarily sulfates and chlorides, at or near the soil surface (see Map 3.4).

Saline soils impede most plant growth, are deficient in plant nutrients, and have high concentrations of gypsum, a sulfate. Many of these soils are also deficient in moisture. Most of these soils are derived from the Moenkopi Formation and the Harrisburg member of the Kaibab Formation, with lesser amounts derived from the Littlefield Formation. Microbiotic soil crusts (see Map 3.5) cover a large percentage these soils and help stabilize them, as well as contribute to plant growth. Although plant growth is sparse in these soils, it would be even sparser if it were not for biological crusts.

Soil Compactability

The compactability grouping (see Map 3.6) rates soils according to their sensitivity to compaction from surficial compressive forces such as trampling and vehicular travel. Compaction is enhanced by soil moisture.

Compaction is one of the most detrimental impacts to soil quality because it can reduce macropore space enough to hinder good root growth, especially for grasses. Reduced pore space also diminishes the soils water holding capacity and along with altered soil structure, decreases the infiltration rate. This, in turn, causes above normal runoff and accelerated erosion. It also

Map 3.4: Saline Potential

Map 3.5: Microbiotic Soil Crusts

Map 3.6: Compactable Soils

limits the exchange of gases between the soil and the atmosphere, which can limit root growth. Such impacts can lessen the productive potential of the ecological site or alter the potential plant community. Soil compaction can often transform grasslands by allowing invasive species an advantage over grasses, especially invasive species with strong roots or deep root systems such as mustards and tumbleweeds.

Evolving for thousands of years in an environment devoid of trampling by large animal herds and no vehicles, the soils in the Planning Area developed porous surface layers via leaching and illuviation. Soil conditions were altered when early settlers brought in herds of sheep, horses, and cattle that compacted the soils and affected the epipedons in many areas. Soil compaction continues to occur today, especially in areas of heavy, repetitive use such as near stock waters, campsites, and on roads and trails.

The soils rated as "slight" in terms of compactability are resistant to compression. This is partially due to containing a high percentage of coarse fragments and/or coarse textures. Only in cases of excessive trampling, such as around high-use stock waters, campsites, and on trails and roads, do these soils become tightly compacted. All soils not shown as compactable on Map 3.6 are considered to be slight.

The soils rated as "compactable" contain enough silts and clays sufficient to fill the voids or macropores when trampling or vehicles compress them. This can result in physical alteration of soil structure, reduced porosity, permeability, and infiltration rates, which can increase runoff and erosion rates.

The soils containing gypsum with biological crusts are highly compactable. These soils are unique because they tend to crush into highly erosive, silty powder when they dry and are very susceptible to compressive forces. The biological crusts are normally suspended over a very porous, partially crystalline, lattice-like structure that was formed through a process of dissolution and leaching. This structure is very fragile and may be several inches thick.

Soils containing gypsum have other unique characteristics. They tend to have a higher percentage of pore space, lower load-bearing capacities, and lower specific gravity than other soils in the area. They are also susceptible to collapsing, caving in, or sinking due to leaching. There are 294,306 acres of microbiotic gypsum soils in the planning area.

Water Erodibility

Soils are rated under the water erodibility grouping according to their susceptibility to erosion when devoid of all organic cover (see Map 3.7). The rating is based on the assumption that soils are in a natural, undisturbed state and evaluates impacts under worst-case scenarios (i.e., when organic cover is lacking). The water erodibility rating would likely increase if the soil has been degraded by compaction or surface disturbances. Because wildland soils are non-renewable resources, they have a lower soil loss tolerance than similar cultivated farmland soils.

Map 3.7: Water Erosion Potential

Soils rated as “none” to “slight” on the water erodibility scale are limited in the Planning Area. They consist mainly of gravel cobble or stone surfaces and associated rock outcroppings, or other forms of course, textured surfaces. These soils tend to have high infiltration rates, slopes of less than 15 percent, and are not likely to erode unless heavily disturbed.

Soils rated as “moderate” under the water erodibility grouping include gravel or cobble-like surfaces with some slopes of 15 to 25 percent, moderately coarse textured surfaces, or surfaces with a restrictive layer. These soils are susceptible to erosion if they are disturbed.

Soils rated as “severe” have slopes of more than 25 percent or have surface textures that are highly erosive such as sands. These soils readily erode when disturbed or when their vegetative cover is reduced.

A separate group of soils rated as “run-in” is characterized by high susceptibility to rill and gully erosion caused by surface disturbances or excessive runoff from surrounding uplands. These soils mostly occur on floodplains or alluvial fans at slopes of less than 5 percent. See Map 3.8 for location of floodplains across the Planning Area. Gully erosion usually results in irreversible soil losses.

Wind Erodibility

Soils are rated under the wind erosion potential grouping according to their susceptibility to wind erosion in a worst-case scenario, as if they are devoid of all organic cover (see Map 3.9). Existing surface disturbances potentially increase the rating. Ratings can vary according to the percentage of coarse fragments at the surface.

Soils rated as “slight” for wind erosion potential consist mainly of gravel, cobble, or stone surfaces. The soils in these surfaces resist wind erosion due to their structural stability, weight, or having a protective cover of coarse fragments.

Soils with moderate wind erosion potential consist mainly of fine textured surfaces or calcareous, medium-textured surfaces that are susceptible to wind erosion when disturbed.

Soils with high wind erosion potential consist mainly of sand and loamy, sand-textured surfaces of medium or smaller sized sands. Many of these soils make up dunes or stabilized dunes. Most of the gypsum soils fall in this group based on their tendency to be crushed into fine, sandy particles.

Map 3.8: Floodplain Soils

Map 3.9: Wind Erosion Potential

Parashant Soils

The acres of soils that fall in the various groups within Parashant are presented in Table 3.3.

Table 3.3: Acres by Soil Groupings in Parashant			
Productivity Rating			
Very High	**High**	**Medium**	**Low**
17,209	310,654	160,568	554,346
Salinity			
Saline		**Not Saline**	
108,500		939,816	
Compactability			
Compactable		**Slightly Compactable to Not**	
296,542		751,681	
Water Erosion Potential			
Severe	**Moderate**	**Slight**	**Can Gully**
566,261	319,605	133,500	23,379
Wind Erosion Potential			
High	**Moderate**	**Slight**	
39,880	85,269	917,622	

Productive Soils

The soils with the highest productive potential are the mollisols that are located in the higher elevations (above 6,000 feet) of the Mt. Trumbull, Parashant, and Black Rock Mountain areas. Other mollisols are located at Hidden Hills, Poverty Mountain, Wolfhole Mountain, around Mustang Knoll, and in the Virgin Mountains from Mt. Bangs south to the Nevada border. Many of these areas are experiencing pinyon-juniper or sagebrush invasions. Other areas are undergoing various stages of erosion, with gullies commonly occurring in floodplains.

Saline Soils

Most of the saline gypsum soils in the Monument are located in the Pakoon basin. Well-developed biological crusts cover an area of about 13,537 acres in the basin, 2 miles northeast of Tassi Springs, with small areas south of Bundyville and in the lower parts of Andrus and Parashant canyons. There are 17,895 acres of microbiotic gypsum soils in Parashant, 3,120 of which are in the NPS portion.

Compactable Soils

Highly compactable soils occur mainly in the Parashant, Mt. Trumbull, Poverty Mountain, Hidden Hills, and Black Rock Mountain areas. Trampling by cows around and in-between livestock waters on floodplains and vehicle travel on roads cause most of the compaction.

Additional compaction occurs along trails, at campsites, and in areas of off highway vehicles (OHV) use. Some of these areas are in various stages of erosion, including gullying. Large areas of biological crusts/gypsum soils are found in the south end of the Pakoon basin. They are in extremely good condition due to light use. About 88,050 acres of compactable soils (roughly 30 percent) are in the NPS portion of the Monument.

Water Erodible Soils

Soils that are severely eroded by water, including "run-in" soils, occur across the Monument. Valuable run-in mollisols susceptible to gully erosion are located in the Parashant and Mt. Trumbull areas on floodplains and alluvial fans.

Wind Erodible Soils

The largest areas with high potential for wind erodibility are located in the Pakoon Basin, which includes the sand dunes near Mud Mountain and the gypsum soils near Lake Mead. Another large area of wind erodible soils is located on the sandy bench near Copper Mountain mine.

Vermilion Soils

The acres of soils that fall in the various groups within Vermilion are presented in Table 3.4.

Table 3.4: Acres by Soil Groupings in Vermilion

Productivity Rating			
Very High	**High**	**Medium**	**Low**
0	0	3,685	289,998

Salinity	
Saline	**Not Saline**
2,009	291,679

Compactability	
Compactable	**Slightly Compactable**
5,025	288,662

Water Erosion Potential			
Severe	**Moderate**	**Slight**	**Can Gully**
106,834	183,873	2,974	0

Wind Erosion Potential		
High	**Moderate**	**Slight**
283,108	9,965	610

Soil Productivity

Most of the soils within Vermilion are sandy and naturally low in fertility and productivity. There are no known mollisols in the Monument.

Saline Soils

Saline gypsum soils occur along the base of the Vermilion Cliffs. Some of these areas contain biological crusts. There are approximately 2,009 acres of microbiotic gypsum soils in Vermilion.

Compactable Soils

Only a few, small areas of compactable soils occur in Coyote Valley. Trampling around and in-between livestock waters on floodplains and vehicle use on roads cause most of the compaction. Additional compaction occurs along trails, at campsites, and by OHV use. Areas with biological crusts over gypsum soils are present along the base of the Vermilion Cliffs.

Water Erodible Soils

Run-in soils are most likely to occur on the steep areas and alluvial fans along the Vermilion Cliffs, in Paria Canyon, at locations along the north edge of the Monument, and in the Ferry Swale area.

Wind Erodible Soils

Excluding the escarpments, most of the Monument consists of stabilized sand dunes or sandy soils with little or no surface gravels. The sandy soils are highly susceptible to wind erosion where there is little to no vegetation.

Arizona Strip FO Soils

The acres of soils that fall in the various groups within the Arizona Strip FO are presented in Table 3.5.

Table 3.5: Acres by Soil Groupings in the Arizona Strip FO

Productivity Rating			
Very High	**High**	**Medium**	**Low**
4,361	151,906	603,879	1,219,869

Salinity	
Saline	**Not Saline**
402,177	1,578,887

Compactability	
Compactable	**Slightly Compactable to Not**
678,103	1,302,906

Water Erosion Potential			
Severe	**Moderate**	**Slight**	**Can Gully**
728,105	998,423	108,289	145,188

Wind Erosion Potential		
High	**Moderate**	**Slight**
340,286	664,533	975,190

Soil Productivity

Mollisols in the Arizona Strip FO are located in the higher elevations of the Virgin Mountains, on Black Rock Mountain, near Mustang Knoll, on Wolfhole Mountain, north of Poverty Mountain, north and east of Mt. Trumbull, and in small areas east of Fredonia atop the Buckskin Mountains. As in Parashant, many of these areas are experiencing pinyon-juniper or sagebrush invasions, while other areas are undergoing various stages of erosion.

Saline Soils

Saline soils are widely scattered across the Arizona Strip FO. Concentrations include areas west of Beaver Dam Wash, in the St. George Basin, Hurricane Valley, Clay Hole Valley, around Fredonia, and in House Rock Valley. The most developed biological crusts occur south of Fort Pearce Wash. These soils have received much human and livestock use, but their overall condition has not been assessed or documented.

Compactable Soils

Approximately 1/3 or (34%) of the soils scattered throughout the Arizona Strip FO are susceptible to compaction. About 2/5 or 40% of these soils are high in gypsum at or near the surface and can support biological crusts.

Water Erodible Soils

Highly water erodible soils are widespread across the area. Run-in soils susceptible to gully erosion are mostly concentrated in drainages and on alluvial fans in Hurricane Valley, the Clay Hole area, near Fredonia, and in House Rock Valley. Smaller areas of mollisols near Mt. Trumbull also have the potential to gully.

Wind Erodible Soils

Soils susceptible to wind erosion are concentrated west of Beaver Dam Wash, south of St. George, in Hurricane Valley, south and east of Colorado City, in House Rock Valley, and near Lake Powell. Most of them have sandy surface textures. Disturbance of these surfaces increase the potential for erosion.

GEOLOGY AND PALEONTOLOGY

Overview

Physiography

The Planning Area lies within two distinct physiographic provinces (Hayes, 1969), the Basin and Range and the Colorado Plateau. The western third of the Planning Area, from the Grand Wash Cliffs fault zone to the Nevada border, lies in the Basin and Range province. This area is characterized by irregular surfaces, northerly trending mountain ranges, sediment filled basins, abundant igneous and metamorphic rock exposures, extensive faulting and folding, and widely exposed Precambrian rocks.

The eastern three-fourths of the Planning Area, from the Grand Wash Cliffs fault zone east to Marble Canyon, lies within the Colorado Plateau province. This province is characterized by predominantly sedimentary rock exposures; a regular, gently dipping surface; and plateau elevations exceeding 5,000 feet with subordinate plateaus exceeding 9,000 feet. The portion of the Colorado Plateau within the Planning Area has been further subdivided by Hayes (1969), who refers to the Planning Area section of the Colorado Plateau as the Grand Canyon section. This section is characterized by block plateaus over 7,000 feet in elevation, which has been cut up to 3,000 feet by the tributaries to the Colorado River.

Major structures that occur in the Planning Area include faults (Virgin, Grand Wash Cliffs, Mainstreet, Hurricane, Dellenbaugh, Toroweap, Sevier, and Muav Canyon faults), anticlines (Vermilion, Kaibab, and Echo anticlines), and monoclines (Kaibab and Echo Cliffs monoclines). See Map 3.10 for the location of major geological formations on the Arizona Strip. In general, northerly trending normal faults, down thrown to the west, dominate the structural setting of the western two-thirds of the Planning Area. East of the Muav Canyon fault zone, anticlines and monoclines are the most common major structural types. In most cases, the low sides of the monoclines lie to the east of the flexures.

Several minor plateaus have been defined in the portion of the Planning Area that lies in the Colorado Plateau province (Dutton 1882). Table 3.6 lists these plateaus from west to east and identifies the major features that define their boundaries.

Table 3.6: Minor Plateaus and Their Bounding Features in the Planning Area

Plateau	West Feature	Location	East Feature	Location
Shivwits Plateau	Grand Wash Cliffs Fault Zone	Parashant	Hurricane Cliffs Fault Zone	Parashant Arizona Strip FO
Uinkaret Plateau	Hurricane Cliffs Fault Zone	Parashant Arizona Strip FO	Toroweap Fault Zone	Parashant Arizona Strip FO
Kanab Plateau	Toroweap Fault Zone	Parashant Arizona Strip FO	Muav Canyon Fault Zone	Arizona Strip FO
Kaibab Plateau	Muav Canyon Fault	Arizona Strip FO	Kaibab Monocline	Arizona Strip FO
Paria Plateau	Vermilion Cliffs	Vermilion	Paria Canyon	Vermilion

Map 3.10: Geological Formations on the Arizona Strip

Historical Geology and Stratigraphy

In northwestern Arizona, Paleozoic rocks unconformably overlie the Precambrian through lower Cenozoic sediments of both continental and marine origin. In addition, Tertiary and Quaternary volcanic features overlie these sediments in the western half of the Planning Area. Generally, the geological structure of the Colorado Plateau has remained stable over time. The historical geology of the Planning Area is detailed in Appendix 3.A. Figure 3.1 is a stratigraphic drawing illustrating the various geologic layers in Parashant and western Arizona Strip FO, while figure 3.2 illustrates geologic layers in Vermilion and eastern Arizona Strip FO.

Paleontology

Geologic layers representing nearly 2 billion years of time are present in the Planning Area. Many of these layers contain paleontological resources. The potential for a given geologic formation to contain paleontological resources varies by formation age and deposition type. The geologic layers containing paleontological resources span from 570 million years old to 10,000 years old. Appendix 3.B shows some of the more common paleontological resources contained within geologic units of varying age throughout the Planning Area.

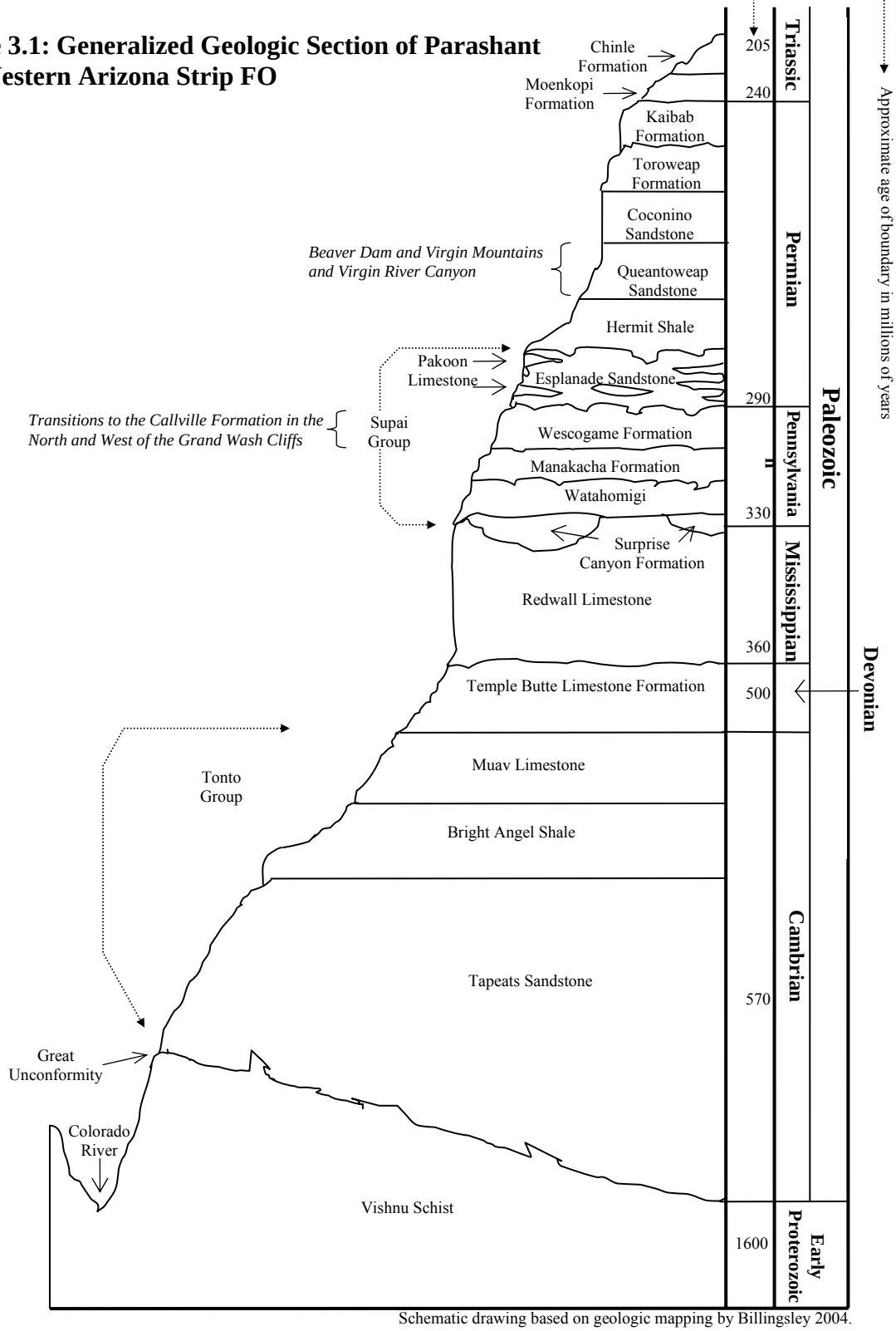
Parashant Geology and Paleontology

The Parashant proclamation describes the Monument with its deep canyons, mountains, and lonely buttes as a "geological treasure," and identifies geologic features such as Monument objects as worthy of protection. The geologic history of the Monument spans almost 2 billion years with Paleozoic and Mesozoic sedimentary rock layers relatively un-deformed and un-obscured by vegetation, offering a clear view to understanding the geologic history of the Colorado Plateau.

Figure 3.1 illustrates the geologic formations found in Parashant. Many of the formations have been exposed by millennia of erosion by the Colorado River. The Cambrian, Devonian, and Mississippian formations (Muav Limestone, Temple Butte Formation, and Redwall Limestone) are exposed at the southern end of the lower Grand Wash Cliffs. The Pennsylvanian and Permian Formations (Supai Group, Esplanade Sandstone, Hermit Shale, Coconino Sandstone, Toroweap Formation, and Kaibab Formation) are well exposed within Parashant, Andrus, and Whitmore Canyons, and on Grand Wash Bench. The Triassic Chinle and Moenkopi Formations are exposed on the Shivwits Plateau, and the purple, pink, and white shale, mudstone, and sandstone of the Chinle are exposed in Hell's Hole.

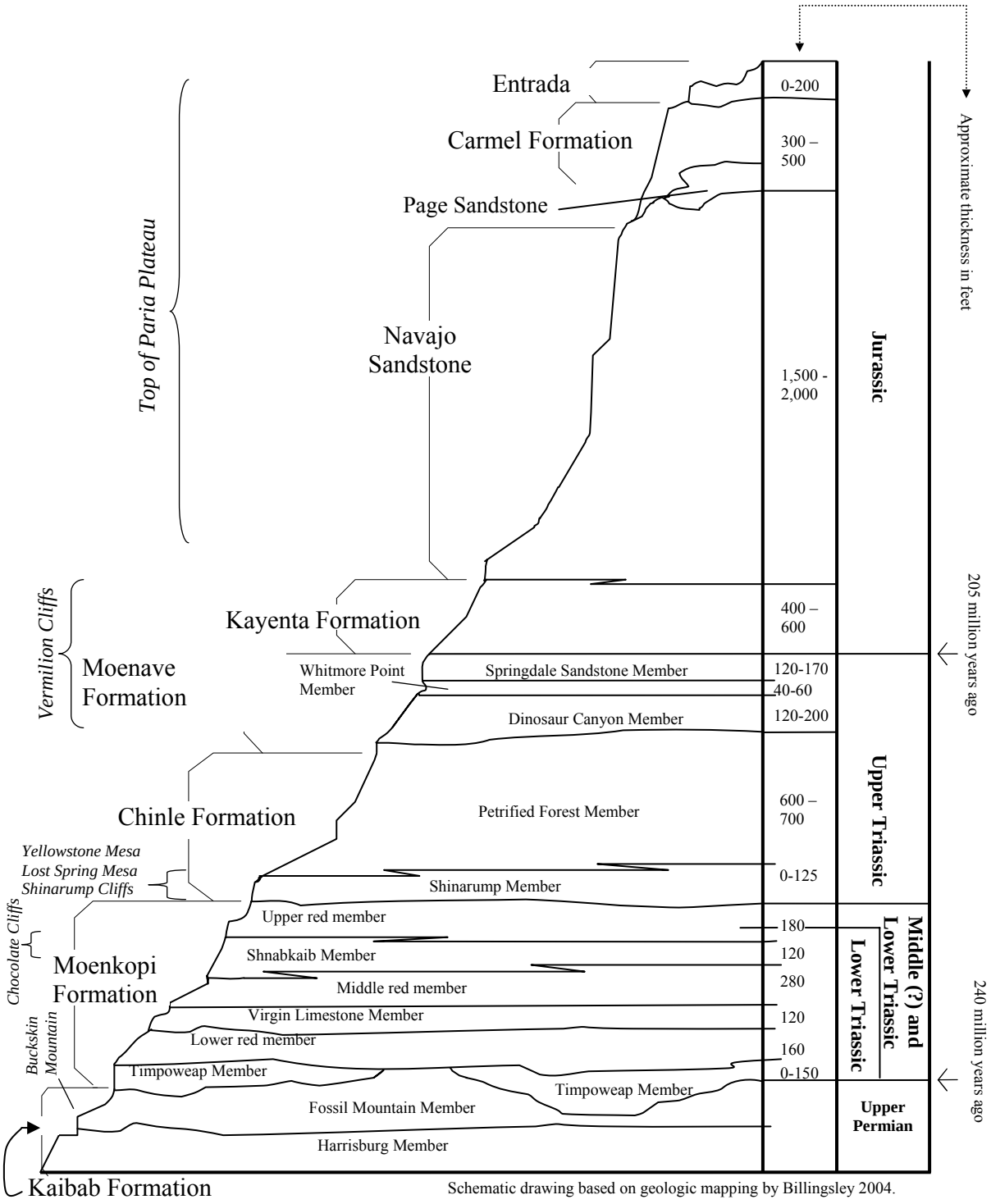
The Monument encompasses the lower portion of the Shivwits Plateau, which forms an important watershed for the Colorado River and Grand Canyon. The Plateau is bounded on the west by the Grand Wash Cliffs and on the east by the Hurricane Cliffs. These cliffs, formed by

Figure 3.1: Generalized Geologic Section of Parashant and Western Arizona Strip FO



Schematic drawing based on geologic mapping by Billingsley 2004.

Figure 3.2. Generalized Strata of Vermilion and Eastern Arizona Strip FO



Schematic drawing based on geologic mapping by Billingsley 2004.

large faults slicing north to south through the region, are the major topographic barriers. At the south end of the Shivwits Plateau are several important tributaries including the rugged and beautiful Parashant, Andrus, and Whitmore canyons. Volcanic rocks with an array of cinder cones cap the Plateau and basalt flows, and range in age from 9 million to 1,000 years old. Lava from the Whitmore and Toroweap areas has flowed into the Grand Canyon and dammed the river many times over the past several million years. The Monument is pocketed with sinkholes and breccia pipes, structures associated with volcanism and the collapse of underlying rock layers through ground water dissolution.

Parashant also contains portions of several active geologic faults in the area. These include the Dellenbaugh fault, which cuts basalt flows dated 6 to 7 million years old; the Toroweap fault, which has been active within the last 30,000 years; the Hurricane fault, which forms the Hurricane Cliffs and extends over 150 miles across northern Arizona into Utah; and the Grand Wash fault, which separates the Colorado Plateau and Basin & Range physiographic provinces.

The potential for an abundant fossil record exists in Parashant. Large numbers of invertebrate fossils are known to occur within the Monument, including bryozoans and brachiopods in the Calville limestone and brachiopods, pelecypods, fenestrate bryozoa, and crinoid ossicles in the Toroweap and Kaibab Formations of Whitmore Canyon. There are also sponges in nodules and pectenoid pelecypods in the Kaibab Formation of Parashant Canyon (see Appendix 3.B).

Vermilion Geology and Paleontology

Vermilion is also described in its proclamation as a geological treasure worthy of protection. In the center of Vermilion sits the majestic Paria Plateau, a grand terrace lying between the East Kaibab and the Echo Cliffs monoclines. The Vermilion Cliffs, which lie along the southern edge of the Paria Plateau, rise 3,000 feet in a spectacular escarpment capped with sandstone underlain by multicolored, actively eroding, dissected layers of shale and sandstone. The stunning Paria River Canyon winds along the east side of the plateau to the Colorado River. Erosion of the sedimentary rocks in this 2,500-foot deep canyon has produced a variety of geologic objects and associated landscape features such as amphitheaters, arches, and massive sandstone walls.

In the northwest portion of the Monument lies Coyote Buttes, a geologically spectacular area where crossbeds of sandstone exhibit colorful banding in surreal hues of yellow, orange, pink, and red caused by the precipitation of manganese, iron, and other oxides. Thin veins or fins of calcite cut across the sandstone, adding another dimension to the landscape.

Figure 3.2 illustrates the geologic formations found in Vermilion. The Vermilion Cliffs are composed of the Jurassic Moenave and Kayenta Formations. Directly at their base are the Chocolate Cliffs consisting of the Triassic Moenkopi Formation. The Paria Plateau and the Coyote Buttes are composed of Jurassic Navajo Sandstone, with scattered representations of Page Sandstone, Carmel Formation, and Entrada Sandstone, also from the Jurassic period.

Arizona Strip FO Geology and Paleontology

The geology of the Arizona Strip FO is a mix of some of the same formations in Parashant and Vermilion. Geologic formations found on the western side of the Arizona Strip FO are represented in Figures 3.1 while geologic formations found on the eastern side are represented in Figure 3.2. Specific features found in the Arizona Strip FO include Buckskin Mountain consisting of Permian Kaibab Formation; Yellowstone Mesa, Lost Spring Mesa, and the Shinarump Cliffs consisting of Triassic Shinarump Member of the Chinle Formation, and the Tertiary/Quaternary volcanics associated with the Hurricane, Toroweap, and other faults.

VEGETATION

Overview

Most of the Strip is within the Colorado Plateau physiographic province. This region contains a variety of vegetation communities such as grasslands similar to those found in the Great Plains, ponderosa pine forests, sagebrush and pinyon-juniper woodlands, and interior chaparral. Managing this diversity requires that plants are grouped into areas with common ecologies. Similarities in ecological functions and conditions allow for the classification of large areas into ecological zones. Ecological zones are primarily based on the geology, soils, hydrology, plants, and animals of the area. In many areas, there is a gradual gradient between ecological zones. In other areas, there are inclusions of one zone within another. Ecological processes do not necessarily stop at ecological zone boundaries, and events that affect one ecological zone may affect conditions in another. Along the edges of the ecological zones, management can adapt to include solutions as deemed necessary. Within inclusions, management processes may vary from those in surrounding areas. Map 3.11 shows the location of ecological zones in the Planning Area.

Public lands in the Planning Area support a wide variety of vegetation types based on soils, climate, landform, and the effects of land use. Healthy, productive vegetation is the key to soil stability, wildlife habitat quality, and the type and amount of potential human uses. Recreation opportunities and the scenic qualities of an area are also based in large part on vegetation.

The vegetation and ecosystem condition in the Planning Area has been looked at through a variety of lenses. The BLM has used Ecological Site Inventory and Desired Plant Community descriptions, usually from a rangeland or wildlife habitat perspective. The BLM also uses Fire Regime Condition Classes to classify vegetation condition in relation to fire hazard and the range of natural variability.

Historical human uses and management practices have not always been consistent with stable ecological principles. Surface-disturbing activities such as logging, grazing, fire suppression, mining, and OHV activity have affected the vegetation, altering species composition and density,

Map 3.11: Ecological Zones

and allowing noxious weed invasion. In some areas, proactive restoration of ecological functions and conditions is needed (c.f., Dale et al. 1999).

Noxious Weeds

While the Planning Area has relatively fewer noxious weed infestations than found in nearby counties, it is susceptible to invasions from the north and the south. Nine invasive plant species designated in Arizona as noxious are found in the Planning Area. They are Russian knapweed (*Acroptilon repens*), camelthorn (*Alhagi maurorum*), globed-podded hoary cress/whitetop (*Cardaria draba*), diffuse knapweed (*Centaureau diffusa*), spotted knapweed (*Centaureau maculosa*), halogeton (*Halogeton glomeratus*), three-lobed morning glory (*Ipomoea triloba*), Puncturevine (*Tribulus terrestris*), and scotch thistle (*Onopordum acanthium*). Map 3.12 illustrates the locations of known noxious weeds in the Planning Area.

The Planning Area also has six additional invasive species that are not listed on the state list: perennial pepperweed (*Lepidium latifolium*), tamarisk (*Tamarix sp.*), Russian olive (*Elaeagnus angustifolia*), downy brome/cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens*), and Malta star thistle (*Centaurea Melitensis*). Medusahead (*Taeniatherum caput-medusae*), a species of concern, is moving from the north and may occur in the Planning Area in the future.

Ecological Zones

Below is a description of vegetation resources and associated fire ecology in the Planning Area, which is organized by ecological zone. Although the boundaries between ecological zones are not precise, several vegetation communities or stages of development may be found in any ecological zone, the grouping system can be used to describe vegetation over vast regions, such as the Planning Area. Table 3.7 lists dominant plant species for each ecological zone, Map 3.13 illustrates the major vegetation types across the Arizona Strip. The use of ecological zones can also be helpful to describe the role fire plays in various vegetation communities. Map 3.14 illustrates fire history across the Planning Area.

Table 3.7: Dominant Plant Species by Ecological Zone

Ecological Zone	Dominant Plant Species
Mojave Desert	Creosote, white bursage, Joshua tree
Mojave-Great Basin Transition	Blackbrush, yucca
Interior Chaparral	Shrub oak, manzanita
Great Basin	Sagebrush, pinyon pine, juniper
Colorado Plateau Transition	Sagebrush, juniper, grasses
Plains-Grassland	Grasses: grama, muhly, needlegrass, wheatgrass, brome, galleta, fescue, dropseed
Ponderosa Pine	Ponderosa pine
Riparian Co	ttonwood, willow, tamarisk

Map 3.12: Noxious Weeds

Map 3.13: Major Vegetation Types on the Arizona Strip

Map 3.14: Fire History

Riparian Ecological Zone

The Riparian Ecological Zone (including riparian areas and wetlands) is subdivided into two groups based on type of soil, vegetation, and hydrology: 1) lotic, which includes running water habitats such as rivers, streams, and springs, and 2) lentic, which includes standing water habitats such as lakes, ponds, bogs, and meadows. Most riparian areas are typically lotic habitats while wetlands are typically lentic habitats. Virtually all riparian habitats within in the Planning Area are lotic habitats.

Riparian areas are a form of transition between permanently saturated areas and upland areas with visible vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Riparian areas in the Planning Area primarily include lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers, streams, and springs. Ephemeral streams or washes that do not exhibit the presence of vegetation that is dependent upon free water in the soil are not considered riparian areas.

Native riparian-associated vegetation in the Planning Area includes cottonwoods, willows, seep willows, arrowweed, ash, cattails, rushes, and sedges as well as a variety of grasses and forbs. Most of the riparian areas also contain invasive weeds. Tamarisk and Russian olive are considered woody invasives, while rabbit foot, dallisgrass, Bermuda grasses, cocklebur, and thistles are considered herbaceous invasives.

Although accounting for less than 1 percent of the Planning Area, riparian areas are among its most productive and important ecosystems. Characteristically, riparian areas have a greater diversity of flora and fauna than adjacent uplands. Healthy riparian systems filter and purify water as it moves through. In addition, healthy riparian areas reduce sediment loads and enhance soil stability, provide microclimatic moderation when contrasted to extremes in adjacent areas, and contribute to groundwater recharge and base flow.

Historically, fire was probably uncommon in this ecological zone. Fire frequency varied depending upon drought cycles and the surrounding upland vegetation. Flammable fuel loads have increased dramatically in riparian areas affect by drought, limiting flooding that would ordinarily remove litter and woody debris, and allowing for buildup of contiguous vegetation. In many areas, native vegetation has been replaced by tamarisk, a highly flammable, invasive species. Tamarisk can recolonize rapidly following a fire, so each initiation of a burn cycle can successively enhance its dominance of a site. Human-caused wildland fires near transportation corridors and communities can contribute to this cycle.

Priority riparian areas assessed in the Monuments and the Arizona Strip FO are listed in Table 3.8. Additional riparian areas exist, but due to their stability, small size, or other factors, they are not included in the table. The list of priority riparian areas is dynamic and is expected to change over time.

Table 3.8: Priority Riparian Areas

Name	Approximate Size	Functioning Condition*	Location
Randall Spring	1 acre	Not Rated	Parashant
Red Rock Spring	1 acre	Proper	Parashant
Sawmill Spring	1 acre	Not Rated	Parashant
Burro Spring	2 acres	Not Rated	Parashant
Whiskey Spring	6 acres	Proper	Parashant
Middle Spring	7 acres	Proper	Parashant
Little Arizona Spring	8 acres	Proper	Parashant
Grapevine Spring	8 acres	Proper	Parashant
Pakoon Springs	11 acres	Not Rated	Parashant
Tassi Spring	11 acres	Not Rated	Parashant
Buckhorn Spring	14 acres	Proper	Parashant
Cane Springs	14 acres	Proper	Parashant
Pocum Wash	81 acres	At Risk	Parashant
Badger Spring	12 acres	Proper	Vermilion
Soap Creek	15 acres	Not Rated	Vermilion
Wrather Riparian Area	75 acres	Proper	Vermilion
Paria River	1,332 acres	Proper	Vermilion
Smiths Potholes	1 acre	Not Rated	Arizona Strip FO
Sacatone Cienega	2 acres	Not Rated	Arizona Strip FO
Sullivan's Spring	3 acres	Not Rated	Arizona Strip FO
Cottonwood Canyon Spring	3 acres	Not Rated	Arizona Strip FO
Gates & Mullen Spring	5 acres	Proper	Arizona Strip FO
Parashant Springs	7 acres	Not Rated	Arizona Strip FO
Swale Spring	10 acres	Proper	Arizona Strip FO
Willow Springs	12 acres	At Risk	Arizona Strip FO
Rock Canyon	15 acres	Not Rated	Arizona Strip FO
Cottonwood Spring	17 acres	Not Rated	Arizona Strip FO
Quaking Aspen Spring	21 acres	Not Rated	Arizona Strip FO
Beaver Dam Confluence	27 acres Prope	r	Arizona Strip FO
Bitter Seeps	45 acres	Proper	Arizona Strip FO
Kanab Creek Riparian Area	806 acres	Proper	Arizona Strip FO
Virgin River	2959 acres	Proper	Arizona Strip FO

***Functioning Conditions** were determined through "Rapid Assessment" (see BLM 1993a; 1993b):
Proper: Riparian area is functioning adequately.
At Risk: Riparian area functioning adequately but susceptible to degradation.
Source: Arizona Strip FO (BLM 2003a; 2003b)

Ponderosa Pine Ecological Zone

Within the Planning Area, ponderosa pine communities are found in limited, isolated pockets at the highest elevations, such as Mt. Logan/Mt. Trumbull, the Dellenbaugh area, and around Black

Rock. A small patch of white fir exists on the north face of Mt. Bangs. The Mt. Trumbull/Mt. Logan area is the largest and has approximately 18,824 acres of ponderosa pine. The Dellenbaugh area contains about 18,349 acres, and the Black Rock area has about 5,236 acres.

The species most commonly associated with ponderosa pine is Gambel oak. Small clumps of quaking aspen may also grow in the general area, often near a meadow. Other species include New Mexican locust and serviceberry, both usually as shrubs or small trees. At lower elevations in the western half of the Planning Area and on the Paria Plateau, an occasional ponderosa pine may be found mixed with pinyon-juniper communities. The understory of more open stands supports abundant grasses and forbs. Shrubs present include those from adjoining communities along with scattered individuals of mountain snowberry, Oregon grape, common juniper, and Oregon boxwood.

Prior to European settlement, very frequent, generally low intensity fires averaging four years apart, killed young trees and shrubs, minimized ladder fuels, and maintained open stands of ponderosa pine with herbaceous understories. More than 100 years of fire suppression have created dense, closed canopy forests with abundant litter, continuous fuels, and limited herbaceous vegetation. Trees in these situations must compete for limited moisture and nutrients and are at risk of stand-replacing fires.

Northern Arizona University (NAU) and AGFD are conducting on-going research projects on ponderosa pine restoration treatments at Mt. Trumbull. Much of this work involves returning the ponderosa pine forest to a state resembling its pre-settlement condition. Treatments to accomplish this include raking litter, mechanical removal and thinning of trees, prescribed burning, seeding, and temporarily excluding livestock. The BLM, NAU, and AGFD are currently conducting wildlife studies to evaluate the effects of treated and non-treated areas on species diversity, success, and behavior.

Several species of wildlife are dependent upon ponderosa pine, including Kaibab squirrels, goshawks, and Merriam's turkey. Certain varieties of neo-tropical migratory songbirds are found only in close association with pine. Some wildlife species use ponderosa pine as a resource and may have impacts on pine stands. Porcupines eat the inner bark of young ponderosas, stripping and killing terminal shoots. Kaibab squirrels consume the fresh green needles produced by pines and can weaken trees. Mule deer will feed on new shoots and saplings, but generally prefer other forage.

Great Basin Ecological Zone (including Sagebrush and Pinyon-Juniper Communities)

The Great Basin Ecological Zone covers more area (1,525,402 acres) than any other ecological zone in the Planning Area. Large portions of the Shivwits and Uinkaret plateaus, Buckskin Mountain (the mountain on the north end of the Kaibab Plateau), and the Paria Plateau are all classified as Great Basin. This ecological zone contains a wide range of vegetation communities

including grasslands, shrublands, and woodlands. The vegetation composition in this ecological zone changes over time based on the type and amount of disturbance (or lack thereof).

Herbaceous, grass-dominated communities have become less prevalent as grazing and fire suppression have allowed woody species to become established, and often to dominate an area. Now, in many areas, a single or a few species dominate. Major shrubs include basin big sagebrush, blackbrush, shadscale, Mormon teas, and greasewood. Invasive, annual grasses have invaded parts of the Great Basin desertscrub life zone, but have not caused the fire problems seen in the Mojave desertscrub.

Sagebrush communities are the most widespread of the "typical" Great Basin plant communities. Basin big sagebrush is the most common species. Sand sage dominates on sandy soils. Shadscale communities are usually found between greasewood-dominated communities and sagebrush communities in harsh, cold deserts on dry plains, foothills, valley bottoms, or dried alkali lakes. Common associates include black greasewood, big sagebrush, winterfat, spiny hopsage, blue grama, needle-and-thread, wild ryes, cheatgrass, Indian ricegrass, and alkali sacaton.

Pinyon and juniper are the dominant tree species of this zone in northern Arizona. The species of pinyon most often present is the common pinyon (two-leaf pinyon or Colorado pinyon), with single leaf pinyon occasionally being found. Utah juniper is the most common juniper present, with one-seed juniper occasionally found. The understories of pinyon-juniper and dense mature juniper woodlands are very species-poor, containing only widely scattered shrubs, forbs, and small clumps of grass. Grasses are the most common understory component. Predominant (or formerly predominant) grasses include grama, Arizona fescue, prairie junegrass, Indian ricegrass, needlegrass, dropseed, and squirreltail. Shrubs may include sagebrush, cliffrose, serviceberry, rabbitbrush, shadscale, and winterfat. Understory plants are most common along the edges of the zone. Bare ground is very common. Utah juniper is a climax species in a number of pinyon-juniper, sagebrush, grassland, and shrub-steppe communities. The natural fire regime of these pinyon-juniper areas ranges from frequent to infrequent fire return intervals of between 30 to 100 years apart with mixed to local stand replacement fire severity.

Mojave Desert Ecological Zone

The Mojave Desert Ecological Zone encompasses the western boundary of the Planning Area and lower elevations in the Virgin River and Whitmore Canyon drainages. The Pakoon Basin contains approximately 195,000 acres of the ecological zone and is connected to similar areas in Nevada. North of the Virgin Mountains, the Virgin and Beaver Dam slopes combined make up 168,447 acres of the ecological zone. This is the hot desert portion of the Planning Area, averaging less than 12 inches per year of precipitation. Ecological processes are relatively slow in the ecological zone.

Low shrubs characterize the Mojave Desert Ecological Zone, with creosote bush being the most common shrub. Creosote bush communities are typically very open and species-poor, and occur in areas with considerable amounts of bare ground. Exotic annual grasses, particularly red brome, have invaded large areas of the ecological zone. Joshua tree communities are found throughout this ecological zone. Other common species include Mormon tea, broom snakeweed, blackbrush, white bursage, California buckwheat, Wright eriogonum, galleta, and bush muhly.

Historically, the Mojave Desert Ecological Zone did not typically produce enough continuous vegetation to carry a fire more than a few yards. Desert shrubs are neither fire-tolerant nor fire-dependent. They are adapted to survive long drought periods and, as a result, many are very slow growing. By the 1930's, invasive, annual grasses had entered the area, mostly red brome and Mediterranean grass (Brooks and Esque 2002). Today, invasive, annual grasses that cure early in the fire season and provide fine, flashy fuels dominate this area. These grasses cure standing, creating continuous fuels that allow fires to spread. The fires kill native vegetation and allow invasive, annual grasses to dominate the landscape and thus increase the number and size of fires and proliferation of annuals. The fire/grass regeneration cycle is much shorter than the native shrub regeneration cycle. Over 100,000 acres in the Pakoon Basin have been converted from Mojave Desert shrub to steppe or grassland since 1980. Only a few remaining Joshua tree forests and small pockets of native vegetation are dispersed throughout the Planning Area. Overall, the ecological zone can be characterized as sensitive, highly altered, with high levels of human impact.

Mojave-Great Basin Transition Ecological Zone

This ecological zone is a transition between the Mojave Desert and the Great Basin and contains vegetation-type representatives from both ecological zones. Soil and vegetation vary widely within the transition area, although it more closely resembles the Mojave Desert. Historically, wildland fires were a function of woody plant condition and density. More precipitation supports a greater annual grass fuel load than the Mojave Desert, resulting in a grass/fire regeneration cycle and susceptibility to type conversion. Fire years are typically correlated with high spring moisture, which follow several years of lower than average precipitation. The fire regime of this zone is an infrequent fire return interval with fires occurring an estimated average of about 40 years apart. Mixed fire severity creates a mosaic of plant ages and species across the landscape. There is a large transition area in lower Whitmore Canyon, one along the Grand Wash Cliffs and the Virgin Mountains, and another south of St. George. These three areas encompass approximately 387,748 acres.

Blackbrush communities occur in the Mojave-Great Basin Transition Ecological Zone. Blackbrush is typically found on gentle slopes above creosote bush communities and below the interior chaparral or big sagebrush/pinyon-juniper communities (Bradley and Deacon 1967, Randall 1972, Beatley 1976). Blackbrush communities are characterized by relatively high cover (50 percent) of low stature (20 inches tall) evergreen woody shrubs, dominated by blackbrush, which can comprise 90 to 95 percent of the total plant cover (Shreve 1942).

Blackbrush is usually killed by fire and may take over 100 years to re-establish itself. It is co-dominant with other native species such as creosote, juniper, desert almond, Anderson wolfberry, and yucca. Dominant invasive species include cheatgrass and filaree. These communities change little over several decades, exhibiting very low reproductive rates and very slow growth.

Colorado Plateau Transition

This area consists of the rocky slopes and cliffs along the edge of the Paria Plateau and in the canyons of Kanab Creek. It encompasses approximately 138,819 acres. The vegetation here is generally a transition between grassland and Great Basin. It consists of scattered juniper, cacti, grasses, and an occasional shrub. The fire regime of this area is similar to the Mojave-Great Basin Transition Ecological Zone. Bighorn sheep and Peregrine Falcons are two important species found in this ecological zone.

Interior Chaparral Ecological Zone

Interior chaparral areas are relatively limited in the Planning Area. They are found on approximately 33,592 acres in the Virgin Mountains below Mt. Bangs and in the southern portions of the Grand Wash cliffs, specifically around the Snap Point area. Dense stands of tough, evergreen shrubs characterize this ecological zone. Curl-leaf mountain mahogany is usually the tallest species, often reaching as high as 10 feet. Most shrubs average 3 to 7 feet tall. Typical species found in interior chaparral include manzanita, shrub live oak, sumac, mountain mahogany, ceanothus, buckthorn, cliffrose, and turpentine bush. Grasses are less abundant in mature stands of interior chaparral, but may become abundant following fire and in younger, more open stands.

Interior chaparral is an important vegetation community for wildlife. Game animals such as deer and bighorn sheep use several plant species as forage and others as cover. Distinct from the communities above and below it, interior chaparral provides a significant amount of wildlife habitat diversity. The Arizona Game and Fish Department (AGFD) and the BLM have cooperated in some habitat projects to benefit mule dear, including a series of chaining treatment areas that established a mosaic of “edge” habitats, breaking up the monotypic stand of pinyon-juniper.

Chaparral shrubs are adapted to fire and typically re-sprout from root crowns or germinate from long-lived seeds following fire. Lack of fire can lead to encroachments by woodland species. Exotic annual grasses can increase fire frequency to the point where even the fire-adapted interior chaparral cannot recover. The natural fire regime for this zone is infrequent fires averaging about 45 years apart with fire severity that predominantly replaces vegetation stands.

Plains-Grassland Ecological Zone

There are two areas of Plains-Grassland Ecological Zone in the Planning Area, the Main Street/Hurricane Rim/Clayhole Valley area (approximately 685,865 acres) and House Rock Valley (approximately 110,414 acres). Historically, perennial and annual grasses covered much of the ecological zone in a clumpy, relatively continuous carpet interspersed with shrubs and forbs. The natural fire regime for this zone involves frequent fires, which occur an average of 10 years apart, nearly all of which have stand replacement fire severity. Frequent fires are limited to woody species with a varied vegetation pattern across the landscape. Changes in fuel continuity from past management practices and fire suppression activities essentially eliminated fire from this ecological zone, resulting in increased shrub densities, loss of perennial grasses, and spread of non-native, invasive species. Typical grass genera include grama, muhly, needlegrass, wheatgrass, brome, galleta, fescue, and dropseed. An occasional cactus, shrub, or juniper may also be present, usually along the edge of the grassland or in microhabitats.

The Plains-Grassland Ecological Zone consists mostly of vast areas of relatively flat terrain compared to the surrounding canyons and plateaus of the Planning Area. There are few trees in the ecological zone, consisting mostly of scattered pinyon and juniper. Grasslands are important habitat for pronghorn antelopes.

Parashant Vegetation

Ecological Zones

Riparian Ecological Zone

While Parashant contains no streams, rivers, or lakes, it does include numerous springs and associated riparian areas. A number of large springs with associated riparian areas occur at Mt. Trumbull and Parashant Point. Several smaller springs also occur throughout the region. Most of these are in good or “proper” functioning condition as they have been fenced to prevent livestock entry since the early 1980s. Despite the fencing, some areas have had occasional trespasses. One of the fenced riparian areas, Red Rock Spring, is unique because it possesses a healthy stand of heleborine (*Epipactis gigantea)*, a rare orchid. The numerous springs on the west side of the Monument create a valued ecosystem for multiple plant and wildlife species dependent on flowing water and food not ordinarily available in the surrounding uplands. Springs within Parashant are also piped for livestock purposes and one is used as a water source by a lodge and BLM administrative sites.

The Cane Springs riparian area, on BLM-administered lands (BLM lands) in the Monument, provides a unique opportunity for wildlife and other values. Livestock have grazed the riparian habitat at Cane Springs, except for a 30’ by 30’exclosure around the spring. The Cane Springs pasture, of which Cane Springs is a part, is grazed two months every three years, one of which is

during the growing season. Monitoring studies indicate that the riparian area is in proper functioning condition.

Pakoon Springs, and the private land surrounding it, was acquired by the BLM on November 26, 2002. The springs are some of the largest in the region and have been extensively modified by bulldozing the original spring mound, piping the water to several agriculture fields, and creating several large water ponds. BLM has since cleaned up the site by removing old equipment and artifacts and burning the remaining wooden artifacts and buildings. None of the historic features or buildings qualified for listing on the National Register of Historic Places (NRHP). Because the springs and private property had not been under Federal administration, no monitoring studies have occurred.

Ponderosa Pine Ecological Zone

In addition to the primary Ponderosa Pine Ecological Zone in the Mt. Logan/Mt Trumbull area, there is a small ponderosa pine area the northern portion of the Monument around Black Rock in the Virgin Mountains. In the southern portion of the Monument, ponderosa pine can be found around Mt. Dellenbaugh and Yellow John Mountain. In addition to the typical pine forests, ponderosa in the Parashant area exists at its lower elevation limit in drainage areas where cooler temperatures and run-in moisture allow them to survive. These ponderosa pine 'stringers' are frequently located in the midst of Great Basin woodlands and shrublands, and are of very high ecological value. The natural fire regime of these areas exhibit very frequent surface fires averaging four years apart with generally low, occasionally mixed and very rare stand replacement fire severity.

Great Basin Ecological Zone

The Great Basin Ecological Zone covers an area from the slopes below Black Rock down to Snap Point and over into the Tuweep Valley. A wide variety of vegetation exists within the ecological zone. Extensive pinyon-juniper woodlands dominate the mountains and plateaus, with grass and shrubs prevalent in the valleys. The fire regime of this area is generally a variable fire return interval from frequent to infrequent from 30 to 100 years apart, with generally mixed and limited stand replacement fire severity. Over time, these areas shift between community types based on impacts due to disturbance.

Mojave Desert Ecological Zone

Along the western edge of Parashant lies the Pakoon Basin, a very remote and isolated part of the Mojave Desert. The Pakoon includes the lowest elevations within the Planning Area and is bisected by Grand Wash, an ephemeral drainage for the western half of the Monument. This area provides important habitat for bighorn sheep. The historical fire regime of this area exhibits infrequent fire return intervals averaging about 75 years apart with high variation of fire occurrence due to year-to-year variation of drying shrub foliage, shrub mortality, and forb

production as they relate to local drought and moisture cycles. Fire years typically correlate with high spring moisture. Mixed fire severity generally limits stand replacement events. The west side of the Pakoon has burned repeatedly over the last several decades due to the presence of invasive annual grasses.

Mojave-Great Basin Transition Ecological Zone

To the north and east of the Pakoon Basin is the Mojave-Great Basin Transition Ecological Zone. This includes the southern Virgin Mountains and Grand Wash Cliffs. Repeated burning has substantially altered the ecological processes along the Grand Wash Cliffs and invasive, annual grasses now dominate large areas. The Virgin Mountains transition area contains plant species from all of the surrounding areas – creosote and cacti from the desert below, blackbrush, sagebrush, and pinyon-juniper from the Great Basin, and oak and manzanita from the nearby chaparral. Fire years typically correlate with high spring moisture, which follow several years of lower than average precipitation. The fire regime of this zone is an infrequent fire return interval with fires occurring about 40 years apart. Mixed fire severity creates a mosaic of ages and species across the landscape. Repeated burning has substantially altered the ecological processes along the Grand Wash Cliffs and invasive, annual grasses now dominate large areas. This ecological zone provides important habitat for bighorn sheep.

Interior Chaparral Ecological Zone

The only area representative of Interior Chaparral Ecological Zone within the Planning Area is located in the Virgin Mountains west and south of Black Rock. The southern portion of this ecological zone is in within Parashant.

Plains-Grassland Ecological Zone

Only a very small portion of the Main Street Valley Plains-Grassland Ecological Zone is within the Monument, just south of the private lands (Bundyville) near Mt. Trumbull.

Vermilion Vegetation

Ecological Zones

Riparian Ecological Zone

The Riparian Ecological Zones in Vermilion are located along one river and a few springs, all of which are properly functioning (see Table 3.8). The Paria River flows through the Paria River Riparian Ecological Zone and is known for low base flows with seasonal flash floods of enormous proportions. Livestock have not grazed the upper 20 miles of the river for decades, although the lower 7 miles of the Paria River above Lees Ferry have been grazed recently. In the early 1980s, the lower segment was switched from yearlong grazing to seasonal (winter - spring)

use under a three-pasture, rest-rotation system. This grazing system brought positive changes to vegetation along the Paria River such as increased growth of perennial grasses, cottonwoods, and willows. In 1998, cattle were completely removed from the lower segment and no livestock grazing has occurred since then.

The other riparian resources in Vermilion include a few springs along the Vermilion Cliffs. The largest of these (Soap, Badger, and Lowrey springs) are used as water sources by three lodges and two residential subdivisions located at the foot of the cliffs along Hwy 89A, as well as by ranchers in House Rock Valley. Other springs in Vermilion have also been piped for livestock purposes. Some of these springs are associated with small riparian areas.

Great Basin Ecological Zone

The Paria Plateau contains the wide range of vegetation communities found in the Great Basin. Valleys contain grasslands and shrublands, dominated by sagebrush. Pinyon-juniper woodlands are also found here. The natural fire regime of this area is similar to this zone in Parashant, as described above, except that pinyon and juniper trees tend to be more widely scattered resulting in smaller area fires. Lightning strikes tend to only cause single-tree fires in this area.

Colorado Plateau Transition Ecological Zone

Along the Vermilion Cliffs and the Paria River is an ecological zone best described as Colorado Plateau Transition. Components of the Great Basin and Plains-Grassland ecological zones can be found mixed together here. The Paria River Riparian Ecological Zone runs through the middle of this zone in Paria Canyon. The natural fire regime of this area is similar to this zone described above in Parashant except that more widely scattered shrubs and trees result in smaller fires.

Plains-Grassland Ecological Zone

The House Rock Valley, Plains-Grassland Ecological Zone extends into the southwest corner of Vermilion below the Vermilion Cliffs. It lies in the rain shadow of the Kaibab Plateau; consequently, precipitation is generally lower and less dependable than in other nearby areas. The natural fire regime of this area is similar to this zone described above in the overview for this section.

Arizona Strip FO Vegetation

Ecological Zones

Riparian Ecological Zone

The two major Riparian Ecological Zones in the Arizona Strip FO are the Virgin River and Kanab Creek Riparian Ecological Zones. Both originate in Utah and flow across the Planning Area. The Virgin River flows 39 miles (measured from the Utah border to the Nevada border) and Kanab Creek flows 22 miles (measured from the Kaibab Paiute Reservation boundary to the USFS boundary) through Arizona. The Virgin River is considered a relatively large river for the Southwest and is essential to the communities and agricultural areas along its route, including St. George, Utah; Littlefield, Arizona; and Mesquite, Nevada. Kanab Creek is similarly important to Kanab, Utah and Fredonia, Arizona. Both waterways and their associated riparian areas are currently in properly functioning condition. The Virgin River is open to seasonal (fall/winter) livestock grazing. Due to grazing restriction implemented for tortoise recovery purposes, cattle are removed from the Virgin River and adjacent uplands by March 15 every year. Kanab Creek is available to livestock grazing from October to mid-April.

Another important riparian area occurs along Beaver Dam Creek. Only a quarter mile of the Creek flows across BLM lands, with the rest flowing across state and private lands. Beaver Dam creek has relatively high water quality with areas of healthy cottonwood growth. These include the area of Mormon Wells and the creek's confluence with Virgin River, which is located on BLM lands.

A number of large springs with associated riparian areas occur in the Virgin Mountains. Several smaller springs also occur throughout the region.

Ponderosa Pine Ecological Zone

The Black Rock Ponderosa Pine Area described above in the Parashant section extends north onto the Arizona Strip FO. This small area is home to wild turkeys and is crucial summer mule deer range. The natural fire regime of this area is similar to this zone described in Parashant above.

Great Basin Ecological Zone

Arizona Strip FO lands classified as Great Basin Ecological Zone include the Lower Hurricane Valley, Seegmiller Mountain and surrounding area, Lost Spring Mountain, Cottonwood Point, Yellowstone Mesa, the Kanab Plateau, the northern portion of the Shivwits and Uinkaret Plateaus, and the area east of Fredonia including the Buckskin Mountains. The large area includes a variety of vegetation types, grasslands, shrublands, and woodlands that transition between the various conditions based on time and disturbance factors. Livestock grazing and

attempts at fire exclusion have transformed many areas that were once grasslands into areas dominated by woody species. The historical fire regime of this area is similar to this zone in Parashant described above. Sagebrush or junipers have encroached on some sites within the last hundred years and exhibit high rates of erosion and low species diversity and productivity.

Mojave Desert Ecological Zone

The area around the communities of Beaver Dam and Littlefield in the northwest corner of the Planning Area is commonly referred to as the Beaver Dam Slope and Virgin Slope, since the area is primarily comprised of the alluvial fans (bajadas) at the base of the Beaver Dam and Virgin Mountains. The Mojave Desert extends up through the Virgin River Gorge, east across Big Valley south of St. George, Utah, to the base of the Hurricane Cliffs. This area represents the extreme northeast edge of the Mojave Desert, and is home to desert tortoises (listed as threatened by the US Fish and Wildlife Service (USFWS)) and bighorn sheep. The Beaver Dam Slope is part of a larger area that extends into Utah and Nevada, while the Virgin Slope is an extension of a desert area between the Virgin River and Virgin Mountains. The historical fire regime of this area is similar to this zone described above in Parashant.

Mojave-Great Basin Transition Ecological Zone

Upslope from the Mojave Desert is the Mojave-Great Basin Transition Ecological Zone. This zone extends from south of Mesquite, Nevada, east through the Virgin Mountains to the base of the Hurricane Cliffs. The natural fire regime of this area is similar to this zone described above in Parashant. Generally, rocky, steep slopes reduce human activity, but wildfire is an increasing concern as invasive, annual grasses increasingly dominate the area. This ecological zone provides important habitat for bighorn sheep.

Colorado Plateau Transition Ecological Zone

The only area classified as Colorado Plateau Transition in the Arizona Strip FO is along the canyons surrounding Kanab Creek. These steep-walled canyons provide habitat for bighorn sheep and Peregrine Falcons. Like other transition zones, this area contains plant species representative of the adjacent ecological zones (in this case the Great Basin and Plains-Grassland ecological zones). The Kanab Creek Riparian Ecological Zone runs through the middle of this zone. This zone includes the portions of Hack, Sunshine, and Grama canyons where they meet Kanab Creek. The historical fire regime of this area is similar to this zone in Parashant as described above.

Interior Chaparral Ecological Zone

Along the slopes of the Virgin Mountains below Mt. Bangs is an area classified as Interior Chaparral Ecological Zone that straddles the boundary between the Arizona Strip FO and Parashant. This site is characterized by steep, rocky slopes and is largely within the wilderness

areas. In addition to those species normally found in native Interior Chaparral communities, this ecological zone has a high level of invasive, annual grasses, primarily brome, and has experienced fires in the last decade. The historical fire regime of this area is similar to this zone described above in Parashant. Although this ecosystem needs to burn in order to remain functional, burning can accelerate domination by invasive, annual grasses.

Plains-Grassland Ecological Zone

There are two large areas considered within the Plains-Grassland Ecological Zone in the Arizona Strip FO. The largest area includes the Clayhole Valley and Main Street Valley, from the town of Mt. Trumbull/Bundyville over the Hurricane Cliffs to the Utah border, east to the rim above Kanab Creek and up to Fredonia. House Rock Valley is the other grassland area in the ecological zone. The natural fire regime of this area is similar to this zone in Parashant as described above.

FIRE AND FUELS MANAGEMENT

Overview

The diverse nature of the ecological zones on the Arizona Strip leads to a wide variety of fire and fuels management practices based on ecological principles. Fire suppression, wildland fire use, and fuels treatments, including prescribed fire and mechanical, manual, chemical, and biological treatments, are based on goals, objectives, and strategies described in the most current Arizona Strip District and Lake Mead NRA fire management plans.

History

Table 3.9 provides the number of fires and acres burned each year from 1980 to 2003. During this period, the Planning Area averaged 85 wildland-fire starts annually, ranging from 37 starts in 1987 and 2002 to 161 starts in 1996. These fires burned an average of 7,450 acres per year. Lightning was the most common cause of fires, accounting for approximately 81 percent of starts and 96 percent of the acres burned. Eighty-nine percent of fires burned less than 10 acres, with less than 2 percent consuming over 1,000 acres. Although fires occurred during all months, most burned between May and September, with the number of starts peaking in July and August. The greatest number of acres burned in June and July. Acreage numbers provided in the Vegetation and Fire and Fuels Management section were generated as actual acres burned or treated, not from Geographic Information Systems (GIS) data.

Table 3.9: Wildland Fires and Acres Burned in the Planning Area

Year	Number of Fires	Acres Burned	Year	Number of Fires	Acres Burned
1980	110	62,737	1992	104	685
1981	85	1,146	1993	66	13,517
1982	47	421	1994	103	2,456
1983	63	4,452	1995	124	30,757
1984	91	770	1996	161	3,509
1985	57	538	1997	52	542
1986	72	21,685	1998	87	290
1987	37	746	1999	92	18,943
1988	107	8,727	2000	155	3,465
1989	41	505	2001	151	767
1990	44	16	2002	37	1,772
1991	50	61	2003	110	297

Fuels Treatments

The potential for catastrophic fires is reduced by decreasing fuel loads through fuel treatment projects, including prescribed fire, mechanical treatments (i.e., using equipment to suppress, inhibit, or control vegetation), and chemical treatments (i.e., the use of herbicides). Most fuels treatments were conducted in the Ponderosa Pine and Great Basin ecological zones. Ponderosa pine and pinyon-juniper are typically treated mechanically prior to using prescribed fire to reduce hazardous fuel loads. Sagebrush is treated chemically to increase species diversity and increase herbaceous ground cover, improving wildlife habitat and watershed condition. Table 3.10 lists fuels treatment projects in the Planning Area.

Table 3.10: Acres of Fuels Treatment Projects in the Planning Area, 1998-2003

Year	Prescribed Fire	Mechanical	Chemical
1998	7,568	0	4,810
1999	5,686	0	8,850
2000	308	4,470	5,490
2001	430	3,435	7,560
2002	70	7,323	2,000
2003	549	1,413	6,250
Average	**2,435**	**2,774**	**5,827**

Fire Regime/Condition Class (FRCC) assessment process is a classification system describing the degree of departure from the historic fire regime and vegetative conditions (See Table 3.11). This departure can increase the danger of losing key ecosystem components such as species composition and structural condition. This, in turn, can result in changes in stand age, canopy closure, fuel loadings, and mosaic patterns. This departure may be the result of fire suppression, timber harvesting, livestock grazing, introduction and establishment of invasive plant species, introduced insects or disease, or other past management activities (Hardy et al. 2001, Schmidt et al. 2002). The Arizona Strip District Office defines and updates FRCC using science-based methods, including Rapid Assessment, in accordance with BLM policy.

Table 3.11: Fire Regime/Condition Class Definitions (Schmidt et al. 2002)	
Condition Class	**Fire Regime**
I	Fire regimes are within historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition, structure, and pattern) are intact and functioning within the historical range.
II	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more fire return intervals (either increased or decreased), resulting in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation and fuel attributes have been moderately altered from their historical range.
III	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals, resulting in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

Fire Management

The Color Country South Zone is an interagency fire organization that covers BLM lands administered by the Arizona Strip and St. George Field Offices and lands administered by the Pine Valley Ranger District of the Dixie National Forest. An interagency fire team handles fire management responsibilities (e.g., preparedness, suppression, extended attack), with dispatching occurring from the Color Country Dispatch Fire Center in Cedar City. The fire team does not manage prescribed fire for the St. George Field Office. Fire management on NPS lands of Parashant involves cooperative activities and actions between Lake Mead NRA and Color Country South Zone managers.

Fire and fuels management activities in the Planning Area are described in the agencies' fire management plans, which are updated regularly. These documents provide for firefighter and public safety, and include fire management strategies, tactics, and alternatives (appropriate management response to wildland fires and identification of areas for fire use). The plan also addresses values to be protected and public health issues, describes fuels and restoration projects, and is consistent with resource management objectives.

The Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management (BLM 2004a) amends seven land use plans in Arizona, including the Arizona Strip District Resource Management Plan (RMP; BLM 1992). The amendment incorporates guidance from the National Fire Plan and the Federal Wildland Fire Management Policy (2001) and addresses current wildland fire management concerns, issues, and policies. The amendment directs the assignment of BLM lands as Wildland Fire Use areas where wildland fire may be used to meet resource management objectives under suitable conditions, and Non Wildland Fire Use areas where wildland fires are not desired. Table 3.12 lists fire return intervals, mean FRCC, and Fire Management Allocations. Appendix 3.C provides definitions for fire management allocations.

Table 3.12: Historic Fire Return Intervals, Mean FRCC, and Fire Management Allocations for each Ecological Zone

Ecological Zones	Historic Fire Return Interval[1]	Mean FRCC[2]			Allocation
		I	II	III	
Mojave Desert	>250	25%	15%	60%	Non Wildland Fire Use Area
Transition[3]	-	25%	15%	60%	-
Interior Chaparral	20-100	0%	45%	55%	Wildland Fire Use Area
Great Basin	20-70[4]	25%	40%	35%	Wildland Fire Use Area
Plains-Grassland	10-30	10%	20%	70%	Wildland Fire Use Area
Ponderosa Pine	2-12	15%	20%	65%	Wildland Fire Use Area
Riparian	35-200	4%	1%	95%	Non Wildland Fire Use Area

[1]Historic Fire Return Intervals reported in Schussman and Gori (2004).
[2]Surveys have not been conducted, so classifications are preliminary estimates.
[3]Transition ecological zones were not analyzed in the Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management (2004a).
[4]Fire history is poorly understood in pinyon-juniper woodlands. There are no reliable estimates of mean fire intervals for low-severity surface fires. Fire rotation for high-severity fires has only been estimated in two studies (400 and 480 years), and fires sometimes burn with mixed severity (Baker and Shinneman 2004).

Wildland-Urban Interface

Wildland-Urban Interface (WUI) is the line, area, or zone where structures and other human developments meet or intermingle with undeveloped wildland or vegetative fuels. The community of Littlefield, Arizona is listed as a WUI community at high risk from wildland fire (Federal Register Vo. 66, No. 160,s 8/17/01, p. 43386). Although not on the Federal Register list, the nearby community of Beaver Dam has similar threats from wildland fire and is considered a WUI community for management purposes. The adjoining communities of Hildale, Utah, which is on the Federal Register list, and Colorado City, Arizona, share the same WUI attributes. Other communities within or adjacent to the Planning Area considered to be at risk from wildland fire are Scenic, Kanab, Cane Beds, and Mt. Trumbull. There are numerous homes, cabins, administrative sites, and other structures scattered across the Planning Area also considered at risk.

The BLM works with local fire departments when possible to reduce the risk of wildland fire in these communities, thereby protecting homes and adjacent federal lands. Support includes wildland firefighter training and assistance with Community Fire Plan development. Arizona Strip FO personnel provide public education through programs, which include Smokey Bear and fire education programs in schools, Fire Wise programs, and open houses that focus on fire education, fire-safe homes, and WUI community awareness throughout communities at risk within the Color Country South Zone.

Smoke Management

Airsheds within the Planning Area are managed as PSD Class II, except for airsheds within the Grand Canyon National Park that are managed as Class I (see previous section on Air Quality).

There are no air quality non-attainment areas in the Planning Area. Smoke from wildland fires and prescribed burns can influence the adjacent Class I airsheds under some weather conditions. The BLM is under the jurisdiction of the ADEQ in matters relating to air pollution from prescribed burning. The BLM works with the ADEQ to ensure compliance with the ADEQ's Smoke Management Plan (See http://www.azdeq.gov/environ/air/smoke/fires.html), which works toward a reduction in smoke impacts due to prescribed burning of nonagricultural fuels.

Parashant Fire and Fuels Management

The majority (91 percent) of the Ponderosa Pine Ecological Zone occurs in Parashant. Most fuels treatments in this ecological zone have been implemented in the Mt. Trumbull area. Fuels treatments have also been implemented in sagebrush and pinyon-juniper communities. The Mt. Trumbull/Bundyville community is adjacent to the Monument, and several private cabins and administrative sites are within the Monument.

The BLM and NPS work cooperatively in planning and implementing fuels treatment projects near the administrative boundary, sharing crews and equipment for wildland fire suppression.

Vermilion Fire and Fuels Management

Fuels in the Monument are generally sparse and discontinuous, and wildland fires rarely spread beyond a few acres. The Monument is a low priority for fuels treatments. Marble Canyon, Vermilion Cliffs, and Cliff Dwellers are WUI communities adjacent to the Monument. These communities are at minimal risk from wildland fire due to the lack of fuels in the area.

Arizona Strip FO Fire and Fuels Management

Approximately 46 percent of the Great Basin Ecological Zone occurs in the Arizona Strip FO, Fuels treatments in sagebrush and pinyon-juniper communities have been implemented. There have been few, if any, ponderosa pine fire and fuels treatments on Black Rock. All of the WUI communities and several administrative sites and cabins are located in the Arizona Strip FO.

FISH AND WILDLIFE

Overview

Portions of the Basin and Range and Colorado Plateau physiographic provinces meet in the Planning Area, providing a variety of unique wildlife habitats. The majority of the Planning Area is characterized by species typical of perennial grassland and pinyon-juniper woodlands of the two provinces. The most common animal species in these habitats include mule deer, pronghorn antelope, coyote, blacktail jackrabbit, Pinyon Jay, and desert spiny lizards. Lower elevation habitats on the western edge of the Planning Area are typical of the Mojave Desert and

home to bighorn sheep, kangaroo rat, quail, raven, crow, desert tortoise, and other reptiles. Table 3.13 lists dominant animal species for each of the ecological zones in the Planning Area.

Table 3.13: Dominant Animal Species by Ecological Zones

Ecological Zone	Representative Animal Species
Riparian	Southwestern Willow Flycatcher, speckled dace
Ponderosa Pine	Kaibab squirrels, mule deer, porcupine, White-breasted Nuthatch, Merriam's Turkey, Goshawk, a variety of neo-tropical migratory songbirds,
Great Basin	Black-tailed jackrabbit, cottontail rabbit, coyote, mule deer, pronghorn antelope, bighorn sheep, mountain lion, Screech Owl, Scrub Jay, Pinyon Jay, Juniper Titmouse, Gray Vireo, Great Basin rattlesnake, horned lizards, fence lizards, whiptail lizards
Mojave Desert	Bighorn sheep, kangaroo rat, quail, raven, crow, desert tortoise, snakes, lizards
Mojave-Great Basin Transition	Mule deer, bighorn sheep, quail
Colorado Plateau Transition	Bighorn sheep, Peregrine Falcon
Interior Chaparral	Mule deer, bighorn sheep, Black-Chinned Sparrow
Plains-Grassland	Pronghorn antelope, House Rock Valley chisel toothed kangaroo rat, Brewer's Sparrow

The AGFD has statutory authority and obligation under Arizona Revised Statutes for fish and wildlife management in the State, including the Planning Area. In cooperation with the AGFD, the BLM develops wildlife habitat management plans (HMPs) for wildlife species and habitats. Many the management directions for wildlife included in HMPs are based on statewide goals of the AGFD in managing particular species. Past HMPs in the Planning Area have focused on construction and maintenance of habitat improvement projects, primarily water developments for big game species. Since completion of the Arizona Strip RMP (BLM 1992a), additional HMPs have been written for the management of special status species. The NPS also cooperated with the AGFD and the BLM in the development of Parashant Interdisciplinary Management Plan (BLM and NPS 1997), which included objectives for wildlife management in the NPS portion of the Monument. Big and small game habitat improvements, transplants, big game surveys, special status species surveys and coordination, and the maintenance of a special status species database are only a few of the management practices being implemented in the Planning Area.

Over 180 wildlife water catchments, reservoirs, and spring developments have been constructed on BLM lands throughout the Planning Area. Many livestock waters have also been modified to accommodate wildlife use. Many of these water catchments are in disrepair and require maintenance. Other habitat enhancement projects implemented include prescribed burns, seeding, and chemical or mechanical treatments of poor quality habitat areas. Fences have been modified to ensure they are passable by wildlife. Wildlife habitat monitoring studies are conducted to assess the results of management towards meeting wildlife objectives.

In cooperation with AGFD, several species of wildlife have been reintroduced to former ranges to supplement existing populations and help in meeting populations goals. These include pronghorn antelope, desert bighorn sheep, mule deer, Kaibab squirrel, and Merriam's Turkey.

Pronghorn Antelope
(*Antilocapra americana*)

Pronghorn antelope are native to the Planning Area, with early residents having reported that they were common. However, the species were apparently eliminated from the Arizona Strip in the early 1900s. They were reintroduced to the area beginning in 1961, and reintroduction efforts continue today.

The Planning Area includes approximately 1.4 million acres of pronghorn habitat (see Map 3.15). Of this, nearly 97 percent is considered poor to moderate quality habitat, with only 3 percent being high quality. Populations since the 1980s have been low, but stable.

Management actions to help restore pronghorn to their former ranges within the Planning Area include modifying fences to allow pronghorn movement, improving forage species composition and diversity, modifying fences around water lots to accommodate pronghorn access, and developing or making other water sources available for pronghorns.

Desert Bighorn Sheep
(*Ovis canadensis nelsoni*)

There are five identified bighorn sheep habitat areas in the Planning Area totaling 361,347 acres (Map 3.16). Three of the habitats are in the Arizona Strip FO (Virgin and Beaver Dam Mountains, Hurricane Cliffs, and Kanab Creek), one is in Vermilion (the Paria-Vermilion Cliffs Wilderness Area), and one is in Parashant (Grand Wash Cliffs). With the exception of occasional sightings, bighorn sheep were believed to have been eliminated from these habitats around the turn of the century. In a cooperative effort between the BLM and AGFD beginning in 1979, bighorn sheep were reintroduced into the suitable habitat areas. These reintroduction efforts and successful reproduction have resulted in a gradual increase in the populations of desert bighorn sheep. Bighorn sheep populations now appear to be stable.

The Arizona Strip Desert Bighorn Sheep Management Plan (BLM and AGFD 2001) outlines objectives and actions for bighorn sheep within the Planning Area. The plan identifies crucial bighorn habitat as well as habitat used on an infrequent basis. Completed projects benefiting bighorn sheep include the construction of 17 water catchments and developments. The Rangewide Plan for Managing Habitat of Desert Bighorn Sheep (BLM 1995b) also directs sheep habitat management.

Mule Deer
(*Odocoileus hemionus*)

Mule deer were not common on the Arizona Strip prior to the arrival of early settlers. Mule deer populations began increasing during the early 1900s. Populations peaked within the Planning Area during the 1960s following decades of intensive predator control measures. Since that

Map 3.15: Pronghorn Antelope Habitat

Map 3.16: Bighorn Sheep Habitat

time, mule deer herds in the Planning Area have cycled through several decline and recovery periods. The AGFD considers the current mule deer population within the Planning Area to be low but stable.

The Planning Area contains about 3.3 million acres of suitable mule deer habitat (see Map 3.17). Habitat quality for deer, both summer and winter, has been changing since the 1960s. This may be attributed to the removal of domestic sheep, improved livestock management, and aggressive fire suppression. Succulent forage on crucial summer ranges and young nutritious browse on winter ranges are giving way to older browse, trees, and perennial grasses. Numerous waters have been developed to make more habitats accessible to deer.

Merriam's Turkey
(*Melagris gallopavo merriami*)

About 350 Merriam's turkeys occur on approximately 42,430 acres of ponderosa pine habitat in the Planning Area (see Map 3.18). These populations are the direct result of transplants that have occurred at Mt. Trumbull, the Parashant, and Black Rock Mountain since the 1970s. Several wildlife catchments have been constructed in order to assure reliable water in turkey habitats.

Kaibab Squirrel
(*Sciurus kaibabensis*)

The Kaibab squirrel, a tassel-eared, bushy, white-tailed species, is unique to the Kaibab Plateau (see Map 3.18). These squirrels were transplanted to the Mt. Trumbull ponderosa pine forest in the 1970s. The exact number of squirrels currently in the area is unknown, but 1,000 individuals were estimated in the Arizona Strip RMP (BLM 1992a). The squirrel population and habitat are both in good condition and there are few known conflicts with other resource uses.

Parashant Fish and Wildlife

Desert Bighorn Sheep
(*Ovis canadensis nelsoni*)

More than 75 desert bighorn have been released into historic range within the Grand Wash Cliffs since 1983. This population, which appears to be stable, is perhaps the most intensely managed bighorn sheep population on the Arizona Strip. In addition to recent transplant activities, water developments, and intensive survey efforts, the AGFD has identified the Grand Wash Cliffs as a high-priority future transplant site and a site for remote water hole camera deployment. Both the AGFD and BLM will continue to manage the site to ensure it meets regional and statewide goals for the species.

Map 3.17: Mule Deer Habitat

Map 3.18: Merriam's Turkey & Kaibab Squirrel

Mule Deer
(*Odocoileus hemionus*)

Portions of Parashant are world famous for large buck deer and are managed as trophy hunting units. The higher deer density areas include Black Rock and the Dellenbaugh area. In December 1988, 107 deer from Utah were transplanted to the Mt. Trumbull area. This was primarily an attempt to relocate excess deer rather than to restock deer numbers in Arizona, although subsequent sightings of deer in the area indicated an increase of resident animals.

Merriam's Turkey
(*Melagris gallopavo merriami*)

About 44 percent of the known Merriam's Turkey population occurs in the Mt. Trumbull/Mt. Logan area, with the remainder in the Parashant area and Black Rock Mountain.

Kaibab Squirrel
(*Sciurus kaibabensis*)

Kaibab squirrels were transplanted to the Mt. Trumbull area in the 1970s and have expanded to all suitable habitats throughout the 18,823 acres of ponderosa pine forests in the area.

Vermilion Fish and Wildlife

Desert Bighorn Sheep
(*Ovis canadensis nelsoni*)

Bighorn sheep were transplanted to the Paria Canyon/Vermilion Cliffs area beginning in 1984. This population has exhibited one of the best reproductive success rates for any bighorn transplant in Arizona, primarily because of desirable habitat conditions.

Arizona Strip FO Fish and Wildlife

Pronghorn Antelope
(*Antilocapra americana*)

Most of the 1.4 million acres of pronghorn habitat occurs on the Arizona Strip FO, mainly in the Clayhole, Mainstreet, and House Rock Valley areas.

Desert Bighorn Sheep
(*Ovis canadensis nelsoni*)

Bighorn sheep populations in the Arizona Strip FO include three habitat areas: the Virgin and Beaver Dam Mountains, Hurricane Cliffs, and Kanab Creek. In a cooperative effort beginning in

1979 between the BLM and AGFD, 56 desert bighorn were released on Arizona Strip FO lands within the Virgin Mountains. Transplants also occurred in the Kanab Creek area beginning in 1984.

Mule Deer
(*Odocoileus hemionus*)

The higher deer density areas include the Buckskin Mountains and Black Rock in the Arizona Strip FO.

American Bison
(Bison bison)

A herd of bison was introduced into the southern end of the House Rock Valley in the early 1900s. A portion of the herd still uses this area during the winter months. During the warm season, most of the bison move up slope to graze in the meadows on the Kaibab Plateau. The AGFD manages the herd between 80 and 135 animals.

Merriam's Turkey
(*Melagris gallopavo merriami*)

Some Merriam's Turkeys are known to occur in the Arizona Strip FO portion of Black Rock Mountain. The existing population was supplemented in the mid-1990s, increased to a high of over 30, and then declined again.

Brown-headed Cowbirds
(*Molothrus ater*)

The Brown-headed Cowbird is one of two species of Cowbirds found in North America. This species has expanded its range from the short grass prairies of the high plains into agricultural and suburban landscapes throughout most of North America. Brown-headed Cowbirds may be found in a variety of habitats, particularly grasslands with low or scattered trees, woodland edges, riparian, fields, pastures, orchards, and residential areas. Cowbirds are frequently associated with livestock operations, foraging primarily on the ground for seeds, arthropods, and animal waste.

Cowbirds lay their eggs in the nests of other species, a strategy known as brood parasitism. As a result, they are considered a threat to populations of many other species of birds, especially endangered species such as Southwestern Willow Flycatcher.

SPECIAL STATUS SPECIES

Special status species include those federally listed as threatened or endangered under the Endangered Species Act (ESA), those proposed or candidates for federal listing, AGFD Wildlife of Special Concern, and those species identified by the BLM State Director as sensitive or rare. NPS policy also recognizes AGFD's Wildlife of Special Concern list. All species identified as sensitive by the BLM must be managed proactively to minimize the need for future listing as threatened or endangered under the ESA.

Because the Arizona Strip lies in the transition zone between the Basin and Range, the Mojave Desert, and the Colorado Plateau, many plant and wildlife species are at the extreme edge of their historic range. Such species tend to have less stable populations than those closer to the center. However, the historic isolation and remoteness of these transitional habitats make the Planning Area an important research area for special status species. The eight ecological zones in the Planning Area provide large areas of relatively undisturbed habitats that provide opportunities for re-introductions and establishment of new populations of special status species.

Special Status Animals

Overview

At least 44 special status animals are known to occur or have the potential to occur within the Planning Area, including 15 bird species, 12 mammals, 4 reptiles, 3 amphibians, 6 fish, and at least 4 invertebrates (see Table 3.14). Of these, the Yuma Clapper Rail, Southwestern Willow Flycatcher, woundfin, and Virgin River chub are federally listed as endangered. Also listed as endangered is the California Condor, but the population within the Planning Area is an experimental, nonessential population and is managed as a species proposed for listing. Federally listed threatened species are the desert tortoise, Bald Eagle, and Mexican Spotted Owl. Relict leopard frogs and western Yellow-billed Cuckoos are candidates for listing. These federally listed or candidate species are described below, as well as other special status species that may be affected by the alternatives proposed in this Proposed Plan/Final Environmental Impact Statement (FEIS).

Table 3.14: Special Status Animal Species

Common Name	Scientific Name	Status			Planning Area	Occurrence
		USFWS	BLM	AGFD		
Birds						
Northern Goshawk	*Accipiter gentilis apache*	SC		WSC	Parashant	Verified
Western Burrowing Owl	*Athene cunicularia hypugea*	SC	S		Parashant Vermilion Arizona Strip FO	Verified Probable Verified
American Bittern	*Botaurus lentiginosus*			WSC	Arizona Strip FO	Verified
Ferruginous Hawk	*Buteo regalis*	SC		WSC	Parashant Vermilion Arizona Strip FO	Verified Possible Verified
Yellow-billed Cuckoo	*Coccyzus americanus*	C		WSC	Arizona Strip FO	Verified
Fulvous Whistling Duck	*Dendrocygna bicolor*		S		Arizona Strip FO	Verified
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	LE		WSC	Arizona Strip FO	Verified
Peregrine Falcon	*Falco peregrinus anatum*	SC		WSC	Parashant Vermilion Arizona Strip FO	Verified Verified Verified
California Condor	*Gymnogyps californianus*	XN			Parashant Vermilion Arizona Strip FO	Probable Verified Verified
Bald Eagle	*Haliaeetus leucocephalus*	LT		WSC	Parashant Vermilion Arizona Strip FO	Probable Verified Verified
Loggerhead Shrike	*Lanius ludovicianus*		S		Parashant Vermilion Arizona Strip FO	Verified Verified Verified
White-faced Ibis	*Plegadis chihi*	SC	S		Parashant Vermilion Arizona Strip FO	Verified Probable Verified
Yuma Clapper Rail	*Rallus longirostris yumanensis*	LE		WSC	Arizona Strip FO	Verified
Mexican Spotted Owl	*Strix occidentalis lucida*	LT		WSC	Parashant Vermilion Arizona Strip FO	Possible Possible Possible
Mammals						
House Rock Valley chisel-toothed kangaroo rat	*Dipodomys microps leucotis*	SC	S	WSC	Arizona Strip FO	Verified
Spotted bat	*Euderma maculatum* SC		S	WSC	Parashant Vermilion Arizona Strip FO	Verified Verified Verified
Allen's big-eared bat	*Idionycteris phyllotis* SC		S		Parashant Vermilion Arizona Strip FO	Verified Probable Verified

Table 3.14: Special Status Animal Species (cont.)

Common Name	Scientific Name	Status			Planning Area	Occurrence
		USFWS	BLM	AGFD		
Mammals						
California leaf-nosed bat	*Macrotus californicus* SC		S	WSC	Arizona Strip FO	Verified
Small-footed myotis bat	*Myotis ciliolabrum* SC		S		Parashant Vermilion Arizona Strip FO	Verified Verified Verified
Long-eared myotis bat	*Myotis evotis* SC		S		Parashant Arizona Strip FO	Probable Verified
Fringed myotis bat	*Myotis thysanodes* SC		S		Parashant Vermilion Arizona Strip FO	Verified Verified Verified
Long-legged myotis bat	*Myotis volans* SC		S		Parashant Arizona Strip FO	Verified Verified
Big free-tailed bat	*Nyctinomops macrotis* SC		S		Parashant Arizona Strip FO	Verified Verified
Reptiles						
Mojave Desert tortoise	*Gopherus agassizii*	LT CH		WSC	Parashant Arizona Strip FO	Verified Verified
Banded Gila monster	*Heloderma suspectum cinctum*	SC	S		Parashant Arizona Strip FO	Verified Verified
Chuckwalla	*Sauromalus obesus*		S		Parashant Vermilion Arizona Strip FO	Verified Verified Verified
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	S			Parashant Vermilion Arizona Strip FO	Verified Possible Verified
Amphibians						
Relict leopard frog	*Rana onca* C			WSC	Parashant Arizona Strip FO	Suitable Hab. Historic
Fish						
Desert sucker	*Catostomus clarki*	SC	S		Vermilion Arizona Strip FO	Verified Verified
Flannelmouth sucker	*Catostomus latipinnis*	SC			Arizona Strip FO	Verified
Virgin River chub	*Gila seminuda*	LE CH		WSC	Arizona Strip FO	Verified
Virgin spinedace	*Lepidomeda mollispinis mollispinis*	SC CA		WSC	Arizona Strip FO	Verified
Woundfin	*Plagopterus argentissimus*	LE CH		WSC	Arizona Strip FO	Verified
Speckled dace	*Rhinichthys osculus*	SC	S		Vermilion Arizona Strip FO	Verified Verified

Table 3.14: Special Status Animal Species (cont.)

Common Name	Scientific Name	Status			Planning Area	Occurrence
		USFWS	BLM	AGFD		
Invertebrates						
Succineid snails	Family Succineidae		S		Arizona Strip FO	Possible
MacNeil sooty wing skipper	*Hesperopsis gracielae*		S		Parashant Arizona Strip FO	Verified Verified
Grand Wash springsnail	*Pyrgulopsis bacchus*	SC	S		Parashant	Verified
Desert springsnail	*Pyrgulopsis deserta*		S		Arizona Strip FO	Verified

USFWS Status: LE – Listed Endangered; LT – Listed Threatened; C – Candidate; CA – Signed Conservation Agreement; SC – Species of Concern; XN – Experimental Nonessential Population; CH – Designated Critical Habitat
BLM Status: S – Sensitive; AGFD: WSC – Wildlife Species of Concern

Parashant Special Status Animals

There have been verified occurrences of 18 special status animal species, probable occurrences of three, and possible occurrences of one in Parashant (see Table 3.14). Suitable habitat also occurs for the relict leopard frog. Descriptions of the federally listed special status species and those particularly susceptible to management actions proposed under the alternatives are presented below.

Bald Eagle
(*Haliaeetus leucocephalus*)
USFWS Listed Threatened; AGFD Wildlife Species of Concern

The USFWS listed the Bald Eagle as endangered on March 11, 1967 (32 FR 4001). The species suffered population declines throughout its range due to habitat loss, mortality from shooting and poisoning, and reduced reproductive success from ingestion of contaminants (USBR 1999). Recovery efforts have been successful in combating dramatic population declines over the past several decades, resulting in down listing the species to threatened status on July 12, 1995 (60 FR 35999). Further improvements in Bald Eagle populations prompted the USFWS to propose delisting of the species on July 6, 1999 (64 FR 36453).

Bald Eagles mainly inhabit coastal areas, estuaries, and unfrozen inland waters. Some Eagles inhabit arid areas of the western interior and southwestern portion of the U.S. where there are large trees or cliffs near water with abundant prey, such as along rivers, lakes, and reservoirs. Northern Bald Eagles migrate in the winter to climates that are more temperate. Wintering Bald Eagles concentrate near rivers, reservoirs, and lakes, with their distribution being dependent on prey availability, perch suitability, weather, and human disturbance intensity (AGFD 2003a). Due to the lack of large bodies of water and other suitable wintering habitat features, observations of Bald Eagles on the Monument have been infrequent. The species is considered a rare winter visitor.

Mexican Spotted Owl
(*Strix occidentalis lucida*)
USFWS Listed Threatened; AGFD Wildlife Species of Concern

The Mexican Spotted Owl was listed as a threatened species on March 16, 1993 (58 FR 14248). The logging of old growth forests and possible competition with great horned owls in thinned forests contribute to the decline of this species. The species' preferred habitat includes steep slopes, and deep, shady ravines or canyons associated with dense older forests consisting of mixed conifer species or ponderosa pine and Gambel oak. In the northern-most part of their range, including the Arizona Strip, old growth forests are not as important as the owls primarily occur in rocky canyons (Kertell 1977, Reynolds 1990, Rinkevich 1991, Willey 1993), particularly canyons with steep walls and associated riparian areas. Mexican Spotted Owls roost during the day and hunt during dusk and night hours (AGFD 2003b). They are intolerant of even moderately high temperatures and may roost on north facing slopes with dense overhead canopies in summer daytime hours.

Suitable forested habitats within Parashant have been surveyed using accepted protocols with no Mexican Spotted Owls being detected. Radio-telemetry studies from Zion National Park have indicated that wintering owls may disperse into a variety of different habitats within the Planning Area, including the pinyon-juniper woodlands within Parashant (Rinkevich 1991).

California Condor
(*Gymnogyps californianus*)
USFWS Listed Endangered/Experimental, Non-essential Population

Parashant is contained within the experimental, non-essential area designated for the California Condor with the species frequenting the area. Please refer to the discussion under Vermilion Special Status Animals for a detailed discussion of the species.

Peregrine Falcon
(*Falco peregrinus anatum*)
USFWS Species of Concern; AGFD Wildlife Species of Concern

In 1970, the American Peregrine Falcon subspecies was listed as endangered under the Endangered Species Conservation Act of 1969 (the law preceding the ESA of 1973) reflecting their critical biological status. Beginning in the late 1940's, Peregrine Falcon populations suffered rapid declines. By the mid-1970's, peregrine populations were reduced by 80 to 90 percent in the Western U.S. The primary cause of decline was high concentrations of the pesticide dichlorodiphenyltrichloroethane (DDT) and its breakdown product, dichlorodiphenyldichloroethylene (DDE). Peregrines accumulated DDT in their tissues by feeding on birds that had eaten DDT-contaminated insects or seeds. The toxic chemical interfered with eggshell formation. As a result, Falcons laid eggs with shells so thin they often

broke during incubation or otherwise failed to hatch. Because too few young were raised to replace adults that died, Peregrine populations declined suddenly. Subsequent bans on the use of DDT and DDE pesticides has allowed for recovery of the species. Peregrine Falcons were delisted in August 1999.

Peregrine Falcons have been documented throughout Parashant, including Parashant and Andrus Canyons, and the upper Grand Wash Cliffs. The USFWS, AGFD, and BLM continuously monitor two of these sites. The birds observed in Parashant are potentially yearlong inhabitants. Although they have been observed and reported on numerous occasions throughout the area for more than 30 years, recorded data on population numbers, trend, ecology, and habitat use patterns is limited. Several nests or "eyries" have been identified and many others are suspected to exist.

Northern Goshawk
(*Accipiter gentilis apache*)
USFWS Species of Concern; AGFD Wildlife Species of Concern

Northern Goshawks are listed by the State of Arizona as a Wildlife Species of Concern. Goshawks have been proposed for federal listing under the ESA on a number of occasions but the listing has not been found to be warranted.

Goshawks nest in coniferous forests and will winter in lower elevations in forested areas. Within Parashant, as many as three active goshawk nests have been located in the ponderosa pine forests at Mt. Trumbull and Twin Points.

Western Burrowing Owl
(*Athene cunicularia hypugea*)
USFWS Species of Concern; BLM Sensitive Species

Burrowing Owls are found in open, dry grasslands, agricultural areas, rangelands, and desert habitats often associated with burrowing animals, particularly prairie dogs. They can also inhabit grass, forb, and shrub stages of pinyon and ponderosa pine habitats. They commonly perch on fence posts or on top of mounds outside the burrow. Burrowing Owls consume a variety of prey items, including young desert tortoise. Rangewide, their populations have declined in many areas due to human-caused habitat loss or alteration. Since there are no prairie dogs in the Planning Area, this species must use the burrows provided by ground squirrels, desert tortoise, or badgers. They are infrequently observed, typically in low elevations habitats in the Pakoon Basin.

Ferruginous Hawk
(Buteo regalis)
USFWS Species of Concern; AGFD Wildlife Species of Concern

The Ferruginous Hawk is the largest hawk in North America averaging 22½ to 25 inches long, with a 53- to 56-inch wingspan. Although populations of Ferruginous Hawks seem to have declined in most areas over their range, they have been observed in a variety of locations within Parashant.

Ferruginous Hawks are birds of open country. They occur in semiarid grasslands with scattered trees, rocky mounds or outcrops, and shallow canyons that overlook open valleys. The species rely primarily upon rodents, but also feed upon snakes, lizards, meadowlarks, grasshoppers, and crickets. The birds select rocky outcrops, hillsides, rock pinnacles, or trees for nest sites, although they will occasionally use haystacks, power poles, or nest platforms. Ferruginous Hawks may lay eggs between February and July, with the number of eggs laid, as well as the number of active nests in an area, potentially being tied to the abundance of prey. Population abundance and density estimates are not available for this species within the Planning Area.

Desert tortoise, Mojave population
(*Gopherus agassizii*)
USFWS Listed Threatened with Critical Habitat; AGFD Wildlife Species of Concern

USFWS listed the Mojave population of desert tortoises as a threatened species on April 2, 1990 (55 FR 12178), which includes tortoises north and west of the Colorado River. See Map 3.19 for the location of desert tortoise habitat within Parashant. Critical habitat was designated for the Mojave population on February 24, 1994 (59 FR 5820, 59 FR 9032). Tortoises within the Monument are part of the Northeast Mojave Recovery Unit, Gold Butte - Pakoon Basin Desert Wildlife Management Area (DWMA). The Parashant includes approximately 169,377 acres of desert tortoise habitat on BLM lands and 52,670 acres on NPS lands.

Tortoise habitat includes sandy loam and rocky soils in valleys, bajadas, and rocky slopes and hills in the Mojave Desert at elevations ranging from 500 to 5,100 feet (USFWS 1994). Creosote and other shrubs with small cacti and, in some areas, Joshua trees, dominate the plant communities in these habitats (AGFD 2003c). Another important habitat feature is adequate shelter. Tortoises dig burrows below vegetation to provide protection from heat and predators. Desert tortoises are patchily distributed across their habitat, and appear to be concentrated where soils and vegetation provide preferred conditions. These higher-density areas are interspersed among areas with less suitable habitat. Habitat preferences for desert tortoise, however, are not well documented.

Little is known concerning the density and abundance of desert tortoise in Parashant. A 2-square mile study plot in the area was first surveyed in 1991 by Advantage Environmental (1991). They

Map 3.19: Desert Tortoise

located 10 live tortoises and 11 sets of shell remains in 60 person days of searching using standard field techniques. The sex ratio of the tortoises found was 67 percent male to 33 percent female. The size class structure was 10 percent immature and 90 percent adult. One tortoise had definite symptoms of upper respiratory distress syndrome URTD and two had possible symptoms. They estimated a density of 6 to 8 tortoises per square mile in one section and 9 to12 tortoises per square mile on the other. Grasses, forbs, and water were adequate. Caliche caves were plentiful but soil burrows were very scarce. Throughout much of the site, there was only a shallow substrate of soil over a solid substrate of caliche. Therefore, soil burrows where tortoises can lay eggs at a proper depth are thought to be the limiting resource (Advantage Environmental 1991).

Because of its remote nature and limited access, the Pakoon Basin is subjected to relatively few human intrusions that affect desert tortoises and their habitat. The Desert Tortoise Recovery Team rated the threats to tortoises in this area as low-moderate. Although few human activities occur in the Pakoon Basin, fire is a significant threat. More than 150,000 acres of tortoise habitat in the Pakoon basin has burned since the 1940's (BLM 1995c, USFWS 2006). During the 2005 and 2006 fire season, lightening-caused fires burned more than 37,000 acres in the Planning Area. It is unlikely that areas that have been burned by especially hot fires or that have burned repeatedly have the necessary forage or cover to support desert tortoises for many years (pers. comm. 1999, Tim Duck, BLM - Arizona Strip FO, St. George, Utah). Other threats to tortoises and their habitat in the area include cattle grazing, limited use of OHVs, disease (URTD and cutaneous dyskeratosis), and drought.

Relict Leopard Frog
(*Rana onca*)
USFWS Candidate Species; AGFD Wildlife Species of Concern

Please refer to the discussion under Arizona Strip FO Special Status Animals for a detailed discussion of the species. Although suitable habitat exists for relict leopard frogs in Parashant, no individuals have been located. Consideration is being given to Pakoon and Tassi springs as reintroduction sites. Considerable restoration would be required to make Pakoon Springs suitable for such efforts.

Grand Wash Springsnail
(*Pyrgulopsis bacchus*)
USFWS Species of Concern; BLM Sensitive

The Grand Wash springsnail is known to occur in only three springs within Grand Wash trough Mohave County, Arizona. The species possibly also occurs in the Virgin Mountains in Clark County, Nevada. The species lives within aquatic communities associated with spring flows. It is threatened by groundwater depletion and subsequent loss of spring flows and habitat degradation due to livestock use.

Vermilion Special Status Animals

There have been verified occurrences of 10 special status animal species, probable occurrences of two, and possible occurrences of four in Vermilion (see Table 3.14). Please refer to the above Parashant section for the descriptions of Peregrine Falcon, Western Burrowing Owl, Ferruginous Hawk, and Mexican Spotted Owl. Peregrine Falcons have been documented within Paria Canyon and the Vermilion Cliffs and are considered yearlong residents in these areas. Bald Eagles are only known to be infrequent winter visitors to the Monument. Surveys for Mexican Spotted Owls have been completed in Paria Canyon and associated side canyons. No owls were detected. The area is considered too hot and dry to provide suitable habitat for Mexican Spotted Owls, although the possibility that they may be present remains. A detailed description of the California Condor is provided below.

California Condor
(*Gymnogyps californianus*)
USFWS Listed Endangered/Experimental, Non-essential Population

The California Condor was listed as endangered on March 11, 1967 (32 FR 4001). The northern Arizona population was designated as an experimental, nonessential population under Section 10(j) of the ESA (61 FR 54043). The experimental, non-essential area encompasses Vermilion as it extends from its eastern boundary along Highway 191 from Utah into Arizona to the intersection with Interstate 40, the southern boundary as Interstate 40 from the junction with Highway 191 west across Arizona to Kingman, and the western boundary from Kingman northwest along Highway 93 to Interstate 15. There is no critical habitat designation associated with the experimental population. The decline in Condor numbers has been attributed to illegal collection of eggs and birds, poisoning from predator control, lead poisoning, the effects of DDT and other pesticides, and an increase in roads and houses in the open country needed by Condors for foraging. Their slow rate of reproduction and years required to reach breeding maturity make Condors vulnerable to these threats.

Condors nest in caves, ledges, or large trees near open grasslands and savannahs where they forage on carrion. Individual birds may travel long-distances to find sufficient food. They mostly roost near nesting or foraging areas, on rock cliffs, snags, and live conifer stands on the Vermilion Cliffs and the Paria Plateau, although they also roost in other scattered sties throughout Vermilion (USBR 1999).

The last wild Condor was reported in Arizona in 1924. On October 29, 1996, USFWS released six California Condors at the Vermilion Cliffs. In the years following, additional birds have been released, with more than 50 Condors flying in northern Arizona in 2005. The primary release site is located along the southwestern edge of the Paria Plateau in Vermilion. Some released Condors have flown to parts of Arizona outside the designated area, returning after a short period. Reproduction among these birds has been moderately successful, with several young fledged from nest sites within the experimental, non-essential area. The population continues to experience periodic

mortality of individuals due to a variety of causes. Lead contamination continues to be a problem.

Arizona Strip FO Special Status Animals

There have been verified occurrences of 33 special status animal species and possible occurrences of two more in the Arizona Strip FO (see Table 3.14). Historic habitat also occurs for the relict leopard frog. Please refer to the above Parashant section for the descriptions of Peregrine Falcon, Western Burrowing Owl, and Ferruginous Hawk. Peregrine Falcons have been documented within Kanab Canyon, Hack Canyon, near Fredonia, the Hurricane Cliffs, and the Virgin Mountains and may be yearlong residents. Bald Eagles are only known to be infrequent winter visitors to the Arizona Strip FO. Detailed descriptions of other special status species particularly susceptible to management actions proposed under the alternatives are presented below:

Southwestern Willow Flycatcher
(*Empidonax traillii extimus*)
USFWS Listed Endangered; AGFD Wildlife Species of Concern

Southwestern Willow Flycatchers were listed as endangered on February 27, 1995 (60 FR 10693). Critical habitat was designated on July 22, 1997 (62 FR 39129), but was set aside by the 10th Circuit Court of Appeals on May 11, 2001. The USFWS is expected to issue a new critical habitat designation before 2006 (USFWS 2002). This species has declined in population due to riparian habitat loss and fragmentation resulting from the draining of wetlands; channeling and levying of streambeds; construction of canals, drains, and impoundments; livestock grazing and off-road vehicle use in riparian areas and wetlands; and the invasion of riparian habitat by invasive species. Other probable factors contributing to population decline include predators and brood-parasitism by Brown-headed Cowbirds (see discussion of Brown-headed Cowbirds in the Wildlife Section).

A riparian-obligate species, Southwestern Willow Flycatchers prefer dense canopy cover, a large volume of foliage, and surface water during midsummer. Breeding birds occupy habitat along rivers, streams, wetlands, and lakes, where dense growths of willow, seepwillow, buttonbush, box elder, tamarisk, or other plants are present, often with a scattered overstory of cottonwood and/or willow.

Map 3.20 illustrates Willow Flycatcher habitat in the Arizona Strip FO. Nine patches of suitable Flycatcher habitat occur along the Arizona reach of the Virgin River, with the largest patch at the confluence of Beaver Dam Wash and the Virgin River. These sites average less than 10 acres each and are composed mainly of tamarisk. The species has been observed using the Beaver Dam confluence area to nest. Two patches of suitable habitat are located along Kanab Creek, one patch at Clearwater Springs and the other a half-mile downstream from the springs. Both

Map 3.20: Southwestern Willow Flycatcher Habitat

sites are dominated by dense stands of tamarisk. Although these sites are considered suitable habitat, no Willow Flycatchers have been documented there.

Yuma Clapper Rail
(*Rallus longirostris yumanensis*)
USFWS Listed Endangered; AGFD Wildlife Species of Concern

The Yuma Clapper Rail was listed as endangered on March 11, 1967 (32 FR 4001) due to a decline in the population linked to loss of habitat. Channelization and marsh development are primary causes of habitat loss.

The Yuma Clapper Rail nests and forages in areas with wet substrates (mudflats, sandbars) and dense herbaceous (e.g., cattails and bulrushes) or woody vegetation (e.g., tamarisk.). The interface between water, soil, and vegetation seems to be a more important habitat characteristic than the species of plant that covers the site. The species nest on the ground in areas of dense vegetation near the water's edge, showing a preference for banks that are slightly higher than adjacent marshes (BLM 2002a). Sightings of this species have occurred in the marsh habitat at the confluence of Beaver Dam Wash and the Virgin River.

Yellow-billed Cuckoo
(*Coccyzus americanus*)
USFWS Candidate; AGFD Wildlife of Concern

The Yellow-billed Cuckoo is a candidate species for federal listing (June 13, 2002, 67 FR 40657). Declines in populations may be due to habitat loss. Yellow-billed Cuckoos are a riparian-obligate species, which means that they require large blocks of riparian woodlands to thrive. Their habitat includes a mixture of mature cottonwood/willow galleries and tamarisk/mesquite thickets where they build their nest 4 to 30 feet above the ground (AGFD 2002). Yellow-billed Cuckoos have been observed in the Arizona Strip FO in the cottonwood/willow galleries at the confluence of Beaver Dam Wash and the Virgin River.

American Bittern
(*Botaurus lentiginosus*)
AGFD Wildlife Species of Concern

The American Bittern is a secretive, medium-sized heron considered a species of concern because of the continuing disappearance of the wetland habitats it needs to exist. The species is most easily identified by its large size, up to 34 inches tall and with a 50-inch wingspan, and its streaked brown plumage. They are most commonly found in marshes and wetland borders along lakes, ponds, rivers, and streams. American Bitterns have been sighted in the marsh habitat at the confluence of Beaver Dam Wash and the Virgin River.

California Condor
(*Gymnogyps californianus*)
USFWS Listed Endangered/Experimental, Non-essential Population

While the primary release site for Condors is located along the southwestern edge of the Paria Plateau in Vermilion, a secondary release site on the Hurricane Rim within the Arizona Strip FO was used for two years and then abandoned, though the site could be used again. Condors continue to frequent the Arizona Strip FO, which is included within the experimental, non-essential area.

Mexican Spotted Owl
(*Strix occidentalis lucida*)
USFWS Listed Threatened; AGFD Wildlife Species of Concern

Mexican Spotted Owl critical habitat was designated for a number of federally managed lands in Arizona and New Mexico, including 9,600 acres within Grama, Hacks, Chamberlain, and Water Canyons in the Arizona Strip FO. These and other drainage areas of Kanab Creek have been surveyed for the species, but no individuals were found. Surveys have also been conducted in forest habitats at Black Rock with no owls being detected. Radio-telemetry studies from Zion National Park have indicated that wintering owls may disperse into a variety of different habitats within the Planning Area, including the Arizona Strip FO (Rinkevich 1991).

Desert tortoise, Mojave population
(*Gopherus agassizii*)
USFWS Listed Threatened; AGFD Wildlife Species of Concern

The Arizona Strip FO is within the Northeast Mojave Recovery Unit for desert tortoise and includes two areas of critical habitat for the species: one along the western slope of the Beaver Dam Mountains (Beaver Dam Slope) and the other along the northern slope of the Virgin Mountains (Virgin Slope; see Map 3.19). Tortoises on the Beaver Dam Slope are part of a larger population that includes portions of Utah and Nevada, collectively referred to as the Beaver Dam Slope DWMA. Management of this area is primarily focused on survival and recovery needs for desert tortoise and is part of the Beaver Dam Slope Area of Critical Environmental Concern (ACEC). The Beaver Dam Slope includes 69,407 acres of habitat, approximately 90 percent of which is considered to have high suitability for tortoise. The Virgin Slope ACEC is part of the Gold Butte-Pakoon DWMA, and includes 38,979 acres of habitat with moderate and low suitability. See the desert tortoise discussion under the Parashant for additional information about listing and habitat.

Desert tortoise studies have been conducted on the Beaver Dam Slope population since the 1930s. Three, 1-square meter study plots have been established and read in the area, including the Beaver Dam Slope Exclosure where 31 tortoises were located in 1996, though only three of these were tortoises that had been located and tagged in previous studies. Walker and Woodman (2002) located only six live tortoises. They found no eggshells, fragments, nest sites, or other

indications of reproductive behavior. Due to the small sample size, they did not present any population estimates. All six live tortoises found were within 0.4 mile of one of the two dirt roads on the plot. Four of the six tortoises were located within 0.1 mile of a dirt road. Three of the tortoise found by Walker and Woodman (2002) had signs of URTD and two had lesions indicative of cutaneous dyskeratosis. Duck and Schipper (1989) located 56 tortoise carcasses, Goodlett et al. (1996) located 29 carcasses, and Walker and Woodman (2002) located 18 tortoise carcasses, seven of which were marked. Of the latter carcasses, five were estimated to have died within the last year, five likely died within the previous one to two years, and eight had probably been dead for two to four years. Walker and Woodman (2002) were not able to establish a likely cause of death for any of the tortoises. Based on consideration of previous studies, they concluded that 85 percent of the population on the plot had died and estimated that the desert tortoise population in the Beaver Dam Exclosure plot had collapsed, and considered it functionally extinct. Young et al. (2002) suggested that the cause of the decline was unknown, but speculated it was due to a combination of factors including but not restricted to: disease, drought, and/or unknown toxicants.

In 2001, Utah Division of Wildlife Resources (UDWR 2001) surveyed 53 random transects across the Beaver Dam Slope DWMA, including areas in Utah, Arizona, and Nevada. Each transect was 1.6 km square with 400 m sides. Tortoise sign was found on 21 (40 percent) of the transects, while no sign was found on 32 (60% percent) of the transects. The density of reproductive tortoises was estimated at 3.04 tortoises per square kilometer with a 95 percent confidence interval of 1.3 to 7.12. This estimate is one of the lowest observed of the areas surveyed by UDWR during the spring 2001. Eleven of the 53 transects were located in the Arizona Strip FO. No live tortoises or shells were observed on any of these eleven transects. Three transects had definite signs, three had possible signs, and five had no signs of tortoises (UDWR 2001). In 2002, UDWR surveyed 27 random transects across the DWMA, seven of which were in Arizona. Tortoise sign was found on eight (30 percent) of the transects: two transects had definite tortoise sign, two had possible signs, and four had no signs of tortoises. Nineteen (70 percent) of the transects had either no sign or a possible tortoise burrow that could not be confirmed (i.e., no scat). No live tortoises were encountered on any transect, while two shells were found on one transect. Density estimates are not included in the field summary report on file (UDWR 2003).

The Littlefield study plot was established in 1977 (Hohman and Ohmart 1978). Since that time, the plot has been surveyed by Sheppard (1981), Duck and Schipper (1989), Rourke (1993), Woodman et al. (1998) and Young et al. (2002). The number of adult and sub-adult tortoises located has been relatively consistent on the Littlefield plot from 36 in 1993 (Rourke 1993), to 44 in 1998 (Woodman et al. 1998), and 33 in 2002 (Young et al 2002). Abundance estimates for the plot were 49 $\pm$ 7.7 in 1997 (Woodman et al. 1998). In 2002, Young et al. (2002) estimated desert tortoise adundance on the plot to be 49 $\pm$ 12.8. There was no significant difference in the number of adults from 1998 to 2002 (Young et al 2002). Eggshells and fragments were observed in 1998 and 2002, indicating reproduction was occurring. Only one tortoise had possible signs of URTD, while 23 (62.3 percent) had cutaneous dyskeratoris. Thirty-nine carcasses were

collected in 1987 (Duck and Snider 1988), 14 were collected either between 1987 and 1993 or during 1993 (Rourke 1993), 11 in 1998 (Woodman et al. 1998), and 44 in 2002 (Young et al. 2002). The cause of death was determined for 22 of the 44 carcasses collected in 2002: 13 were thought to have been killed by canids (i.e., coyote, fox, dog), 2 by ravens, and 1 by a mountain lion; 2 were possibly crushed by ungulates (e.g., deer, cow); 1 died due to a bladder stone; 1 was killed by gunshot; 1 died due to being on its carapace; and 1 death was a probable vehicle mortality. Young et al. (2002) concluded that the Littlefield Study Plot was in the midst of a high mortality event based on a high mortality rate of 3.5 adults per year from 1998 to 2002, a high incidence of cutaneous dyskeratosis, and evidence of predation from ravens and canids. The combination of a high mortality event and a consistent estimate of abundance of live adults indicates that either recruitment or immigration was keeping the number of desert tortoise at about the same level over time.

The Virgin Slope study plot was established and read in 1992 (Advantage Environmental Consulting 1992), and read again in 1997 and 2003 (Goodlett and Woodman 2003). The number of adult and sub-adult tortoises located has varied considerably over the three readings of this plot. In 1992, 12 live tortoises were captured and marked (Advantage Environmental Consulting 1992). The number increased to 32 in 1997, but dropped to 9 in 2003 (Goodlett and Woodman 2003). In 1992, the relative abundance of desert tortoise on the plot was estimated at 35 $\pm$ 39.5 (Advantage Environmental Consulting 1992). In 1997, the abundance estimate was 38 $\pm$ 14.6. No abundance estimate was made for the 2003 reading due to small sample size and the fact that the recapture portion of the study was not completed (Goodlett and Woodman 2003). In 2003, one of the nine tortoises (11.1 percent) displayed signs of URTD, while 14.6 percent of the animals showed signs of URTD in 1997 (Goodlett and Woodman 2003). Seven of nine animals showed signs of cutaneous dyskeratosis. Nineteen carcasses were collected in 2003. About half were sub-adults or larger that had died more than four years ago while only two had died within the previous year. The cause of death was determined to be predation by a mountain lion for one carcass, but the remainder could not be (Goodlett and Woodman 2003). Goodlett and Woodman (2003) concluded that desert tortoises were dying at an alarming rate on the Virgin Slope study plot. From 1997 to 2003, 29 percent of the tortoises in the plot died. This was a significant change from 1992 to 1997, which saw a total mortality rate of 10 percent. Goodlett and Woodman (2003) attributed the probable cause of this decline to cutaneous dyskeratosis. They suggested URTD could also be a contributing factor, but felt there was insufficient data to support this conclusion. They also concluded that the die-off began just prior to 1997 and felt that it was environmentally related rather than by direct spread of the disease through nose-to-nose contact.

Relict Leopard Frog
(*Rana onca*)
USFWS Candidate Species; AGFD Wildlife Species of Concern

The USFWS designated relict leopard frogs as a candidate species on June 13, 2002 (67 FR 40657). Threats to the species include elimination or dramatic alteration of aquatic habitat due to

dams, agriculture, marsh draining, and water development; the spread of predacious nonnative bullfrogs, crayfish, and fishes; and a fungal disease.

Relict leopard frogs inhabit permanent streams, springs, seeps, and spring-fed wetlands below 2,000 feet in elevation. Their breeding habitat includes pools or slow moving sections of streams, with or without emergent vegetation. Historic distribution of the species includes springs, streams, and wetlands within the Virgin River drainage from the vicinity Hurricane, Utah, to the Overton Arm of Lake Mead in Nevada and along the Muddy (Moapa) River in Nevada. An historic population of relict leopard frogs was found at a privately owned spring adjacent to the Virgin River at Littlefield, Arizona. That population has since been extirpated. No relict leopard frogs are known to exist on BLM lands in the Arizona Strip FO.

Woundfin
(*Plagopterus argentissimus*)
USFWS Listed Endangered; AGFD Wildlife Species of Concern

The woundfin was listed as endangered in 1970 (35 FR 16047). Populations of this species continue to decline due to habitat modifications including dam construction; dewatering from agriculture, mining, and urbanization; and management of non-native species. The mainstem Virgin River and its 100-year floodplain extending from the confluence of La Verkin Creek, Utah, to Halfway Wash, Nevada, was designated as critical habitat on January 16, 2000 (65 FR 4140). This includes the section of river that runs through the Arizona Strip FO.

Woundfin live in swift parts of silty, warm streams, seemingly avoiding clear waters and are very seldom found in quieter pools (AGFD 2003d). Within the Virgin River, the species seems to be restricted to approximately 50 miles of perennial reaches of the Virgin River in Utah, Arizona, and Nevada, including the Arizona Strip FO portion where they are sporadically found. Population density estimates are not available for this species, though numbers are thought to be low in the Arizona portion of the Virgin River due to absence of suitable habitat features.

Virgin River Chub
(*Gila seminuda*)
USFWS Listed Endangered; AGFD Wildlife of Concern

The Virgin River chub was listed as endangered on August 24, 1989 (54 FR 35305). Populations of this species continue to decline due to habitat modifications, including dam construction; predation; dewatering from agriculture, mining, and urbanization; and management of non-native species. Critical habitat was designated on January 26, 2000 (65 FR 4140) along the main channel of the Virgin River and its 100-year floodplain along the entire Arizona portion of the river, which includes 39 miles of river that cuts across the Arizona Strip FO.

Virgin River chubs occur only in the mainstem of the Virgin River, and very rarely in the immediate mouths of its major tributaries. Water in the Virgin River is generally warm, turbid,

and saline, with the primary vegetation on its banks being tamarisk. Virgin River chubs are most often associated with deep runs or pool habitats of slow to moderate velocities with sand and instream cover, such as root snags and large boulders (AGFD 2001, 65 FR 4140). Other habitat elements also include side channels, secondary channels, backwaters, and springs.

Population abundance and density estimates are not available for this species. However, the Virgin River Gorge provides suitable habitat that is considered among the best available for this species. Virgin chub are consistently observed within the Gorge.

Virgin Spinedace
(*Lepidomeda mollispinis mollispinis*)
USFWS Species of Concern with Conservation Agreement; AGFD Wildlife Species of Concern

The USFWS has signed a Conservation Agreement to protect the population of Virgin spinedace. Populations continue to decline due to habitat modifications including dam construction; loss of water from agriculture, mining, and urbanization; and management of non-native species.

This species seems to prefer cool, clear, swift moving water and a bottom substrate of rubble, cobbles, or sand. Its range is limited to tributary streams and forks of the Virgin River. In the river's mainstream, the species seems to be limited to the area above Quail Creek Diversion in southern Utah, as the lower reaches of the river tend to be too warm and turbid. However, it is occasionally found around the mouth of the occupied tributaries. In the Arizona Strip FO, Virgin spinedace occupies three reaches of Beaver Dam Wash. It has also been collected in the Virgin River near Littlefield, although these occurrences have generally been associated with tributary inflows.

Desert Springsnail
(*Pyrgulopsis deserta*)
BLM Sensitive

The desert springsnail is found in springs along Virgin River in southwestern Utah and northwestern Arizona, including springs located in the Arizona Strip FO. The biology of the species is unknown, although it is probably similar to that of other springsnails. The known populations are threatened by potential water projects such as spring capping and by development, highway construction, and land exchanges in its habitat.

Special Status Plants

Overview

Special status plants include those that are listed under the ESA as threatened or endangered. Also included are candidate species for listing under the ESA and those recognized by the BLM

as sensitive or rare. The NPS has a policy to recognize state species of concern and use those and other criteria to develop a listing of NPS rare plants of concern.

Twenty special status plants have been located within the Planning Area (see Table 3.15), five of which are federally listed as threatened or endangered. Four of these are located on the Arizona Strip FO and one is located in Vermilion. The Arizona Strip FO also contains one plant species that is a candidate for listing. No threatened or endangered plant species have been identified in Parashant. Map 3.21 plots the location of listed plant species in the Planning Area.

Table 3.15: Special Status Plants

Common Name	Scientific Name	Status		Location
		FED	BLM	
Welsh's Milkweed	*Asclepias welshii*	LT		Vermilion
Diamond Butte Milkvetch	*Astragalus toanus var. scidulus*		S	Arizona Strip FO
Cliff Milkvetch	*Astragalus cremnophylax var. myriorrhaphis*	S		Arizona Strip FO
Jones' Cycladenia	*Cycladenia humilis var. jonesii*	LT		Arizona Strip FO
Brady Pincushion Cactus	*Pediocactus bradyi*	LE		Arizona Strip FO
Paradine Plains Cactus	*Pediocactus paradinei*	S		Arizona Strip FO
Fickeisen Grassland Cactus	*Pediocactus peeblesianus var. fickeiseniae*	C	S	Arizona Strip FO
Siler Pincushion Cactus	*Pediocactus sileri*	LT		Arizona Strip FO
Mt. Trumbull Beardtongue	*Penstemon distans*		S	Parashant
Crevice Penstemon	*Penstemon petiolatus*		S	Arizona Strip FO
Grand Canyon Rose	*Rosa stellata ssp. abyssa*		S*	Parashant Arizona Strip FO
Black Rock daisy	*Townsendia smithii*		S	Arizona Strip FO
Three Hearts	*Tricardia watsonii*	S		Parashant
Holmgren Milkvetch	*Astragalus holmgreniorum*	LE		Arizona Strip FO

Federal (FED) Status: LE – Listed Endangered; LT – Listed Threatened; C – Candidate
BLM Status: S – Sensitive
* Also an NPS Sensitive Species

Rare plant surveys have been carried out in the Planning Area since the late 1970s when botanists began collecting and building an Arizona Strip herbarium. The first special status plant lists were developed for the Arizona Strip from rare plant surveys conducted for the USFWS in the 1970s and early 1980s. In 1999, 2000, and 2002, rare plants were inventoried in Parashant and surrounding areas. Plant inventories were initiated in Vermilion in 2003.

The 19 special status plants known to exist within the Planning Area are presented below. Sixteen of these species have been found exclusively in Parashant, Vermilion, or Arizona Strip FO. Only three species, the Black Rock daisy (*Townsendia smithii*), Beaver Dam breadroot (*Pediomelum castoreum)*, and Paradine Pincushion (*Pediocactus paradenei*) have been found in two locations, specifically, Black Rock daisy and Beaver Dam breadroot on Parashant and Arizona Strip FO and Paradine Pincushion on the Vermilion Cliffs and Arizona Strip FO.

Map 3.21: T&E Plant

Parashant Special Status Plants

Mt. Trumbull Beardtongue
(*Penstemon distans*)
BLM Sensitive

This small, gray-green herb has one or more erect stems that stand 1 to 2 feet high. Its blue and violet flowers are trumpet-shaped with a yellow or whitish "beard" and are located on the upper half of the plant's stems. The species tends to be widely scattered in isolated populations that seem to be restricted to the relatively cool and moist microhabitats on north and east facing slopes of Kaibab and Toroweap limestone formations.

This plant was first discovered in Andrus Canyon 1974, but not identified as a new species until 1978 and not described until 1980 (Holmgren 1980). Trend studies were set up in 1987 and 1989 at two locations in Parashant. A large plot of 49 plants increased in number to 80 by 1997. The smaller count plot started with 21 plants in 1987, decreased to 6 in 1992, and increased to 9 plants in 1997 (BLM 1997).

Grand Canyon Rose
(*Rosa stellata ssp. abyssa*)
BLM Sensitive; NPS Sensitive

This species of rose appears to reproduce asexually and spreads by rhizomes (i.e., roots). The plant has brown stems with white to straw-colored thorns. It blooms in May and June and has solitary, dark pink flowers that form at the end of the stems. The plant's leaves turn bright red in the fall and contrast with its light-colored thorns.

All known populations of this rose occur in the Timpoweap member of the Moenkopi Formation, on or near canyon rims or the tops of cliffs at the edges of mesas or plateaus, and along low ledges at depressions caused by breccia pipes (AGFD 2002b). A small population of the species occurs in the Lake Mead portion of Parashant near Twin Points (Holland et al. 1980). It occupies an area of approximately 1 acre.

Three Hearts
(*Tricardia watsonii*)
BLM Sensitive

This member of the waterleaf family has been found in two areas. One population was found in 1980 at the south half of the Pakoon Basin, near the canyon mouth of Grand Gulch Wash. Only three plants have been noted in two subsequent monitoring visits. Another four plants have been found in the Lake Mead NRA portion of the Monument (BLM 2001fb).

Vermilion Special Status Plants

Welsh's Milkweed
(*Asclepias welshii*)
Federally Listed Threatened

This perennial herb spreads primarily through rhizomes and grows 10 to 40 inches tall. It has large, oval leaves and cream-colored flowers with rose-tinged centers. It grows on open, sparsely vegetated, semi-stabilized sand dunes and on the lee slopes of actively drifting sand dunes.

Welsh's Milkweed is found in small numbers in Vermilion, scattered in the Navajo Sandstone derived Aeolian sand dunes of Coyote Buttes. Trend studies have been carried out in this location since 1989. Plant numbers have fluctuated from a high of 566 stems to a low of 68. The most recent studies identified 172 stems (BLM 2002b). Fluctuations seem to be associated with rainfall amounts. In the past, OHV activity was the main threat to this species, but it is now well protected due to the designation and management of the Paria Canyon-Vermilion Cliffs Wilderness Area, which encompasses the Coyote Buttes. Since this plant is federally listed as threatened, the USFWS has created a recovery plan for the species (USFWS 1992b).

Arizona Strip FO Special Status Plants

Holmgren Milkvetch
(Astragalus holmgreniorum)
Federally Listed Endangered

Holmgren milkvetch occurs on one section of BLM land just south of St. George, Utah. The trend plot located on adjacent state land has not had any plants since 1998. None occurred in the plot area from 1998 to 2005. Approximately sixty plants were found on the BLM section in 2004. These all grew to maturity in 2005. Possible threats to plants on this section include off road vehicles, cattle trampling, and right-of-way activity.

Brady Pincushion Cactus
(*Pediocactus bradyi*)
Federally Listed Endangered

This small, nearly round cactus grows up to 2.5 inches tall and 2 inches in diameter. It has straw-yellow flowers and retracts into the soil during dry conditions. The species was listed in 1979 because prospecting, mining, livestock, plant collecting, and OHV use threatened the population. Recovery and habitat management plans were developed in the 1980s (USFWS 1985) and an ACEC plan geared towards conserving the cactus was implemented in 1994 (BLM 1994b).

The BLM administers about 312 acres of known habitat within the Planning Area for this species along the rims of the Colorado River (Marble Canyon area) and its tributaries. The soils from which this species occurs are derived from the Moenkopi Formation and characterized by overlaying limestone chips. Trend studies have been conducted yearly since 1986 and show a stable population with some fluctuations related to rodent depredation and precipitation. An opinion issued by the BLM in 2001, resulting from the evaluation of livestock grazing on the cactus, calls for additional studies (BLM 2001a).

Siler Pincushion Cactus
(*Pediocactus sileri*)
Federally Listed Threatened

This small, solitary, or occasionally clustered cactus grows to about 5 inches tall and 3 to 4 inches in diameter, although some have been known to grow up to 18 inches tall. Flowers are yellowish with maroon veins that bloom in spring. The species is found exclusively on gypsiferous clay to sandy soils and appears to be strongly related to the Shnabkaib and middle red members of the Moenkopi Formation. These soils are high in soluble salts.

The Siler pincushion cactus was originally listed as endangered in 1979. Prospecting, mining, livestock grazing, plant collecting, and OHV use were identified as possible threats. As a result, recovery and habitat management plans were written and implemented (BLM 1987a, 1992f). It was later determined that the cactus was more abundant and widespread than believed at the time of listing. In addition, trend studies, first undertaken in the 1980s, demonstrated a relatively stable population with some fluctuations caused by precipitation and rodent depredations (BLM 1999a). The species was consequently down-listed in 1993 (USFWS 1993). A petition for de-listing was submitted in 2002.

Jones' Cycladenia
(*Cycladenia humilis var. jonesii*)
Federally Listed Threatened

This long-lived perennial herb in the Dogbane family grows 4 to 6 inches tall and has pinkish-rose flowers. It spends the winter as underground rhizomes, reappearing in the spring as stems or "ramets" off those roots. The species was listed as threatened in 1986.

While this plant mainly occurs in Utah, some are found in the Planning Area on gypsiferous, saline soils of the Chinle Formation, just west of the Kaibab Indian Reservation in Potter Canyon and an adjacent canyon. In Utah, threats to the species were OHV use and oil and gas activity. The population in the Planning Area seems to be well protected from such threats due to private land and rugged terrain, which limit access. Trend studies have been undertaken at two plots and have shown a stable population with some precipitation-related fluctuations (BLM 1999b). Plant ramet numbers at the two trend plots were relatively stable from 1993 and 1999 with

approximately 300 ramets identified each year. Ramet numbers then varied for the subsequent two years, from 174 in 2000 to 437 in 2001. There is currently no recovery plan for the species.

Fickeisen Plains Cactus
(*Pediocactus peeblesianus var. fickeiseniae*)
Federal Candidate; BLM Sensitive

This small cactus, averaging 3 inches in height and 1.5 inches in diameter, has cream, yellow, or yellowish-green flowers. It tends to occur in shallow soils derived from exposed layers of Kaibab limestone. After flowering and fruiting, the cactus retracts into the soil making it difficult to locate.

This cactus occurs in very small populations in several locations on the Arizona Strip FO. Trend studies have been ongoing since the middle 1980s and show that the populations are relatively stable, with occasional fluctuations due to precipitation and rodent depredation (BLM 2001d). One exception is a population at North Canyon that was virtually destroyed due to rodent depredation and has taken nearly 10 years to recover back to its initial high count.

Paradine Plains Cactus
(*Pediocactus paradinei*)
BLM Sensitive

This small cactus, also known as the Kaibab plains cactus, is usually no more than 1.5 inches tall above ground with half of its stem underground. It prefers soils with coarse fragments in conjunction with the Kaibab limestone formation. During the dry season, the plant retracts into the ground and is flush with the soil surface, making it difficult to locate. Its flowers have cream to pale yellow petals with a pink midrib.

A few of these cacti were identified in the Arizona Strip FO in 1987; however, all were destroyed by rodent depredation. No new specimens were identified in the Arizona Strip FO between 1987 and 2001 (BLM 2001b). In 2004, four cacti were found near the 1987 site. A monitoring trip in 2005 found that rodents had eaten all four. The cactus occurs consistently on the Kaibab National Forest, with the USFS, BLM, and USFWS signing a conservation agreement for the species in 1996 (USFS 1996).

Grand Canyon Rose
(*Rosa stellata ssp abyssa*)
BLM Sensitive

On the Arizona Strip FO, this plant occurs in four small areas along the Kanab Canyon Rim, in the Timpoweap member of the Moenkopi Formation. The aerial extent of each location ranges from less than half of an acre down to one-tenth of an acre. The total area occupied by the

species is approximately 1 acre. Trend studies have been done on these populations for 10 years, and show that they are very stable, fluctuating only with changes in precipitation (BLM 2001c).

Diamond Butte Milkvetch
(*Astragalus toanus var scidulus*)
BLM Sensitive

This extremely rare vetch grows on small outwash fans by small mesas on alluvium overlaying the Shnabkaib member of the Moenkopi Formation. Less than 12 plants were first discovered in 1999 at two Arizona Strip FO sites (AGFD 1999). These sites have been subsequently monitored, but no plants have been located.

Black Rock Daisy
(*Townsendia smithii*)
BLM Sensitive

This daisy grows on soils derived from Tertiary basalt flows and is quite scattered in some areas and dense in others. The main Arizona Strip FO population occurs along the top of Black Rock Mountain in open sagebrush areas, ranging from Maple Reservoir to Trails End Reservoir (roughly 5 to 6 miles). A smaller population occurs on Wolfhole Mountain covering a total area of approximately 19 acres. The populations have been located consistently during annual surveys and appear to be stable and unthreatened (BLM 2001e). A 0.1-acre sampling plot was established at this site.

Crevice Penstemon
(*Penstemon petiolatus*)
BLM Sensitive

This penstemon has a showy red flower and grows on the steep rocky faces and boulders along the Kaibab Limestone Formation of the Beaver Dam and Virgin Mountains. Although no trend plots have been established for this plant, its known locations are checked every year and it is generally found. Its steep rocky habitats seem to provide adequate protection from human and animal disturbance

WILD BURROS

Overview

The Wild and Free-Roaming Horse and Burro Act became law on December 15, 1971, authorizing the BLM to manage wild horses and burros on public lands. The Act provided that wild and free-roaming horses and burros be protected from unauthorized capture, branding, harassment, or death. They are to be considered an integral part of the natural system on BLM lands based upon their natural distribution.

There are no wild horses within or adjacent to the Planning Area. The original Tassi-Gold Butte Herd Management Area Plan (HMAP) was completed in 1982 and allowed a herd of approximately 90-100 burros to roam freely in 101,816 acres that included public lands managed by the BLM and areas within the Lake Mead NRA, encompassing the Lower Grand Wash Cliffs, Grand Wash Bay, and Tassi Springs area. The Arizona Strip RMP Mojave Desert Amendment (BLM 1998) modified the decision to implement the HMAP and set the herd management level at zero. The Lake Mead NRA Burro Management Plan (1995) established those portions within the NRA as zero use. Consequently, the herd management level for the entire 101,816 acres has been set at zero. This decision was aimed at protecting the Mojave population of the desert tortoise. The Mojave Desert Amendment called for the removal of burros from the Tassi portion of the herd management area, as did the NPS Burro Management Plan. At the current time, it is estimated that a population of around 30 animals still exists and will need to be removed to meet the Animal Management Level.

Parashant Wild Burros

The 101,816 acres of the Tassi-Gold Butte Management Area within the Planning Area are located entirely in Parashant.

CULTURAL RESOURCES

Overview

Archaeological and Historic

The cultural resources of the Planning Area represent a variety of site types, cultures, and time periods. Sites designated for public use in this plan represent all the cultural groups and most of the periods of occupation. These include the Honeymoon and Temple historic trails, Sawmill Site, the Uinkaret and West Bench pueblos, Paiute Cave, Nampaweap, the Little Black Mountain and Notch rock art sites, and Witch's Pool.

Antelope Cave on the Uinkaret Plateau was listed on the NRHP in 1975. Waring Ranch on the NPS portion of Parashant is also listed on the NRHP. Two historic trails and two archaeological districts were nominated and determined eligible for listing on the NRHP in 1976, the Paria Plateau Archaeological District (70,000 acres and 416 sites), Mt. Trumbull Archaeological District (18,250 acres and 72 sites), and the Temple and Honeymoon trails. Many others are potentially eligible for nomination to the NRHP.

The Old Spanish Trail was designated by Congress as a National Historic Trail in 2002. See the section in Special Designations, National Historic Trail in this chapter for more information.

Less than 5 percent of the Planning Area has been inventoried, resulting in 3,500 cultural resource properties recorded thus far. Only a few of these sites have been scientifically investigated, including excavations at Pine Nut (Westfall 1987), Cliff's Edge (Jenkins 1981) , Antelope Cave (Janetski and Hall 1983), Rock Canyon Shelter (Janetski 1986), Landfill Site (Nielson 1998), sites along Navajo-McCullough transmission line (Moffitt et al. 1978), and the Corn Grower (Frank 1990-95) and Reservoir sites (Nielson 1998) in Colorado City. Because most of the cultural resources have not been inventoried or evaluated and few have been scientifically investigated, the knowledge of past occupations is scant and inferred from other, better-studied regions. Most of the sites are in good condition because of the relative isolation of most of the Planning Area and are valuable for scientific and public interpretive and educational uses. (See Appendix 2.J for cultural use categories). However, some site types such as caves and rock shelters have been extensively damaged by vandalism in the past.

The primary threats to cultural resources in the Planning Area are vandalism, collection of surface artifacts, OHV use, and erosion. Intentional vandalism occurring in the Planning area includes sites damaged or destroyed by illegal excavations, collection of surface artifacts, illegal excavations, destruction by metal detectors, and destruction or removal of rock art. Unintentional vandalism to cultural resources is also occurring and includes driving off-road across sites; touching, chalking, or marking rock art sites; creating non-motorized trails across fragile features on sites; removal of features or objects that are part of sites; and camping on sites. Use of Arizona Site Stewards and increased law enforcement personnel helps to inform visitors and to catch and prosecute intentional vandals.

Various cultural groups occupied the Planning Area over a range of time periods, from at least 12,000 years ago to the present day. The major occupational periods are provided below. The fewest sites found come from the early and late periods; with the highest numbers of sites coming from the Puebloan period (c.f., Altschul & Fairley 1989; Belshaw and Peplow 1980; McClellan et al. 1980).

Prehistory (10,000 BC to 1850 AD)

PaleoIndian (10,000 – 8,000 BC): The base of a PaleoIndian Clovis point found at a campsite in the Virgin River Gorge is the only documented PaleoIndian site in the Planning Area (Miller 1978). There have also been several unsubstantiated reports of other Clovis points found in the Planning Area.

Archaic (7,000 – 600 BC): Archaic projectile points associated with open artifact scatters are the primary evidence for Archaic hunters and gatherers in the Planning Area, although there may be some cave and shelter sites with Archaic remains still to be investigated (Janetski 1986). Most of the better-documented sites from this time period are from adjacent areas in the Grand Canyon NP and Glen Canyon NRA. Here split twig figurines and Archaic-style projectile points attest to substantial Archaic occupation. Based on artifacts found, riparian and associated rich ecological zones in and near the Vermilion Cliffs, along the Virgin and Paria rivers, and in

Kanab Creek appear to have been densely occupied during both the Archaic and Ancestral Puebloan periods, representing the transition from hunting and gathering to farming societies.

Ancestral Puebloan (600 BC – 1300 AD): The Ancestral Puebloan people occupied the southern part of the Colorado Plateau. The westernmost branch of this group and the least studied and understood is the Virgin Anasazi, who were present in the Planning Area. The early half of the Ancestral Puebloan period is known as the Basketmaker period while the later half is known as the Puebloan period.

- *Basketmaker (600 BC – AD 700):* Corn cultivation and settled village life began to occur in the Planning Area by about 600 BC. Pithouses and storage cists occur in small clusters in both the upland areas and lower river valleys and creek side settings. Later in the period, the Basketmaker group produced brown pottery containing olivine crystal particles, a distinct pottery type for the Arizona Strip.

- *Puebloan (700-1300 AD):* Most visible of all the archaeological sites in the Planning Area, the Puebloan occupation represents the later Ancestral Puebloan village farmers. Sites include C-shaped villages, granaries, reservoirs, rock art, trails, artifact scatters, and field houses. Kayenta Anasazi people migrated to the eastern portion of the Planning Area around 1050 AD, bringing with them distinct pottery and architecture, including rectangular villages. By 1300 AD, archaeological evidence indicates that the Ancestral Puebloan people left the Planning Area, some migrating to the south and east. Some of the living descendants of the Ancestral Puebloan people can be found on the Hopi Mesas in northeastern Arizona. Others may have migrated elsewhere or may be found in Southern Paiute groups in and near the Planning Area. Archaeological evidence does not dispute the fact that some Ancestral Puebloan may have intermarried with Southern Paiute or other local groups during 1150 – 1300 AD.

American Indian Groups (1150 – 1850 AD): The American Indian groups in the Planning Area when EuroAmerican settlers and explorers arrived in the late 1700s and 1800s include the Southern Paiutes, Havasupai, Hualapai, and Navajo. Linguistic evidence suggests that the Southern Paiutes (Numic speakers) migrated into the Planning Area around 1150 AD from southern California and Nevada. Some archaeologists believe the Southern Paiute may be descended from the Ancestral Puebloan peoples. By the time of contact with Spanish explorers in 1776 and later Mormon colonists in 1850, Southern Paiute groups occupied the entire Planning Area.

Navajo and Apache Indian groups (Athabaskan speakers) arrived from western Canada into New Mexico around 1400 AD. They eventually migrated westward, arriving in their present day locations in north central Arizona and near the Planning Area by the time of the Long Walk in 1864. At that time, many Navajos took refuge in the isolated, hidden canyons of northern Arizona to avoid being taken to New Mexico.

Some Havasupai and Hualapai sites have been found on the extreme southern end of the Planning Area. These "Pai" groups have occupied the Grand Canyon region for thousands of years.

Resources of Traditional Importance to American Indians

American Indian groups either currently or historically living in or adjacent to the Planning Area have cultural ties to the area. American Indians consider traditional cultural properties, power places, sacred sites, and many natural resources to be inextricably linked to parts of an ecosystem (Stoffle et al. 2004). Strong place attachments can occur whether or not direct lineage is established (Stoffle et al. 2004). If a site is within a group's indigenous territory, the members of that group often assume it is part of their heritage.

Cultural landscapes derive from the notion that people's historical memory is anchored on the land, that their relationship and knowledge of the land is shared among them today, and that it is transferred over generations. All human groups develop and come to share cultural landscapes. The concept implies that many cultural groups or ethnic groups can hold different, even conflicting, images of the same land. The imagery of the land that is held by a people is seen as being a result of their past experiences with the land and other cultural perspectives of the people themselves (Stoffle et al. 2004; Austin and Dean 2004).

Individuals from the Hopi, Southern Paiute, Hualapai, Havasupai, and Navajo tribes continue visiting sites, gathering, and using resources in the Planning Area. Some also have ties to natural features, ancient villages, campsites, rock art, and burial sites that they consider sacred. Table 3.16 lists American Indian groups with cultural and historical ties to the Planning Area.

Table 3.16: American Indian groups with Cultural and Historical Ties to the Arizona Strip

Present Designation	Current Reservation	Interest in the Planning Area
Hopi Tribe	Hopi Reservation, Arizona	Entire Planning Area
Hualapai Tribe	Hualapai Reservation, Arizona	Southern, Parashant
Havasupai Tribe	Havasupai Reservation, Arizona	Southern, Parashant
Navajo Tribe	Navajo Reservation, Arizona	Vermilion, Arizona Strip FO
Southern Paiutes		
Kaibab Paiute Tribe	Kaibab Indian Reservation, Arizona	Entire Planning Area
Shivwits Band of Paiutes	Shivwits Reservation, Utah	Entire Planning Area
Cedar Band of Paiutes	Paiute Reservation, Utah	Entire Planning Area
Indian Peaks Band of Paiutes	Paiute Reservation, Utah	Entire Planning Area
San Juan Band of Paiutes	Paiute Reservation, Arizona	Entire Planning Area
Moapa	Moapa Reservation, Nevada Ent	ire Planning Area
Las Vegas Band of Paiutes	Las Vegas Paiute Reservation, Nevada	Entire Planning Area

Hopi

The Planning Area was once home to several Hopi clans, including the Spider, Tobacco, Rabbit, Snake, Sand, Lizard and Sand Strip clans. Other clans have migrated through the Planning Area and their descendants now live in villages on the Hopi Reservation in northeastern Arizona. The clans migrated through and lived in the Planning Area for hundreds, if not thousands, of years. Although the Hopi left the Planning Area by AD 1300, traditional use and sacred areas remain.

Southern Paiute

Various Southern Paiute bands, some no longer existing, occupied the Planning Area. Thirteen bands of the Southern Paiutes were originally identified in the post contact period (Kelly 1934) with an additional band added later. These bands exist in contemporary times as eight federally recognized and one unrecognized tribe. Linguistic evidence suggests they first arrived in the Planning Area around AD 1150 and had contact with the Dominguez-Escalante Expedition in 1776. Mormon settlers who arrived in 1852 also had contact with the Southern Paiutes. The descendants of the 14 bands are now scattered throughout central and southern Utah, northern Arizona, southern Nevada, and in southern California. Members of all Southern Paiute bands are related and trace their ancestry to family members who once lived on the Arizona Strip. Today, the Kaibab Paiute tribe is the only Southern Paiute band with reservation lands remaining on the Arizona Strip, adjacent to the Planning Area on three sides. Members of the Southern Paiute bands still gather firewood, pinyon nuts, and plants in the Planning Area.

The Planning Area contains sites considered sacred by Southern Paiutes, including places where water, plants for medicinal and other purposes, animals, and minerals are found.

Hualapai and Havasupai

The southern portions of the Planning Area were also home to the Hualapai and Havasupai, although both groups generally claim the Colorado River and areas south as their homeland. Both groups retain some indigenous lands in the Grand Canyon at the Hualapai and Havasupai Reservations south of the Planning Area.

Navajo

Navajos occasionally use the Planning Area but live primarily on the eastern side of the Colorado River. Individuals from some of the closest Navajo Chapters to the Planning Area (Bodaway/Gap, LeChee, Coppermine, Cameron, Tuba City, and Coalmine Canyon) still cross the Colorado River to run businesses such as selling items to tourists, and to gather firewood, herbal plants, and pinyon nuts. Some Navajos consider certain places in the Planning Area sacred.

Treaty Rights

The only treaty for tribes on or near the Planning Area is with the Navajo Nation. Signed in 1868, it created the Navajo reservation east of the Planning Area and gave tribal members rights to hunt on "lands adjoining the said reservation formerly called theirs."

The Bands of the Southern Paiute Tribe reservations were all created by Executive Order between 1873 and 1917. Supreme Court cases have affirmed that, "all Executive Order tribes shall have and be treated as Treaty tribes." These Executive Orders established the Kaibab Paiute, Shivwits, Moapa, and Las Vegas reservations.

<u>European and Euro-American (1776 AD – Present Day)</u>

Spanish/Mexican Exploration and Trading (1776 – 1848): The Dominguez-Escalante Expedition out of Santa Fe, New Mexico in 1776 is the earliest recorded European entry into the Arizona Strip. Spanish Friars Dominguez and Escalante, attempting to find a route from Santa Fe, New Mexico to Monterrey, California, abandoned the effort in central Utah and traveled south entering the Planning Area on their way back to Santa Fe. The expedition crossed through the Planning Area and documented an encounter with Southern Paiutes at Coyote Spring, now within Vermilion (Warner and Chavez 1976). The Old Spanish Trail also crosses the Planning Area and was used extensively by Mexican and American traders between 1829 and 1848. (See the section on National Historic Trails in this chapter.)

Colonization, Ranching, and Mining (1854 – Present Day): Settlement of the Santa Clara Mission by Jacob Hamblin in 1854 initiated Mormon colonization and exploration in southern Utah and northern Arizona. William Maxwell established the first ranch on the Arizona Strip at Short Creek in 1862. The following year, the communities of Pipe Spring and Millersburg (now Beaver Dam) were both settled. Most of the early Mormon settlements were in what is now Utah. The Planning Area lands were primarily used for grazing cattle and later for grazing sheep.

The Marble Canyon area was settled by John D. Lee when he established the ferry crossing of the Colorado River (Lees Ferry) and homesteaded at Lonely Dell and Rachel's (Jacobs) Pool in the early 1870s. With the establishment of the Honeymoon Trail (Old Arizona Road) from Kanab and the crossing at Lees Ferry, Mormon colonists were able to travel across the Planning Area en route to other Mormon colonies in central and southern Arizona and back to the Temple in St. George.

Construction of the first Mormon temple west of the Mississippi began in St. George, Utah in 1871. Ponderosa pine logs for temple construction were cut at Mt. Trumbull and hauled along the Temple Trail wagon road some 68 miles north to St. George.

Passage of the Homestead Dry Farming Act in 1909 and the Stock Raising Homestead Act in 1916 encouraged additional farming and ranching in the Planning Area at various locales including Cactus Flats, later known as Mt. Trumbull, which was settled by Abraham Bundy and his son Roy in 1916.

Mining for copper, silver, and gold occurred in the Planning Area from the 1870s to the 1940s primarily in the Grand Gulch area but also at Copper Mountain and in Hack's Canyon. World War II kindled the interest to mine uranium in the area during the 1950s and in the 1980s, resulting in several uranium mines being opened and operated on Kanab Plateau. Overseas competition lowered uranium prices shortly afterward and the mines were closed. Gypsum is presently mined south of St. George in the Arizona Strip FO.

Parashant Cultural Resources

The "long and rich human history spanning more than 11,000 years," as specified in the Proclamation (See Appendix 1.A), is represented by the sites, landscapes and objects in the Monument. All site types, cultures, and time periods discussed in the previous pages are represented in Parashant, with the exception of the Kayenta Anasazi. The only scientific investigations in the Monument have been limited excavations which occurred at the Uinkaret Pueblo in 2002 and other sites in the vicinity in 2004 (Buck 2002, 2005) and some research into potsherds imbedded in lava at the Little Spring area in 2003 (Ort 2003). There are currently seven public use sites in Parashant: Nampaweap, Sawmill Site, Uinkaret Pueblo, Witch's Pool, Temple Trail, Tassi Ranch, and Waring Ranch. Temple trail begins at the Sawmill Site and heads north toward St. George, Utah and onto Arizona Strip FO lands. Waring Ranch is listed on the NRHP, and the Mt. Trumbull Archaeological District and Temple Trail have both been determined eligible for listing on the NRHP. See Table 3.16 for the American Indian groups with cultural ties to Parashant.

Vermilion Cultural Resources

The "long and rich human history" of Vermilion is covered in more detail in the proclamation (See Appendix 1.B), making these Monument objects a primary reason the Monument was created. All site types, cultures, and time periods discussed above are represented in Vermilion. No scientific investigations of cultural resources have thus far occurred in the Monument. There are currently three public use sites in Vermilion: West Bench Pueblo, Honeymoon Trail, and Dominguez/Escalante Trail. The Honeymoon Trail/Old Arizona Road Public Use Site occurs in the southern portion of the Monument paralleling Highway 89A and up House Rock Valley. The Honeymoon Trail/Old Arizona Road and the Paria Plateau Archaeological District have both been determined as eligible for listing on the NRHP. See Table 3.16 for the American Indian groups with cultural ties to Vermilion.

Arizona Strip FO Cultural Resources

All site types, cultures, and time periods discussed above are represented in the Arizona Strip FO, as well as all the excavations mentioned. There are currently five public use sites in the Arizona Strip FO: Honeymoon, Temple, and Dominguez/Escalante Trails; Paiute Cave; and Little Black Mountain Rock Art Site. Antelope Cave is listed on the NRHP, and Temple and Honeymoon historic trails are determined eligible for listing on the NRHP. See Table 3.16 for the American Indian groups with cultural ties to the Arizona Strip FO.

Additional intentional vandalism to cultural resources occurred on the Kanab Plateau and in adjacent remote canyons during the uranium boom of the early 1980s. Workers associated with uranium exploration and extraction, on-or-off duty, used helicopters and motorized vehicles to access previously inaccessible or hard to access sites looking for artifacts. In the process, archaeological sites were damaged and invaluable information lost about the previous occupation and use of this little studied region.

VISUAL RESOURCES

Overview

The visual resource inventory (VRI) created for the 1992 Arizona Strip RMP was recently revised and updated. The new VRI streamlined the revision by using procedures specified in the BLM's VRI Manual H-8410-1, previous inventory information, in-house resource knowledge, aerial photography, topographic information, and seen-area analysis.

Scenic Quality and VRI Classes

Scenic values in the Planning Area are varied and plentiful. They are important for their intrinsic value; in how visitors experience them in "foreground" and "middleground" settings, or "seen areas," as they pass by. VRI classes are based on combinations of three determinations: scenic quality, visual sensitivity, and distance zones, with the most important to visitors probably being scenic quality. Scenic quality is described as the visual appeal of an area. The rating is based on seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Scenery is classified as A, B, or C, with A being the highest scenic quality. Table 3.17 shows the results of the updated inventory of scenic quality in the Planning Area.

Table 3.17: Scenic Quality Ratings and Visual Resource Inventory (VRI) Classes in the Planning Area

Scenic Quality	Acres*	%	VRI Classes	Acres*	%
A (High)	770,596	23	I	265,738	8
B (Med.)	1,087,978	33	II	827,815	25
C (Low)	1,464,477	44	III	948,611	29
--	--	--	IV	1,280,904	38

Source: Arizona Strip FO files
*While these include federal and non-federal lands, management requirements do not apply to non-federal lands.

Classification of scenic quality, visual sensitivity, and distance zones was accomplished during the inventory revision. Then various combinations of these characteristics were used to generate the VRI classes. Classes represent the relative value of the visual resources and are Classes I and II, representing the highest values, Class III, a moderate value, and Class IV, the least value. These inventory classes are informational in nature and provide the basis for considering visual values in the RMP process. They do not establish management direction and are not used as a basis for constraining or limiting surface disturbing activities. The assignment of visual resource management (VRM) classes that will establish management direction is done as part of the formulation of plan alternatives. Both VRI classes and VRM classes use the following class definitions below:

- **Class I:** The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention. (This class typically applies to lands that have a special designation already in place for the protection of scenic values. Examples include areas that have been designated as wilderness, wild and scenic rivers, or outstanding natural areas.)

- **Class II:** The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. (Areas that have a high scenic quality, and where people are highly sensitive to changes in the scenery, are typically rate as Class II.)

- **Class III:** The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. (Scenic quality of lands with this classification may be good to very good. The overall class rating is not typically high enough to meet the objectives defined as Class II.)

- **Class IV:** The objective of this class is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. (In comparison to other lands in the region, these areas may be mundane, with similar-looking vegetation and little change in landform. People are generally less sensitive to changes here.)

The VRI classes determined for the Planning Area are presented in Table 3.17, along with Scenic Quality ratings. VRI classes are depicted in Map 3.22.

Night Sky

The nighttime visual resources (e.g., "dark night skies") of Northern Arizona and Southern Utah are nationally significant and represent one of the best opportunities for the American public to experience such a sight. Dark night skies are an important characteristic of remote settings and contribute to the sense of discovery many users experience in the Planning Area.

Light that is emitted upward and laterally from outdoor artificial lights will scatter through the atmosphere and cause a loss in night sky visibility. Clear dark night skies free of light emissions are increasingly rare. In many "sheltered" portions of the Planning Area, night skies are only slightly affected by indirect sources of human-produced light from distant cities, such as Las Vegas, Nevada and St. George, Utah. From higher elevations, areas of low relief, or as distance from communities is decreased, the affects of indirect sources of human-produced light become more noticeable. From many of the northern portions of the Planning Area, such as statutory wilderness or community interface lands, a direct line-of-sight to lit communities and/or major highways is possible. The increasing demand for and placement of communication towers, some hundreds of feet high and lighted, has begun to erode the dark night skies of more remote and distant portions of the Arizona Strip. Light emissions, either direct line-of-site or diffuse, may also be impacting nocturnal animals.

Parashant Visual Resources

The Parashant proclamation describes the Monument as a "remote area of open, undeveloped spaces and engaging scenery." The geologic objects below are credited in the proclamation as a major contributor to the high scenic quality:

> Deep canyons, mountains, and lonely buttes testify to the power of geological forces and provide colorful vistas. Grand Wash Cliffs juxtapose the colorful, lava-capped Precambrian and Paleozoic strata of the Grand Canyon against the highly faulted terrain, recent lakebeds, and desert volcanic peaks of the down-dropped Grand Wash trough. These cliffs, which consist of lower and upper cliffs

Map 3.22: VRM Inventory

> separated by the Grand Gulch Bench, form a spectacular boundary between the basin and range and the Colorado Plateau geologic provinces. At the south end of the Shivwits Plateau are several important tributaries to the Colorado River, including the rugged and beautiful Parashant, Andrus, and Whitmore canyons.

Because these objects possess high visual sensitivity, they warrant a high level of protection. Scenic quality ratings and VRI classes for Parashant are presented in Table 3.18. A Class I rating was assigned to the four Wilderness Areas in the Monument when they were designated, recognizing a commitment by Congress to maintain a natural landscape. Because this is an interagency management plan, the NPS has chosen to adopt the VRM classification system for its lands in the Monument as well. All NPS-proposed wildernesses are considered VRM Class I.

Table 3.18: Scenic Quality Ratings and VRI Classes in Parashant

Scenic Quality	Acres*	%	VRI Classes	Acres*	%
A (High)	418,274	40	I	95,149	9
B (Med.)	289,798	28	II	500,313	48
C (Low)	340,245	32	III	261,332	25
--			IV	191,522	18

Source: Arizona Strip FO files
*While these include federal and non-federal lands, management requirements do not apply to non-federal lands.

Vermilion Visual Resources

The Vermilion proclamation describes the Monument as possessing geologic objects such as "sandstone slickrock, brilliant cliffs, and rolling sandy plateaus" that help create spectacular scenery. The proclamation further describes the high scenic quality of the Monument:

> Its centerpiece is the majestic Paria Plateau, a grand terrace lying between two great geologic structures, the East Kaibab and the Echo Cliffs monoclines. The Vermilion Cliffs, which lie along the southern edge of the Paria Plateau, rise 3,000 feet in a spectacular escarpment capped with sandstone underlain by multicolored, actively eroding, dissected layers of shale and sandstone. The stunning Paria River Canyon winds along the east side of the plateau to the Colorado River. In the northwest portion of the Monument lies Coyote Buttes, a geologically spectacular area where crossbeds of the Navajo Sandstone exhibit colorful banding in surreal hues of yellow, orange, pink, and red caused by the precipitation of manganese, iron, and other oxides. Thin veins or fins of calcite cut across the sandstone, adding another dimension to the landscape.

Because these objects possess high visual sensitivity, they warrant a high level of protection. Scenic quality ratings and VRI classes for Vermilion are presented in Table 3.19. A Class I rating was assigned to the Paria Canyon-Vermilion Cliffs Wilderness Area, now located in the

Monument, when it was designated, recognizing a commitment by Congress to maintain a natural landscape.

Table 3.19: Scenic Quality Ratings and VRI Classes in Vermilion

Scenic Quality	Acres*	%	VRI Classes	Acres*	%
A (High)	110,353	38	I	89,825	31
B (Med.)	159,760	54	II	118,639	40
C (Low)	23,575	8	III	81,422	28
--	--	--	IV	3,801	1

Source: Arizona Strip FO files
*While these include federal and non-federal lands, management requirements do not apply to non-federal lands.

Arizona Strip FO Visual Resources

The Arizona Strip FO has many geologic wonders that provide the basis for high scenic quality in the area. The majority of the area, from the Black Rock Gulch east to Marble Canyon, lies in the Colorado Plateau physiographic province. This province is characterized by a variety of colored sedimentary formations found in multiple layers, with some carved by steep-walled canyons. Wooded plateaus, high-walled canyons, broad plains, rugged fields of lava, dark cinder cones, and major fault scarps characterize this wide landscape. Distant vistas of scenery far to the north and east of the Planning Area are present. The varied formations and structures in the Uinkaret Volcanic Field provide a dark, stately contrast to the more colorful sedimentary strata in the central portion of the Arizona Strip FO. The Moccasin Mountains and Cottonwood Point are part of the long, colorful continuation of the Vermilion Cliffs structure. The canyon depths, intricacies, and colors of Kanab Creek and Hack Canyon rival those of Paria Canyon and the long, curving line of the Hurricane Cliffs takes the eye on a long journey to and beyond the horizon.

The remainder of the Arizona Strip FO, from the Black Rock Gulch west to the Nevada border, is in the Basin and Range province, characterized by huge “bajadas,” abrupt and up-thrown mountain peaks, extreme folding and faulting, and deeply incised canyons, such as the Virgin River Gorge. Signed on September 28, 1972 by the Secretary of Interior, the Virgin River Gorge Recreation Lands Withdrawal recognized the high quality scenery in this magnificent gorge. Vistas from Black Rock Mountain are some of the best in the region. The Virgin and Beaver Dam Mountains provide an important and sensitive scenic resource for travelers in the more than 8 million vehicles each year that navigate Interstate 15 as it meanders between these two spectacular ranges.

Scenic quality ratings and VRI classes for the Arizona Strip FO are presented in Table 3.20. The four Wilderness Areas received the highest visual rating (Class I). In addition, the areas around Kanab Creek, Grama Canyon, Snake Gulch, Hack Canyon, Hurricane Cliffs, Moccasin Mountains, Virgin Ridge, Lost Spring Mountain and portions of House Rock Valley rate a Class II.

Table 3.20: Scenic Quality Ratings and VRI Classes in the Arizona Strip FO

Scenic Quality	Acres*	%	VRI Classes	Acres*	%
A (High)	241,969	12	I	80,764	4
B (Med.)	638,420	32	II	208,863	10
C (Low)	1,100,658	56	III	605,856	31
--	--	--	IV	1,085,581	55

Source: Arizona Strip FO files
*While these include federal and non-federal lands, management requirements do not apply to non-federal lands.

The growing demand for new mineral material sites, mineral exploration and extraction, and off-road travel pose important threats to visual resources in at-risk areas, such as the Uinkaret Volcanic Field. Other areas, such as the northern slopes, faults, and canyons of Black Rock, Wolfhole, and Seegmiller Mountains, and East Mesa provide a major scenic backdrop for the very fast-growing St. George, Utah metropolitan area just to the north. However, massive deposits of gypsum are present, available, and economically feasible to extract. Current operations at the gypsum mine near the Black Rock Interchange of I-15, south of St. George, clearly demonstrate the effects to visual resources and foreshadow what is possible in similar areas.

SOUNDSCAPES

Overview

In general, places away from highways and communities are quiet places on the Arizona Strip. Most of the Planning Area is naturally quiet and not subject to modern sources of unnatural sound intrusion or noise. The major noise producers are the traffic along Interstate 15 and highways 389 and 89A, communities north, northeast, and northwest of the Planning Area, military overflights, and aircraft flights associated with visitors to the Grand Canyon National Park. Occasional noise also occurs on roads in the Planning Area from vehicular travel. Noise intrusions are most prevalent during high use seasons such as during the summer or hunting seasons. Occasionally a permitted competitive event such as the Rhino Rally may cause noise in specific areas for a short time period.

Aircraft overflights create unnatural sound intrusion year-round. These may be associated with military overflights in the flight-training corridor over the northern portion of the Planning Area or by visitors over the southern portion of the Planning Area viewing the Grand Canyon (see Map 3.23 for overflight areas). Most of the commercial air tours originate out of Las Vegas. Commercial and private flights out of airports at St. George, Kanab, Page, Colorado City, Marble Canyon, and Mesquite may also occur during the year in other portions of the Planning Area. An advisory ceiling of 2,000 feet has been established by the Federal Aviation Administration (FAA) over the wilderness areas.

Map 3.23: Airports, Airstrips and Overflight Areas

Noise related to aircraft overflights is also associated with public land management activities such as fire fighting, wildlife inventories, introduction and monitoring of special status or wildlife species (California Condor, antelope, big horn sheep, etc.), and animal damage control.

Private users also contribute to overflight noise. There are a number of favorable places throughout the Planning Area that are commonly known and consistently used for aircraft landing and departure activities that, through such casual use, have evolved into backcountry airstrips. Backcountry airstrips in the Planning Area receive occasional use by backcountry pilots to camp, explore, or for safety purposes. While some of these are located on private or state land, eight are located on BLM land. In addition, Pakoon, Imlay, Bar Ten, Cliff Dwellers, and Mesquite are airstrips authorized under the BLM Lands and Realty Program through lease, permit, or reservation to the U.S. The Colorado City Airport has been patented under the Airport and Airways Improvement Act. The end of the runway at Marble Canyon has also been patented.

Parashant Soundscapes

As there are no highways or communities within the vicinity, Parashant is, in general, naturally quiet by not being subject to most modern sources of unnatural sound intrusion or noise. There are, however, a few forms of unnatural noise. Aircraft overflights associated with Grand Canyon National Park visitation and viewing are the largest noise contributors on the southern portion of Parashant. Noise from helicopter use is associated with river runners going in or coming out from river trips on the Colorado River at Whitmore Canyon. Noise related to aircraft also occurs around the Pakoon, Imlay, and Bar Ten airstrips, which are authorized by lease and reservation to the U.S. on BLM lands. No airstrips occur on NPS lands in Parashant.

Vermilion Soundscapes

The major noise producers on the Monument are from Highway 89A and local overflights associated with the Marble Canyon Airstrip and Page Airport. There are no leases, permits, or reservations to the U.S. for airstrips in Vermilion.

Arizona Strip FO Soundscapes

Major noise producers on the Arizona Strip FO are Interstate 15, Highways 389 and 89A, communities on and near the Arizona Strip, and Grand Canyon and military overflights. Noise related to aircraft is also notable around Cliff Dwellers and the over flight zone at the end of the Mesquite runway, which are airstrips authorized by lease or permit on the Arizona Strip FO.

WILDERNESS CHARACTERISTICS

Overview

The guidelines presented in BLM Instruction Memorandum (IM) 2003-275 were followed to assess both BLM and NPS lands in the Planning Area for wilderness characteristics. Details of the process used are presented in Appendix 3.D. The three wilderness characteristics identified in the process are naturalness, solitude, and primitive recreation:

- **Naturalness:** Lands and resources exhibit a high degree of naturalness, are affected primarily by the forces of nature, and are areas where the imprint of human activity is substantially unnoticeable. The BLM has authority to inventory, assess, and/or monitor the attributes of the lands and resources on public lands, which, taken together, are an indication of an area's naturalness. These attributes may include the presence or absence of roads and trails, fences and other improvements, the nature and extent of landscape modifications, the presence of native vegetation communities, and the connectivity of habitats.

- **Outstanding Opportunities for Solitude:** Visitors may have outstanding opportunities for solitude […] when the sights, sounds, and evidence of other people are rare or infrequent [and] where visitors can be isolated, alone, or secluded from others.

- **Outstanding Opportunities for a Primitive and Unconfined Type of Recreation:** Visitors may have outstanding opportunities for primitive and unconfined types of recreation […] where the use of the area is through non-motorized, non-mechanical means, and where no or minimal developed recreation facilities are encountered.

BLM and NPS lands possessing the above values may be managed to maintain or enhance some or all of those characteristics. Based on areas suggested for much of Parashant and Vermilion, as well as areas suggested for Arizona Strip south of St. George, Utah and in the Kanab Creek region by both public (external) and BLM and NPS (internal) input, each value has been assessed and mapped (see Map 3.24).

Parashant Wilderness Characteristics

Consistent with current BLM policy, both BLM and NPS lands in Parashant were assessed for wilderness characteristics. Table 3.21 illustrates the total acres of lands determined to possess all three wilderness characteristics. These lands are referred to as the "supply" of wilderness characteristics in Parashant.

Map 3.24: Lands with Wilderness Characteristics

Table 3.21: Lands with Wilderness Characteristics in Parashant		
BLM	**NPS**	**Total Acres**
434,473 acres	6,427 acres	440,899 acres

Vermilion Wilderness Characteristics

BLM lands in Vermilion were assessed for naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive and unconfined recreation. Field assessment determined that Vermilion possessed a supply of 97,380 acres of lands with all three wilderness characteristics.

Arizona Strip FO Wilderness Characteristics

Consistent with current policy, certain BLM lands in the Arizona Strip FO were assessed for naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive and unconfined recreation. Field assessment determined that the Arizona Strip possessed a supply of 158,033 acres of lands with all three wilderness characteristics.

RESOURCE USES

VEGETATION PRODUCTS

Overview

Desert Products

Historically, there has been a demand for vegetation products from the Mojave Desert portion of the Planning Area, such as cacti, yuccas, and desert wildflowers. Many people desire desert plants, both live and dead, for use as ornamental material. Yuccas have been harvested for their fibers and, along with other desert plants, for use in the manufacture of herbal medicines. State law restricts collecting these plants in Arizona. In the early 1990s, the BLM restricted authorizations to collect desert plants as salvage only (i.e., where the plants would be destroyed due to project development). However, collection of cacti and yuccas, both authorized and unauthorized, has occurred frequently throughout the Planning Area.

Woodland Products

BLM lands in the Planning Area do not support large, sustainable commercial quantities of woodland resources. Products that are utilized by the public include small sawlogs, fuelwood, posts/poles, Christmas trees, pine “nuts,” woodchips, and some decorative material. Wood products have been sold on BLM lands through small commercial, personal, and free use permits, salvage permits, and timber sales.

Ponderosa pine forests in the Planning Area produce lumber, poles, chips, and other miscellaneous byproducts. However, due to the limited distribution and small acreage of ponderosa pines, there is insufficient material to support sustainable timber harvesting.

Seed Collection

Collection of native seed for personal and commercial use is common throughout the Planning Area. The demand for native seed for both ornamental uses and restoration projects in the West has increased collection efforts. A wide variety of seeds, including grass, forb, and shrub are collected by beating, pulling, and shaking plants. Seed collection is an opportunistic undertaking because seed production is not dependable due to variations in precipitation, and seeds are available to be collected for only the short period before they leave the plant and scatter. The BLM has routinely issued seed collection permits during the spring. These permits restrict the activity to hand collection (no mechanical collection) and limit the amount of seed that can be taken from any one area. The BLM has also imposed restrictions that prevent seed collection from wilderness areas, ACECs, critical habitat for listed species, and areas rehabilitating or recovering from drought or fire. The BLM issues an average of 10 to 15 permits each year. During extreme drought conditions, seed collection within the Planning Area is restricted until precipitation levels increase.

Parashant Vegetation Products

Collection or utilization of desert products, native seeds, vegetation, or woodland products by the public or for commercial purposes is not permitted on NPS lands within Parashant, as stated in 36 Code of Federal Regulations (CFR) Part 2.1. Seed collection and plant salvage by NPS for restoration projects is allowed under NPS policies.

Desert Products

There has been little interest in desert vegetation products from within Parashant. The Pakoon Basin, which contains the Mojave Desert portion of the Monument, is remote and distant from population centers. Live vegetation harvest has been prohibited in this area since the 1990s, except for the salvage of plants from areas to be disturbed by construction activities.

Woodland Products

The Parashant proclamation provides for the sale of woodland products only in conjunction with a science-based ecological restoration effort, such as timber sales following tree-thinning projects. Commercial use of woodland products is not a primary focus of any activity within the Monument.

Some pinyon-juniper woodlands within the Monument have the potential to be part of a science-based restoration project that uses harvest as a tool. For example, in order to reduce hazardous

fuels and restore grasslands that have been encroached upon by pinyon-juniper as a result of fire suppression and past-management activities, the BLM might consider the limited harvest of wood products such as fuel wood, posts, or poles to reduce woody biomass.

The USFS managed the lands around Mt. Trumbull and Mt. Logan from the early 1900s until 1973. Harvesting occurred in the area from the 1870s through the 1960s. Much of the harvesting focused on removing the largest trees. The approach used by harvesters altered the stand structure and is primarily responsible for the current lack of many large trees. The large trees that remain today are frequently difficult to access or exhibit some characteristic that would make them less desirable for timber harvesting. The Mt. Trumbull Ecosystem Restoration Project is a large-scale ponderosa pine restoration project within the Monument that is returning the ecosystem to a healthy and sustainable state. The BLM prescribes the type and amount of tree harvesting allowed in the area to achieve restoration goals.

Vermilion Vegetation Products

There is little demand for vegetation products from Vermilion. Before designation as a Monument, there was occasional fuelwood harvesting of pinyon-juniper and pine nut collection from the Paria Plateau. There has been no vegetation product harvest since 1984 within the Paria Canyon-Vermilion Cliffs Wilderness.

Arizona Strip FO Vegetation Products

Desert Products

Cacti and yuccas (including Joshua trees) are relatively common throughout the Mojave Desert portion of the Arizona Strip FO. State law restricts the collection of these plants in Arizona. Collection of cacti and yuccas, both authorized and unauthorized, has occurred frequently throughout the Arizona Strip FO. In the early 1990s, the BLM restricted authorizations to collect desert plants to salvage only from areas where the plants would be destroyed due to project development.

Woodland Products

The pinyon-juniper forests in the Arizona Strip FO provide harvestable woodland products for fuelwood, fence posts, seeds, pinyon nuts, and Christmas trees. There are 171,937 acres of designated personal use and commercial fuelwood areas on the Arizona Strip FO (see Map 3.25). The BLM sells approximately 80 cords of fuelwood per year and issues permits for the collection of 200 Christmas trees.

The Arizona Strip FO section of the Black Rock ponderosa pine area is too small to support a sustainable timber harvest.

Map 3.25: Potential Wood Harvesting Areas

LANDS AND REALTY

Overview

The Lands and Realty Program objectives are to (1) manage public lands to support goals and objectives of other resource programs; (2) respond to public demand for land use authorizations; and (3) acquire administrative and public access where necessary. Land tenure actions are completed in accordance with statewide guidance and must achieve the goals, standards, and objectives outlined in the land use plan.

Several methods of public land management are considered in the planning process, including land tenure adjustments (disposals, acquisitions, withdrawals) and land use authorizations (rights-of-way, permits, and leases). Section 102(a) (1) of the Federal Land Policy and Management Act (FLPMA) of 1976 requires that BLM lands be retained in federal ownership unless the BLM determines through the land use planning process that disposal of a particular parcel will serve the national interest (43 U.S. Code (USC) 1701).

Land Acquisition

Section 205(b) of FLPMA (43 USC 1715), as paraphrased, requires that acquisitions of land, or interests in land, be consistent with the BLM mission and applicable agency land use plans. Non-federal land, interests in land, water rights, and easements for access, conservation, scenic, or other purposes would be considered for acquisition when they are within congressionally or administratively designated areas or contain important resources (i.e., National Landscape Conservation System (NLCS) units, ACECs, DWMAs, critical habitat, lands supporting listed species, riparian/wetland areas, etc.). Acquisition, including direct purchase, conservation easement, donation, or exchange would only be considered when there is a willing seller and the goals and objectives of the land use plan would be furthered. Surface or mineral estate would not be acquired if the other remaining estate were not in federal ownership. It is the BLM's policy to acquire access only where needs are identified through land use planning as being essential for the management of BLM lands and resources.

Land Disposal

Public lands have potential for disposal when they are isolated and/or difficult to manage. Disposal actions are usually in response to public request or application that results in a title transfer, wherein the lands leave the public domain. Public lands classified, withdrawn, reserved, or otherwise designated as not available or subject to sale are unavailable for disposal. An amendment to the land use plan would be required to dispose of lands not identified for disposal in the current land use plan. All disposal actions are coordinated with adjoining landowners, local governments, and current land users of record.

There are two distinct sets of criteria in FLPMA for evaluating whether disposal will serve the national interest. One set is for disposal by sale and the other is for disposal by exchange. To dispose of land by public sale, three criteria must be applied to identify public lands as suitable for disposal (Section 203(a) of FLPMA). The criteria are: a) the tract of public land is difficult and uneconomical to manage as part of the public lands and is not suitable for management by another federal department or agency; b) the land is no longer required for a specific purpose; or c) disposal will serve important public objectives. The BLM's current policy and regulations in 43 CFR 2710.0-6(c)(1-5) require the use of competitive sale procedures unless the authorized officer determines the public interest would best be served by modified competitive bidding or direct sale. In no case would land be sold for less than the appraised fair market value. Under Section 209(b) of FLPMA, mineral interests owned by the U.S. may be conveyed where the surface is or will be in non-federal ownership, if there are no known minerals values, and if they are interfering with or precluding appropriate non-mineral development in accordance with 43 CFR 2720.

The Federal Land Transaction Facilitation Act of 2000 (FLTFA) amended FLPMA to allow retention by the BLM of receipts received from sale of land or interests in land that were identified for disposal through land use planning prior to the passage of FLTFA under Section 203 of FLPMA or conveyance of mineral interest under Section 209(b) of FLPMA. Revenue from the sales would be used to purchase inholdings within that state in which the funds were generated in accordance with Statewide Interagency Implementation Agreements. The Arizona Statewide Interagency Implementation Agreement was approved May 9, 2006.

The criteria for determining which public lands or interests in land are available for disposal by exchange are covered in Section 206 (a) of FLPMA. These criteria require the BLM to consider the public interest by giving full consideration to better federal land management and the needs of state and local people, including the need of lands for the economy, community expansion, recreation areas, food, fiber, minerals, and fish and wildlife. The criteria also require that the public objectives to be served must be greater on the lands to be acquired than on the lands to be conveyed/sold.

The State of Arizona currently does not have authority to exchange land. Arizona's 1910 State Enabling Act and the 1912 Arizona Constitution required that State Trust lands could be disposed of only by public auction to the highest and best bidder. In 1936, Congress amended the Enabling Act to authorize the State to make land exchanges under such regulations as the State Legislature may provide. However, the State failed to amend the State Constitution to make the land disposal requirements in the Constitution consistent with the congressional exchange amendment of the Enabling Act. The Legislature did pass exchange statutes and for more than 50 years, the State made land exchanges with the Federal Government and private landowners to consolidate and improve the location of Trust land holdings. The exchange program was halted in 1988 after the State Supreme Court ruled that the State had failed to amend its 1912 State Constitution to authorize the exchange of Trust lands as an alternative to sale at public auction. Subsequent propositions to amend the State Constitution have not passed.

Exchanges with the State of Arizona to consolidate land ownership within the Monuments and other areas identified for retention could be pursued when the State is provided the authority. No lands are identified as suitable for disposal under the agricultural land laws including Desert-Land Entries, Indian Allotments, or Carey Act Grants. The Recreation and Public Purposes (R&PP) Act, as amended**,** authorizes the lease and/or conveyance of BLM lands for recreational and/or public purposes to state and local governments and to qualified nonprofit organizations under specified conditions at less than the appraised fair market value. The Airport and Airway Improvement Act of September 3, 1982, provides for the conveyance of BLM lands to public agencies for use as airports and airways.

Withdrawals and Classifications

Withdrawals are used to preserve sensitive environmental values, protect major federal investments in facilities, support national security, and provide for public health and safety. They segregate a portion of public lands suspending certain operations of the public land laws, such as desert land entries or mining claims, and they remain in effect until specifically revoked, modified, or otherwise expire. Land withdrawals can also be used to transfer jurisdiction to other Federal land managing agencies.

Additionally, whether a specific tract of public land is found suitable for disposal or retention is determined through a classification decision rendered pursuant to Section 7 of the Taylor Grazing Act (see 43 USC 315f) and in accordance with the applicable regulations in 43 CFR 2400. Sales and leases under the R&PP Act require classification (see 43 CFR 2740 & 2912).

Under sections 202(d) and 204(l) of FLPMA, any classification or withdrawal on BLM land is subject to periodic review to determine whether it is serving its intended purpose. The review of withdrawals and classifications on any lands under BLM jurisdiction may result in a determination that withdrawals or classifications are no longer serving their intended purposes and should be revoked/terminated, either all or in part. This review also considers if new withdrawals or classifications for other purposes are needed and should be put into place before revoking/terminating old withdrawals on the same areas.

It is federal policy to restrict all withdrawals to the minimum time required to serve the public interest, maximize the use of withdrawal lands consistent with their primary purpose, and eliminate all withdrawals that are no longer needed.

Land Use Authorizations

The BLM grants to any qualified individual, business entity, or governmental entity land use authorizations which include rights-of-way and temporary use permits issued under the authority of Title V of FLPMA and Section 28 of the Mineral Leasing Act of 1920, and permits, leases, and easements issued under the authority of Section 302 of FLPMA. Land use authorizations are issued in accordance with the regulations applicable to the type of authorization requested (43

CFR 2800, 2880, and 2920). Prior to issuance of any land use authorization, completion of site-specific National Environmental Policy Act (NEPA) documentation along with applicable environmental clearances is required. In most cases, it is the responsibility of the applicant to retain a qualified and properly permitted consultant and provide this documentation to the BLM. Additionally, the applicant is required to pay application fees, monitoring fees, and fair market value rental, as well as to comply with all other applicable regulations pertaining to the type of authorization requested.

There are a number of favorable places throughout the planning area that are commonly known and consistently used for aircraft landing and departure activities that, through such casual use, have evolved into backcountry airstrips (the definition contained in Section 345 of Public Law 106-914, the Interior and Related Agencies Appropriation Act of 2001). In accordance with that law, any closure of an aircraft landing strip contemplated in the future would require full public notice and consultation with local and State government officials and the FAA.

Permits, Leases, and Easements

Permits are usually short-term authorizations, not to exceed three years, allowing few or no permanent facilities. Permits have been used for temporary storage sites, apiary (bees) sites, commercial filming/photography, engineering feasibility studies, and other miscellaneous short-term activities with little or no resource disturbance. Occasionally, permits have been used to authorize trespass prior to resolution. Leases are long-term authorizations that usually require a significant economic investment in the land. In the past, leases have included agricultural development and existing water pipelines in wilderness. An easement can be used to assure that uses of public lands are compatible with non-federal uses occurring on adjacent or nearby land. An example would be a leaseholder of a ski area could request a scenic easement on the adjacent BLM managed land to protect the scenic quality of the entire ski basin.

Rights-of-Way

A right-of-way grant is generally a long-term authorization issued for necessary transportation or other systems or facilities that are in the public interest and require rights-of-way over, upon, under, or through BLM lands for specified purposes. These purposes may include roads, pipelines, utility lines, communication sites, energy development sites, and temporary use of additional public lands for purposes necessary to the project (Section 501, 43 USC 1761 and 30 USC 185). Public land law directs the BLM to minimize adverse environmental impacts by avoiding the proliferation of separate rights-of-way and using rights-of-way in common, to the greatest practical extent (Section 503, 43 USC 1763).

The use of designated right-of-way corridors and right-of-way use areas is encouraged to the greatest extent possible, but, depending on site-specific needs, actual locations may vary. Such variances would be considered consistent with the RMP, provided such locations and uses are

consistent with the selection criteria, goals, and objectives for right-of-way corridors and right-of-way use areas.

Some right-of-way uses have grandfather rights from law that predates FLPMA, such as roads under Revised Statute (RS) 2477 and reservoirs, canals, and ditches under RS 2339 and RS 2340, where no notification of or documentation from the BLM was required. These valid existing rights may exist within the Arizona Strip FO, Parashant, and Vermilion.

Renewable Energy Resources

The President's National Energy Policy encourages the development of renewable energy resources as part of an overall strategy to develop a diverse portfolio of domestic energy supplies for our future. It also requires that the BLM increase and diversify our national sources of both traditional and alternative energy resources, improve our energy transportation network, and ensure sound environmental management. It is BLM policy to consider the need for the production and distribution of energy and to encourage the development of renewable energy sources in acceptable areas (BLM, Washington Office Instruction Memorandum No. 2002-196).

As part of the BLM's proposed National Energy Policy Implementation Plan, the BLM and the National Renewable Energy Laboratory (NREL) have established a partnership to assess renewable energy resources on BLM lands with the objective of identifying planning units with the highest potential for private-sector development of renewable resources. The BLM/NREL team used GIS data to analyze and assess the potential for concentrating solar power (sun as a heat source), photovoltaics (solar cells convert sunlight directly into electricity), wind (turbines generate electricity), and biomass (energy from organic matter) resources and technologies on public lands. The recently published report, *Assessing the Potential for Renewable Energy on Public Lands* (BLM 2003), identified 25 BLM field offices with the highest potential for renewable energy sources. The Arizona Strip FO was ranked 18th in concentrating solar power sites, 15th in photovoltaic sites, and 23rd in biomass sites. The Record of Decision for the Programmatic EIS on Wind Energy Development on BLM-Administered Lands in the Western U.S. was signed on December 15, 2005, which identified policies and best management practices that would be applicable to all wind energy development projects on BLM-administered public lands.

Parashant Lands and Realty

Land Acquisition

The Parashant proclamation directs the BLM, "To consider land or easement acquisitions and land exchanges that will enhance the values of the National Monument …Lands and interests in lands within the proposed Monument not owned by the U.S. shall be reserved as a part of the Monument upon acquisition of title thereto by the U.S." The BLM would consider acquisition of non-federal inholdings, water rights, and/or interests in land within Parashant by direct purchase,

donation, or exchange which are determined to enhance the Monument objectives and values (Section 205 (b) of FLPMA (43 USC 1715)). Lands acquired within the Monument in an exchange shall contain higher resource values than the public lands being exchanged out of federal ownership. In addition, legal access to landlocked public lands may be acquired where determined necessary to further the goals and objectives of the Monument.

Prior to Monument designation, many land exchanges were completed which acquired state land within wilderness, "checker-boarded" railroad grant land, and private land and water rights, some within wilderness. Since Monument designation, the BLM has acquired approximately 640 acres of land and water rights in the Mt. Trumbull area and at Pakoon Springs by purchase and donation. There are approximately 82,230 acres of non-federal mineral estate within Parashant (on both BLM and NPS lands) where the surface estate is in federal ownership (e.g., a split estate). This split estate is generally a result of early land exchanges where the BLM acquired only the surface estate. Approximately 49,807 acres of mineral estate in Parashant is owned by the Santa Fe Pacific Railroad Company.

Land Disposal

As stated in the Parashant proclamation, "All federal lands and interests in lands within the boundaries of Parashant are hereby appropriated and withdrawn from all forms of entry, location, selection, sale, or leasing or other disposition under the public land laws, including but not limited to withdrawal from location, entry, and patent under the mining laws, and from disposition under all laws relating to mineral and geothermal leasing, other than by exchange that furthers the protective purposes of the Monument."

All land disposals were precluded by the proclamation. The only exceptions are land exchanges under the authority of Section 206(a) of FLPMA that further the protective purposes of the Monument. Generally, a land exchange in Parashant would consist of the acquisition of lands within the Monument and disposing of lands within the Arizona Strip FO. However, any BLM lands within Arizona identified for disposal through planning may be considered for exchange. Since completion of the Arizona Strip RMP in 1992, no land disposals have taken place within the area now designated as the Monument.

Withdrawals

The Parashant proclamation stipulates that, "Existing withdrawals, reservations, or appropriations are not revoked, but the National Monument is the dominant reservation." This refers to any lands within the Monument that have been removed or withdrawn from operation under some or all of the public land laws (such as mining and/or mineral leasing laws), by statute, or by Secretarial order prior to the proclamation. These withdrawals were imposed to achieve a variety of purposes, and they remain in effect until specifically revoked, or otherwise expire. Some were established prior to the enactment of FLPMA in 1976. Areas withdrawn

within Parashant remaining in effect include wilderness, an administrative site, and miscellaneous reclamation withdrawals.

Land Use Authorizations

Pursuant to the interim management policy for BLM National Monuments (IM 2002-008):

> No new rights-of-way or ancillary public facilities should be processed, except for rights-of-way pursuant to existing policies and practices and necessary for access and/or maintenance needs to private or state in holdings, public facilities, or administrative sites. In addition, rights-of-way may be permitted within the boundary of existing rights-of-way or designated rights-of-way corridors established by previous land use planning, and where site-specific NEPA analysis determines that impacts to the objects or values for which the Monument was designated would be negligible. Valid existing rights will be recognized.

Valid existing rights within Parashant generally consist of repeaters that provide emergency services and two-way radio communications, federal administrative sites, access roads/airstrips, water facilities, and environmental monitoring equipment sites for various governmental agencies and private parties. There are no designated right-of-way corridors within Parashant. Rights-of-way are excluded within wilderness and NPS proposed wilderness.

There are no existing or proposed energy related right-of-way developments or communication sites within Parashant. Monument designation precluded any potential commercial energy development, production, or distribution. Generally, new proposals for energy development would be accommodated outside of Parashant in the Arizona Strip FO.

Vermilion Lands and Realty

Land Acquisition

The Vermilion proclamation contains the same direction for land acquisitions and exchanges as provided in the Parashant proclamation. In addition, management guidance for Vermilion is the same as provided in the Parashant Land Acquisition section.

Prior to Monument designation, land exchanges were completed which acquired state land within wilderness and private land and interests. There are approximately 7,684 acres of non-federal mineral estate within Vermilion, which is generally a result of early land-tenure adjustments where the BLM acquired only the surface estate.

Land Disposal

The Vermilion proclamation contains the same direction for land disposal as provided in the Parashant proclamation. In addition, management guidance for Vermilion would be the same as provided in the Parashant Land Disposal section and, as previously stated, only land exchanges, under the authority of Section 206(a) of FLPMA, that further the protective purposes of the Monument would be considered. Generally, a land exchange in Vermilion would consist of acquisition of lands within the Monument and disposal of lands within the Arizona Strip FO. However, any BLM land within Arizona identified for disposal through planning may be considered for exchange. Since completion of the Arizona Strip RMP in 1992, no land disposals have taken place within the area now designated as the Monument.

Withdrawals

The Vermilion proclamation contains the same direction for withdrawals as provided in the Parashant proclamation. In addition, management guidance for Vermilion would be the same as provided in the section on Parashant withdrawals. In Vermilion, the Paria Canyon-Vermilion Cliffs Wilderness and Vermilion Cliffs Natural Area are withdrawn and miscellaneous reclamation withdrawals remain in effect.

Land Use Authorizations

The Vermilion proclamation contains the same direction for land use authorizations as provided in the Parashant proclamation. Valid existing rights within Vermilion generally consist of water facilities, power lines, telephone lines, a communication site that provides emergency services and two-way radio communications, and environmental monitoring equipment/sites for various governmental agencies and private parties. There are no designated right-of-way corridors within Vermilion. Rights-of-way are excluded within wilderness areas.

The southern boundary of Vermilion is the Highway 89A right-of-way (200 feet from the center) and around any private land existing on the north side of the highway. Historically, runoff from high intensity rainstorms on Vermilion Cliffs has occasionally caused road damage to Highway 89A. This has made it necessary for Arizona Department of Transportation (ADOT) to complete stream channel work to redirect flows into existing culverts under the highway. In a few locations, it has been necessary to complete some earthwork just outside of the authorized right-of-way depending upon the level of damage to the highway and the intensity and location of flooding. This work has been ongoing since prior to wilderness designation and was addressed in the Final Wilderness Management Plan for the Paria Canyon-Vermilion Cliffs Wilderness (BLM 1986). The entire House Rock Valley portion of Highway 89A is now bordered on the north by Vermilion. Although it is difficult to predict the intensity and location of flash flooding, ADOT has proactively improved highway drainage conditions limited only by available funding. Since completion of the Arizona Strip RMP (BLM 1992a), ADOT replaced many bridges and improved drainage structures within the right-of-way throughout House Rock Valley. In

addition, ADOT initiated regular coordination meetings with the Arizona Strip BLM and is in the process of contracting for environmental inventories along all ADOT-maintained highways within the Planning Area.

There are no existing or proposed energy right-of-way developments or communication sites within Vermilion. Monument designation precluded any potential commercial energy development, production, or distribution. Generally, new proposals for energy development would be accommodated outside of Vermilion in the Arizona Strip FO.

Arizona Strip FO Lands and Realty

Most of the Arizona Strip FO area consists of BLM lands and federal mineral estates. The communities of Scenic, Arvada, Beaver Dam, Littlefield, and Desert Springs are located along the Virgin River corridor in the northwestern corner of the Arizona Strip FO. These communities have recently formed the Virgin River Domestic Wastewater Improvement District and the Scenic Improvement District to help facilitate infrastructure development. The community of Mt. Trumbull/Bundyville is located in the southwestern portion of the Arizona Strip FO and borders on Parashant. The incorporated towns of Fredonia and Colorado City, and the communities of Centennial, Cane Beds, and White Sage Flat are located in the north-central part of the Arizona Strip FO. Small residential developments exist adjacent to three lodges located at the base of the Vermilion Cliffs in the northeastern corner of the Arizona Strip FO. Many other towns and cities are in close proximity to the Arizona Strip FO including St. George, Hurricane, and Kanab, Utah; Page, Arizona; and Mesquite, Nevada.

Land Acquisition

Since completion of the Arizona Strip RMP (BLM 1992a), the BLM has acquired 1.25 acres by donation (Mt. Trumbull School House) and 28.28 acres of land adjacent to the Beaver Dam Wilderness, Virgin River ACEC, and Beaver Dam Slope ACEC. Legal access to landlocked public lands may be acquired where determined necessary for public or administrative purposes.

There are approximately 193,420 acres of non-federal mineral estate within the Arizona Strip FO. This split estate is generally a result of early land tenure adjustments.

Land Disposal

Since completion of the Arizona Strip RMP (BLM 1992a), one direct sale was completed which conveyed 22.77 acres of land encumbered by the Marble Canyon Airstrip into private ownership. Two land exchanges have been completed which resulted in acquisition of a 37.50-acre parcel within the Cottonwood Point Wilderness and acquisition of approximately 4 acres on the east side of Highway 89A in House Rock Valley, which will help preserve the scenic quality of the area. Another land exchange is proposed for approximately 45 acres adjacent to the Paria Canyon-Vermilion Cliffs Wilderness and Vermilion in House Rock Valley.

R&PP Act

Increased demands are placed on public lands because of accelerated growth in and around cities and towns in the Arizona Strip FO. These growing communities rely on adjacent BLM lands for expansion needs. In the Arizona Strip FO, the lease/sale of land under the R&PP Act has been used to authorize schools, fire stations, cemeteries, landfills, and rodeo grounds, among others. Applications are currently under consideration for two school sites and a wastewater treatment facility for the communities along the Virgin River. In the future, it is anticipated that the lease/sale of land under the R&PP Act will be used for wastewater treatment facility expansion, municipal parks, a landfill, and public facilities (i.e., fire stations, schools, etc.). Initially, lands are leased until substantial development has taken place in accordance with the approved plan of development. The lands may then be conveyed subject to provisions identified in 43 CFR 2740.

Since completion of the Arizona Strip RMP (BLM 1992a), approximately 185 acres have been leased for various recreational and public purposes throughout the Arizona Strip FO. Approximately 75 acres have been conveyed for schools after the proposals were completed in accordance with the approved development plans.

Approximately 270 acres were conveyed under the R&PP Act for a new landfill for the communities of Fredonia and Colorado City. The old Littlefield, Colorado City, Fredonia, and Page community landfills, which were authorized by R&PP lease, were closed in compliance with ADEQ regulations. These sites may contain small quantities of commercial and household hazardous waste as determined in the Resource Conservation and Recovery Act of 1976 (42 USC 6901), as amended, and defined in 40 CFR 261.4 and 261.5. Although there is no indication these materials pose any significant risk to human health or the environment, future land uses should be limited to those which do not penetrate the liner or final cover of the landfill unless excavation is conducted subject to applicable state and federal requirements.

FAA Airport Grants

Approximately 112 acres of Arizona Strip FO land were conveyed out of federal ownership west of Colorado City under the Airport and Airway Improvement Act of 1982 for the Colorado City Airport. Another expansion of this airport is currently being considered, which would require conveyance of additional public land in the future.

Withdrawals and Classifications

Withdrawals in the Arizona Strip FO generally consist of reclamation, PWRs, USFS/NPS, wilderness, and miscellaneous recreation/scenic/protective withdrawals.

The proclamations for Parashant and Vermilion established two new withdrawals for protecting the objects identified therein. These withdrawals transferred management on approximately 1,342,014 acres of out of the Arizona Strip FO to the Monuments.

Approximately nine classifications were completed for land disposals under the R&PP Act where the proposed use was accommodated elsewhere. These classifications will be terminated.

Land Use Authorizations

Within the Arizona Strip FO, community boundaries extend to adjacent BLM lands. Growing communities rely on the adjacent BLM lands for expansion needs. In the future, BLM lands may be needed to provide for expanding infrastructure including new access roads, power distribution lines, telephone lines, etc.

Land use authorizations may be considered on all Arizona Strip FO lands that are not identified as avoidance or exclusion areas. Avoidance areas are areas such as critical habitat, lands supporting listed species, areas allocated to maintain wilderness characteristics, DWMAs, or ACECs where rights-of-way or permits may be granted only when no feasible alternative route, site, or designated right-of-way corridor is available. Leases would generally be prohibited. Special terms and conditions would apply if a right-of-way or permit must be granted within the area. Exclusion areas on the Arizona Strip FO are the wilderness areas. In these areas, future rights-of-way may be granted only when mandated by law and existing rights-of-way that may expire, are evaluated prior to expiration, and if still needed, are processed under 43 CFR 2920.

Permits and Leases

Since completion of the Arizona Strip RMP (BLM 1992a), approximately 76 permits have been issued in the Arizona Strip FO. Of these, 46 authorized commercial filming/photography and approximately 30 authorized various types of environmental monitoring equipment, apiaries, temporary storage sites, and equipment feasibility testing. Four leases have been issued for a total of 20.94 acres for reauthorization of existing water pipeline rights-of-way in wilderness and agricultural purposes. One small tract lease issued in 1969 for a cabin on 4.8 acres, now within designated wilderness, was relinquished. Personnel from the BLM cleaned up and removed old cabin remnants and other debris.

Rights-of-Way

There are three existing multi-user communication sites in the Arizona Strip FO located at Seegmiller Mountain, Low Mountain, and Point-of-Rock. Uses at these sites include government agencies that provide emergency services and two-way radio communications, commercial telecommunication providers, and multiple user facilities that are independently managed by a right-of-way holder. These sites are exclusively for low power use and high power broadcasting is strictly prohibited. Communications Site Plans were completed in the fall of 2004 for all three sites. Space is currently available within existing facilities, as well as land area for additional new construction, if necessary, although co-location and subleasing are preferred.

As the population of the region grows, it is anticipated that the demand for high elevation sites may increase slightly. However, the demand for low elevation sites, especially cell phone towers, is expected to increase significantly to provide improved coverage for cell phone users. Antennas for cellular telephones can co-locate on existing utility structures and are capable of sharing structures with multiple providers. New communication sites may be considered in accordance with decisions established in the RMP and with NEPA compliance, which includes evaluation of impacts to visual resources. Since completion of the Arizona Strip RMP (BLM 1992a), two cell towers have been authorized in the Arizona Strip FO; one at Beaver Dam adjacent to and sharing access with an existing water tank right-of-way, and another at Low Mountain adjacent to and sharing access with an existing communication site.

A right-of-way corridor is an existing alignment that has been identified as a preferred location to accommodate similar or compatible projects. Existing alignments on the Arizona Strip FO consist of the major transportation corridors, such as Interstate 15, which crosses the northwest corner of the Arizona Strip FO. State Highway 389 crosses the Arizona Strip FO looping south of the Utah/Arizona state line near Colorado City, Arizona, crossing the Kaibab-Paiute Indian Reservation then north through Fredonia, Arizona, entering back into Utah. State Alternate 89 crosses the Planning Area, extending southeast from Fredonia, Arizona, over the Kaibab Forest into House Rock Valley, along the base of the Vermilion Cliffs, and then leaving the Arizona Strip FO as it crosses the Colorado River at Marble Canyon via the Navajo Bridge.

One regional corridor identified by the Western Utility Group extends through the Arizona Strip FO. The 1998 revision of the Arizona Strip RMP and designation of Parashant effectively eliminated the Lime Kiln portion of this route. The corridor location is currently the Navajo-McCullough power line route and the Rosy Canyon fiber optic line route. Future development of this corridor would be subject to environmental review based on specific proposals.

Approximately 87 new rights-of-way, renewals, and amendments have been processed in the Arizona Strip FO since completion of the Arizona Strip RMP (BLM 1992a). These rights-of-way have been for roads, federal facilities, power transmission lines, communications sites, telephone lines, water pipelines and facilities, and other purposes. Most were in or near developed communities. Several rights-of-way are currently under consideration for access roads, pipelines, and a fiber optic line.

Renewable Energy Resources

There are no existing or proposed energy right-of-way developments or communication sites within the Arizona Strip FO at this time. However, the Arizona Strip FO has been under consideration by industry and intensive studies were completed in the Beaver Dam Area for two separate gas-fired electric power generating plant sites. Any requests for renewable energy projects in the Arizona Strip FO would be considered.

LIVESTOCK GRAZING

Overview

The history of livestock grazing in the Planning Area dates back to the mid 1800s. The number of cattle, sheep, and horses increased rapidly until the early 1900s. During this period, livestock grazing became a regulated and permitted activity on USFS lands. Non-USFS federal land was treated as a "commons" in which those who moved their stock onto the range first each season secured the use of new forage growth. Livestock from across the region were brought in to graze during the winter months and many animals were left on the range year-round. During this period, rangeland resources experienced unregulated use, which resulted in changes to vegetation communities, especially at the elevations that could be used for grazing year round. Control of these “common” ranges did not occur until 1934 with the passage of the Taylor Grazing Act. During the following years, regulations pertaining to operators, allotments, kind and number of livestock, and season-of-use were established on public lands and administered by the Grazing Service. Arizona Grazing District No. 1, the first grazing district to be established under the Taylor Grazing Act, was created on the Arizona Strip in 1935.

The BLM, established in 1946, was a combination of the Grazing Service Administration and the General Land Office. During the late 1950s and early 1960s, range surveys were completed in order to determine the capacity of the land for grazing. Following these surveys, decisions regarding foraging were adjudicated and livestock numbers on most allotments were reduced. A federal court agreement on April 11, 1975 required the BLM to prepare EISs on public grazing lands over a 10-year period. To comply with this agreement, the Shivwits Grazing Management EIS (BLM 1980) and Vermilion Grazing Management EIS (BLM 1979) were prepared. These resulted in further adjustments to livestock numbers, as well as season of use and required implementation of grazing systems and management plans. Because of these actions, grazing use within the Planning Area has significantly decreased from its peak in the early 1900s.

The Arizona Strip FO Rangeland Program Summary Update (BLM 1997) clearly indicates that the level of permitted grazing use on the Strip has decreased significantly over time. The season of use, or amount of time per year that livestock graze, has also decreased. These factors, in combination with rest rotation and deferred rotation grazing systems, have resulted in rangeland conditions improving over the last several decades.

Historically, there were 212 grazing allotments within the Planning Area. Ninety-two Allotment Management Plans (AMPs) covered 170 of these allotments, prescribing grazing schedules and seasons of use. Approximately 20,000 cattle and 300 horses are currently authorized to use a maximum of 183,000 Animal Unit Months (AUMs) of forage annually. All grazing numbers used in this section are from the Arizona Strip District livestock grazing files and reports.

Current Livestock Grazing Practices

Most current livestock operations in the Planning Area are yearlong and involve the raising of calves from a base herd of cattle for marketing. These operations usually encompass a mixed ownership of private, Arizona State Trust, and BLM lands with some NPS lands. Although the operations are year long, they may only use the federal rangelands seasonally.

Today, because of purchases, trades, and combinations, there are 160 grazing allotments within or adjacent to the boundaries of the Planning Area. The Arizona Strip District administers 153 of these grazing allotments. Utah BLM, out of the St. George and Kanab field offices and the Grand Staircase-Escalante National Monument administer the other nine grazing allotments. There is close to 183,000 AUMs of authorized grazing use (including other federal AUMs) on these allotments. Cattle grazing comprise approximately 180,000 AUMs, while horse grazing makes up approximately 3,000 AUMs. There is also the potential for additional AUMs under ephemeral grazing authorizations. See Appendix 3.E for a list of allotment acres and allotment AUMs by land status within the Planning Area.

Three management categories for allotments are used to define the level of management needed to properly administer grazing lands. All allotments have been placed into these categories according to management needs, resource conflicts, potential for improvement, and Bureau funding/staffing constraints. The allotments are categorized and managed as follows:

- Custodial (C) allotments are managed by the BLM to protect resource conditions and values.
- Maintain (M) allotments are managed to maintain current satisfactory resource conditions and are actively managed to ensure that resource values do not decline.
- Improve (I) allotments are managed to improve resource conditions or conflicts and receive the highest priority for funding and management actions.

As allotments are evaluated, the allotment categories, in consultation with affected operators, are reviewed and revised, where needed, to respond to changing resource conditions. See Appendix 2.N for the definitions and criteria for each category. In the Planning Area, there are currently 24 C-category allotments covering 60,643 acres, 61 M-category allotments covering 953,962 acres, and 68 I-category allotments, covering 1,941,705 acres.

Allotment categorization and initial grazing use allocations were made for grazing management in the Planning Area in the Shivwits and Vermilion Grazing Management EISs (BLM 1980; BLM 1979) and Arizona Strip RMP (1992a). These land use plans outlined proposed grazing systems for most I- and M-category allotments. Because of this direction, grazing systems have been developed and implemented on 117 allotments through agreements or decisions with allotees. These grazing systems are usually documented and described in an AMP. An AMP is a documented program, developed as an activity plan that directs management of livestock grazing on specified public land in order to achieve objectives relating to desired future conditions, sustained yield, and multiple use. AMPs are implemented when incorporated into the

terms and conditions of the grazing permits or leases and accepted by the permittee or lessee. Strategic portions of AMPs are the grazing systems/schedules and the rangeland projects identified to implement those systems that will meet resource objectives. New AMPs can be developed and existing plans revised in accordance with BLM polices and prescriptions described in this Plan. Changes in use and management continue to be made based on monitoring data and rangeland health evaluations.

The Arizona Strip District has two types of AMPs: intensive and less intensive. Intensive AMPs involve grazing systems such as rest-rotation, deferred rotation, best pasture systems, and holistic resource management. In addition to the grazing systems, intensive AMPs establish a key forage species utilization level goal of 50 percent average of current years' growth. This utilization level goal is a management tool and, when considered over a period of several years, can indicate the need to make management corrections, or re-evaluate the guidelines, before undesirable long-term trends are identified by monitoring. Less-intensive AMPs involve grazing systems that allow the rancher to operate seasonally but forage species utilization goals are set at 45 percent average of current years' growth.

Under intensive AMPs, rangeland improvements necessary to implement the grazing systems are cooperatively funded. Under less intensive AMPs, the permittee finances range improvements on public lands or cooperates with BLM in construction projects. Table 3.22 summarizes allotment-grazing systems followed under both intensive and less-intensive AMPs.

Table 3.22: Current and Implemented Allotment Grazing Systems in the Planning Area

Grazing Systems	Number of Allotments
Intensive AMPs	
Deferred Rotation Systems	69
Rest Rotation System	15
Winter & Spring Systems	10
Summer & Fall Systems	1
Holistic Grazing Management System	1
Best Pasture System	6
Winter System	2
Less-Intensive AMPs	
Less-Intensive System	13
Source: Arizona Strip District files	

Intensive AMPs, which fully address resource conditions, goals and objectives, grazing systems, range developments, monitoring systems, and evaluation, have been implemented on 104 allotments covering 79 percent of the livestock grazing administered area. Less intensive AMPs, which address livestock management goals, season of use, numbers of livestock, kind of livestock, and, in some cases, pasture rotation or deferment, have been implemented on 13 allotments covering 4 percent of the livestock grazing administered area. No plans have been developed for 36 allotments covering 14 percent of the livestock grazing administered area. Within the Arizona Strip District, 6 percent of the lands are not available to grazing.

Public rangeland grazing is guided by findings of the Shivwits and Vermilion Grazing Management EISs (BLM 1980; BLM 1979), Arizona Strip RMP (BLM 1992a), Mojave Desert Amendment (BLM 1998), the Glen Canyon NRA Grazing Management Plan (1999), and through Memorandums of Understanding (MOUs) where other agency lands are administered by the BLM, ongoing rangeland monitoring studies and evaluations, and allotment categorization priorities. Since the Shivwits Grazing EIS was finalized in 1980, provisions and considerations necessary to manage livestock grazing operations in desert tortoise habitat have been implemented through the Mojave Desert Amendment (BLM 1998). The changes advocate rest cycles in the critical spring green-up period, ensure needed forage is available for tortoise, and locate projects where grazing operations would have the least amount of adverse impact, if any. AMPs are still needed in some of the allotments that contain desert tortoise habitat. Appendix 2.N shows each allotment in the Planning Area by category and AMP status.

Twenty-six allotments cross administrative boundaries, which are located along the Nevada and Utah borders on BLM lands and NPS lands (Lake Mead and Glen Canyon NRAs). The BLM administers grazing on NPS lands through interagency MOUs, which pertain only to livestock grazing. Other BLM offices, the St. George and Kanab field offices, Grand Staircase-Escalante National Monument, and Las Vegas District administer nine of the allotments that cross over the boundary.

There are approximately 227,958 acres of Arizona State Trust lands grazed in conjunction with the BLM allotments. The permittees pay the state for the grazing use on these lands, while the BLM administers grazing activities. There are also 68,526 acres of private lands and 103,028 acres other federal lands that are grazed in conjunction with BLM-administered grazing allotments.

Rangeland Health and Condition

The overall objective of the rangeland management program for the Planning Area is to manage soil and vegetation communities to meet rangeland health standards and multiple use management objectives. The purpose of the standards and guidelines at 43 CFR § 4180 is to provide a measure (Standard) to determine land health and methods (guidelines) to improve the health of the public rangelands. Success will be measured in concrete outcomes on the lands managed. BLM's job is to maintain the health of the land or make appropriate changes on the ground where land health standards are not being achieved. The standards are intended to help the Bureau, public land users, and others focus on a common understanding of acceptable resource conditions. The guidelines provide a basis for working together to achieve that vision. The standards communicate current and desired resource conditions amongst the various groups. Guidelines are used to describe or communicate techniques for managing activities to achieve those desired conditions. Guidelines for grazing management emphasize multiple use management by incorporating needs for wildlife habitat, soil, watershed, riparian, and recreation. The specific goals and objectives of the program are accomplished through planning at the

activity level, with attention given to proper season of use, suitable grazing systems, plant and animal requirements, kind and class of livestock, distribution of livestock, placement of rangeland improvements, and vegetative treatments.

The Arizona Standards for Rangeland Health and Guidelines for Grazing Administration was approved in 1997 (See Appendix 2.A). In concert with livestock operators, other affected agencies, and interested publics, the BLM examines the key indicators addressed by the standards and guidelines and assesses whether they are being met or not. If monitoring shows progress is being made towards objectives, existing management continues. However, if progress is not being made towards meeting objectives, the BLM works with affected partners to determine why the standard was not achieved. Appropriate actions are then prescribed to make satisfactory progress towards meeting standards. Where the assessment and monitoring strategy indicates livestock grazing is wholly or partly responsible for failure to meet standards, existing grazing systems and practices are modified to ensure conformance with the guidelines for grazing management. Adjustments are made by agreement or decision in accordance with law, regulations, and policy so that public land resources are maintained or improved.

At present, the standards and guidelines evaluation process is at various stages of completion on 131 grazing allotments. Appendix 2.D lists allotments and indicates where standards are met or not met. It also provides a proposed schedule for allotments not yet evaluated.

Monitoring continues to play a significant role in the management of the Planning Area. The Arizona Strip District developed a resource-monitoring plan in 1981. Resource monitoring involves the orderly collection of vegetation attributes (i.e., cover, frequency, and species composition), the utilization level of key forage plants, actual livestock use, and climate change from permanently established plots within allotments. The analysis and interpretation part of resource monitoring is necessary to document changes over time, in vegetation attributes, and habitat conditions, and assist in determining if those changes are in response to management and/or natural processes. It further serves to evaluate progress in meeting management objectives. Currently, 129 grazing allotments have active monitoring at approximately 530 key areas. Vegetative attributes data is collected one to three times every 10 years. Utilization studies are intended to be read each year, but may not be due to the allotment category as well as schedules and workloads of the rangeland management specialists. There are more than 57 rain gauges placed across the Arizona Strip used to monitor precipitation amounts and timing. Actual grazing use is collected to facilitate the comparison of production versus utilization levels and to help evaluate the causal effect on the direction of trend.

The Rangeland Program Summary Update (BLM 1997) showed that about 80 percent of the key areas are in an upward to static trend. Trend is the direction of change in plant frequency, ecological status, or some other resource value rating, observed over time. Trend is described as moving “towards meeting objectives,” “away from meeting objectives,” “not apparent,” or “static.” The Arizona BLM allotment evaluation process sets into motion the appropriate actions

needed to make significant progress toward achieving land health standards and other multiple use objectives. Appropriate actions consist of:

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

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

Range Improvements

A number of range improvement projects have been constructed for both the enhancement and protection of watershed and wildlife values and for the management of domestic livestock grazing. These projects consist of water developments (windmills, pipelines, stock ponds) fences, and vegetative treatments. All projects were authorized under cooperative agreements or permits, depending on overall benefits and objectives and private investment levels. The construction of range improvement projects in conjunction with a suitable grazing system is ongoing, primarily in high priority allotments.

Vegetation treatments, including prescribed fires, are used in conjunction with grazing management mostly on Category I allotments to achieve rangeland management objectives. These vegetation treatments mostly occur in sagebrush and pinyon-juniper plant communities.

Parashant Livestock Grazing

The BLM also administers grazing leases within the NPS portion of Parashant, consistent with the Lake Mead NRA authorizing legislation. Laws, regulations, and policies followed by the BLM in issuing and administering grazing leases on all lands under its jurisdiction apply to the remaining portion of the Monument.

The BLM currently administers 28 grazing allotments and manages them in cooperation with 25 permittees throughout Parashant. There is close to 38,000 AUMs (including other AUMs for Lake Mead NRA) of authorized grazing use on these allotments, based on 2004 numbers. The most prevalent use is by cattle, with approximately 37,500 AUMs used. There are also approximately 600 AUMs authorized for horses to graze in Parashant. These animals are mainly used as saddle stock for the cattle operations.

Intensive AMPs have been completed and implemented for grazing practices on 22 allotments covering 73 percent of the Monument administrative area. There are no less intensive AMPs in the Monument area. No plans have been developed for 6 allotments covering 27 percent of the

area. In the Monument area, 19 percent of the lands are not available for grazing. Table 3.23 summarizes the allotments administered by category within Parashant**.**

Table 3.23: Parashant Allotment Categorization Summary			
	Improve (I)	**Maintain (M)**	**Custodial(C)**
Allotment Numbers	15	13	0
Source: Arizona Strip District files			

Vermilion Livestock Grazing

Within Vermilion, all laws, regulations, and policies followed by the BLM in issuing and administering grazing permits or leases on all lands under its jurisdiction apply with regard to the lands in the Monument.

The BLM currently administers ten grazing allotments and manages them in cooperation with nine permittees throughout Vermilion. There is close to 19,000 AUMs (including AUMs for other federal agencies than the BLM) of authorized grazing use on these allotments. The dominant kind of livestock is cattle, with approximately 18,600 AUMs. There are also approximately 400 AUMs authorized for horses to graze in Vermilion as saddle stock.

Intensive AMPs have been implemented on four of these allotments covering 99 percent of the administered area. There are no less intensive AMPs in Vermilion; however, there is one allotment with no formal AMP, which covers 1 percent of the administered area. Table 3.24 summarizes the allotment categories within Vermilion.

Table 3.24: Vermilion Allotment Categorization Summary			
	Improve (I)	**Maintain (M)**	**Custodial(C)**
Allotment Numbers	2	2	1
Source: Arizona Strip District files			

Arizona Strip FO Livestock Grazing

BLM also administers livestock grazing within Glen Canyon NRA. BLM grazing regulations apply to grazing administration in Glen Canyon NRA, as spelled out in interagency agreements and MOUs between the BLM and NPS.

Arizona Strip FO currently administers 120 grazing allotments and manages them in cooperation with 83 permittees. There is close to 126,000 AUMs of authorized grazing use on these allotments. The dominant kind of livestock is cattle, with approximately 124,000 AUMs. There are also approximately 2,000 AUMs authorized for horses to graze in the Arizona Strip FO, most of which are saddle stock used for livestock operations.

Of the 111 grazing allotments, 91 AMPs have been completed and the prescribed grazing practices implemented. Intensive AMPs have been implemented on 78 allotments or 77 percent

of the Arizona Strip FO administered area. Less intensive AMPs have been implemented on 16 allotments (7 percent of the Arizona Strip FO area.) No plans have been developed for 26 allotments (11 percent of the area). In the Arizona Strip FO, less than 0.1 percent of the lands are not available for grazing. Table 3.25 summarizes the allotment categories within the Arizona Strip FO.

Table 3.25: Arizona Strip FO Allotment Categorization Summary

	Improve (I)	Maintain (M)	Custodial(C)
Allotment Numbers	51	46	23
Source: Arizona Strip District files			

MINERALS

Overview

The Planning Area has been rated for its mineral potential using the guidance contained in the BLM's 3031 Manual (BLM, 1988). A summary of the rating for all mineral resources is shown in Table 3.26. A description of the potential and certainty levels is given in Appendix 3.F. The rating given in the table indicates the highest rating for that resource within the district and does not imply that the resource has the potential for uniform occurrence throughout the district. Map 3.26 illustrates the locations of all mining claims within the Planning Area.

Table 3.26: Mineral Resource Potential Ratings

Mineral Resource	Level of Potential*	Level of Certainty*
Leasable Minerals		
Coal	No Potential	D
Oil and Gas	Moderate Potential	C
Geothermal	Moderate Potential	B
Sodium	Moderate Potential	C
Potassium	Low Potential	C
Locatable Minerals		
Metallic Minerals	High Potential	D
Rare Earth (Uranium)	High Potential	D
Non-Metallic (Gypsum)	High Potential	D
Salable Minerals		
Common Varieties (sand, stone, gravel, pumicite, and clay)	High Potential	D

* See Appendix 3.F for a more detailed description of potential and certainty levels.

B. Available data provide indirect evidence to support or refute the possible existence of mineral resources.

C. Available data provide direct evidence but are quantitatively minimal to support or refute the possible existence of mineral resources.

D. Available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources.

Map 3.26: Active Mining Claims

Leasable Minerals

Coal, oil shale, oil and gas, phosphate, potash, sodium, geothermal resources, and all other minerals that may be acquired under the Mineral Leasing Act of 1920, as amended, are referred to as leasable minerals. The only leasable minerals rated for their potential occurrence in the Planning Area are coal, oil and gas, geothermal, and sodium and potassium (see Map 3.27 for fluid mineral leasing locations).

Coal

The geologic history and rock units preserved in the Planning Area are not conducive to the formation and preservation of coal resources. Therefore, there is no potential for the occurrence of this mineral resource and no exploration or extraction activities have been undertaken. The certainty that coal does not exist is very high and has been assigned a certainty level of D.

Oil and Gas

Known oil and gas resources are not significant within the Planning Area and no economic occurrences of oil or gas have been encountered to date. However, the Planning Area has been only lightly explored for these resources with the vast majority of these wells drilled on the Colorado Plateau. As of April 2002, 55 wells were drilled in the Planning Area, with an average of one application for permit to drill received every two years for the last 10 years. As of February 2002, there are approximately 66,815 acres leased for oil and gas drilling on BLM land in the Planning Area. The locations of these wells are provided in Appendix 3.G. Numbers in this section are from Arizona Strip District files.

Ryder (1983) rated the oil and gas potential of the Planning Area as moderate in the north central and extreme western portions (see Map 3.27). This rating was based on several oil shows reported from wells drilled in the area and the location of the tracts in relation to the Paleozoic hingeline. In the case of the moderate potential in the north-central area, consideration was also given to that area's location in relation to the Virgin oil field in southwest Utah. In both areas, Ryder speculated that any hydrocarbons present would have migrated into the area from the Rocky Mountain Geosyncline lying to the west. Heylmun (1987) rated the Planning Area as having good potential for oil accumulations in northwest-striking, anticlinal folds and other structural traps located away from major fault zones. Good potential was also assigned to the Shnabkaib member of the Moenkopi Formation and the Toroweap Formation where stratigraphic traps may exist. Reynolds and others (1988) recognized the Proterozoic Chuar group as a potential source rock for hydrocarbons in northern Arizona. Thus, it would appear that the many thousands of feet of marine sediment that lie in and immediately adjacent to the Planning Area to the west could provide at least a moderate potential for the origination and possible migration of hydrocarbons into the area. Rauzi (1990) associates oil and gas potential on the Planning Area with Cordilleran shelf deposits and considers the truncated Cambrian and Ordovician units in the

Map 3.27: Oil and Gas Resource Potential

westernmost part of the Planning Area and the common facies changes from carbonate to clastic beds as favorable for stratigraphic and structural accumulations of oil and gas.

Areas identified by Ryder (1983) as having moderate potential for hydrocarbon accumulations are addressed here. Oil and gas accumulations, which probably underlie the Planning Area, occur in structural or stratigraphic traps within rocks of upper Proterozoic through upper Paleozoic ages. The certainty of oil and gas in this area is supported by direct evidence in the form of oil and gas shows in wells. However, evidence does not support or refute the existence of a large enough quantity to be a valuable resource and is assigned a certainty level of C.

Tertiary and Holocene erosion along the major drainages crossing most of the southern and eastern portion of the Planning Area tends to lower the potential for the preservation of hydrocarbon accumulations due to probable groundwater flushing and has been rated as having low potential. However, there is only indirect evidence, indicating a possibility that oil and gas may not exist. The certainty that oil and gas resources do not exist in this area is supported only by indirect evidence and, therefore, has been assigned a certainty level of B.

Geothermal

The Planning Area is moderately favorable for the occurrence of low temperature geothermal resources, particularly along major fault zones. The certainty that these resources exist is supported by only indirect evidence in the form of geologic inference. It has therefore been assigned a certainty level of B.

No geothermal leases have been issued on the Planning Area. Extensive exploration for geothermal resources in the Planning Area has not occurred, though warm water springs and wells occur in the area. These occurrences and springs do not lie in areas of identified anomalous geothermal regions (Giardina and Conley, 1978). Due to the lack of indicated geothermal anomalies in the vicinity of the Planning Area, the warm water occurrences are probably related to the deep circulation of ground water along fault zones. The geothermal resources in these areas are thus expected to be limited in extent and quality. They are very low temperature and not presently usable for purposes other than space heating.

Sodium and Potassium

No solid mineral leases have been issued in the Planning Area. Sodium deposits have been reported from the Muddy Creek Formation near Mesquite, Nevada, and are contained within small isolated playa deposits (Wilson and Roseveare, 1949). Though information of a quantitative nature is lacking, this area has been classified as potentially valuable for sodium. Other than reconnaissance work, no exploration or development activity of the sodium resource is known to have occurred. Based on the reported occurrence of sodium within the Muddy Creek Formation in this area, it has been assigned a moderate potential. The available data

provide direct evidence, but are quantitatively minimal to support the possible existence of a sodium mineral resource. The area has been assigned a certainty level of C.

The geologic history and rock units preserved in the Planning Area are not conducive to the formation and preservation of potassium resources. Therefore, there is low potential for the occurrence of this mineral resource. The available data provide quantitatively minimal direct evidence to support or refute the possible existence of potassium and has been assigned a certainty level of C.

Locatable Minerals

Any valuable minerals that are not salable or leasable, such as gold, silver, copper, tungsten, and uranium, are referred to as locatable minerals. Potentially favorable environments for the occurrence of metallic minerals in the Planning Area include carbonate-hosted gold, placer gold, and breccia pipe-related precious and base metal deposits, possibly containing rare earth elements. Favorable environments also occur for non-metallic industrial minerals such as gypsum. See Map 2.10 and Appendix 2.P for locatable mineral land classification locations.

Metallic Minerals

Twelve mining districts have been established in and around the Planning Area (Wilson et al. 1961; Keith et al. 1983; Doelling and Tooker, 1983; Allison, 1988). Production from these districts began as early as 1901 (Keith et al. 1983). While a variety of precious, base, and fissionable metals, including uranium, were produced, there is presently no production of metallic minerals from the Planning Area. See Map 3.28 for metallic mineral potential in the Planning Area.

Gold

There is a moderate potential for carbonate-hosted gold occurring in the Virgin Mountains. Any gold mineralization present would be of the bulk-tonnage, low-grade type described by Berger (1986) and Fisher and Juilland (1986). Mineralization would be associated with normal, thrust, and possibly detachment faults in the area. Small deposits and anomalies of tungsten, copper, silver, arsenic, molybdenum, lead, and zinc have been identified in the area (Villalobos and Ham, 1981). These elements were identified by Berger (1986) as being either pathfinder - elements or elements occurring in small deposits near gold mineralization. Due to the indirect evidence available, the level of certainty that deposits of this nature exist has been assigned Level B.

Placer gold deposits reportedly occur along the lower western slope of the Beaver Dam and Virgin Mountains. Based on the geologic environment, the inferred geologic processes, and reported occurrence of gold, the alluvial material along the Virgin River and Beaver Dam Wash show a moderate potential for the occurrence of gold. Available data provide direct evidence,

Map 3.28: Metallic Mineral Resource Potential

but are quantitatively minimal, to support the existence of a mineral resource of this type in this area and has therefore been assigned a certainty level of C.

Exploration and testing of gold mineralization in the Navajo Sandstone has occurred on the extreme western portion of the Paria Plateau. The gold is reportedly of the low grade/bulk tonnage type. The reported mineralization is of unknown origin.

Other Metals

Breccia pipe deposits containing precious and base metals occur along the lower Grand Wash Cliffs and eastern slope of the Virgin Mountains. These deposits reportedly contain copper (up to 23 percent), silver (up to 10 ounces per ton), and relatively minor amounts of lead, zinc, uranium, and gold (Keith et al. 1983). The rare metallic elements of germanium and gallium occur in the Apex deposit in Utah (Bernstein 1986). These two elements reportedly occur in breccia pipes along the Lower Grand Clash Cliffs (Winston 1988). Based on known deposits of this nature, the Lower Grand Wash Cliffs area and eastern slope of the Virgin Mountains have been rated as having a high potential for the occurrence of breccia pipe related metallic mineral resources. The level of certainty that these deposits exist is supported by abundant direct and indirect evidence and assigned a certainty level of D.

Uranium

Favorable environments for the occurrence of uranium minerals within the Planning Area include breccia pipe related uranium deposits and sandstone type uranium deposits. Breccia pipes originate in fractured Redwall Limestone and form collapse features in overlying rocks as recently formed as the Chinle Formation. Uranium mineralization occurs in the Supai through Toroweap formations (Krewedl and Carisey, 1986). Exploration and development operations for uranium deposits were very active in the Planning Area during the 1980s up through the mid-1990s. These activities resulted in the discovery of 18 uranium deposits and the construction of six uranium mines (Hack Canyon, Hermit, Pigeon, Arizona 1, Pinenut, and Kanab North mines). The mines were developed in breccia pipes found near Kanab Creek and its tributaries. The total production from these mines was 9,600 tons of uranium oxide (U_3O_8) and the proven reserves in the remaining deposits are estimated at 12,250 tones of U_3O_8 (Smith, R., personal communication, April 2002). Most of the developed deposits contained copper and silver, in addition to uranium. In the 1980s, the price of uranium fell dramatically, negatively affecting the economics of uranium mining. Currently three of the mines (Arizona 1, Pinenut, and Kanab North mines) are undergoing care and maintenance and are in stand-by mode. The other three mines have been closed and reclaimed. Generally, the reclaimed mines have responded very well to reclamation efforts. Through 1990, when production was suspended, uranium output from the Planning Area has totaled 23.3 million pounds of U_3O_8 with an average grade of about 0.60 percent U_3O_8 (McMurray 2003).

Sandstone-type uranium deposits occur in the Petrified Forest and Shinarump members of the Chinle Formation. These deposits typically occur in medium to coarse-grained sandstones and conglomerates deposited along ancient stream channels. Uranium mineralization is associated with carbonaceous material contained within the sandstone and conglomerates. Uranium was produced from sandstone type deposits in the 1950s (Keith et al. 1983; Scarborough 1981; Baillieu and Zollinger 1980). Approximately 1,524 tons of uranium ore averaging 0.201 percent U_3O_8 was produced from the Vermilion Cliffs deposits between 1954 and 1957 (Scarborough 1981). These deposits are located within Vermilion. Uranium was produced from similar deposits in the Rainbow Hills mining district though no production figures are available. In general, sandstone-type deposits are presently not economic to develop, being of too low a grade and discontinuous nature

Uranium occurrences are also known from the Virgin Mountains and Littlefield areas. In the Virgin Mountains, these occurrences are probably associated with epithermal mineralization along faults. In the Littlefield area, the uranium probably occurs in playa deposits of the Muddy Creek Formation.

Based on the geologic environment, known deposits and mines in these areas there is a high potential for the occurrence of uranium resources (see Map 3.29). The level of certainty that these deposits exist is supported by abundant direct and indirect evidence and has been assigned a certainty level of D.

Non-metallic, Industrial Minerals

Non-metallic industrial minerals in the Planning Area include gypsum, halite, mica, and kaolinite (McCrory and O'Hare 1965; Phillips 1988). These minerals are located primarily in the western half of the Planning Area. Gypsum is widespread in the area and occurs in the Pakoon Dolomite, the Harrisburg Member of the Kaibab Formation, and the Moenkopi Formation. The gypsum resource has been developed on a limited basis in the Cedar Pockets and a large deposit with many years of proven reserves is being mined in Black Rock Canyon areas. Mica occurs in the older Precambrian gneisses exposed on the west slope of the Virgin Mountains. Mineralized areas are small, discontinuous and of no economic significance. Kaolinite has been reported in a breccia pipe on the lower Grand Wash Cliffs. See Map 3.30 for non-metallic mineral resource potential within the Planning Area.

Gypsum

In the Planning Area, potentially favorable environments for the occurrence of gypsum include sabkha environments associated with marine regressions in rocks of Permian and Triassic age. Large gypsum deposits occur in the northwestern portion of the Planning Area. These deposits occur in the upper portion of the Pakoon Dolomite (Hintze 1986), the Harrisburg Member of the Kaibab Formation (Nielson 1986; Cheevers and Rawson 1979), and the Lower Red Member of the Moenkopi Formation (Hintze 1986; Nielson 1986; Moore 1972).

Map 3.29: Uranium Resource Potential

Map 3.30: Non-Metallic Mineral Resource Potential

Gypsum occurring in the Pakoon Dolomite, known as the Cedar Pocket deposit, has been assayed by the U.S. Bureau of Mines and the BLM, it was found to be of good quality, being relatively pure and free of acid insoluble residue and suitable for cement, agricultural, filler, wallboard, and food and pharmaceutical markets. This deposit has been mined intermittently; however, the mine is presently inactive.

Near Black Rock Gulch, gypsum occurrences are wide spread and several mines have been developed in the Harrisburg member of the Kaibab Formation. Commercial production has been established at three mines Snowflake, Gypsum City, and Domtar Ridge near Black Rock Gulch. Initial production during mine start-up in 1990 was approximately 7,000 tons of gypsum. The annual production in 2001 was approximately 700,000 tons of gypsum, while the total production from these mines is approximately 5 million tons of gypsum (Cercala, D., personal communication, May 2002). The Snowflake and Gypsum City operations were mined out and have been reclaimed. The initial reserve estimate for the Domtar Ridge Mine was approximately 93 million tons and inferred resources may be as high as 5 billion tons (Cercala, D., personal communication, 1997). The principal uses for this commodity include manufacturing wallboard and Portland cement. Other uses include agricultural, pharmaceutical, feed grade, food processing and mineral additives. The predicted trend is an increase in production in both the near future and the long term.

Based on the known occurrence of gypsum in these formations and the developed mines, areas where the Toroweap, Kaibab, and Moenkopi formations are exposed have been assigned a high potential for the occurrence of gypsum. The gypsum deposit in the Pakoon Dolomite appears to be an isolated occurrence in the Cedar Pockets area and, as such, the Pakoon Dolomite in the Cedar Pockets area has high potential for the occurrence of gypsum. The level of certainty that these deposits exist is supported by abundant direct and indirect evidence and has been assigned a certainty level of D.

Salable Minerals (Mineral Materials)

Common varieties of sand, stone, gravel, pumicite, and clay that may be acquired under the Materials Act of 1947 are considered salable minerals or mineral materials. See Map 3.31 for salable mineral resource potential within the Planning Area.

Common variety minerals are important in construction and to collectors. These minerals include sand, gravel, cinders, building stone, petrified wood, etc. These commodities occur in various locales throughout the Planning Area. Development of construction materials depends largely upon the location of construction projects or population centers. Petrified wood is generally collected as a hobby or sold as specimens by commercial enterprises. Potentially favorable environments for the occurrence of common variety minerals include Permian through Quaternary sedimentary and volcanic rocks.

Map 3.31: Salable Mineral Resource Potential

Authorized mineral material disposal areas are shown in Appendix 2.Q. Mineral material disposal sites in the table include community pits, common use areas, negotiated sales, and free use permits. In all of the cases, materials were used in connection with the expansion of local communities. Decorative boulders were purchased for use in landscaping at Zion National Park, Utah and by commercial operators for use in nearby communities. Limestone blocks were used to construct the Navajo Bridge Information Center near Lees Ferry. Flagstone is sold for construction projects in the St. George area and outlying communities.

Sand and Gravel

In the western portion of the Planning Area, gravel is abundant along the lower portions of the western slopes of the Virgin and Beaver Dam Mountains. Alluvial fans have formed in this area and the gravel is expected to be unsorted but of good quality.

Gravel also occurs along the Beaver Dam Wash and the Virgin River. Well-sorted good quality gravel is expected in the stream channels and along stream terraces that have formed along both sides of the channels. Based on the surface exposures of gravel in these environments, these areas are assigned a high favorability for the occurrence of gravel with a certainty level of D.

Sand and gravel resources in significant accumulations are relatively scarce in the central portion of the Planning Area. Large deposits are confined to isolated exposures of gravel in the lower portions of the Moenkopi Formation. Both Cedar Knoll and Little Cedar Knoll are examples of this type of deposit. These deposits, though few, contain substantial quantities of good quality gravel. The remainder of the central portion of the Planning Area is relatively gravel-poor. Good quality gravel is confined to exposures of the Shinarump Member of the Chinle Formation, Quaternary aged ephemeral stream channels cut into the Kaibab Formation, and Quaternary aged alluvial fan deposits formed along the western slope of the Hurricane Cliffs. Examples of deposits developed in these environments include the Yellowstone Mesa community pit in the Shinarump Member and a stream channel deposit west of Hack Reservoir. Gravel deposits within the Shinarump Member may be cemented and drilling, blasting, or ripping may be required to develop the gravel resources in some areas. Gravel that occurs in Quaternary stream channel deposit would probably be confined to a relatively narrow zone, averaging approximately 75 feet in width. Gravel from alluvial fans on the western slope of the Hurricane Cliffs provides a significant source of gravel just north of the Planning Area in Utah. This same environment could contain significant gravel resources in Arizona. Based on the known occurrence of gravel in these environments, these areas have been assigned a high potential for the occurrence of this resource. The certainty that gravel exists in these areas is high and it has been assigned a level of D.

In the extreme eastern portion of the Planning Area, gravel is relatively scarce. In the House Rock Valley area, the Shinarump Member of the Chinle may contain good quality gravel in large quantities. However, accessible exposures of this unit are rare and gravel from this unit should not be counted on as a long-term source. Recent gravel deposits of large quantity and relatively

good quality have formed at the bottom of the western slope of the Kaibab monocline. Gravel in these deposits is expected to be poorly sorted with sizes ranging from boulder to sand. In addition to these two types of deposits, potential also exists for stream channel gravels to occur on exposures of the Kaibab Formation. Deposits of this nature would be similar to those in the central portion of the Planning Area, as described above. Based on the physical exposures of gravel from these environments in the House Rock Valley area, these areas have been assigned a high potential for the occurrence of gravel with a certainty level of D.

Building Stone

Building stone occurs throughout the Planning Area and community pits for flagstone are established in the Moenkopi Formation. The existing sites established for this use is expected to meet local demand. Due to the widespread occurrence of this commodity, no attempt has been made to classify areas of high potential.

Cinders

Cinders are known to occur in the immediate vicinity of some of the volcanic centers on the Shivwits and Uinkaret plateaus. Only those deposits identified as authorized mineral material disposal areas have been designated as high potential and assigned a certainty level of D.

Parashant Minerals

Upon designation, Parashant lands were withdrawn from location, entry, and patent under the mining laws, subject to valid existing rights. There are no active mining claims in Parashant. However, non-federal mineral estate exists in the Monument and is not subject to the decisions in this Proposed Plan/FEIS (See Lands and Realty section in this chapter).

Locatable mineral production in Parashant has come exclusively from breccia pipe-type deposits. Copper mining dates back to the late 1800s and uranium was first recognized in association with copper mineralization in the 1940s. The Copper Mountain Mine, a mineralized breccia pipe, operated from 1913 to 1974 and produced 634,000 lbs. of copper, 6,000 lbs. of lead, 17,000 lbs. of zinc, 200 ounces of gold, and 7,000 ounces of silver (Keith and others, 1983).

Breccia pipe related precious and base metal deposits also occur in the Lower Grand Wash Cliffs area on the west side of Parashant. The Grand Gulch Mine operated between 1901 and 1966 and produced 18,000 tons of copper, lead, zinc, and silver. The deposit reportedly contained copper (up to 23 percent of the deposit), silver (up to 10 ounces per ton), and relatively minor amounts of lead, zinc, uranium, gold, gallium, and germanium (Keith and others, 1983). Other, less prolific, mines in this area include the Savanic, Cunningham, and Hidden Canyon. Production from these mines/prospects included copper and silver, however, very little is known about the history of these mines.

The Monument was extensively explored during the 1970s and 1980s, after two new uranium ore bodies were discovered at Hack Canyon. Exploration often included examination of low altitude, 1:24,000 scale, color aerial photographs for the following features: (1) concentrically inward-dipping beds that generally surround a basin; (2) amphitheater-style erosion along cliff faces; (3) concentric drainage, soil, and vegetation patterns; (4) breccia; and (5) altered and mineralized rock (Wenrich 1988). Fieldwork included geological mapping and drilling to confirm the presence of these features.

Vermilion Minerals

Upon designation, Vermilion lands were withdrawn from location, entry, and patent under the mining laws, subject to valid existing rights. No active mining claims currently exist in the Monument. However, non-federal mineral estate exists in the Monument and is not subject to the decisions in this Proposed Plan/FEIS (See Lands and Realty section in this chapter).

Exploration and testing of gold mineralization in the Navajo Sandstone has occurred on the extreme western portion of the Paria Plateau in Vermilion. The gold is reportedly very low in grade and not economic to mine. The mineralization is of unknown origin.

The only mineral production known to occur in the Monument is uranium. Approximately 1,524 tons of uranium ore was produced from Vermilion Cliffs deposits between 1954 and 1957 (Scarborough 1981).

Arizona Strip FO Minerals

There are reports that uranium was first discovered in the 1940s associated with copper in the Hack Canyon Mine, a breccia pipe copper mine with production dating back to the early 1850s (McMurray 2003). Though a minor amount of ore was shipped from the Hack Canyon Mine in the early 1950s, it was not until Western Nuclear leased the mine in 1974 and subsequently discovered two additional breccia pipe ore bodies, Hack II and Hack III, when exploration emphasis began to be focused on uranium-bearing breccia pipes. Energy Fuels Nuclear acquired the Hack Canyon complex of ore bodies in 1980, and the first shipment of ore from this complex was made that same year. Energy Fuels Nuclear conducted extensive uranium exploration on the Arizona Strip and eventually put another five, breccia pipe related uranium mines into production. Through 1990, when mining for uranium on the Arizona Strip ceased, production totaled 1.472 million tons of ore (McMurray 2003). Of these eight deposits, five were mined out and have been reclaimed (Hack Mines I, II and III, Pigeon Mine, and Hermit Mine). The other three (Kanab North, Arizona 1, and Pinenut mines) are presently shut down. Uranium mining ceased in 1990 after the price fell to less than $10 per pound.

Large gypsum deposits have been identified in the northwestern portion of the Arizona Strip, near Black Rock Gulch. These deposits occur in the upper portion of the Pakoon Dolomite (Hintze 1986), the Harrisburg Member of the Kaibab Formation, and the Lower Red Member of

the Moenkopi Formation (Hintze 1986; Nielson 1986; Moore 1972). Near Black Rock Gulch, gypsum occurrences are widespread and commercial production has been established. Western Mining and Minerals is currently producing gypsum from the Harrisburg member of the Kaibab Formation. Initial production during mine start-up in 1990 was approximately 7,000 tons of gypsum. The annual production in 2001 was approximately 700,000 tons of gypsum, while the total production from these mines has reached approximately 5 million tons (Cercala, D., personal communication, 2002). The principal uses for this commodity include manufacturing wallboard and Portland cement. Other uses include agricultural, pharmaceutical, feed grade, food processing, and mineral additives.

RECREATION AND VISITOR SERVICES/INTERPRETATION AND ENVIRONMENTAL EDUCATION

Overview

Recreation-Tourism Service Delivery System

Area Bounds

Local communities within and adjacent to the Planning Area such as Littlefield, Scenic, Beaver Dam, Arizona; Mesquite, Nevada; St. George, Hurricane, Washington, Santa Clara, Hildale, and Kanab, Utah; and Colorado City, Fredonia, and Page, Arizona all contribute to producing recreation-tourism opportunities for local, regional, national and international visitors and residents.

Recreation-Tourism Providers

Producing recreation and tourism opportunities within the Planning Area involves more than just programs and activities provided on public lands by the BLM and NPS. The USFS, local and surrounding counties (i.e., Mohave and Coconino in Arizona and Washington and Kane in Utah,) and American Indian groups (the Paiute Tribe and Navajo Nation) also contribute to producing recreation and tourism opportunities, primarily through the management of entry to and through recreation areas or “landscapes.” State governments in Arizona and Utah also play important roles in various facets of recreation delivery in the Planning Area, including the management of game and fish and recreation activities on state trust lands, creation and funding of grant programs that enhance OHV and non-motorized recreation opportunities, and providing state law concerning vehicle-related licensing.

Non-government recreation providers also play an important role in producing recreation and tourism opportunities. Many local and regional businesses provide for a variety of direct recreation opportunities on public and state lands that enable customers to realize specific recreation experiences via numerous commercial and competitive activities or events. Many other businesses also contribute indirectly or “off-site” to producing recreation opportunities,

such as local bike shops, OHV dealerships, outdoor equipment retailers, hotels, and restaurants. Taken all together, producing recreation and tourism opportunities in the Planning Area are influenced, guided, constrained, and managed by many providers.

Resource Attractions

Much of the Planning Area and the surrounding region can be enjoyed by driving for pleasure, flying, or vehicle exploring in mostly natural, quiet settings under night skies that are only slightly affected by indirect sources of outdoor artificial light emissions. (See Map 3.32 for recreation and historic trails, fee areas, recreation sites, etc.) Ponderosa and pinyon pine forests, basalt-capped mesas, colorful sandstone and limestone cliffs, deep slot canyons, and Mojave Desert bajadas and basins are some of the popular settings that attract visitors. Interstate 15, U.S. Highway 89A, State Route 389, and old U.S. Highway 91 are major tourist routes into the northern part of the Planning Area and provide the only paved roads to the entire region. A number of backcountry airstrips also provide recreation aviators access to a variety of attraction sites across the south-central portion of the Planning Area.

The Planning Area also attracts visitors interested in wildlife hunting and viewing opportunities. The region has long been known for its trophy-size mule deer, as well as populations of pronghorn antelope, coyotes, Kaibab squirrel, quail, dove, rabbits, waterfowl, and the seldom seen mountain lion. Bighorn sheep are also seen in portions of the Planning Area.

In contrast, many of the public lands in the region are near to and thus readily accessible from six different communities, making community interface lands extremely important for day-use recreation and organized group activities.

The majority of lands in the Planning Area are essentially a transition between the two extremes of urban and wilderness settings. These transitional lands offer a moderate to high degree of challenge and risk for visitors seeking outdoor adventures of many sorts. Due to the ample supply of unpaved roads, primitive roads, trails, and a handful of backcountry airstrips, opportunities for the public to enjoy a wide variety of motorized, mechanized, and non-motorized recreation activities are very good. These lands contain a mix of trailheads (ranging from well developed with facilities to backcountry airstrips), information/safety signs, and rudimentary recreation facilities that provide modest, setting-appropriate convenience for visitors. The near-urban public lands tend to be subjected to the greatest variety of simultaneous visitor use in the most confined space. While challenge and risk are typically not as important as in more remote settings, these lands can be important for competitive and challenge events.

Many of the primary routes provide de facto “backcountry byway” opportunities, as no official backcountry byway designations exist.

Map 3.32: Recreation

Existing Conditions

Recreation Activities

The Planning Area provides a wide array of recreation opportunities, ranging from competitive events, to vehicle exploring and sightseeing, to backcountry aviation, to backpacking. Probably the most popular activities in the region involve some form of OHV driving for pleasure. Exploring or sightseeing constitutes the activity of choice for many visitors and can involve various modes of transportation, such as sports-utility vehicle, equestrian, small aircraft, walking, OHV, hiking, motorcycle, bicycle, sedan, or motor home. The fact that "transportation/access" was the issue that received the most public input during the public scoping for this Plan attests to the popularity of exploring.

Wildlife viewing and hunting, for both big and small game, are two other popular recreational activities in the Planning Area. The AGFD has a responsibility to manage wildlife resources in the state of Arizona, including regulation of hunting, fishing, and trapping activities, where not prohibited by law.

Other popular activities include visiting cultural sites, bird watching, viewing wildflowers, camping, hiking, backpacking, climbing, and seasonal whitewater boating. Flying radio-controlled aircraft, rock crawling, parasailing, and geocaching are also growing in popularity.

Recreation Setting Conditions

Critical to producing recreation opportunities is the condition of recreation settings on which those opportunities depend. These settings conditions can range along a continuum from primitive to urban and can be classified and mapped, based on the variation that exists among the various physical, social, and administrative attributes of any landscape. The physical setting describes variations in components such as remoteness, naturalness, and facilities. The social setting reflects the variations in components such as group size, number and types of contacts and encounters between individuals or groups and the evidence of use by others. The administrative setting can reflect variations in the kind and extent of components such as visitor services, management controls, user fees, and mechanized use.

Using the Recreation Opportunity Spectrum (ROS) as a basis for classifying existing recreation setting character conditions, the Planning Area contains combinations of five out of the six recreation environments described in the ROS table in Appendix 3.H. They range from areas that are primitive, have low-use, and involves inconspicuous administration, to rural areas near communities with higher-use and highly visible administrative presence. The wide variety of moderately regulated recreation settings in the Planning Area greatly enhances the quality of recreation experience and benefit outcomes for most visitors.

Recreation Management – Resources, Signing, Recreation Facilities

A network of unpaved roads, primitive roads, trails, and a number of backcountry airstrips provide entry to the central and southern parts of the region. Many of these provide the only motorized and/or mechanized entry to some of the more remote areas of Grand Canyon National Park and Lake Mead and Glen Canyon NRAs. Most primary county and BLM roads are marked at most intersections and directional signing provides direction and mileage to primary destinations. Several of the backcountry airstrips are depicted on aeronautical charts, but few are marked or signed on the ground.

The Virgin River Campground and Stateline Campground are the only developed campgrounds in the Planning Area. At-large camping occurs throughout the Planning Area at many existing primitive or undeveloped sites along existing routes, spur routes, and at backcountry airstrips. Several areas provide tables for visitors for picnicking and camping.

Recreation Marketing – Visitor Services, Information, Interpretation, and Environmental Education

Interpretation and education opportunities in the Planning Area have not been extensively developed. Only a handful of small interpretive sites and a variety of single interpretive signs are scattered throughout the Planning Area. Currently, visitors receive information on opportunities in the Planning Area, as well as on safety concerns, from both off-site and on-site sources. Off-site sources include assorted resource brochures distributed throughout the area, maps, programs given by resource specialists or local historians, teacher information packets, field trips, fact sheets, BLM and NPS web sites, and souvenirs such as posters, pins, and T-shirts. On-site information is obtained from directional signs, road markers, ranger patrols, and interpretive signs.

An integral part of the BLM's recreation outreach is the Interagency Visitor Information Center in St. George, Utah operated by the Arizona Strip Interpretive Association (ASIA), which provides interpretation, education, and information to visitors interested in route conditions, the recreation opportunities available in the region, and current events. ASIA also provides information on the Planning Area at six additional visitor centers: Fredonia Welcome Center, Arizona; Kane County Visitor Center, Kanab BLM, and Grand Staircase-Escalante National Monument Visitor Center in Kanab, Utah; the Paria Contact Station between Kanab, Utah and Page, Arizona; and the Pine Valley Heritage Center in Pine Valley, Utah.

The continual increase of residents to Washington County, Utah, especially retired winter residents, and their acute interest in interpretive programs, is expected to place additional demands on BLM, NPS, and ASIA for interpretive spaces and media, both at the information center and in the field.

Recreation Monitoring - Visitation

Due to the remote nature of much of the area and the dispersed nature of most recreation activities in which visitors engage, it is difficult to obtain actual numbers of most visits to the Planning Area. For example, no reliable visitor data exists for river running or backcountry aviation activities, though these activities are known to take place. Currently, the estimates for BLM visitor use are based on data collected from various traffic counters, registration sheets, and professional assumptions based on field patrol experience. The visitation figures in Table 3.27 were primarily obtained from those reported in the Recreation Management Information System (RMIS), which is the BLM's database of historic recreation visitation statistics. NPS visitation data is derived primarily from traffic counters located at numerous locations at or near the NPS boundary within the Monument. Traffic counter installations were completed in 2004 so data is sparse and inconclusive. Additionally, visitor registration boxes have been installed at various destination locations to obtain information to help determine needs and trends as well as visitation data. In addition, visitor use data from the remaining portion of Lake Mead NRA, Grand Canyon National Park, and Zion National Park contribute to the overall validity of visitor statistics for the region.

Table 3.27: Recreation Visits

Year	Arizona Strip FO	Parashant		Vermilion
		BLM	NPS	
1999	114,252	13,093	---	39,704
2000	120,150	12,058	---	39,702
2001	125,472	12,949	---	41,884
2002	118,745	14,280	---	39,934
2003	112,475	25,298	8,880	45,329
2004	112,846	44,233	9,180	39,093

The Interagency Visitor Information Center has recorded visitation over the past six years (see Table 3.28).

Table 3.28: Interagency Visitor Center Visitation (ASIA)

Year	Number of Visits
1998 N	ot Recorded
1999 9	3,048
2000 8	7,926
2001 9	6,062
2002	100,387
2003 8	4,384
2004 8	5,875

In the past five years, Lake Mead NRA, Grand Canyon National Park, and Zion National Park have recorded a slight, but steady increase in visitation. While visitor use for many years has had its peak-use periods during the spring and fall months, improved navigation technologies, outdoor gear, transportation modes and promotion of attraction sites have contributed to visitation increases in what were "shoulder" or "off-season" periods.

Within the Planning Area, the trends are similar, but for very localized reasons. For example, winter use in the St. George Basin involves all but true winter sports activities, as the mild winter climate provides excellent opportunities for non-snow-related motorized and non-motorized activities while most of the remaining region to the north and east lie under snow. Another example of changing seasons of use is the Coyote Buttes area. International notoriety, huge demand, a truly unique scenic resource, and visitor use limits have pushed visitor use into summer and winter months previously thought to be intolerable due to temperatures and route conditions.

With the continuing demographic shift of population to the Southwest, the increasing popularity of National Monuments, and the growing interest in "adventure tourism," the demand for recreation opportunities in key areas across the Planning Area is expected to increase during the life of the Plan. Still another trend is the continued shortening of recreation visit duration. Visitors are investing less time in their visits, pointing, in part, to a potential increase in demand for all manner of recreation opportunities closer to communities. Given such a trend, identifying and maintaining appropriate recreation settings in near-urban areas will be more important.

Recreation Administration – Visitor Limits and Regulations; Permits and Fees

Many existing regulations govern visitor use on both public lands and within NPS units. The primary sources of standard regulations related to visitor use are found at 43 CFR 8300 for BLM lands and 36 CFR 2 for NPS units. Other supplemental rules applicable to a specific management unit may be developed under the regulations cited above.

Permits are typically issued for specific uses of public lands and related waters. They are issued as a means to mitigate or eliminate potential resource impacts, control visitor use, provide recreational resources, or as a mechanism to accommodate commercial services that assist the public in realizing recreation experience opportunities offered by the public lands. The agencies manage a wide variety of permit types within the Planning Area (see Table 3.29). Permits are typically required from any agency that manages the land where the use will take place, requiring some users to obtain permits from more than one agency.

Table 3.29: Number of Active Permits by Use Type (9/1/2002)

Type of Permits	Arizona Strip FO	Parashant		Vermilion
		BLM Lands	NPS Lands	
Backpacking (Overnight) (SRP)	2	1	0	0
Environmental Education	0	2	0	0
Guided Big Game Hunts (SRP)	7	18	2	0
Hiking/Walking (Day) (SRP)	1	1	0	3
Horseback Riding (SRP)	1	1	0	0
Scenic Route Tours (SRP)	1	0	0	1
Viewing Cultural Sites (SRP)	0	0	0	1
Competitive Motor Events (SRP)	1	0	0	0
OHV Tours (SRP)	0	2	1	2
Row/Float/Raft (SRP)	0	0	0	0
Virgin River Canyon Recreation Use Permits	2,695	0	0	0
Non-Commercial, Special Area (SRP)	0	0	0	5,448
Source: RMiS and Office Files				

Parashant Recreation and Visitor Services/Interpretation and Environmental Education

Recreation-Tourism Service Delivery System

Area Bounds

Local communities such as Littlefield, Scenic, Beaver Dam, Arizona; Mesquite Nevada; St. George, Hurricane, Washington, Santa Clara, Hildale, and Kanab, Utah; and Colorado City and Fredonia, Arizona, all contribute to the delivery of recreation-tourism opportunities to local, regional, national, and international visitors and residents.

Recreation-Tourism Providers

See discussion above, in the Overview section.

Resource Attractions

The Mt. Trumbull area is currently identified as a Watchable Wildlife area. Much of the Monument is contiguous to the western portion of the Grand Canyon and offers excellent scenic vistas of the canyon. Specific attraction sites include Whitmore Canyon, Mt. Trumbull, Shivwits Plateau, Twin Point, Kelly Point, and part of Black Rock Mountain.

Trails of several types lie within Parashant, such as remnants of the Temple Historic Trail as well as recreation trails at Mt. Trumbull and Grand Bench. A number of backcountry airstrips provide recreation aviators access to a variety of attraction sites across the Parashant. The

overwhelming majority of Parashant, however, is without formally constructed trails for foot, horse, bike, or motorcycle. Therefore, exploration of the routeless areas of Parashant via off-route foot or horse travel, or backcountry aviation requires exceptional navigation and outdoor skills.

Four statutory wilderness areas, NPS-proposed wilderness, and various lands with wilderness characteristics within Parashant offer some of the best backcountry opportunities to enjoy recreation activities in the most primitive, challenging settings. The fact that many of these areas typically include incredible scenic beauty and diverse landscape settings increases their recreational quality.

Existing Conditions

Recreation Activities

The Monument's remote, open, sparsely developed area and engaging scenery provides a wide array of dispersed recreation opportunities for moderately regulated recreation. Exploration, driving for pleasure, hiking, backpacking, camping, picnicking, big and small game hunting, and wildlife observation are the most common activity types. Motorized or mechanized vehicle, small aircraft, walking, or equestrian are typical modes of travel.

Recreation Setting Conditions

Current recreation setting conditions for Parashant range from Primitive to Roaded Natural (see Appendix 3.H, ROS Settings). No Rural or Urban settings are present in the Monument. (See Map 3.32, depicting key attraction sites, trails, Special Recreation Management Areas (SRMAs), and wilderness.)

Recreation Management – Resources, Signing, Recreation Facilities

The Monument has 758 miles of maintained roads out of a total of 1,809 miles. Many are primitive roads, can be rough, and are rutted much of the year. Most of these primitive roads provide outstanding opportunities for 4WD and ATV exploring. This system of roads, primitive roads, trails, and a number of backcountry airstrips provide a variety of rustic recreation opportunities to travel to destination attractions, or just enjoy the variety of recreation activities mentioned above.

Camping occurs at many existing primitive or undeveloped sites along existing routes, spur routes, and at backcountry airstrips. In the ponderosa pine groves near Dellenbaugh, several tables are available to visitors for picnicking and camping. Otherwise, no developed campgrounds exist within Parashant.

Recreation Marketing – Visitor Services, Information, Interpretation, and Environmental Education

There are a few small interpretive sites, such as at the Sawmill Site, and a few single interpretive signs, such as in the forest restoration area, in Parashant.

Recreation Monitoring - Visitation

Due to the dramatic changes of ecosystem types and elevations throughout the Monument, its types and seasons of use are cyclic and change throughout the year. In 2003, an estimated 25,300 recreational users visited the BLM portion of Parashant. A Social Indicators Survey completed on Parashant (Northern Arizona University 2003) provides a descriptive analysis of a population of recreation users, non-recreational users, and surrounding community members. Most returned surveys came from Arizona (40 percent), Utah (39 percent), and Nevada (8 percent). A majority of the visitors to Parashant were male (68 percent), age 35-59 (57 percent), with a total annual household income of $20,000-<$50,000 (27 percent). Eighty-four percent of the respondents participate in outdoor recreation activities with their spouse/partner (31 percent), family (29 percent), or friends (24 percent). Ninety-four percent have no special needs to be accommodated by land mangers when participating in outdoor recreation activities. Ninety-one percent have some form of college education and 69 percent have some type of college degree.

Seventy-six percent of the respondents to the mail back survey have visited Parashant. The most visited area is the Mt. Trumbull region (Survey Area E; 57 percent), followed by the Shivwits Plateau, (Survey Area C; 55 percent), Whitmore Canyon area, (Survey Area D; 50 percent), the lower Paiute Wilderness area (Survey Area A; 45 percent), and the Pakoon Basin (Survey Area B; 44 percent). In the last two years, most visitors to Parashant have visited these areas one to five times. No reliable visitor data exists for backcountry aviation activities, though these activities are known to take place.

Recreation Administration – Visitor Limits and Regulations; Permits and Fees

Even though the intent of management is to administer BLM and NPS lands within Parashant as seamlessly as possible, differences in basic mission mandates are evident in rules and regulations, recreation management, and visitor statistics reporting. The primary sources of standard regulations related to visitor use are found at 43 CFR 8300 for BLM lands and 36 CFR 2 for NPS units. Other supplemental rules applicable to a specific management unit may be developed under the regulations cited above.

Permits or fees are currently not required for public recreation use in Parashant. However, commercial recreation operators are required to obtain and pay for permits. Applicable rules and regulations for such permits are significantly different between NPS and BLM.

Vermilion Recreation and Visitor Services/Interpretation and Environmental Education

Recreation-Tourism Service Delivery System

Area Bounds

Local communities such as Kanab, Utah and Fredonia and Page, Arizona contribute to the delivery of recreation-tourism opportunities to local, regional, national, and international visitors and residents.

Recreation-Tourism Providers

See discussion above, in the Overview section.

Resource Attractions

The Paria Canyon, Coyote Buttes, and Vermilion Cliffs offer excellent hiking, backpacking, and photography opportunities, while the network of primitive roads on the Paria Plateau offers a variety of opportunities for vehicle exploring and driving for pleasure. The area is contiguous to a portion of the Glen Canyon NRA and much of the upland areas of the Monument offer excellent scenic vistas of Lake Powell, the Echo Cliffs, Marble Canyon, the Kaibab Plateau, and House Rock Valley. Visitors typically enjoy the Monument spring through fall, although winter use has increased, especially in the Coyote Buttes area, due to greater demand for use in the area.

One statutory wilderness area and various lands with wilderness characteristics within Vermilion offer some of the best backcountry opportunities to enjoy recreation activities in the most primitive, challenging settings. The fact that many of these areas typically include incredible scenic beauty, diverse landscape settings, and are readily accessible by the network of primitive road increases their recreational quality.

Remnants of historic trails such as the Honeymoon Trail and the Dominguez-Escalante Route lie within Vermilion.

Existing Conditions

Recreation Activities

The Monument's rugged, open, sparsely developed area and engaging scenery provides a wide array of dispersed recreation opportunities for moderately regulated recreation. Backcountry exploration, driving for pleasure, recreation aviation, hiking, backpacking, camping, picnicking, big and small game hunting, and wildlife observation are the most common activity types. Motorized or mechanized vehicle, small aircraft, walking, or equestrian are typical modes of travel.

Recreation Setting Conditions

Current recreation setting conditions for Vermilion range from Primitive to Roaded Natural (see Appendix 3.H, ROS Settings). No Rural or Urban settings are present in the Monument. (See Map 3.32, depicting, key attraction sites, trails, SRMAs, and wilderness.)

Recreation Management – Resources, Signing, Recreation Facilities

The Monument has only 117 miles of maintained roads, out of a total of 564 miles of existing roads. Most are primitive roads and very sandy. This system of primitive roads provides outstanding opportunities for 4WD and ATV exploring and driving opportunities to key destinations and features.

No formally constructed trails for foot, horse, bike, or motorcycle are present. However, getting into areas such as Paria Canyon, Sand Hill Crack, and Sun Valley Mine require hiking along canyon-bottom or abandoned roads. Due to this, exploration of the backcountry areas of Vermilion require excellent navigational, outdoor and, in many places, canyoneering skills.

No developed campgrounds and no backcountry airstrips exist in Vermilion. At-large camping occurs at many existing primitive or undeveloped sites along existing routes and spur routes.

Recreation Marketing – Visitor Services, Information, Interpretation, and Environmental Education

Various small interpretive sites, such as Dominguez-Escalante (with picnic tables) and the Condor Viewing Site, and a small number of single interpretive signs are scattered throughout the area, such as along the Honeymoon Trail.

Recreation Monitoring - Visitation

In 2004, an estimated 39,093 recreational users visited Vermilion. This number would be much higher were it not for the current visitor use limits in the Paria Canyon / Coyote Buttes Special Management Area. Current visitor use limits are 20 persons per day (cumulative from all access points), in each of the three sections of the Special Management Area: Paria Canyon, Coyote Buttes North, and Coyote Buttes South, or an total daily limit of 60. Within the visitor use limits, group sizes are also in place. Maximum group size in Paria Canyon is 10, and in Coyote Buttes North and South the limit is six. Dogs are allowed in all areas, but are subject to applicable fees (see next section).

Recreation Administration – Visitor Limits and Regulations; Permits and Fees

The primary source of standard regulations related to visitor use is found at 43 CFR 8300 for BLM lands. Other supplemental rules applicable to a specific management unit may be developed under the regulations cited above.

Non-Commercial Special Recreation Permits are currently required for use in the Paria Canyon / Coyote Buttes Special Management Area of Vermilion. The permit/fee program helps to regulate use and protect sensitive biological, geological, archeological, and social features of these areas. This area is a component of the Federal Lands Recreation Enhancement Act and is managed in partnership with the BLM Kanab Field Office and the Grand Staircase Escalante National Monument. Fees for all non-commercial permits are $5 per person, per day. For visitors wishing to bring their dogs into the Special Management Area, the cost is $5 per dog, per day. Commercial recreation operators within the Monument are also required to obtain and pay for permits. Currently, no new commercial recreation permits are being issued, pending the completion of this Plan.

Arizona Strip FO Recreation and Visitor Services/Interpretation and Environmental Education

Recreation-Tourism Service Delivery System

Area Bounds

Local communities such as Littlefield, Scenic, Beaver Dam, Arizona; Mesquite Nevada; St. George, Hurricane, Washington, Santa Clara, Hildale, and Kanab, Utah; and Colorado City, Fredonia, and Page Arizona all contribute to the delivery of recreation-tourism opportunities to local, regional, national and international visitors and residents.

Recreation-Tourism Providers

See discussion above, in the Overview section.

Resource Attractions

A vast network of improved roads and primitive roads offer a variety of opportunities for driving for pleasure, flying, or vehicle exploring. Several backcountry airstrips provide recreation aviators access to a variety of attraction sites across the planning area. Remnants of historic trails such as the Temple Trail, Honeymoon Trail, Dominguez-Escalante Route, and the recently designated Old Spanish National Historic Trail are within the Arizona Strip FO. Additionally, portions of the Great Western Trail and the last 12 miles of the Arizona Trail are in the eastern portion of the planning area. The Woodhill Loop Road, an R&PP lease, is located east of

Fredonia and provides a mix of sedan-accessible picnic and campsites. Unfortunately, vandalism of recreation facilities and signing has plagued this project. The overwhelming majority of Arizona Strip FO is without formally constructed trails for foot, horse, bike, or motorcycle. Therefore, exploration of its routeless areas via off-route foot or horse travel, or backcountry aviation requires exceptional navigation and outdoor skills.

Four statutory wilderness areas and various lands with wilderness characteristics within the Arizona Strip FO offer some of the best backcountry opportunities to enjoy recreation activities in the most primitive, challenging settings. The fact that many of these areas typically include incredible scenic beauty and diverse landscape settings increases their recreational quality. The Kanab Creek and Paiute wilderness areas offer excellent hiking, backpacking, and photography opportunities. The area is contiguous to portions of the Glen Canyon NRA, Grand Canyon National Park, Grand Staircase-Escalante National Monument, and Kaibab National Forest. The open landscapes provide long-distance vistas easily viewed from both paved and unpaved routes.

The entire segment of U.S. Highway 89-A through the Arizona Strip FO is designated by the State of Arizona as a state scenic road. The segment, along with the other paved routes mentioned, are part of the multiple-partner Vermilion Cliffs Highways Project – an initiative to provide interpretation signs at some 23 sites under the major theme of "Saga of Exploration and Survival."

Existing Conditions

Recreation Activities

The plains, plateaus, mountains, cliffs, and sweeping scenery of the Arizona Strip provide a wide array of dispersed recreation opportunities for moderately regulated recreation. Exploration, driving for pleasure, hiking, backpacking, camping, picnicking, big and small game hunting, wildlife observation, and competitive and organized group events are the most common activity types. Motorized or mechanized vehicle, small aircraft, walking, or equestrian are typical modes of travel.

The Arizona Strip FO also produces the bulk of mountain biking, rock climbing, geocaching, and rock crawling activity opportunities in the Planning Area. This area likely accommodates most of the equestrian use as well, including the occasional equestrian endurance-racing event.

Recreation Setting Conditions

Current recreation setting conditions for the Arizona Strip FO range from Primitive to Rural. No Urban settings are present directly on public lands; however, the Arizona Strip FO interfaces with all six communities on or adjacent to the Planning Area. (See Map 3.32, depicting, key attraction sites, trails, SRMAs, and wilderness.)

Recreation Management – Resources, Signing, Recreation Facilities

The Arizona Strip FO has 1,943 miles of maintained routes, out of a total of 5,193 miles of routes. Many are primitive and can be rough and rutted much of the year. This system of routes provides a variety of backcountry driving opportunities and access to key destinations and features.

This remote area offers both the hearty, outdoor adventurer and the sightseeing tourist a wide variety of primitive roads that provide outstanding opportunities for 4WD and ATV exploring and driving opportunities to key destinations and features or for just enjoying the variety of recreation activities. Exploration of most of the backcountry areas of Arizona Strip FO requires excellent navigational, outdoor and, in many places, canyoneering skills.

Few formally constructed trails for foot, horse, bike, or motorcycle are present in the Arizona Strip FO. However, a short accessible nature trail leading to an interpretive wayside is maintaining in the Virgin River Canyon Recreation Area. Little Black Mountain Petroglyph Site contains a small network of nature/interpretive trails. The Dutchman and Sunshine Mountain Bike Trails are delineated primarily along portions of both existing and abandoned vehicle routes. The Mokaac Trail is primarily laid out along old routes. Other hiking routes in the Arizona Strip FO tend to take advantage of canyon bottoms, such as Soap Creek and Sullivan and Hack canyons, or old cattle trails, such as around Lyon Point, Willow Spring, and the Esplanade, or ridgelines and old roads, such as Paiute Trails and Pocum Cove.

The Virgin River Canyon Recreation Area and the closed ADOT rest area nearby, located in the Virgin River Gorge, and the Stateline Campground in Coyote Valley far to the east are the only significantly developed camping facilities within the entire Planning Area. At-large camping occurs at many existing primitive or undeveloped sites along existing routes and spur routes. In the ponderosa pine groves of Black Rock Mountain, several scattered tables are provided for visitors for picnicking and camping.

Recreation Marketing – Visitor Services, Information, Interpretation, and Environmental Education

Various small interpretive sites, such as Little Black Mountain and Mt. Trumbull Schoolhouse, and a variety of single interpretive signs are scattered throughout the area, such as at Hayrocks (also a picnic site) and along the Temple and Honeymoon Trails.

Recreation Monitoring - Visitation

As mentioned earlier, the Arizona Strip FO's community interface areas probably see the greatest variety of recreation users and the highest day-use visitation rates in the Planning Area. Motorized activities in these areas are popular and increasing, along with the demand for more opportunities. For instance, local community groups envision the potential to establish formal

networks of OHV and/or motorcycle routes connecting various communities in the Arizona Strip FO. With such increases in motorized-vehicle use come some undesired consequences, such as the development of new routes created by off-road travel. Proactive management solutions are thus needed to avoid such consequences.

Visitors typically enjoy the area spring through fall, although summer use in the Virgin Slope and Beaver Dam Slope areas is virtually intolerable due to excessive heat. Winter use in these hot, lower-elevation deserts is popular.

While the figures in Table 3.27 are estimates based on route counters, trail registers, and patrols, they represent the overall number of visitors to the area. No social surveys have been conducted for Arizona Strip FO lands in recent years. In addition, no reliable visitor data exists for river running or backcountry aviation activities, though these activities are known to take place.

Recreation Administration – Visitor Limits and Regulations; Permits and Fees

The primary source of standard regulations related to visitor use is found at 43 CFR 8300 for BLM lands. Other supplemental rules applicable to a specific management unit may be developed under the regulations cited above.

Recreation Use Permits are required for day, overnight, and group area use in the Virgin River Campground of the Virgin River Canyon Recreation Area. Fees are not currently charged for the 4-unit Stateline Campground or for public recreation use in the remaining Arizona Strip FO. Commercial recreation operators within the Arizona Strip FO are required to obtain and pay for permits.

The Arizona Strip FO manages many of the commercial guides for touring, sightseeing, and hiking, as well as the several competitive and organized group events. In coordination with the St. George Field Office, the Arizona Strip FO has hosted, for some 20 years, the annual Rhino Rally, sponsored by the Wizards Motorcycle Club, as well as portions of the Color Country Endurance Ride (an equestrian event). In recent years, organized events such as the Tri-State ATV Jamboree have provided well-managed, guided ATV touring, using numerous combinations of looping routes in the Southern Utah/Northern Arizona area. Its popularity has grown beyond local and regional riders to national renown.

TRAVEL MANAGEMENT

Overview

Paved roads to public lands in the Arizona Strip are limited. Major highways include a 59-mile segment of Interstate 15 in the northwest corner of the Planning Area and US Highway 89A between the Utah State line north of Fredonia and the Navajo Bridge at Marble Canyon. One other major highway, Arizona State Route 389, runs between Fredonia and the Utah state line at Colorado City. These latter two highways provide a single east-west route across about two-

thirds of the Planning Area. There are two additional small segments of paved roads, Highway 91 near Littlefield and Forest Road 22 (Ryan Road) south of Fredonia. All other routes into the Planning Area are either improved natural-surfaced roads or primitive roads. Various federal, state, or county agencies and private groups or individuals maintain these roads. Inventory of these routes (including capture of the route by Global Positioning System (GPS) devices) has been completed for Parashant and Vermilion. The inventory, while incomplete for Arizona Strip FO, continues, with completion slated for no later than 2008. Table 3.30 provides the total miles or "network footprint" of various existing route types in the Planning Area.

Table 3.30: Miles of Roads, Primitive Roads and Trails in the Planning Area by Route Type

Route	Length
Paved Roads	193
Primary Unpaved Roads	631
Secondary Unpaved Roads	2,052
Tertiary Unpaved Roads	4,082
Single Track Routes	53
Closed Routes	126
Undetermined Routes	431
Non-Motorized Trail	464
Total	**8,032**

Source: GIS data based on Route Inventory, Aerial Photos from 1992 and 2002, and existing transportation data.

Interstate 15 is a major north-south artery that runs from California to Montana and carries thousands of vehicles per day. The portion of the Interstate through the Virgin River Gorge is very scenic and provides views into the Beaver Dam Mountains and Paiute wilderness areas, which are rated Class I under the VRM system. The interstate also provides easy access to recreational opportunities located at the Virgin River Gorge Campground. The other paved roads (US 89A, US 389, Highway 91, and Forest Road 22) are used as travel corridors by local and out-of-town users for entry into and across the Planning Area.

Several thousand miles of unpaved roads provide essential access to destinations within the Planning Area. These roads are necessary for access to livestock operations, mining properties, utility and communication facilities, range and wildlife developments, wildfire prevention/management and suppression, special use areas, recreation sites, research areas, monitoring stations, and intermingled private and state-owned lands. The transportation network also provides for important wildlife management activities including wildlife surveys (big game, small game, and special status species), wildlife transplants, wildlife law enforcement, and wildlife habitat improvements (e.g., controlled burns and pinyon-juniper thinning).

Increasingly, the public uses such roads and trails for touring and general recreation. The most commonly used unpaved roads (with average daily traffic (ADT)) from west to east are Whitney Pockets (9 ADT), Lime Kiln (15 ADT), Quail (57 ADT), Antelope (5 ADT), Clayhole (12

ADT), Toroweap (21 ADT), and Two Mile (7 ADT.) These roads are either BLM or county maintained. The public also uses numerous routes that currently are not officially maintained by any agency (non-system routes). Traffic on these routes is generally much lighter and often consists of OHVs. There are no designated OHV play areas in the Planning Area. Table 3.31 provides information on the agencies responsible for route maintenance throughout the Planning Area.

Table 3.31: Total Miles of Routes by Responsibility

	Federal	State	County	BLM	NPS	FS	Non-System	Non-Motorized Trails
Parashant	0	0	135	595	162	0	916	25
Vermilion	0	0	0	111	0	0	453	71
Arizona Strip FO	106	16	258	1,835	0	25	2,954	368
Total	**106**	**16**	**395**	**2,541**	**162**	**25**	**4,323**	**464**

Existing Rights-of-Way/Easements for Public Use

The Federal Highway Administration or ADOT has obtained rights-of-way for those portions of the public highways crossing public lands within the Planning Area. The USFS has acquired a right-of-way for the paved road south from Fredonia to the Kaibab National Forest boundary (Ryan Road). By Resolution No. 947, dated August 19, 1974, Mohave County adopted and approved a traffic safety study thereby setting forth the proposed county highway system. This county highway system identified and classified each route including those within the Planning Area. The BLM acquired easements for Quail Hill Road (BLM Road 1069); one easement from the state of Arizona just south of the Arizona/Utah state line and three from private individuals near Wolf Hole Lake where this route connects to Mohave County Road 5.

Overall Trend

As estimated via traffic counters, visitor registrations, and permits, visitation in the Planning Area over the past five years appears to be on a slight upward trend. The designation of the Monuments has increased interest in these areas and visitation most likely will continue to increase. Recent construction and improvement of Quail Hill Road south of St. George, Utah, increased visitor use in the western portion of the Planning Area and will undoubtedly play a factor in increasing visitation to Parashant.

Routes Open for Administration Use Only

Sixty-one miles of routes in the Planning Area are closed to the public but open for administrative use. Primarily these are routes within designated wilderness areas that provide for occasional motorized and/or mechanized entry to facilities associated with agency, grazing permittee, private/state inholdings, or AGFD programs or interests.

Transportation Facilities

Transportation facilities in the Planning Area include roads (see Appendix 2.S for road types and construction and maintenance standards; see this section for road specifics), trails, pullouts, interpretive panels and kiosks, and one rest stop in the Virgin River Gorge off Interstate 15. No roads in the Planning Area have administrative, conservation, historical, or back country byway designations.

Work on the Vermilion Cliffs Highway Project is ongoing and will include 27 interpretive panels at 11 pullouts along the major highways in the region. Partners in the project include: Coconino, Mohave, and Washington counties; the cities of Page, Washington, Hurricane, Kanab, and St. George; the towns of Colorado City and Fredonia; Kaibab Paiute Tribe; Navajo Department of Tourism; Kaibab National Forest; Glen Canyon NRA; Grand Staircase-Escalante and Pipe Springs National Monuments; AGFD; Marble Canyon, Lees Ferry, and Cliff Dwellers Lodges; ASIA; and Glen Canyon Natural History Association.

Parashant Travel Management

Table 3.32 provides the "network footprint" of various existing route types in Parashant. The Parashant proclamation called for prohibiting all off-road motorized and mechanized vehicle use, with the exception of emergency or authorized administrative purposes.

Table 3.32: Miles of Roads, Primitive Roads, and Trails in Parashant by Route Type

Route	Length
Paved Roads	0
Primary Unpaved Roads	140
Secondary Unpaved Roads	577
Tertiary Unpaved Roads	992
Single Track Routes	5
Closed Routes	13
Undetermined Routes	27
Non-Motorized Trail	25
Total	1,834

Source: GIS data based on Route Inventory, Aerial Photos from 1992 and 2002, and existing transportation data.

There are no paved roads in Parashant. The closest paved road is roughly 6 miles west of the Monument, originating from Bunkerville, Nevada. It is known as the Whitney Pockets Road, which turns into a primary unpaved road prior to crossing the Nevada/Arizona State line and then becomes Pakoon Springs Road (County Road 111). The Lime Kiln Road (County Road 242) is another primary unpaved road entering the northeastern edge of the Monument, originating from Mesquite, Nevada. The primary unpaved roads that originate from the north in Utah are Quail Hill Road (BLM Road 1069) from St. George and Antelope/Temple Trail Road (BLM Road 1015/1001) from Hurricane. Other routes entering the Monument from the

northeast and originating in Arizona include Mt. Trumbull Loop Road (County Road 5), originating in Colorado City, and Antelope Valley Road (County Road 109), beginning between Fredonia and Pipe Springs. All of these primary unpaved roads provide access to numerous secondary and four-wheel drive roads within the heart of the Monument.

The Lake Mead NRA General Management Plan (NPS 1986) established a system of approved roads for the NRA, including those areas now within Parashant. The recognized approved road system on the NPS lands within Parashant remains the recognized route network.

Transportation Facilities

Kiosks and interpretive panels are located at Nixon Springs on the south side of Mt. Trumbull.

Vermilion Travel Management

Table 3.33 provides the "network footprint" of various existing route types in Vermilion. The Vermilion proclamation called for the prohibition of all off-road motorized and mechanized vehicle use, with the exception of emergencies or authorized administrative purposes.

Table 3.33: Miles of Roads, Primitive Roads, and Trails in Vermilion by Route Type

Route	Length
Paved Roads	0
Primary Unpaved Roads	12
Secondary Unpaved Roads	16
Tertiary Unpaved Roads	426
Single Track Routes	0
Closed Routes	13
Undetermined Routes	96
Non-Motorized Trails	71
Total	**634**

Source: GIS data based on Route Inventory, Aerial Photos from 1992 and 2002, and existing transportation data.

While there are no paved roads within Vermilion, Highway 89A parallels the southern boundary of the Monument, providing numerous entry portals for access to the base of the Vermilion Cliffs. Heading north from Highway 89A at the western edge of the Monument is a primary unpaved road known as Two Mile Road (BLM Road 1065). This road is located mostly along the western boundary of the Monument. Stemming off Two Mile Road and heading east is Pine Tree Pocket Road (BLM Road 1017). This road is the primary means of motorized entry onto the Paria Plateau and connects to numerous secondary unpaved roads and four-wheel drive routes.

The Glen Canyon NRA General Management Plan (NPS 1979) established a system of approved roads for the NRA, which lies contiguous to the eastern edge of the Monument. This recognized approved road system remains the recognized route network for the NRA.

Transportation Facilities

Pullouts and interpretive panels and kiosks occur along Highway 389A on the south side of the Monument. Most of the interpretive panels are part of the Vermilion Cliffs Highway Project. They interpret the scenery, history, biology, cultures, and geography of the area for people traveling along this major highway. Some of the pullouts and interpretive panels also highlight the California Condor and their release site on top of the Vermilion Cliffs.

Arizona Strip FO Travel Management

Table 3.34 provides the "network footprint" of various existing route types in the Arizona Strip FO.

Table 3.34: Miles of Roads, Primitive Roads, and Trails in the Arizona Strip FO by Route Type

Route	Length
Paved Roads	194
Primary Unpaved Roads	480
Secondary Unpaved Roads	1,459
Tertiary Unpaved Roads	2,663
Single Track Routes	48
Closed Routes	44
Undetermined Routes	308
Non-Motorized Trails	368
Total	5,564

Source: GIS data based on Route Inventory, Aerial Photos from 1992 and 2002, and existing transportation data.

The Arizona Strip FO encompasses all of the paved roads in the Planning Area (Interstate 15, US 89A, US 389, County Road 91, and Forest Road 22). The communities of Fredonia, Colorado City, Centennial, Cane Beds, Desert Springs, Littlefield, Beaver Dam, and Marble Canyon are located along these roads. These communities depend upon the roads to connect them to larger cities and towns outside the Planning Area, as well as providing them motorized/mechanized passage to various destinations in the Planning Area for work and recreation purposes.

The Glen Canyon NRA General Management Plan (NPS 1979) established a system of approved roads for the NRA, which lies contiguous to the eastern edge of the Arizona Strip FO. This recognized approved road system remains the recognized route network for the NRA.

Transportation Facilities

Pullouts, interpretive panels, and kiosks occur along Highways 389 and 89A from Colorado City, Arizona, through Fredonia and over the Kaibab Plateau. Most of the interpretive panels are part of the Vermilion Cliffs Highway Project. The Virgin River Gorge Rest Area along Interstate 15 transferred from ADOT to BLM in 2003. ADOT closed the rest area in 1996 before the transfer. BLM is presently working on plans to reopen the facility as an interpretive and educational site.

SPECIAL DESIGNATIONS

CONGRESSIONAL DESIGNATIONS

Wilderness Areas

Overview

Permanent wilderness protection for federal lands comes only through Congressional action that creates “statutory” or “designated” wilderness areas. Such lands are managed under the mandates of the Wilderness Act of 1964 and any special management instructions that Congress may include in the specific legislation that “designates” specific wilderness areas.

The Wilderness Act dictates that wilderness areas are managed to protect and preserve their “wilderness character.” The factors that make up an area's wilderness character are spelled out in the Wilderness Act's definition of wilderness (section 2(c)) and are specifically documented during an inventory prior to designation. They are:

- **Size** -- A wilderness, with few exceptions, contains at least 5,000 acres of federal land.

- **Naturalness** -- A wilderness area "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.” Wilderness areas must be managed to ensure that this condition is maintained or enhanced.

- **Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation**: A wilderness area can have either "outstanding opportunities for solitude or a primitive and unconfined type of recreation” or it can have both. Solitude is defined as: (1) the state of being alone or remote from habitations (isolation) and (2) a lonely, unfrequented, or secluded place. The emphasis is on the opportunities a person has to avoid the sights, sounds, and evidence of other people within a particular area. Primitive and unconfined types of recreation are defined as those activities that provide dispersed, undeveloped recreation that do not require facilities or motorized equipment. In most cases, opportunities for solitude and primitive recreation go hand-in-hand. Wilderness areas must be managed to ensure that these opportunities are not degraded.

- **Special Features**: Congress specified that wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.” These optional wilderness features are also documented during the inventory; some combination of features is usually present in wilderness areas. In some cases, these features may be a prime reason for wilderness designation. In addition, these features may contribute directly to an area's opportunities for primitive recreation. Wilderness areas must be managed to ensure that these features are not degraded.

The NPS portion of Parashant also contains seven proposed wilderness units (see Map 2.6). They were proposed in 1979 (Lake Mead NRA Wilderness Proposal) after the NPS lands were inventoried for wilderness character. NPS proposed wilderness would continue to be managed similar to designated wilderness, as required by NPS Management Policies (2001) and Director's Order 41 in order to protect wilderness characteristics and values until Congress has completed the legislative process.

There are eight wilderness areas across the Planning Area, which are also considered SRMAs. These are presented in Table 3.35 and illustrated in Map 2.6 All wilderness areas in the Planning Area have wilderness management plans in place except for the Kanab Creek Wilderness Area. The Paiute Wilderness is the only one that transcends planning boundaries, with the southern section located in Parashant and the northern section located in the Arizona Strip. The Arizona Wilderness Act of 1984 designated these eight areas, two of which are jointly managed with Utah BLM (Paria Canyon-Vermilion Cliffs and Beaver Dam) and one jointly with the USFS (Kanab Creek).

Table 3.35: Existing Wilderness Areas

Name	Location	Acres on BLM Lands in Arizona	Acres on NPS Lands	Acres of Private Inholdings	Acres of State Lands in Arizona	Acres outside the Planning Area
BLM Wilderness Areas						
Paiute (Southern Section)*	Parashant	35,278	0	0	0	0
Grand Wash Cliffs*	Parashant	35,272	0	0	0	0
Mt. Trumbull*	Parashant	7,999	0	0	0	0
Mt. Logan	Parashant	14,560	0	40	0	0
Paria Canyon-Vermilion Cliffs*	Vermilion	89,598	0	227	0	22,365 Utah BLM
Paiute (Northern Section)*	Arizona Strip FO	52,484	0	3	0	0
Kanab Creek	Arizona Strip FO	6,804	0	0	0	61592
Cottonwood Point*	Arizona Strip FO	6,442	0	133	0	0
Beaver Dam Mountains*	Arizona Strip FO	14,900	0	0	0	3,652 Utah BLM
NPS Proposed Wilderness Units						
Azure Ridge	Parashant	0	8,602	0	0	0
Cockscomb	Parashant	0	16,798	0	0	0
Balanced Rock	Parashant	0	14,709	0	0	0
Shivwits Plateau	Parashant	0	84,881	0	0	0
Andrus Point	Parashant	0	16,129	0	0	0
Whitmore Point	Parashant	0	37,707	0	0	0
Lava	Parashant	0	11,649	0	0	0

*Wilderness Management Plan in place

Parashant Wilderness Areas

Paiute Wilderness Area (Southern Section)

The southern portion of the Paiute Wilderness Area ranges from ponderosa pine atop Black Rock Mountain to pinyon-juniper woodlands below (the northern portion of the wilderness is in the Arizona Strip FO). The large elevation changes in the area provide diverse vegetation communities and wildlife habitat for over 250 species including mule deer, mountain lion, and desert bighorn sheep. Outcrops of red sandstone provide a colorful contrast to the predominant greens of pinyon and juniper and the blacks of basalt in the Pocum Cove and Sand Cove areas. Broad vistas of distant and striking landscapes to the north, east, and south from Black Rock Mountain are some of the highest quality on the Arizona Strip.

Grand Wash Cliffs Wilderness Area

This 13-mile stretch of the Grand Wash Cliffs Wilderness Area is wild and very remote. Many rugged canyons, scenic escarpments, miles of cliffs, and sandstone buttes mark the transition between the Colorado Plateau and Basin and Range provinces. The cliffs are important habitat for desert bighorn sheep and raptors, while the low desert area contains desert tortoise and Gila monsters.

The Grand Gulch Bench road "corridor" passes through the entire wilderness, north to south. This route, while not open for public motorized or mechanized use, is available for occasional administrative and grazing permittee use, as depicted on Congressional maps that accompany the enabling legislation. It is also used as a hiking trail.

Mt. Trumbull Wilderness Area

The Mt. Trumbull Wilderness Area contains the slopes and summit of Mt. Trumbull (named by John Wesley Powell), involving an elevation change of nearly 2,700 feet. The area has basalt ledges, pinyon-juniper woodlands, ponderosa pine forests, and groves of Gambel oak and aspen. These vegetation communities are habitat for mule deer, wild turkey, and the unique Kaibab squirrel. Broad vistas of distant and striking landscapes can be seen in all directions from Mt. Trumbull and are some of the most beautiful on the Arizona Strip.

Mt. Logan Wilderness Area

The Mt. Logan Wilderness Area is one of recent volcanic origin and contains Mt. Logan (named by John Wesley Powell) and portions of the Uinkaret Mountains. It includes basalt ledges, ponderosa pine forests, pinyon-juniper woodlands, and a large, colorful, naturally-eroded amphitheater known as Hell's Hole. Like Mt. Trumbull Wilderness Area, it provides habitat for deer, turkey, and Kaibab squirrels. The ponderosa stand here contains some of the largest pines

of this species found anywhere in Arizona. The broad vistas of distant and striking landscapes in all directions from Mt. Logan, Mt. Emma, and various overlooks are some of the highest quality on the Arizona Strip.

Parashant Proposed Wilderness Areas (NPS Lands Only)

Azure Ridge Proposed Wilderness Area

The Azure Ridge Proposed Wilderness Area is located at the southeastern end of Gold Butte, along the Arizona/Nevada State line, set back 300 feet from the high water line and stretching towards the Azure Ridge. The area provides panoramic views of Grand Wash and well as Grand Wash Bay of Lake Mead. The sedimentary landscape is interrupted by a lava flow in the northern third of the proposed wilderness area, creating a dramatic contrast in the geology of the area. The area is accessible from adjacent roads in Cottonwood Canyon and Grand Wash, and is be accessible by boat from the waters of Lake Mead during periods with high water levels.

Cockscomb Proposed Wilderness Area

The Cockscomb Proposed Wilderness Area is located on the eastern side of Grand Wash Bay and the God's Pocket area of Lake Mead. Cockscomb contains the Cockscomb, a tilted and rugged multi-colored limestone ridge that dominates the landscape in the area. The brighter red clays of the Moenkopi Formation lie in sharp contrast with the browns and grays of the typical sedimentary geology. The combination of the isolated and rugged setting along with the striking and colorful geology, create a unique wilderness setting. This area is accessible from the north by the Pigeon Wash Road and from the shoreline of Lake Mead or the Colorado River, depending on water levels.

Balanced Rock Proposed Wilderness Area

Located along the Grand Wash Cliffs, Balanced Rock Proposed Wilderness Area contains many features associated with the Colorado Plateau physiographic province. The most notable feature of the area is the spectacular Grand Wash Cliffs that make a dramatic abrupt 2,000-foot rise above the slopes adjacent to the God's Pocket area of the Colorado River or Lake Mead, depending upon water levels. The area is extremely remote, accessible by road only from the north and by boat from the Colorado River corridor. Because of its remoteness, the area receives only limited visitation.

Shivwits Plateau Proposed Wilderness Area

Visitors to the Shivwits Plateau Proposed Wilderness Area are provided a diversity of recreational activities in a remote and primitive area, ranging from backcountry exploration to hunting. Due to the higher elevations above Lake Mead, the region is cooler, receives more precipitation, and support pinyon-juniper and ponderosa pine forests and a wider variety of

wildlife, including the highest number of mule deer to be found in the Lake Mead NRA. The area is characterized as "plateau country" and provides spectacular views of the Grand Canyon. A few road corridors containing gravel roads are cherry-stemmed within the proposed wilderness area, offering visitors vehicular access to many parts of the area, including Twin and Kelly Point overlooks.

Andrus Point Proposed Wilderness Area

The Andrus Point Proposed Wilderness Area is located on the plateau between Andrus and Parashant Canyons. Andrus Point, located on the southern end of the plateau, is at an elevation of 5,425 feet, is accessible only by foot, and offers spectacular views of the Colorado River 3,000 feet below. Pinyon-juniper vegetation and rich artifacts of the Ancestral Puebloan and Paiute peoples characterize the plateau. The proposed wilderness area is extremely remote and receives only limited visitation.

Whitmore Point Proposed Wilderness Area

Extremely diverse in its topography and ecology, the Whitmore Point Proposed Wilderness Area is the only proposed wilderness area in the NPS portion of Parashant that includes lands below the rim of the Shivwits Plateau. The most predominate feature is Whitmore Point, a 5,491-foot peninsula that is accessible by roads and provides a dramatic 180-degree panoramic of the Grand Canyon. Most of the proposed wilderness, however, includes lands below the plateau rim at elevations 1,500 feet below Whitmore Point, which are dramatically different from the plateau in terms of geology and ecology. Below the rim, the geology primarily consists of sandstone formations and black lava flows. Plant communities are a mixture of the Great Basin, Mojave, and Sonoran Deserts. The Sonoran elements include noticeable and conspicuous species such as Ocotillo and crucifixion thorn. A number of access corridors are cherry-stemmed within the proposed wilderness area, with most visitations occurring at Whitmore Point.

Lava Proposed Wilderness Area

The Lava Proposed Wilderness Area is uniquely characterized by Colorado Plateau topography with extensive areas consumed by lava flows. Volcanism is the dominate feature of the area with dramatic exhibits of free flowing lava over the layered plateau cliff lines. The resulting topography is a gently sloping area flowing south toward the Grand Canyon between elevations of 7,154 and 3,000 feet. At the southern end is an abrupt and dramatic cliff where the Colorado River has cut into the geology. The area is remote and rugged and because it slopes toward the Colorado River, and provides a dramatic overview of the inner Grand Canyon. Visitation to the proposed wilderness area is limited primarily due to its remoteness.

Vermilion Wilderness Areas

Paria Canyon-Vermilion Cliffs Wilderness Area

The Paria Canyon-Vermilion Cliffs Wilderness Area straddles the Utah-Arizona state line and is jointly managed by Arizona and Utah BLM offices. The wilderness in Arizona is contiguous along almost 10 miles of its boundary with NPS lands in Glen Canyon NRA. Several tracts of private land inholdings in the Jacob Pool area have been identified for acquisition.

The wilderness area is nationally known for its beauty and solitude. Paria Canyon has towering walls streaked with desert varnish, huge red rock amphitheaters, sandstone arches, wooded terraces, and hanging gardens. Along the bottom of the canyon, the Paria River and numerous springs combine to form a ribbon-like oasis of willows and cottonwoods.

Joining Paria Canyon at its mouth are the Vermilion Cliffs. This 3,000-foot escarpment dominates the area with its thick Navajo Sandstone face; steep, boulder-strewn slopes; rugged arroyos; and stark overall appearance. This attraction is visible along a Highway 89A and 89 south of Page, Arizona.

Petrified logs, dinosaur tracks, and two historic trails, the Honeymoon Trail and the Dominguez-Escalante Route, provide information on the history of the area. Several significant archaeological sites on the Paria Plateau are included in the wilderness. Desert bighorn sheep inhabit the wilderness area.

Coyote Buttes is a geologically spectacular area where crossbeds of the Navajo Sandstone exhibit colorful banding in surreal hues of multiple colors. It is internationally recognized and continues to gain fame, creating a greater demand for visitors wanting to enter the area.

Arizona Strip FO Wilderness Areas

Kanab Creek Wilderness

Managed jointly by the BLM and USFS, Kanab Creek is part of the largest canyon system on the north side of the Grand Canyon. It is rich in impressive rock formations, colorations, and features carved by wind and water. Numerous springs provide an interesting contrast with the generally arid terrain. The cliffs are home to bands of desert bighorn sheep as well as Peregrine Falcons.

The wilderness straddles the Mohave-Coconino county line, and is contiguous along about 14 miles of its boundary with NPS lands in Grand Canyon National Park that are currently proposed for wilderness designation. The Hack Canyon portion of the wilderness consists primarily of the canyon bottom. Most of the canyon slopes, cliffs, and rims are excluded due to pre-designation negotiations designed to allow for future exploration and potential extraction of uranium.

Paiute Wilderness (Northern Section)

The Virgin Mountains form the backbone of the Paiute Wilderness Area, which ranges from ponderosa pine forest to the Mojave Desert. It includes the south side of the Virgin River Gorge, which is readily seen from l-15. The large elevation changes contain diverse vegetation communities and wildlife habitat for over 250 species including mule deer, mountain lion, desert tortoise, and desert bighorn sheep. Excellent scenic vistas are available from the top of the Virgin Mountain ridgeline and the Black Rock Mountain area. The long and deep Sullivan Canyon is a distinctive contrast to the high ridges of the Virgin Mountains to the west. Spectacular folding and faulting of massive beds of stone are evident in the northern portion of the wilderness. Exposures of Precambrian formations in and to the west of the main ridges provide a rare opportunity outside of the Grand Canyon to view these oldest of rocks.

The wilderness is adjacent to the rapidly growing communities of Mesquite, Nevada and Beaver Dam, Littlefield, and Scenic, Arizona, and I-15 in the Virgin River gorge. Urban sights and sounds are readily noticeable from much of the western and northern portions of the wilderness.

Cottonwood Point Wilderness

This wilderness is part of the impressive Navajo Sandstone plateau overlooking the Arizona Strip to the south. The 1,000-foot multicolored Vermilion Cliffs, wooded canyons, craggy pinnacles, and alcoves dominate the landscape and are visible from scenic State Highway 389. The Cottonwood Spring area contains excellent riparian habitat set against the striking colors of the Vermilion Cliffs.

The wilderness is contiguous to the southern end of the BLM's Canaan Mountain WSA in Utah, which has been recommended for wilderness designation. The wilderness is adjacent to the small communities of Colorado City, Arizona, and Hildale, Utah, and the rural settlement of Cane Beds. Urban sights and sounds are readily noticeable from much of the wilderness. The exterior wilderness boundary encompasses various parcels of private lands, primarily around the southern periphery of Lyon Point. Since designation, 37.5 acres have been acquired through exchange and the remaining 134 acres have been identified for acquisition.

Beaver Dam Mountains Wilderness

This wilderness consists of rugged mountains, gently sloping alluvial fans, and the north side of the Virgin River gorge. Vegetation includes Joshua trees, desert shrubs, and several rare plant species. Notable wildlife species include desert bighorn sheep, desert tortoise, woundfin minnow, the Virgin River chub, and various birds of prey. The Beaver Dam area contains the northern reaches of the Grand Wash that crosses the Grand Canyon and finally peters out near Kingman, Arizona. This unit also contains approximately 3 miles of the Virgin River that has

been found suitable for designation as wild and scenic river segment with a potential classification as wild.

Ironically, Interstate 15, enabling millions of travelers to view the wilderness as they drive through the Virgin River Gorge, separates this wilderness from the Paiute Wilderness. Excellent scenic vistas are available from the top of the Beaver Dam Mountains ridgeline.

BLM Road 1005 corridor passes through the entire wilderness. This route is open for public motorized or mechanized use, as depicted on the congressional maps that accompanied the enabling legislation, and used for entry to private landholdings along the road. The wilderness is close to the rapidly growing communities of Mesquite, Nevada, Beaver Dam, Littlefield, and Scenic, Arizona, and I-15 in the Virgin River gorge. Urban sights and sounds are readily noticeable from much of the western portion of the wilderness.

Wild and Scenic Rivers

Overview

The Wild and Scenic Rivers Act of 1968, as amended, was passed to protect free flowing rivers or river segments and their related outstandingly remarkable values (e.g. scenic, recreational, geologic, fish and wildlife, historic, or cultural values). The Wild and Scenic Rivers Act establishes three wild and scenic river classifications: wild, scenic, and recreational. Wild rivers are free of dams, diversions, or other impoundments and generally inaccessible except by trail, with essentially primitive watersheds or shorelines and unpolluted waters. Scenic rivers are generally free of impoundments, with largely primitive shorelines or watersheds and shorelines mostly undeveloped, but accessible in places by roads. Recreational rivers are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past. The BLM and NPS are required to evaluate all rivers located on land under their respective administrations in order to determine if the rivers are eligible and suitable for inclusion in the National Wild and Scenic Rivers System.

In 1994, the Arizona State Office of the BLM finalized the Arizona Statewide Wild and Scenic Rivers Legislative EIS, which analyzed the proposed action to recommend 13 rivers to Congress as suitable for inclusion in the National Wild and Scenic Rivers System. Two of these rivers, the Paria and Virgin, are located in the Planning Area. Table 3.36 lists wild and scenic rivers in the Planning Area.

Table 3.36: Suitable Wild and Scenic Rivers in the Planning Area

Suitable River	Segment	Length in Miles Across BLM Lands	Outstandingly Remarkable Values	Tentative Classification	Location
Paria River	1	27.0	Scenic, Recreational, Fish and Wildlife, Cultural and Historic, Geologic	Wild Verm	ilion
Virgin River	1	2.9	Scenic, Recreational, Fish and Wildlife, Geologic, Aquatic	Wild	Arizona Strip FO
	2	7.6		Scenic	
	3	6.7		Recreational	
	4	12.1		Recreational	

The Arizona Statewide Wild and Scenic Rivers Legislative EIS (BLM 1994) identifies certain interim management prescriptions that include management objectives, management actions, and appropriate allocations of land and resource uses that maintain or enhance the outstandingly remarkable values and tentative classification of the suitable rivers. Pursuant to the Wild and Scenic Rivers Act of 1968 on the wild and scenic eligibility and suitability determinations, no uses will be authorized which would reduce or threaten their potential eligibility classification or suitability for consideration for inclusion in the National Wild and Scenic Rivers System until Congress makes final decisions.

Parashant Wild and Scenic Rivers

There are no designated or suitable wild and scenic rivers in Parashant.

Vermilion Wild and Scenic Rivers

Twenty-seven miles of the Paria River in Vermilion were identified as eligible for further study in the wild and scenic river evaluation process due to possessing outstanding scenic, recreational, geologic, riparian, fish and wildlife, and cultural values (BLM 1994a). The river segment, located on Map 3.33, was determined suitable for inclusion in the National Wild and Scenic Rivers system (BLM 1994a) and recommended by the BLM to Congress. All 27 miles are located in the Arizona portion of the Paria Canyon-Vermilion Cliffs Wilderness Area and received a tentative classification as wild.

Arizona Strip FO Wild and Scenic Rivers

A 38.5-mile section of the Virgin River within the Arizona Strip FO was studied in the Arizona Strip RMP (BLM 1992a). Most of the river section, 31 miles or 80.5 percent, occurs on BLM lands and was determined eligible for further study in the wild and scenic river evaluation process due to possessing outstandingly remarkable scenic, recreational, fish and wildlife, geologic, and aquatic values (see Map 3.34). Four segments of the Virgin River (see Table 3.36) were determined to be suitable for inclusion in the National Wild and Scenic Rivers system (BLM 1994) and recommended by the BLM to Congress. The three upstream river segments run

Map 3.33: Wild and Scenic Rivers: Paria River

Map 3.34: Wild and Scenic Rivers: Virgin River

through or adjacent to the Paiute and Beaver Dam Mountains wilderness areas. Segment 1, which runs from the Utah state line to I-15 and is located entirely within the wilderness areas, was recommended as suitable for classification as wild. Segment 2 (from the confluence of the river and I-15 to the Virgin River Campground) was recommended as scenic, while segments 3 (from the Virgin River Campground to the mouth of the gorge) and 4 (from the mouth of the gorge to the Nevada state line) were recommended as recreational segments.

National Historic Trails

Overview

The National Historic Trails System was established to identify and protect historic routes and their remnants for public use and enjoyment. These are extended trails that follow as closely as possible original routes of travel that are of national historical significance. National historic trails are authorized and designated only by an Act of Congress.

Public Law 107-325 was signed on December 4, 2002 and amended the National Trails System Act to designate the Old Spanish Trail as a National Historic Trail. This legislation recognizes approximately 3,000 miles of trail routes from Santa Fe, New Mexico to Los Angeles, California. About 34 miles of the primary trail route crosses the extreme northwestern corner of the Planning Area near Beaver Dam, Arizona. Also included in this designation is a portion of the Armijo Route, which crosses the entire length of the Planning east to west. Trail segments and associated trail resources on the Arizona Strip have not been inventoried, identified, or evaluated yet.

The Old Spanish Trail was primarily a mule- and horse-pack trade route between the Mexican frontier outposts of Santa Fe, New Mexico, and Mission San Gabriel, California between 1829 and 1848. During these years, Mexican and American traders who traded New Mexico woolen goods for California-bred horses and mules used it extensively. The trail routes resembled stock driveways more than well-worn trails and connected water and forage. Each caravan deviated slightly from the path taken by the last, so that no single set of tracks developed along the route. The trail trade had a significant impact on the American Indian tribes along the trail. Southern Paiutes on the Arizona Strip participated in the trade and, on occasion, were enslaved by neighboring tribes to be traded as commodities on the trail (Schlanger et al. 2004).

Parashant National Historic Trails

No national historic trail segments cross Parashant.

Vermilion National Historic Trails

Segments of the Armijo Route of the Old Spanish Trail may cross through Vermilion. Inventories that would confirm or refute this have not yet been conducted.

Arizona Strip FO National Historic Trails

Roughly, 34 miles of the primary route of the Old Spanish Trail crosses the northwestern corner of the Arizona Strip FO near Beaver Dam, Arizona. Most, if not all, of the Armijo Route in the Planning Area occurs in the Arizona Strip FO. Inventories to determine exact trail location and length have not been conducted.

ADMINISTRATIVE DESIGNATIONS

Areas of Critical Environmental Concern

Overview

ACECs contain one or more resources that require special management and protection to maintain the value of the area and its resources. Areas designated as ACECs may contain important historic, cultural, and scenic values, or habitat for endangered, sensitive, or threatened species.

The BLM recognizes that ACECs have significant values and establishes special management measures to protect those values. The designation is a reminder that significant values exist that must be accommodated when future management actions and land use proposals are considered within the ACEC. Designation may also support a funding priority. The designation of ACECs is achieved only through the planning process, either in the RMP itself or in a plan amendment. The NPS does not designate ACECs.

To be designated as an ACEC, an area must meet the relevance and importance criteria listed in BLM Manual 1613 (BLM 1988) and require special management to protect and prevent irreparable damage to relevant and important resource values.

There are currently 12 ACECs throughout the Planning Area: three in Parashant and nine in the Arizona Strip FO. No ACECs are located in Vermilion. Three ACECs were created in response to USFWS's Desert Tortoise Recovery Plan (USFWS 1994). The plan recommended creating Desert DWMAs as reserves where desert tortoise populations could be managed to achieve the species' recovery. Since BLM has no statutory authority to create DWMAs, the areas were designated as ACECs in the 1998 Mojave Desert Amendment to the Arizona Strip RMP. All existing ACECs and their existing values are summarized in Table 3.37. Refer to Map 2.20 in Chapter 2 for the location of ACECs.

Table 3.37: ACECs Currently Existing in the Planning Area

Name	Size (acres)	Values	Location
Witch Pool ACEC	279	Cultural	Parashant
Nampaweap ACEC	535	Cultural	Parashant
Pakoon ACEC	76,014	Desert Tortoise	Parashant
Beaver Dam Slope ACEC	51,197	Desert Tortoise	Arizona Strip FO
Virgin River Corridor ACEC	8,075	Riparian Endangered Fish Scenic Desert Tortoise Wild and Scenic River	Arizona Strip FO
Virgin Slope ACEC	39,931	Desert Tortoise	Arizona Strip FO
Little Black Mountain ACEC	241 Cu	ltural	Arizona Strip FO
Fort Pearce ACEC	916	Watershed Siler Pincushion Cactus	Arizona Strip FO
Marble Canyon ACEC	11,012	Brady Pincushion Cactus Scenic Raptors	Arizona Strip FO
Johnson Springs ACEC	2,464	Cultural Siler Pincushion Cactus	Arizona Strip FO
Lost Spring Mountain ACEC	8,262	Cultural Siler Pincushion Cactus	Arizona Strip FO
Moonshine Ridge ACEC	5,095	Cultural Siler Pincushion Cactus	Arizona Strip FO

Parashant ACECs

Parashant currently contains three ACECs. These are described as follows:

- **Witch Pool ACEC** was designated in the 1992 Arizona Strip RMP to protect cultural and historical values. It is located on the northeast side of Mt. Trumbull and consists of 279 acres. This may be the location of John Wesley Powell's visit with Southern Paiutes in 1870 when he was inquiring about the three missing members of his historic expedition down the Colorado River in 1869.

- **Nampaweap ACEC** was designated in the 1992 Arizona Strip RMP to protect cultural values. It encompasses 535 acres of an east-west trending canyon that leads from the high Ponderosa pine country of Mt. Trumbull east to Tuweep Valley. Within this ACEC is a half-mile long rock art site containing rock art figures related to Archaic, Ancestral Puebloan, and Southern Paiute cultures. The canyon itself may have been a travel corridor in prehistoric times leading to and from differing ecosystems exploited by earlier people during specific seasons.

- **Pakoon ACEC** was designated in the 1998 Arizona Strip RMP Mojave Desert Amendment to protect desert tortoises. It encompasses 76,014 acres of BLM lands in the Pakoon Basin, north of Lake Mead NRA and east of the Arizona/Nevada State line. The ACEC designation was considered important for the maintenance of viable tortoise populations in the Pakoon Basin and includes designated critical habitat for the species.

Vermilion ACECs

No ACECs currently exist in Vermilion.

Arizona Strip FO ACECs

- **Beaver Dam Slope ACEC** was designated in the 1992 Arizona Strip RMP to protect desert tortoises. Under the 1992 designation, it encompasses 20,800 acres. Under the Mojave Desert Amendment, the ACEC was expanded to 51,197 acres in 1998. The ACEC is located in the northwestern corner of the Arizona Strip FO; west of the Beaver Dam Mountains, east of Beaver Dam Wash, north of the Virgin River, and south of the Arizona/Utah state line. The ACEC designation was considered important for the maintenance of viable tortoise populations on the Beaver Dam Slope.

- **Virgin River Corridor ACEC** was designated in the 1992 Arizona Strip RMP to protect riparian, endangered fish, and scenic values. The ACEC encompasses 8,075 acres, including 29 miles of the Virgin River. The Virgin River and associated riparian area provides habitat for two federally listed fishes, the Virgin River chub and the woundfin minnow. The corridor pushes though the Virgin/Beaver Dam Mountains and contains unique scenic values, which are visible to many thousands of people who travel through the corridor on Interstate 15. In 1998, the objectives for the Virgin River Corridor ACEC were modified under the Mojave Amendment to include protection of a desert tortoise population. In 1994, the corridor was recognized as suitable for its wild and scenic river values in the Arizona Statewide Wild and Scenic Rivers Legislative EIS (BLM 1994).

- **Virgin Slope ACEC** was designated in the 1998 Arizona Strip RMP Mojave Desert Amendment to protect a population of desert tortoises. It encompasses 39,931 acres between the Virgin River (Interstate 15) and the Virgin Mountains. This area is designated as critical habitat for the species.

- **Little Black Mountain ACEC** was designated in the 1992 Arizona Strip RMP to protect cultural values and interpret them for public use. The ACEC encompasses 241 acres directly south of the Arizona/Utah state line, about 5 miles east of St. George, Utah and includes a large rock art site with rock art styles related to Archaic, Ancestral Puebloan, Southern Paiute, and historic cultures.

- **Fort Pearce ACEC** was designated in the 1992 Arizona Strip RMP to protect critical watershed resources and a population of endangered cactus. The ACEC encompasses 916 acres directly south of the Arizona/Utah state line and just east of Little Black Mountain ACEC. The Fort Pearce area is a large watershed subject to flooding and severe erosion. Soils in the area are highly saline and contribute to the salinity of the Colorado River. It also includes a dense population of the endangered Siler pincushion cacti.

- **Marble Canyon ACEC** was designated in the 1992 Arizona Strip RMP to protect a population of endangered cactus. It also has scenic values and is the home to a number of raptors, including Peregrine Falcons, Bald Eagles, and Ferruginous Hawks. The ACEC encompasses 11,012 acres at the eastern-most edge of the Arizona Strip FO, along the rim of the Marble Canyon section of Grand Canyon National Park, and includes one of only two populations of Brady pincushion cactus known to occur on public lands. It is also the only area where the species overlaps with Fickeisen pincushion cactus.

- **Johnson Springs ACEC** was designated in the 1992 Arizona Strip RMP to protect cultural values and a population of endangered cactus. The ACEC encompass 2,464 acres adjacent to the Utah border approximately 9 miles east of Fredonia. The area includes the Shinarump Cliffs, which contain a wide range of Ancestral Puebloan sites. The area also includes dense population of the endangered Siler pincushion cactus.

- **Lost Spring Mountain ACEC** was designated in the 1992 Arizona Strip RMP to protect cultural values and a population of endangered cactus. The ACEC encompass 8,262 acres due west of Colorado City, on top of a pinyon-juniper-covered mesa known as Lost Spring Mountain. The ACEC contains archaeological site types that represent a broad range of human occupancy and activity including pithouses, camps, rock shelters, petroglyphs, pictographs, and pueblos. The area also includes a dense population of the endangered Siler pincushion cactus.

- **Moonshine Ridge ACEC** was designated in the 1992 Arizona Strip RMP to protect cultural values and a population of endangered cactus. The ACEC encompass 5,095 acres on top of Yellowstone Mesa, approximately 14 miles south of Colorado City. It contains a high density of significant Ancestral Puebloan sites that represent a continuous use of the area. The area also includes dense population of the endangered Siler pincushion cactus.

Resource Conservation Areas

Overview

Resource Conservation Areas (RCAs) are different from ACECs in that they are not official designations and are thus not afforded the same protection as ACECs. RCAs cover large landscapes, are reminders that significant resource values exist that must be accommodated in future management actions, and emphasize a broad spectrum of recreation opportunities. These areas were designated in the 1992 Arizona Strip RMP to recognize special values in these areas, to encourage more detailed planning, and to focus management in these areas. The NPS does not designate RCAs.

There are currently three RCAs within the Planning Area, two in Parashant and one in Vermilion. There are no RCAs in the Arizona Strip FO.

Parashant Resource Conservation Areas

- **Parashant Area RCA** encompasses 39,868 acres that contain important wildlife habitat and livestock grazing, cultural, recreation, and watershed values. A unique ponderosa pine community occurring outside its normal range distinguishes this area. The ponderosa pines mixed with pinyon-juniper woodlands provide habitat for mule deer, small game, Merriam's turkey, raptors, and various non-game species. Its remote location offers opportunities for primitive and semi-primitive recreation activities, and provides access to Mount Dellenbaugh and several remote canyons in Lake Mead NRA and Grand Canyon National Park.

- **Mt. Trumbull Area RCA** encompasses 102,307 acres that contain wildlife habitat, livestock grazing, recreation, Ponderosa forest, cultural, scenic, wilderness, watershed, and geologic resource values. The RCA encompasses both the Mt. Trumbull and Mt. Trumbull Wilderness areas in the southeastern corner of Parashant and includes archaeological sites representing human occupancy from Archaic to recent historic times. The area also contains remnants of sawmills built in 1872 that were used to provide lumber for construction of the Mormon Temple in St. George. Wagons hauled the timber some 68 miles along the Temple Trail, which begins in the RCA. The Uinkaret Volcanic Field is also located within the area and includes 144 square miles of cinder cones, basalt capped mesas, ice caves, and rugged lava flows.

Vermilion Resource Conservation Areas

- **Canyons and Plateaus of the Paria RCA** encompasses 293,689 acres that contain cultural, recreation, scenic, wilderness, and wildlife values. The RCA contains the spectacular Vermilion Cliffs and the dramatic views of and from them. The Paria Canyon-Vermilion Cliffs Wilderness Area is within this RCA and many opportunities

exist for a wide range of recreational activities, including primitive backpacking and hiking in the Paria Canyon and Coyote Buttes. A wide range of cultural resources exists ranging in age from Archaic through Southern Paiute. The pinyon-juniper forest and sagebrush provides habitat for mule deer, small game, raptors, and other non-game species. In addition, it is the major release site for the California Condor.

Arizona Strip FO Resource Conservation Areas

No RCAs currently exist in the Arizona Strip FO.

SOCIAL AND ECONOMIC CONDITIONS

SOCIOECONOMICS

Overview

The Planning Area encompasses the northern portions of Coconino and Mohave Counties in Arizona. Due to the size of the Planning Area and its influence on neighboring states, counties, and communities, the socioeconomic study area also includes southern Washington and Kane counties, Utah, and extreme southeastern Clark and Lincoln counties, Nevada. There are 17 "communities" within these five counties, which are included below:

- Coconino County, Arizona: Fredonia, Page, and the Marble Canyon area (includes Vermilion Cliffs, Marble Canyon, and Cliff Dwellers)
- Mohave County, Arizona: Colorado City and the Virgin River Communities (includes Desert Springs, Beaver Dam, Littlefield, Scenic, and Arvada)
- Coconino and Mohave Counties: Kaibab-Paiute Reservation and the Town of Moccasin
- Kane County, Utah: Big Water and Kanab
- Washington County, Utah: Apple Valley, Hildale, Hurricane, Ivins, St. George, Santa Clara, and Washington
- Clark County, Nevada: Bunkerville and Mesquite
- Lincoln County, Nevada

Below is a brief description of the counties and communities in the study area. Appendix 3.I provides a much more detailed socioeconomic description.

In general, the study area is sparsely populated but has an exceptional growth rate. Sixteen of the 17 communities had a total combined population of 104,687 in 2000 (Apple Valley is not included in this number as the town was just incorporated in 2004). Almost half of this number lives in St. George, Utah. Thirteen of the communities experienced an average population increase of 75.1 percent over the 10-year period between 1990 and 2000, which is remarkable when compared to the national average increase of only 11.6 percent over the same period.

The 16 communities in the study area had a combined civilian labor force of 45,512 in 2000. Unemployment rates in the study area were generally higher than the national average rate in 2000. Per capita income for most communities was several thousand dollars lower than the national average.

The study area is diverse in terms of employment opportunities, with no single occupation dominating the whole area. The same can be said about industry, although a few communities are dominated by the arts, entertainment, recreation, accommodation, and food services industry. This suggests that these communities rely heavily on tourism.

Although ranching is currently not a major industry in the study area in terms employment numbers, it has played a vital role in the economic development of the area and brings in a sizeable amount of "new money" into the economy. The BLM manages roughly 180,000 AUMs for livestock in the Planning Area. A rough dollar value per AUM is $35.96 (Fletcher et. al 2006), which makes the value of livestock AUMs in the Planning area at $6,472,800. Table 3.38 illustrates the estimated economic contribution per AUM as well as for the 180,000 AUMs managed by the BLM on the Arizona Strip.

Table 3.38: Estimated Economic Contributions of Grazing in the Planning Area

Economic Contribution	One AUM of Grazing	180,000 AUMs of Grazing
Total economic activity	$89.70	$16,145,767
Total earned income	$15.94	$2,869,856
Total number of jobs	0.0014845	267
Indirect business taxes	$2.68	$482,507

Based on $38.90 per AUM. Source: Fletcher et al. 2006.

Another important economic contributor to the Planning Area stems from outdoor recreation activities, specifically that relating to OHV use. OHV-related expenditures contribute $215.3 million to local economies in Coconino County and $182 million to local economies in Mohave County (Arizona State Parks 2003).

Parashant Socioeconomics

Parashant is located within Mohave County, Arizona. No communities identified in the study area are located within the Monument boundaries. The closest communities are Mesquite and Bunkerville, Nevada and the Virgin River communities in Arizona. Fredonia, Colorado City, the Kaibab Paiute Reservation, and Moccasin are the closest communities on the northeast side of the Monument.

Vermilion Socioeconomics

Vermilion is located within Coconino County, Arizona. No communities identified in the study area are located within the Monument's boundaries, although the businesses and dwellings in the Marble Canyon area are located adjacent to the southern boundary. Page, Arizona, is located just

outside the eastern corner of the Monument, while Big Water, Utah, is located directly north of the Monument.

Arizona Strip FO Socioeconomics

The incorporated communities of Fredonia and Colorado City, Arizona, are located inside the boundaries of the Arizona Strip FO. The businesses and dwellings in the Marble Canyon area are also located within the boundaries of the Arizona Strip FO, against the southern boundary of Vermilion. The Kaibab-Paiute Reservation is surrounded by the Arizona Strip FO on three sides, while Kanab and all the Washington County communities in Utah are located directly north of the Planning Area. Mesquite, Nevada is directly west of the Arizona Strip FO.

ENVIRONMENTAL JUSTICE

Overview

Executive Order 12898, dated February 11, 1994, established the requirement to address environmental justice concerns within the context of federal agency operations:

> To the greatest extent practical and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and averse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations in the U.S.

As part of the NEPA process, agencies are required to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income communities. Six general principals for environmental justice under NEPA include:

1. Identify minority and low-income populations in the area affected by the project;
2. Consider relevant public health data and industry data regarding potential multiple and cumulative exposures of minority and low-income populations to human health or environmental hazards;
3. Recognize interrelated cultural, social, occupational, historical, or economic factors that could amplify environmental effects of the project;
4. Develop effective public participation strategies that overcome linguistic, cultural, institutional, geographic, and other barriers;
5. Assure meaningful community representation in the process; and
6. Seek tribal representation consistent with the government-to-government relationship between the U.S. and tribal governments.

Environmental justice concerns include any adverse affect on minority and low-income populations in the study area. Key indicators reviewed for environmental justice include minority populations, poverty rates, and income within a community.

Minority Populations

Table 3.39 shows the race and ethnicity (Hispanic or Latino) of the population in the study area. With the exception of Coconino County, Clark County, the community of Page, and Kaibab Census Designated Place (CDP), the study area has percentages of white population higher than the 2000 national average of 77.1 percent. Mohave County and Colorado City, Arizona, and all the counties and communities in Utah were over 90 percent white. The largest population of non-whites in the Utah portion of the study area was in Big Water, where American Indians make up 4.1 percent of the population.

The county with the greatest percentage of minorities was Coconino County. The county's major population center, Flagstaff, is a university town with more ethnic diversity than many outlying areas of the county. Whites made up 65.1 percent of the population in Coconino County in 2000, which was smaller than both the Arizona and the U.S. averages. The largest minority group was American Indians who made up nearly 30 percent of the population, compared to 5.7 percent in Arizona and only 1.5 percent nation-wide. This is not surprising as Indian reservation lands, including the Navajo, Hopi, Paiute, Havasupai, and Hualapai Nations, comprise 38.1 percent of lands in Coconino County.

Although Fredonia has a higher percentage of whites than the Arizona and national averages, it also had a greater percentage of American Indians, although only about one-third as much as Coconino County. Page more accurately reflects the racial makeup of Coconino County, with 70 percent being white and 29 percent being American Indian. The Navajo Nation surrounds Page, which explains the high percentage of American Indians living within the city.

Over half of the population in the Kaibab CDP, 54.9 percent, was American Indian, with 43.6 percent being white. Most whites, 58.2 percent, live in the community of Moccasin, which is not on reservation lands.

The population in Clark County more closely reflects that of the nation, being 75 percent white, 10.5 percent some other race, 10 percent black, and 6.6 percent Asian. Much of the diversity within Clark County can be found in Las Vegas, the county's major population center, which is approximately 55 miles from the western border of Parashant and Arizona Strip FO. At 10 percent of the population, Clark County has the only significant black population in the study area, although it is below the national average of 12.9 percent. The Asian population in Clark County is slightly higher than the national average.

Though Hispanics made up 12.5 percent of the Nation's population in 2000, they are not very prominent in the study area. While the percentage of Hispanics in Arizona's population was

Table 3.39: Race and Persons of Hispanic or Latino Origin

	RACE (Percentages)[1]						Hispanic or Latino		POVERTY[2]	
	White	Black or African American	American Indian or Alaska Native	Asian	Pacific Islander	Some Other Race	#	%	% Individuals in Poverty	% Families in Poverty
UNITED STATES	77.1	12.9	1.5	4.2	0.3	6.6	35,305,818	12.5	12.4	9.2
Arizona	77.9	3.6	5.7	2.3	0.3	13.2	1,295,617	25.3	13.9	9.9
Coconino County	65.1	1.4	29.7	1.1	0.2	5.0	12,727	10.9	18.2	13.1
Fre donia	87.2	1.3	12.5	0.1	0.1	0.7	15	1.4	15.0	12.3
	70.0	0.7	28.9	0.8	0.3	2.5	320	4.7	13.9	12.8
Mohave County	92.0	0.7	3.3	1.1	0.2	4.9	17,182	11.1	13.9	9.8
C olorado City	97.8	0.2	0.6	0.6	0.7	2.5	97	2.9	31.9	29.0
Kaibab CDP	43.6	- -	54.9	- -	- -	5.1	21	7.6	29.5	26.8
Kaibab Paiute Tribe	28.6	- -	69.9	- -	- -	6.6	20	10.2	31.6	29.7
Vi rgin River Com.	85.6	0.0	1.8	0.6	0.3	13.7	355	23.2	12.4	10.4
Utah	91.1	1.1	1.8	2.2	1.0	5.1	201,559	9.0	9.4	6.5
Kane County	97.3	0.1	2.4	0.4	0.2	1.1	140	2.3	7.9	5.5
B ig Water	95.2	- -	4.1	0.2	0.5	1.2	22	5.3	14.5	11.0
Kana b	97.9	0.1	1.7	0.5	0.3	0.8	67	1.9	5.6	4.0
Washington County	95.1	0.4	2.1	0.8	0.7	2.8	4,727	5.2	11.2	7.7
Hi ldale	97.2	0.2	1.2	0.6	0.6	0.9	19	1.0	41.2	37.0
Hu rricane	97.1	0.3	1.6	0.4	0.5	1.4	224	2.71	13.1	10.8
Ivi ns	96.0	0.3	2.2	0.6	0.6	2.6	175	3.9	6.8	4.9
St . George	93.9	0.5	2.2	0.9	1.0	3.5	3,337	6.7	11.6	7.4
Sant a Clara	98.4	0.3	0.6	0.8	0.6	0.7	94	2.0	3.5	2.7
Was hington	95.3	0.4	2.0	0.6	0.3	2.6	384	4.7	7.9	7.5
Nevada	78.4	7.5	2.1	5.6	0.8	9.7	393,970	19.7	10.5	7.5
Clark County	75.0	10.0	1.5	6.6	0.9	10.5	302,143	22.0	10.8	7.9
Bu nkerville CDP	80.5	0.9	1.6	2.4	1.0	19.7	252	24.9	7.9	3.6
M esquite	82.0	1.0	1.6	1.9	0.2	15.7	2,324	24.8	10.2	6.2
Lincoln County	93.3	2.1	2.6	0.6	0.2	3.5	221	5.3	16.5	11.5

CDP = Census Designated Place. "- -" = No Data Available.
[1]Alone or in combination with one or more of the other races listed. The six percentages may add to more than 100 percent because individuals may report more than one race.
Data Sources: U.S. Census Bureau, Census 2000. [2]Poverty data is from 1999.

about twice as high as the national average, all of the counties and communities within the Arizona portion of the study area were below the national average, with the exception of the Virgin River communities, which were 23.2 percent Hispanic. The Utah counties and communities in the study had a much lower than National average percent of Hispanics, ranging from only 1 percent of the population in Hildale, to 6.7 percent in St. George. Nevada had a relatively large Hispanic population at 19.7 percent for the state, 22 percent for Clark County, and roughly 25 percent in both Bunkerville CDP and Mesquite.

Poverty Rates and Income

Table 3.39 includes the percent of individuals and families living in poverty in the study area. In 2000, 12.4 percent of individuals and 9.2 percent of families lived in poverty nationwide. Half of the communities within the study area fell below these numbers. The neighboring communities of Hildale, Utah and Colorado City, Arizona, were the worst off in terms of poverty. Thirty-seven percent of Hildale's families and 41.2 percent of individuals lived in poverty. These communities also had the lowest per capita income in the study area, $4,728 for Hildale and $5,293 for Colorado City, substantially lower than the national average per capita income of $21,587 during that same period. A contributing factor to the low per capita income levels and high poverty rates was both communities' large family size, at 8.10 for Hildale and 7.58 for Colorado City, more than twice the national average family size of 3.14.

The Kaibab-Paiute tribe also had a very high individual poverty rate at 31.6 percent, a high family poverty rate at 29.7 percent, and a low per capita income at $7,951. Family size did not seem to play an important role in the tribe's poverty rates and low per capita income. The tribe's average family size was 3.51, only slightly higher than the national average.

Other areas with individuals and families living in poverty and low per capita incomes were Fredonia and Page in Arizona and Big Water and Hurricane in Utah. The Virgin River communities had relatively low per capita income and a slightly higher percentage of families living in poverty than the national average, although the percent of individuals living in poverty was similar to the national average.

All of the communities in the study area had per capita income lower than the national average, even those with relatively low individual and family poverty rates. All of the communities, with the exception of Page and Santa Clara, had lower family income than the national average. A number of the communities have higher than average family sizes, which decreases the average per capita income.

Non-labor income, much of it brought by retirees, is the largest source of income in several of the counties involved, and the second highest in the other counties. Increasing numbers of retiring baby boomers are choosing to relocate from big cities to rural towns to enjoy the lower cost of living, slower pace of life, and outdoor recreational opportunities that such communities

offer. The income that these new residents bring can have beneficial economic effects for local restaurants, stores, and service and health care businesses.

HEALTH AND SAFETY

Abandoned Mines

Overview

Based on available information (BLM 2004b), there are 239 abandoned mines in the Planning Area: 105 in Parashant, 17 in Vermilion, and 117 in Arizona Strip FO. Twenty of the abandoned mines in Parashant are on NPS lands and the remaining 85 are on BLM lands. Environmental and public hazards identified in association with these abandoned mines include size and depth of opening, stability of ground around the opening, the amount of waste present, presence of structures, and any water present at the mine. The potential for public interaction or accessibility with the mine was also analyzed (BLM 2004b). These categories include the accessibility of the mine, the distance from a populated area, the visibility of the mine, the difficulty of rescue, the amount of recreational activities around the mine, and the potential for land development near the mine.

Parashant Abandoned Mines

Nine mines located in Parashant are considered public safety hazards and/or are suspected of being environmental concerns due to potentially containing hazardous materials. These are presented in Table 3.39

Table 3.40: Parashant Mines with Suspected Public Safety and/or Environmental Concerns

Mine Name	Type of Potential Hazard
Grand Gulch Mine	Environmental and Public Safety
Copper Mountain Mine (NPS)	Environmental and Public Safety
Cunningham Mine	Public Safety
White Pockets Mine	Public Safety
Savanic Mine	Public Safety
Hidden Mines	Public Safety
Goddess Mine	Public Safety
Unnamed Mine (Mt Bangs)	Public Safety
Unnamed Mine (Hen Springs)	Public Safety

Vermilion Abandoned Mines

Two mines located in Vermilion are considered public safety hazards and/or are suspected of being environmental concerns due to potentially containing hazardous materials. These are presented in Table 3.41.

Table 3.41: Vermilion Mines with Potential Public Safety and/or Environmental Concerns	
Mine Name	**Type of Potential Hazard**
Sun Valley Mine	Environmental and Public Safety
Red Wing Mine	Environmental and Public Safety

Arizona Strip FO Abandoned Mines

Five mines located in the Arizona Strip FO are considered public safety hazards or are suspected of being environmental concerns due to potentially containing hazardous materials. These are presented in Table 3.42

Table 3.42: Mines with Potential Public Safety and/or Environmental Concerns	
Mine Name	**Type of Potential Hazard**
Unnamed (White Pockets)	Environmental
Unnamed (Wild Band Pockets)	Environmental
Unnamed (White Sage Flat)	Environmental
Unnamed Mine (Gyp Hills)	Public Safety
Unnamed Mine (Elbow Canyon)	Public Safety

Hazardous Materials

Overview

As defined by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and the Superfund Amendments and Reauthorization Act of 1986, a hazardous material is a substance, pollutant, or contaminant that, due to its quantity, concentration, or physical or chemical characteristics, poses a potential hazard to human health and safety or to the environment if released into the workplace or the environment.

The Resource Conservation and Recovery Act (RCRA) of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984, defines hazardous waste as a solid waste or combination of wastes that, due to its quantity, concentration, or physical, chemical, or infectious characteristics, could cause or significantly contribute to an increase in mortality, an increase in serious irreversible or incapacitating reversible illness, or could pose a substantial present or future hazard to human health or the environment when improperly treated, stored, disposed of, or otherwise managed. A solid waste is a hazardous waste if it is not excluded from regulation as a hazardous waste; exhibits any ignitable, corrosive, reactive, or toxic characteristic; or is listed in Subpart D of the RCRA.

The RCRA requires that hazardous wastes be managed through a record keeping system that entails tracking properly labeled hazardous shipments from point of generation to ultimate disposal. Also required by federal law are proper labeling, storage, containerization, training, and emergency procedures for hazardous waste. Materials can leak from improperly closed,

improperly removed, or existing storage tanks, potentially contaminating ground and surface water.

There are no known aboveground storage tanks or underground storage tanks on BLM or NPS lands in the Planning Area. In general, the occurrence of hazardous materials has been incidental, mostly close to towns or along highways. These include the dumping of used oil and lead-acid batteries and the burning of wire. Household trash dumps are inspected for hazardous chemicals and are cleaned-up as part of the Hazardous Materials program. Many of the old, unauthorized small dumpsites that exist throughout the Planning Area, many are now considered historic. Information regarding authorized active and closed landfills can be found in the Lands and Realty Section. Some dynamite and blasting caps have been found in remote areas, such as abandoned mines and ranching operations. Ranchers and the BLM use herbicides for controlling noxious weeds and sagebrush.

Parashant Hazardous Materials

Illegal dumping of hazardous materials in Parashant is rare due to the Monument's remoteness. Minor oil and fuel spills at administrative sites, along roads, and at old farms and ranches have occurred. These have been cleaned up. Small amounts of waste, such as oil and fuel, have leaked from well pumping engines near ranching developments. One of the largest concentrations of hazardous materials located in the Monument was at Pakoon Springs Ranch, which was recently acquired by the BLM and subsequently cleaned-up. Hazardous materials found at the site included lead acid batteries, diesel fuel, gasoline, solvents, insecticides, herbicides, used motor oil, petroleum contaminated soil, and a variety of household chemicals.

Vermilion Hazardous Materials

Illegal dumping of minor waste, such as used oil and lead-acid batteries, has occurred in Vermilion close to the settlements along Highway 89. The potential for hazardous wastes on the Paria Plateau is much lower due the remoteness of the area, although some wastes may be located near ranching developments. Blasting caps and dynamite have been found and cleaned-up at a few abandoned mines.

Arizona Strip FO Hazardous Materials

Most incidents of illegal dumping of hazardous materials in the Planning Area, such as used oil and lead-acid batteries, have occurred in the Arizona Strip FO due to its proximity to towns and highways. Accidental fuel spills also occur along the highways and major routes due to vehicle crashes. Illegal dumping and accidental spills will probably continue and potentially increase, along with growth in the local population.