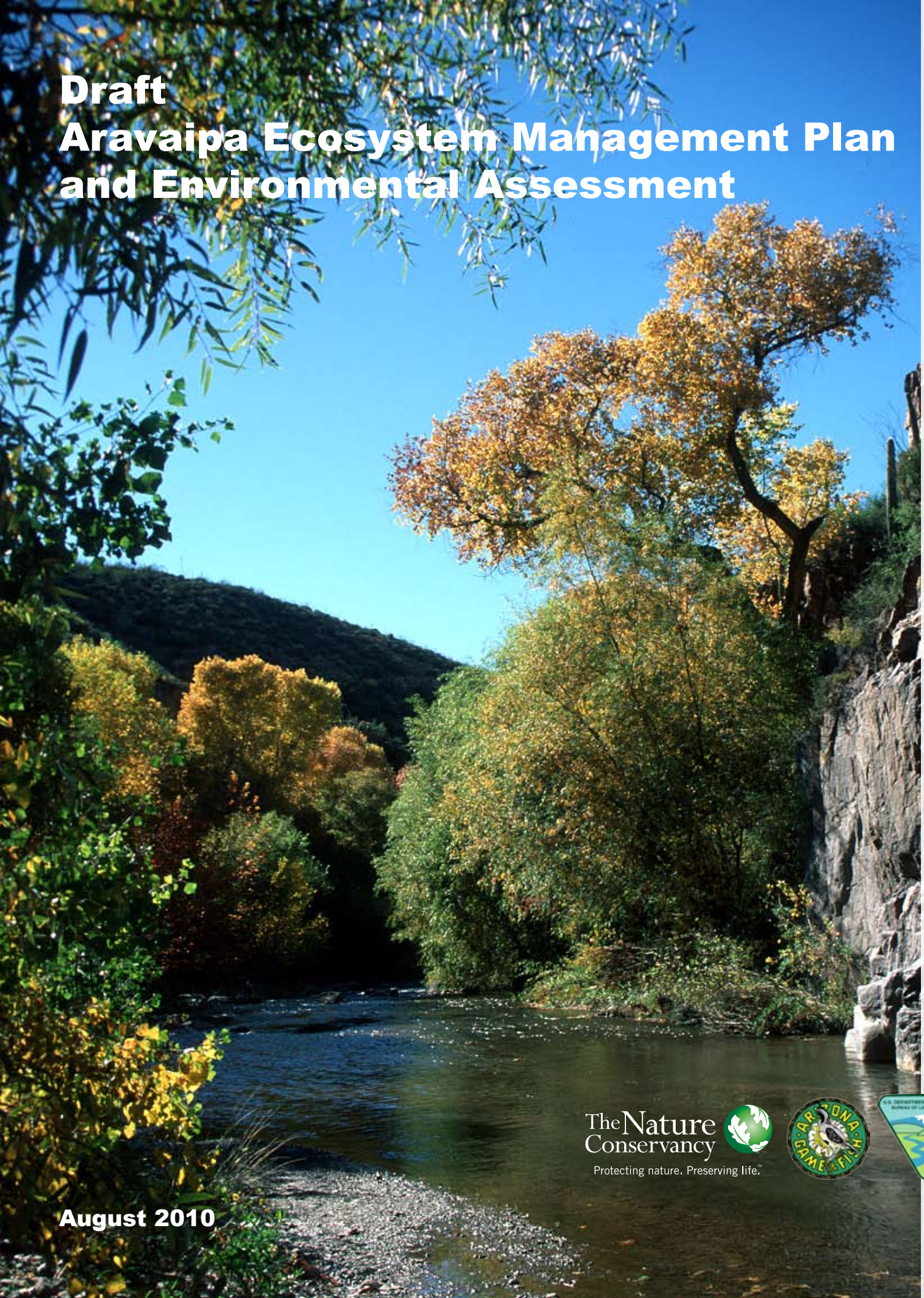
Draft
Aravaipa Ecosystem Management Plan and Environmental Assessment



BLM

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August 2010

Mission Statements

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The Bureau of Land Management (BLM) is responsible for managing the National System of Public Lands and its resources in a combination of ways, which best serves the needs of the American people. The BLM balances recreational, commercial, scientific and cultural interests and it strives for long-term protection of renewable and nonrenewable resources, including range, timber, minerals, recreation, watershed, fish and wildlife, wilderness and natural, scenic, scientific and cultural values. It is the mission of the BLM to sustain the health, diversity and productivity of the public lands for the use and enjoyment of present and future generations.

Arizona Game and Fish Department

The mission of the Arizona Game and Fish Department is to conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs, and to provide wildlife resources and safe watercraft and off-highway vehicle recreation for the enjoyment, appreciation, and use by present and future generations.

The Nature Conservancy

The mission of The Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

Cover photo: Aravaipa Creek.
Photo © Greg Gamble/TNC

BLM/AZ/PL-08/006

United States Department of the Interior

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In Reply Refer To:
1615 (AZG010)

August 2, 2010

Dear Reader:

Thank you for your interest in the future of the Aravaipa Ecosystem. The Draft Aravaipa Ecosystem Management Plan, Aravaipa Ecosystem Management Plan Environmental Assessment (EA), and unsigned Finding of No Significant Impact (FONSI) are now available for your review and comments. The 90-day public comment period for the Draft Plan and EA will end on November 30, 2010.

The Draft Plan is based upon a series of collaborative efforts from 2004 to 2009. It reflects a lengthy public participation to address issues and concerns, beginning with five open houses in 2004. A public workshop was held in Willcox, Arizona, on March 5, 2005, to group comments into general themes. Seven workgroups were formed at that workshop; members continued to work together to develop proposed objectives for the management of the planning area. These objectives were further refined to address issues raised during scoping.

The Aravaipa Plan Core Team – which includes the Bureau of Land Management (BLM), Arizona Game and Fish Department, and The Nature Conservancy – developed management actions that, over time, would realize the objectives that each workgroup developed. Some objectives proposed at the workshop were later determined by the Core Team to conflict with the vision of the planning area or were constrained by regulation, policy, or law; these were not carried forward into the draft plan.

Your comments will be considered in the development of the Final Aravaipa Ecosystem Management Plan and Decision Record. Comments are most useful when they address one or more of the following:

- errors in the analysis
- new scientific information that would have a bearing on the analysis
- misinformation that could affect the outcome of the analysis
- requests for clarification
- a substantive new alternative whose mix of allocation differs from those under any of the existing alternatives

When commenting about a particular statement in the document, please include the section number or table number and title within your comment. When commenting about a particular map, please refer to the map number and title that contains the information.

To ensure that you have opportunities to share your comments about the Draft Plan, EA, and unsigned FONSI, public meetings will be held in Safford, Klondyke, Winkelman, and Tucson midway through the comment period.

Public comments, including names and street addresses of respondents, will be available for public review at the BLM Safford Field Office, 711 S. 14th Avenue, Safford, Arizona, 85546, during regular business hours (8:00 a.m. to 4:00 p.m.), Monday through Friday, except holidays. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act (FOIA), you must state this prominently at the beginning of your comments. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

For your convenience, the Draft Aravaipa Ecosystem Management Plan, accompanying EA, and unsigned FONSI are available on CD and on the BLM Arizona website at www.blm.gov/az/.

Please send written comments to the following address:

Draft Aravaipa Ecosystem Management Plan
Safford Field Office
711 S. 14th Avenue
Safford, AZ 85546

Comments may also be submitted by email to SFOWEB_AZ@blm.gov. Please put Aravaipa Plan Comments in the subject line of the email. Comments will be accepted at public meetings to be held during the 90-day comment period following release of the Draft Plan and EA. Exact dates, places, and times of public meetings will be posted on the BLM web page, or you may call the Safford Field Office at 928-348-4400 for further information.

We appreciate your interest and encourage your continued involvement in the planning process.

Sincerely,

Scott C. Cooke	Tom Collazo	Raul Vega
Field Manager	Assoc. State Director for	Regional Supervisor
Safford Field Office	Conservation Programs	Region V Office
Bureau of Land Management	The Nature Conservancy (AZ)	Arizona Game & Fish Dept.

Draft
Aravaipa Ecosystem Management Plan and Environmental Assessment

Prepared by

U.S. Department of the Interior
Bureau of Land Management
Safford Field Office
Arizona

Arizona Game and Fish Department
Region V

The Nature Conservancy
Arizona Chapter

August 2010

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CHAPTER 1.
PURPOSE AND NEED

Photo © Peter Warren/TNC

A. Introduction

This planning effort was needed to develop one management plan that would revise existing activity plans and comply with current policies, laws, and administrative designations.

The plan establishes guidance, objectives, policies, and management actions for the 70,000 acres of public land managed by the Bureau of Land Management (BLM) in and around the Aravaipa Canyon area. It integrates management direction for adjacent properties owned by The Nature Conservancy (TNC). It also incorporates management goals of the Arizona Game and Fish Department (AGFD) for wildlife, hunting, and off-highway vehicle recreation. The plan is meant to be comprehensive, and to resolve or address issues both within the area of contiguous public lands and in the greater Aravaipa watershed, as identified through agency, interagency, and public scoping efforts. As described in the 1991 Safford District Resource Management Plan (RMP), "Management goals for the Aravaipa Creek watershed . . . are designed to maintain or restore the natural ecological processes, biological communities, and cultural resource values as practicable while allocating and actively managing the full spectrum of compatible multiple uses."

The plan explains or identifies the ecosystem resources present, current management situation, desired future conditions to be maintained or achieved,

measureable objectives for those conditions, management actions necessary to achieve and monitor progress toward these objectives, and a schedule and cost estimate for implementing the actions.

The plan integrates and updates the 1988 Aravaipa Canyon Wilderness Management Plan and establishes management for three Areas of Critical Environmental Concern (ACEC): Turkey Creek Riparian ACEC, Table Mountain Research Natural Area ACEC, and Desert Grasslands Research Natural Area ACEC (Pilares unit). It also integrates management guidance for the Aravaipa Canyon Wildlife Area, as established by the Arizona Game and Fish Commission.

B. Partners

The Aravaipa Ecosystem Management Plan is a collaborative effort between three primary organizations and interested members of the public.

Bureau of Land Management

The Bureau of Land Management (BLM) is responsible for managing the National System of Public Lands and its resources in a combination of ways, which best serves the needs of the American people. The BLM balances recreational, commercial, scientific and cultural interests and it strives for long-term protection of renewable and nonrenewable resources, including range, timber, minerals, recreation, watershed, fish and wildlife, wilderness and natural, scenic, scientific and cultural values. It is the mission of the BLM to sustain the health, diversity and productivity of the public lands for the use and enjoyment of present and future generations.

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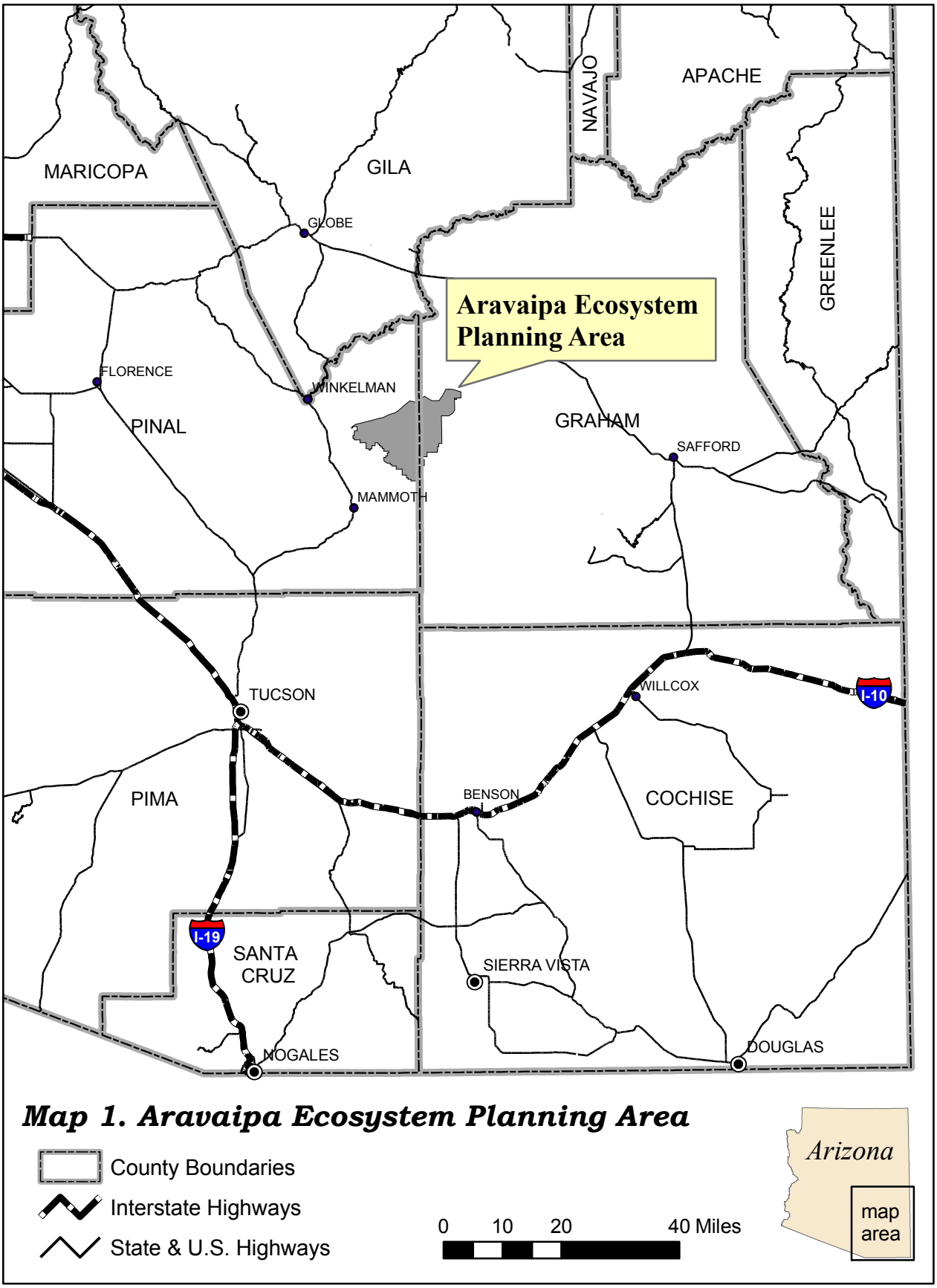
The Nature Conservancy

The mission of The Nature Conservancy (TNC) is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Working throughout the United States and more than 30 countries around the world, the Conservancy employs a range of non-confrontational strategies tailored to local circumstances. The result is a network of places protected at an appropriate scale with the cooperation of local partners.

C. Planning Area

Aravaipa Canyon is located about 50 miles west of Safford, Arizona, along the border of Graham and Pinal counties (Map 1). The complete Aravaipa watershed area is about 558 square miles (356,984 acres), with an elevation range of 2,160



Map 1. Aravaipa Ecosystem Planning Area

to 8,441 feet. In the upper watershed, surface flow is ephemeral to intermittent in a broad alluvial valley between the Pinaleño and Santa Teresa mountains to the east, and Galiuro Mountains to the west. The creek becomes perennial at Aravaipa Spring, at the head of Aravaipa Canyon near Stowe Gulch, and cuts westward through the Galiuros.

Aravaipa Creek's 22-mile-long perennial reach supports one of the last remaining assemblages of desert fishes in Arizona, with seven native species including two - spikedace and loach minnow - federally listed as threatened species. Other wildlife using the canyon includes the threatened Mexican spotted owl and candidate western yellow-billed cuckoo.

Riparian habitats support mixed forests of sycamore, cottonwood, willow, walnut, ash, and white oak. Mesquite bosques line higher terraces above the floodplain. Low-elevation upland areas are dominated by Sonoran desert scrub with creosote, palo verde, diverse shrubs, and saguaro. Mid-elevation slopes have semidesert grassland/scrub with native perennial grasses. Steeper slopes at middle and upper elevations support evergreen woodlands of oak and juniper and mixed chaparral.

The area explicitly addressed by this plan includes approximately 69,609 acres of BLM land around Aravaipa Canyon, incorporating eight grazing allotments: Aravaipa, Aravaipa South, Brandenburg Mountain, South Rim, Painted Cave, Dry Camp, Hell Hole, and Horse Mountain (Map 2). It also addresses cooperative management issues for 7,802 acres of private land owned by The Nature Conservancy within or adjacent to the South Rim allotment. As noted above, this area includes the Aravaipa Canyon Wilderness, three areas of critical environmental concern, and the Aravaipa Canyon Wildlife Area. The Aravaipa Canyon Wilderness is now part of the National Landscape Conservation System (NLCS) that was created by the BLM in June 2000 and officially designated by Congress in March 2009 to include the crown jewels of the public lands managed by the BLM. The purpose of the NLCS is to conserve, protect, and restore nationally significant landscapes recognized for their outstanding cultural, ecological and scientific values.

D. Planning Process

Ecosystem management can be defined simply as keeping natural environments healthy, diverse, and productive so people can benefit from them year after year. The ecosystem management approach means identifying limits to use and development of the land's resources and managing within those limits in order to ensure the long-term health, biodiversity, and productivity of the environment. For some areas, it means trying to restore damaged land to a healthy condition. It also means recognizing the inherent connections between various types of land management actions and adapting those actions to meet the full range of management objectives.

Photo © TNC

Representatives from the BLM, AGFD, and TNC developed this ecosystem plan with public input. We chose the planning area to reflect common management issues, including the uplands which have the most direct effects on the perennial reach of Aravaipa Creek, and those lands managed by BLM and TNC. A vision for the area was developed, based on the missions of the three organizations and shared experience with the area. As detailed in Chapter 8, the planning effort involved concerned members of the public in identifying issues of concern, drafting objectives and management actions, and review of the draft plan. The core planning team compiled information on current ecosystem resources and refined the objectives and actions, connecting them to the identified issues. Out of the various proposed actions, a preferred alternative was developed which best addresses the issues of concern and the resource needs of the area. Monitoring actions were then prescribed to track progress toward achieving the objectives. Finally, a plan evaluation schedule was specified, allowing the plan to be amended as we learn more about the condition and functions of this ecosystem through research and monitoring.

E. Relationship to Statutes, Regulations, & Other Plans

This plan conforms with the Safford District RMP (BLM 1991). The 1994 Partial Record of Decision II for that plan directed that BLM prepare a Coordinated Resource/Interdisciplinary Ecosystem Management Plan for public lands in the Aravaipa watershed. This coordinated plan eliminates the need for separate plans addressing wilderness, areas of critical environmental concern, wildlife, grazing, recreation, and cultural resource management.

The proposed plan actions comply with the Federal Land Policy and Management Act of 1976 (FLPMA), which requires the BLM to manage public lands for multiple use on a sustained-yield basis.

Those actions pertaining to the Aravaipa Canyon Wilderness comply with the Wilderness Act of 1964, Arizona Wilderness Act of 1984, and Arizona Desert Wilderness Act of 1990, and are guided by wilderness management policy as outlined in BLM Manual 8560 and 43 CFR 6300.

The laws expanding the Aravaipa Canyon Wilderness withdrew wilderness lands from new entry, location, sale, or leasing under the mining laws. Overall guidance on managing mineral resources outside the Aravaipa Canyon Wilderness appears in the following: General Mining Law of 1872 (as amended); Mining and Minerals Policy Act of 1970; FLPMA; National Materials and Minerals Policy; Research and Development Act of 1980; State of Arizona statutes and rules; and the BLM's Mineral Resources Policy of 1984.

Management of rangelands in the planning area is guided by the Taylor Grazing Act of 1934, FLPMA, and the Public Rangelands Improvement Act of 1978, along with the Safford District RMP (BLM 1991), Eastern Arizona Grazing EIS (BLM 1986), Arizona Standards for Rangeland Health and Guidelines for Grazing Management, and Statewide Land Use Plan Amendment for Fire, Fuels and Air Quality Management (BLM 2004b). This plan conforms with the 2006 revised grazing regulations for public lands (43 CFR 4100).

Legal authority for BLM's management of riparian-wetland areas is based on many laws and executive orders including the Taylor Grazing Act of 1934, Endangered Species Act of 1973, Federal Land and Policy Management Act of 1976, Emergency Wetland Resources Act of 1986, Water Quality Act of 1987, and Executive Orders 11988 and 11990. BLM riparian area management policy is provided in BLM Manual 1737.

Legislation, including the Endangered Species Act, FLPMA, Public Rangelands Improvement Act, and Sikes Act, direct the BLM to manage habitats to meet the needs of fish and wildlife. Those actions pertaining to threatened and endangered species management conform to the Endangered Species Act, BLM Manual 6840, and relevant recovery plans which include the following: Loach Minnow Recovery Plan (USFWS 1991), Spikedace Recovery Plan (USFWS 1991), Gila Topminnow Recovery Plan (USFWS 1998), and Desert Pupfish Recovery Plan (USFWS 1993).

The BLM administers cultural resources according to mandates set forth by a number of regulations, laws and acts, including the National Historic Preservation Act of 1966, FLPMA, and the Archaeological Resources Protection Act of 1979. In Arizona, the BLM also operates under the terms of a national Programmatic Agreement and a Protocol with the Arizona State Historic Preservation Officer.

Management of the Aravaipa Canyon Wildlife Area is directed by Arizona Game and Fish Commission Order 40 and rule R12-4-802, and Arizona Revised Statute 17-309 A.12.

CHAPTER 2.
VISION FOR THE ARAVAIPA ECOSYSTEM

Photo © Dale Turner/TNC

Identifying grasses on the South Rim Allotment.

The shared vision of the Aravaipa Ecosystem planning team is to sustain or restore natural ecological processes, viable native species populations, healthy biological communities, significant cultural resources, and outstanding wilderness values while providing for compatible levels of human use and maintaining lifestyles that emphasize living in harmony with the ecosystem. This will be achieved through cooperative management efforts based on the best available knowledge. Regular monitoring of resource conditions and human use levels will be integrated with all areas of management, and management direction will regularly incorporate new insights gained from the monitoring results.

CHAPTER 3.
ECOSYSTEM RESOURCES

BLM file photo

Bighorn sheep at Aravaipa.

The current conditions within the Aravaipa ecosystem were formed by interactions between a variety of human and natural influences. Fish in Aravaipa Creek depend on water in the creek and on insects that use the riparian plants. The volume of water in the canyon and the quality of its flows are affected by conditions of the watershed, which are influenced by geology, climate, fire, historic human use, and current management efforts.

Few things work in isolation, so ecosystem management planning needs to incorporate our best understanding of the whole system. This chapter attempts to summarize the current knowledge of some major resource categories. It is not comprehensive, but includes references to some primary information sources used in this planning effort.

A. Climate

Precipitation

Precipitation events create the short-term high flows through Aravaipa Canyon and recharge the aquifers that provide its perennial low flow. High flows affect the stream channel morphology and thus the habitat for aquatic and riparian species,

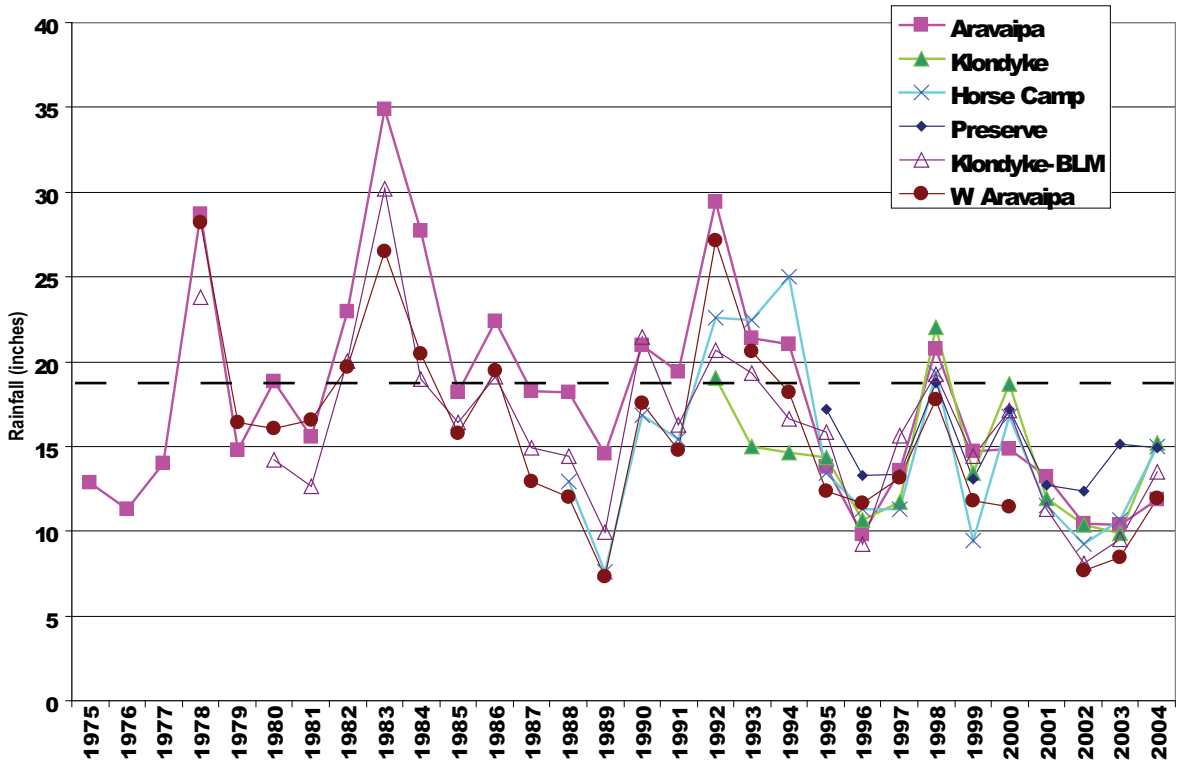


Figure 3-1. Annual rainfall at six sites around Aravaipa Canyon. Station descriptions given in Table 3-1. Dashed line shows Aravaipa Canyon average rainfall, 17.96 inches/year.

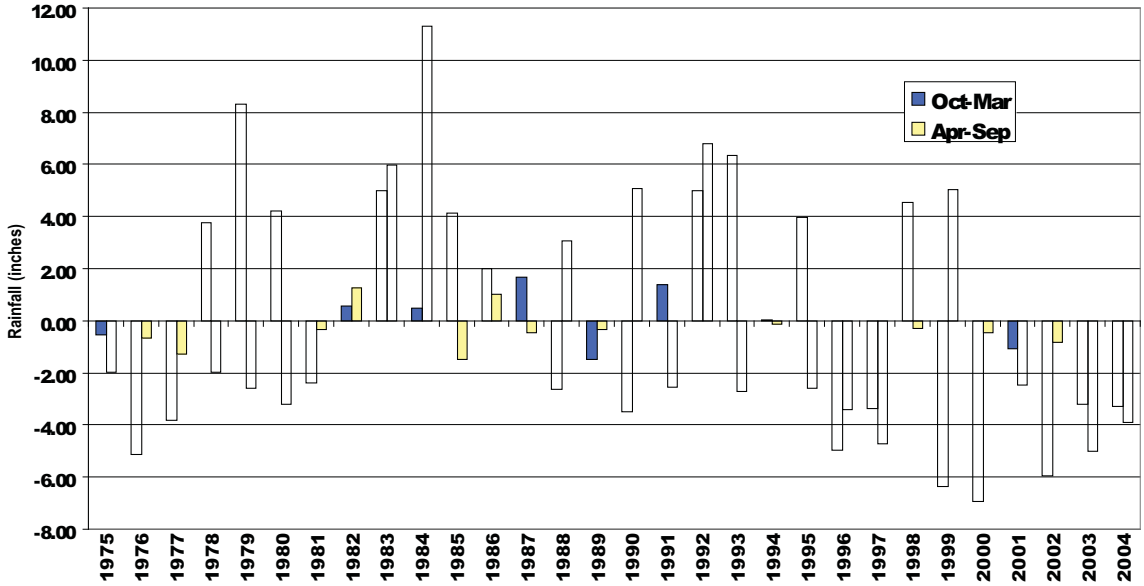


Figure 3-2. Departure from average for seasonal rainfall. Data from Aravaipa Canyon (Schnell residence) showing the amount greater or less than normal for the season.

Table 3-1. Rainfall data sets in or near Aravaipa Canyon. West Aravaipa rain gauge was moved in 2001 from trailhead to Brandenburg Ranger Station.

Site	Elevation (feet)	Period of record	Average annual rainfall (inches)	Median annual rainfall (inches)
Aravaipa Canyon (Schnell residence)	3,200	1974-2004	17.96	16.86
Klondyke (Schnell residence)	3,600	1991-2004	14.39	14.37
Horse Camp Canyon Remote Automated Weather Station	4,040	1987-2004	14.20	13.46
TNC Aravaipa Preserve Office	3,220	1995-2004	14.80	14.14
Klondyke (BLM Ranger Station)	3,475	1977-2004	16.26	16.04
West Aravaipa (Brandenburg)	2,690	1977-2004	15.77	15.77

while low flows allow persistence of aquatic species. Upland plants and animals are strongly affected by both the amount and season of precipitation.

We have six sets of rainfall data for the Aravaipa Canyon vicinity (Table 3-1, Figure 3-1). Rainfall averages between 12 and 18 inches annually for the six sites, evenly divided between winter and summer. Comparing data for the period they have in common (1991-2004) shows no significant difference between most sites. The lowest elevation site, West Aravaipa, generally had the lowest rainfall and was significantly less than the Aravaipa (Schnell) site, but the long-term averages are similar.

The season of rainfall affects upland vegetation. Rains during the summer (April-September) growing season are critical to native bunchgrasses, while winter rains tend to favor the deeper-rooted shrub species (Figure 3-2).

Temperature

Temperatures at the nearby Winkelman weather station for the period 1971-2000 range from an average maximum of 65° F in December to 104° in July. Average minimums range from 29° in December to 69° in July.

B. Hydrology and Water Quality

The Aravaipa watershed area is about 558 square miles, with an elevation range of 2,160-8,441 feet. In the upper watershed, surface flow is ephemeral to intermittent in a broad alluvial valley between the Pinaleño and Santa Teresa mountains to the east, and Galiuro Mountains to the west. The creek becomes perennial at Aravaipa Spring, near Stowe Gulch, and cuts westward through the Galiuro Mountains.

Table 3-2. Major tributary watersheds of Aravaipa Creek. This includes watersheds outside the planning area.

Name	Acres	Name	Acres
Rattlesnake Creek	30,338	Buford Canyon	9,113
Deer Creek	21,109	KH Canyon	8,713
Fourmile Canyon	16,893	Stowe Gulch	8,593
Paddy's River	14,554	Durkee Canyon	8,383
Turkey Creek	14,107	Low Creek	7,444
Sheep Wash	13,090	Parsons Canyon	5,706
Black Canyon	11,217	Tenstrike Mine Canyon	5,252
Squaw Creek	10,742	Holy Joe Canyon	5,178
Oak Creek	10,329	Klondyke Wash	5,176
Virgus Canyon	9,494	Buzan Canyon	5,094

Perennial surface flow runs about 22 miles, usually ending several miles above the San Pedro River confluence. Table 3-2 lists all tributary watersheds of Aravaipa Creek larger than 5,000 acres.

Groundwater

Management and monitoring around Aravaipa has largely focused on the aquatic and riparian systems. The source of water discharging from Aravaipa Spring is the upper aquifer (younger alluvium) of the Klondyke reach of Aravaipa Creek and Stowe Gulch (Adar 1983). Based on a water balance and mixing model for the basin, Adar (1984) estimated that Stowe Gulch supplies nearly half the water in Aravaipa Spring. Turkey Creek and other tributaries in the canyon reach contribute enough water to increase surface flows by 22% between the east- and west-end gaging stations.

Groundwater withdrawal between Haby Spring and Aravaipa Spring likely affects discharge at Aravaipa Spring. Consumptive use on 270 acres of irrigated fields between Haby Spring and the canyon, assuming all available area is planted with alfalfa, is estimated to be 900 acre-feet per year (Fuller 2000). Adar (1984) estimated annual pumpage in the reach from Haby Spring to Stowe Gulch was between 2,500 and 3,000 acre-feet per year. Evapotranspiration losses by 5.9 miles of riparian vegetation upstream from the east-end BLM gage is estimated to be 1,500 acre-feet per year (Fuller 2000). The total annual discharge at Aravaipa Springs is between 9,000 and 13,000 acre-feet per year (Adar 1984).

Increased groundwater withdrawals from the upper basin for agriculture, domestic use, or inter-basin transfer could pose a threat to flow in Aravaipa Creek. However, irrigated acreage and population in the valley have decreased during the past 20 years. Water levels in wells appear to be steady or rising during this period. Based on that, Fuller (2000) concluded that the basin appears to be in a nearly steady-state condition.

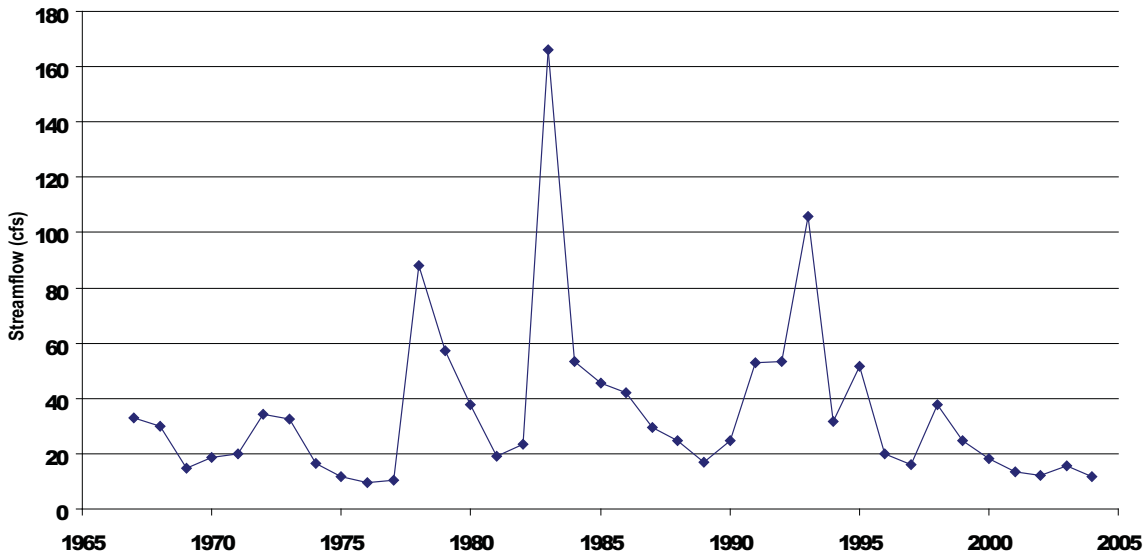


Figure 3-3. Average annual flow on Aravaipa Creek. Data from USGS gage on west end of Aravaipa Canyon.

Surface Water

Streamflow data are available for three sites along Aravaipa Creek: two east-end sites (Aravaipa East and Schoolhouse sites: monthly data, 1979 to present) and for the USGS gage upstream from the San Pedro River confluence (daily data, 1932-1943 and 1967 to present; Figure 3-3). Inspection of streamflow data for the years 1979 through 2001 indicates a declining trend for mean annual streamflow at the three monitoring sites. Large precipitation and streamflow events were recorded in 1983 and 1993. Groundwater pumping has not increased in the Aravaipa Valley; therefore, the trend of reduced streamflow from 1979 to present is most likely a result of reduced precipitation.

The base flow varies from month to month, with the highest flows in February and the lowest in June. Average annual base flow is approximately 9,500 acre-feet per year (Fuller 2000). Monthly base flow was calculated using the minimum daily flow for each month, with the average amount greater than that minimum assumed to be runoff (Figure 3-4).

Both BLM and TNC have instream flow water rights on Aravaipa Creek, intended to maintain stream flows for plants and wildlife. Other private land owners have surface water diversion rights both upstream and downstream of the wilderness.

Stream Geomorphology

Within Aravaipa Creek, monitoring data show excessive sediment deposition with the greatest effects at the canyon's upstream (eastern) end. The result is reduced aquatic habitat diversity – pools are filled in and cobbly runs and riffles are replaced by shallow sandy runs.

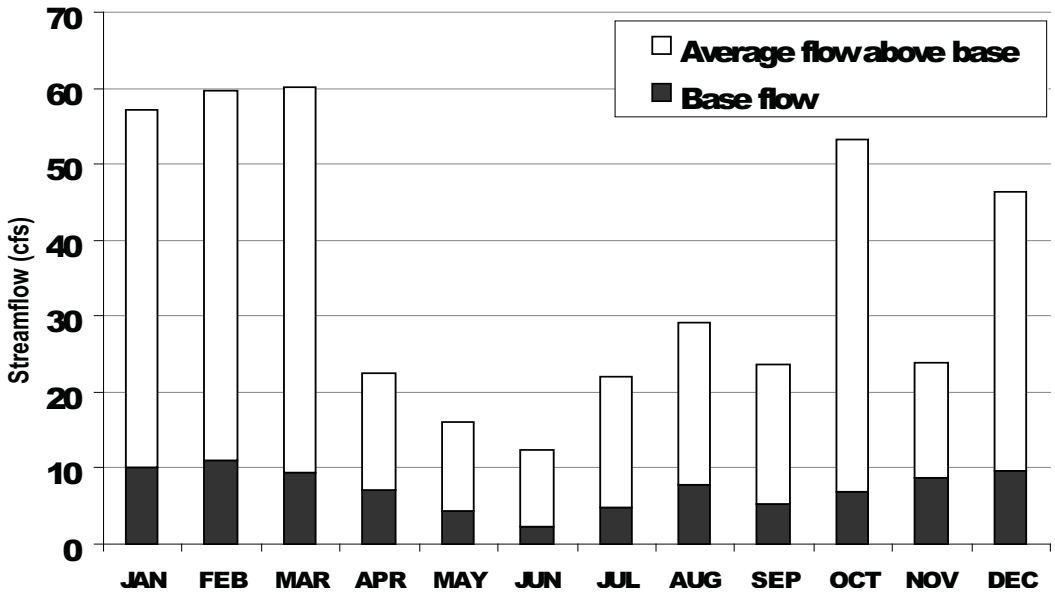


Figure 3-4. Average monthly flows at USGS gage, Aravaipa Creek, 1967-2003. Redrawn from Fuller (2000) using USGS web site data.

Large floods substantially modify channel pattern and channel and canyon-bottom geometry. Small floods exert a stronger control on channel morphology than is typical for other streams in Arizona. Following large floods, normal flows and small floods do the work of reestablishing channel geometries (Fuller 2000). Average flows and small floods (up to bankfull discharge) are essential in maintaining the health of Aravaipa Creek's channel-bed habitats.

Thirteen channel cross-sections along Aravaipa Creek were initially surveyed for elevation and vegetation in 1994 (Fouty 1994). Conservancy staff resurveyed elevations at four cross-sections near the east end in 2002, and at two cross-sections near the west end in 2004. Survey results from the east end show that the channel aggraded by 0.5 to two feet, with the greatest increases in the upstream cross-sections. Western cross-sections got 0.5 foot deeper or added an overflow channel during that same period.

Arizona Department of Environmental Quality (ADEQ) conducted a separate cross-sectional geomorphologic survey of Aravaipa Creek near Aravaipa Spring in May 1998. ADEQ determined the functional rating at this location to be "Functional at Risk/Upward Trend." ADEQ staff cited excessive sediment, straightness of channel, numerous mid-channel bars, and lack of vegetation on point bars as departures from fully functional (unpublished data from ADEQ file).

The upper Aravaipa Creek watershed is in a substantially degraded condition. In the vicinity of Eureka Springs Ranch the channel is incised and is probably still actively down-cutting. In several locations, especially from Haby Spring downstream, push-up berms have been created by farmers in an attempt to

protect their fields from bank erosion associated with flood flows. Berms cause channel straightening, which results in increased flow velocities, flood peaks, and sediment transport. Smaller flood flows are confined by the berms and lose the opportunity to spread out across the floodplain, thereby depriving adjacent areas of the rejuvenating affects of flooding. Larger flood flows erode the berms, contributing to the sediment load carried by the flood water.

As pointed out by Minckley (1981), the origin and nature of flood flows in the Aravaipa basin strongly influence sediment loads and therefore have different impacts on the channel. Large amounts of sediment are transported to and through the system when floods originate in upper Aravaipa Valley, resulting in aggradation (i.e. deposition) downstream. Floods originating in and traveling through bedrock tributaries below Aravaipa Spring carry little suspended material and therefore have high energy available to remove finer sediments. Clear-water floods of high volume carry sediment out of the canyon, resulting in reestablishment of pool habitats.

Aquatic Habitat Processes

Fish habitat types are controlled by sediment input and transport and by stream depth and velocity. High gradient, narrow channels receive coarser substrate, while finer sediments are deposited in areas where floodplains are wider and gradients lower. Pools tend to be permanent only where there are large obstructions like boulders and trees. Pools are rare after a period of consistently low discharge due to sediment filling; during these periods, the streambed can become elevated, braided channels may develop, and large-particle substrates are buried. A major flood event incises stream beds, straightens channels, and scours pools, thereby renewing the cycle.

Recurrent flooding appears to help native fish species maintain a competitive advantage over invading nonnative species by flushing out nonnatives unable to withstand flood velocities. It also maintains a diversity of stream habitat types, such as pools, riffles, and runs, which supports a diversity of fish and invertebrate species.

Water Quality

The water quality in Aravaipa Creek is generally good (Ellingson 1979, ADEQ data). However, there are threats to water quality posed by the legacy of mining in the watershed.

Historic tailings from an ore processing mill in Klondyke, adjacent to an ephemeral reach of the creek, have been placed on the state's Water Quality Assurance Revolving Fund registry of contaminated sites. Sampling there showed high levels of arsenic, beryllium, cadmium, manganese, nickel, lead, and zinc in

Photo © Dale Turner/TNC

Klondyke tailings pile, with Aravaipa Creek in the foreground.

the soil and groundwater. A public health assessment found that the Klondyke site does not pose a health risk to nearby residents, campers, swimmers, or ATV users (ADHS 1999), but its location creates a risk that flood waters could carry significant amounts of tailing material downstream into Aravaipa Canyon.

Additional potential for contamination comes from tailings at mine sites north of Klondyke, which may be transported to the creek by storm water runoff or wind dispersal (ADEQ 2003, Morfin 2003).

Contamination has affected Aravaipa's fish, with elevated levels of arsenic, cadmium, lead, and selenium found in fish tissues (King and Martinez 1998). The fish can ingest or absorb contaminants in sediment, food items, or surface water, and so may be affected by any additional erosion of the tailings piles.

The Arizona Department of Environmental Quality is conducting studies, and has capped and protected the Klondyke tailings to prevent further erosion.

C. Geology

The Aravaipa Ecosystem is in Arizona's Basin and Range physiographic province, and includes two mountain ranges, the Galiuro Mountains on the southwest side and the Santa Teresa Mountains on the northeast. The Galiuros are mostly a thick pile of Paleogene (early Tertiary) age volcanic ash falls and lava flows, and the Santa Teresas consists mostly of Paleogene granite. These two parallel, northwest-trending mountain ranges are separated by the Aravaipa Valley.

The major rock units of the ecosystem are well exposed along the deeply incised

Aravaipa Canyon, through the northern part of the Galiuros. Going from east to west, the following rock formations are exposed on the walls of the canyon.

The pitted, light-colored walls exposed on the east side of the canyon are composed of the Hell Hole Conglomerate of Pliocene age, about five million years old. This conglomerate is made up of volcanic rock debris, consisting of pebbles, cobbles and occasional boulders set in a sand or grit matrix. The material likely came from volcanic highlands of the Galiuro Mountains. This conglomerate forms dramatic vertical cliffs up to over 600 feet high where cut by the major streams in the area, extending westward to Parsons Canyon on the south wall and Hell Hole Canyon on the north wall. The exposures have a pitted or somewhat cavernous look due to the weathering out of pebbles or pebble beds.

Continuing westward, the Galiuro Volcanics are exposed for most of the rest of the canyon, and throughout most of the ecosystem. These are a thick series of volcanic rocks composed mostly of lavas ranging in composition from rhyolite to andesite, tuffs (ash falls) of similar composition, some obsidian, and coarse pyroclastic rocks. The composite thickness of the formation is more than 6,000 feet, and has been divided into 12 major units (Simons 1964). Most of the ecosystem is covered by the upper tuff unit, the Hell's Half Acre tuff unit, or the rhyolite obsidian unit. These are the predominant rocks of the ecosystem, shaping Paisano Canyon, and the country from Booger to Horse Camp Canyon. These rocks in the mid-portion of the canyon create impressive red, orange, and gray walls with columns towering more than 1,000 feet.

In the west side of the canyon, the creek cuts into the ancient crystalline basement rocks of the area, a porphyry that is probably a part of the Pinal Schist formation, over 2.6 billion years old. This is a dark red, brown, or gray metamorphosed rock with quartz and feldspar crystals set in a fine-grained matrix. The rock commonly contains numerous quartz veins, typically about three inches thick. It is older and harder than the other formations and may be why the stream has cut a narrower channel in this area.

On the west end of the canyon, west of Whitewash Canyon, a dark gray diabase occurs over an area of several miles from the west side of the canyon to Brandenburg Mountain, and consists mostly of a medium-grained rock with feldspar crystals set in a matrix of pyroxene (Krieger 1968). These are intrusive rocks that formed as sills, more than 1,000 feet thick in places.

Finally, in the western and southern parts of the ecosystem, a section of Paleozoic sedimentary rocks is sporadically exposed, ranging in age from the Cambrian (500 million years old) to the Pennsylvanian period (200 million years old). These are dominated by the Mississippian Escabrosa Limestone and the underlying Devonian Martin Formation. These formations represent a period in history during the Paleozoic Era, about 350 million years ago, when the area was covered

by shallow seas. The Escabrosa is a massive, cliff-forming, thick-bedded, mostly coarse-grained, gray limestone. The cliffs are up to 50 feet high, and the limestone contains fossils of sea animals such as corals, bryozoans, crinoid stems, and brachiopods. The Martin is mostly a slope-forming, brownish shale with a few fossiliferous limestone beds.

Economic concentrations of minerals are virtually absent in the ecosystem area. The thick sequence of Galiuro Volcanics is devoid of near-surface mineral concentrations, and this sequence covers most of the subject area. The only mine in the area is the inactive Table Mountain Mine, located in the southern part of the study area in the Escabrosa Limestone. This is a former gold mine last worked in 1974 now considered subeconomic because of its low grade and low tonnage. There has been extensive mining for gold, silver, copper, and other metals in the Aravaipa mining district immediately to the east of the planning area but within the Aravaipa watershed, and in the Copper Creek (or Bunker Hill) mining district immediately to the south of the ecosystem. Both of these are inactive now, with no mining since the 1970s (Scott 1988).

D. Vegetation and Soils

Ecosystem management involves trying to understand the connections between what happens on different parts of the landscape. Management of upland vegetation affects watershed functions, which then affect the riparian and aquatic communities.

Ecological Sites

Looking across any landscape it is not difficult to recognize that some parts are different from others in the kinds and amounts of vegetation. To understand this variation across the landscape, the Natural Resources Conservation Service (NRCS) classifies these into units called ecological sites. An ecological site is defined as a distinctive kind of land with specific characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. It is the product of all the environmental factors responsible for its development, and it has a set of key characteristics – soils, hydrology, and vegetation – that are included in the ecological site description. Rangeland ecological sites are organized according to parent geologic material for the soils and precipitation zones within some larger region. An ecological site does not reference a specific location.

Recent ecological site descriptions include conceptual models describing “states” – the most common vegetation communities – and “transitions” – the management actions or natural processes that can cause shifts between community types. These can provide insight to what vegetation conditions are possible on a site and appropriate management to reach desired conditions (Appendix 3).

photo by Dan Robinett/NRCS

Participants in a 2004 workshop to describe ecological sites in the Aravaipa area.

The Aravaipa ecosystem falls within Arizona Interior Chaparral, NRCS Major Land Resource Area (MLRA) 38. It includes four described ecological sites, but detailed soil surveys have not been conducted for the Graham County portion of the ecosystem so additional sites may be described (http://www.nrcs.usda.gov/technical/efotg/).

Two Volcanic Hills sites occur in the Aravaipa ecosystem. They occur on rugged mountain slopes, ridgetops and mesa sides. Elevations range from 3,200-5,900 feet. Slopes are from 15-70%. The sites are divided according to mean annual rainfall which ranges from about 12-16 inches on one, and 16-20 inches on the other.

The Volcanic Hills soils are shallow (10-20 inches) and dark colored. They are clayey throughout (smectitic) and well drained. They have formed in residuum and slope alluvium from basalt, andesite and related volcanic tuffs and ash. The surface textures are clay loam to clay. Surfaces are well covered by dark-colored gravels, cobbles and stones. The effective rooting depth is limited by hard bedrock at 10-20 inches. Runoff is moderate to high on moist soils. The erosion hazard is slight due to gravel, cobble and rock covers. The soils mapped on this site include Graham, Eskiminzin, Beaumain, and Kuykendall.

The historic native plant community is a diverse mixture of desert trees, shrubs, succulents, forbs and grasses. This includes a diverse flora of native annual grasses and forbs of both the winter and summer seasons. Periodic wildfires

Photo © Dale Turner/TNC

Brown Pasture in the South Rim Allotment, September 2004, showing the effects of a 2003 controlled burn (foreground) compared to unburned vegetation (background).

occurred at moderate intervals (10-30 years) and helped maintain a balance between herbs and shrubs. In the absence of fire for longer periods, shrubby species and cacti can become dominant. The interactions of drought, fire and continuous livestock grazing can, over time, result in the loss of palatable grasses, half shrubs and suffrutescent forbs. In some situations nonnative annuals can dominate the site. These species can, over time, diminish the soil seedbank of native annual species. Nonnative annuals can act to increase the fire frequency of areas of the site near roads and urban areas, where the incidence of man-made fires is high.

Northern exposures have a higher percentage of mid-grasses and some cool-season grasses that will not occur on south slopes. North slopes will also be more likely to experience tree increases especially juniper species, mesquite and canotia. Southern exposures will have a higher percentage of shrubs and succulents in the plant community. More xeric grasses like tanglehead will dominate southern exposures. At lower precipitation zone boundaries, southern exposures will look more like the plant community of the site in the 10-13 inch precipitation zone of MLRA 40 (Upper Sonoran).

Two Clayey Upland sites occur in the Aravaipa ecosystem. Elevations range from about 3,200-6,000 feet. The sites are divided according to mean annual rainfall

which ranges from about 12-16 inches on one, and 16-20 inches on the other. These sites occur in an upland position. Slopes range from 0-8 percent on gently sloping old valley fill plains and mesa tops.

Clayey Upland soils are moderately deep to deep (30 to > 60 inches), clayey throughout and well drained. They are formed in alluvium from basalt, andesite and related volcanic tuff and ash. The surface textures are clay and silty clay except that granular silty clay loam or heavy clay loam is at the surface in some places. These soils have vertic properties and crack and churn with wetting and drying. The effective rooting depth is 30-60 inches. Runoff is slow on dry soils due to cracks and holes, but is moderate to high on moist soils. The erosion hazard is slight unless heavy traffic causes trailing and compaction. The soils mapped here include Sontag clay, Cloverdale clay and Cherrycow clay.

The historic native plant community is a tobosa grassland (canopy cover of 40-50%) with a diverse flora of native annual grasses and forbs of both the winter and summer season. Periodic wildfires occurred every 10-15 years, June through August, and controlled shrubs and succulents encroaching from adjacent areas of shallow soils. In the absence of fire for long periods, shrubs and cacti can become dominant. The interactions of drought, grazing and fire can result in loss of tobosa cover. If tobosa canopy cover is reduced to less than 5% and is patchy in distribution, it may not be able to re-colonize large areas. In these situations, annual species, both native and nonnative can dominate the plant community. Nonnative annuals may, over time, diminish the soil seedbank of native annual species.

Upland Vegetation Monitoring

Vegetation on the Aravaipa uplands largely represents the legacy of historic grazing practices. There has been only limited grazing since 1971 on what is now the South Rim allotment, which comprises The Nature Conservancy's Aravaipa Preserve. Active grazing operations utilize the other allotments in the Aravaipa ecosystem.

Recent monitoring efforts by TNC on the South Rim have attempted to understand the current conditions of the vegetation and to identify trends caused by recent management activities. The BLM conducted an evaluation of the Dry Camp allotment in 2000, using canopy and frequency data through 1998 to detect condition and trend. There are no recent monitoring data available for the other allotments.

Warren and Anderson (1980) mapped upland vegetation communities in what became the South Rim allotment. They also collected baseline vegetation data from 15 plots (Johnson 1980). They noted a relatively low abundance of native bunchgrasses and high abundance of yucca and snakeweed, evidence of heavy

Table 3-3. Canopy cover on South Rim Allotment monitoring plots. Values for year 2000 do not sum to 100% due to different methods of data collection. Only shrub cover was measured in 2004.

Plot	Soil/Gravel 2000	Rock 2000	Grass 2000	Shrub 2000	Shrub 2004
Catclaw	14.5%	7.6%	38.9%	28.3%	15.3%
Chimney Ridge	28.3%	11.6%	27.3%	4.1%	7.3%
Deer Creek Pasture	48.3%	9.5%	13.6%	56.7%	25.1%
Sand Wash	44.2%	17.6%	2.8%	33.2%	40.3%
Holy Joe 1	22.1%	4.5%	23.6%	30.8%	43.7%
Holy Joe 2	28.4%	10.1%	28.0%	27.1%	35.6%
Elephant Corral	28.1%	8.3%	40.1%	6.8%	20.7%
Wire Corral	7.6%	12.1%	50.9%	21.2%	15.8%
Brown Pasture	41.9%	16.1%	16.8%	35.0%	12.6%

grazing pressure. They found cover by woody species ranging from 19-35%, and grass cover 0-6%. The plots were not permanently marked, and thus have not been resampled.

A new set of 1,000-1,250 square meter (0.23-0.28 acre) plots on the South Rim were established in 1990 and an additional plot was added in 2002. Plots were resampled in 1991, 1992, 1993, and 2000, and data on shrub cover only were collected in 2004 (Table 3-3). During that period, five of the plots were affected by fire.

Comparison of the data showed several changes. Overall, Aravaipa experienced significant decreases in frequency of both annual and perennial grasses and increases in forbs between 1990 and 2000. Despite reduced grass frequency, the diversity of perennial grasses has significantly increased between 1990 and 2000. The average number of species grew from 7.3 to 11.2, with increases found on all plots.

Perennial grass cover was not measured in 1990 so one cannot detect trend on matched plots, but the 2000 data showed an average canopy cover of 26.9%. This suggests a large increase over the cover measured in 1980.

There was a significant increase in total ground cover (litter plus live basal cover) averaging 10% between 1990 and 2000. This increase does not appear to be the direct result of climate, given the rainfall patterns discussed above. Total ground cover provides an index of a watershed's capacity to prevent runoff and soil erosion and encourage infiltration; as ground cover increases, runoff and soil erosion decrease and infiltration increases (Wilcox et al. 1988; Wilcox and Wood 1989; Abrahams et al. 1994).

Thus, grazing rest appears to have resulted in improved watershed condition throughout the allotment, but shrub cover remains at unhealthy levels. Shrub

cover declined significantly between 1990 and 2004, with declines in most plots probably due to drought. Only one plot has less than 10% total shrub cover while six plots have greater than 20%. This appears to be similar to levels recorded in 1980.

Some changes in shrub cover have resulted from restoration of fire to the ecosystem, but more needs to be done. Fire effects show a clear pattern of immediate reduction in shrub cover, followed by a steady return to pre-burn levels if not burned again.

Upland Vegetation Processes

The upland vegetation community in a given place may shift among a series of ecological states with the changing influences of climate and disturbance processes such as fire and grazing. The present vegetation communities in the Aravaipa ecosystem are an expression of past environmental conditions, disturbance regimes, and land use practices.

In the semi-desert grasslands, fire was probably the single most common disturbance controlling the transition from grassland to shrub land in the volcanic hills and clayey upland ecological sites prior to European settlement. Periodic wildfires reduced shrub cover and allowed grasses to remain dominant.

Historic livestock grazing practices (described in Section 3.J) played a major role in defining the present ecological state in the Aravaipa ecosystem. In addition to direct removal of grasses and other select plant species, livestock grazing has reduced the frequency of fire by removing the fine fuels which would otherwise allow fire to spread and which support fires hot enough to kill shrubs. Under heavy grazing use and with low fire frequency, shrubs such as catclaw, whitethorn, juniper, and snakeweed will increase and remain dominant until removed by fire or some other disturbance.

Studies of fire regimes in the region (e.g., Swetnam et al. 1989, Swetnam and Baisan 1996, Kaib et al. 1996) suggest that 7-10 years was the prehistoric return interval for fire in semi-desert grasslands (Table 3-4). This is supported by monitoring data on the response of woody species at both Aravaipa and the Muleshoe Cooperative Management Area.

Fire has been largely absent from the landscape in recent years. According to the BLM fire database, there were 43 fires from 1980 through 2005 within the contiguous BLM allotments around Aravaipa Canyon. Of those, 39 were wildfires which were either suppressed (35) or were extinguished by natural causes (4), and four were prescribed burns. Most of the fires have been small (average 63 acres). Fire management of the Aravaipa ecosystem is guided by a 2004 plan (BLM 2004).

To better understand the upland communities and the transitions that affect their composition, state-and-transition models have been constructed for some of the ecological sites in the Aravaipa ecosystem (Appendix 3). These were developed by the NRCS, in collaboration with a variety of range management experts. The process is not complete for the entire planning area because soils mapping has not been completed, but the models should apply to most of the area.

Table 3-4. Historic fire return interval of vegetation communities in the Aravaipa ecosystem. Return interval data from Schussman and Gori (2004: 53).

Vegetation community	Interval (years)
Semi-desert Grassland	7-10
Interior Chaparral	20-100
Upland Sonoran Desert Scrub	> 250
Madrean Evergreen Woodland	10-20
Riparian	35-200

Riparian Areas

The riparian forest within Aravaipa Canyon is part of the attraction for recreational users of the area and provides habitat for a wide array of wildlife. Smaller but similar riparian communities grow in many of the tributary canyons, forming ecological corridors through the more arid uplands.

The moisture gradient from aquatic to upland communities is a major factor controlling the diversity of riparian ecosystems. Individual riparian plant species have unique needs or tolerances for depth to groundwater, flood disturbance, drought, soil saturation, soil nutrient level, soil texture, light availability, grazing, and competition from other plants, with the visible effect being species assemblages sorted by those influences (Stromberg et al. 1991). In the Aravaipa ecosystem, riparian zones up to about 5,200 feet elevation are vegetated by Sonoran riparian deciduous forest species (Fremont cottonwood, Goodding willow, velvet mesquite) and by those characteristic of interior riparian deciduous forests (netleaf hackberry, velvet ash, sycamore and Arizona walnut).

In general, the relative surface elevation of the floodplain increases with increasing distance away from the stream. This results in partitioning between community types such as streamside aquatic plants, cottonwood-willow forests, and mesquite bosques. Water availability for plants also varies considerably along the length of a stream, as determined by the underlying bedrock contours of the valley bottom. In areas where bedrock is shallow beneath floodplain alluvium, such as in Aravaipa Canyon downstream from Stowe Gulch, the water table remains relatively close to the surface and streamflows may be perennial. Areas underlain by deep alluvium, such as near Klondyke, experience surface flow only during significant floods. Depth to water table sets the upper limit of a riparian species' vertical position on the floodplain, while ability to tolerate flood scour may set the lower limit.

Photo by Patrick O'Neill/BLM

Scoured stream bed after an August 2006 flood in Aravaipa Canyon.

Riparian Processes

Cottonwoods and willows are vulnerable to high salinity levels, which inhibit seed germination and weaken tree health, and increase the community's susceptibility to invasion by more salt-tolerant exotics such as tamarisk. Cottonwood/willow regeneration along the Hassayampa River occurred only after flood disturbance of at least a seven-year magnitude (Stromberg et al. 1991); these floods remove some competing herbaceous cover, deposit fertile sediments, and moisten the floodplain, creating conditions ideal for seedling recruitment. Seedlings produced in most years succumb to dehydration or flood scour, but seedlings produced after large floods were recruited. Large floods level the floodplain, producing establishment sites close to the water table but far enough from the main channel to resist later, smaller floods. Survivorship of cottonwood saplings during large floods may be related to terrace height and channel realignment (stream movement), which reduce local flow velocities.

Above and below the perennial flow, there are places along Aravaipa Creek with a few very old cottonwood trees but no recruitment. A number of factors contributed to this condition, including clearing, channel downcutting, and lowered water table because of pumping, but the greatest influence historically was probably livestock grazing on seedlings. However, the areas have been

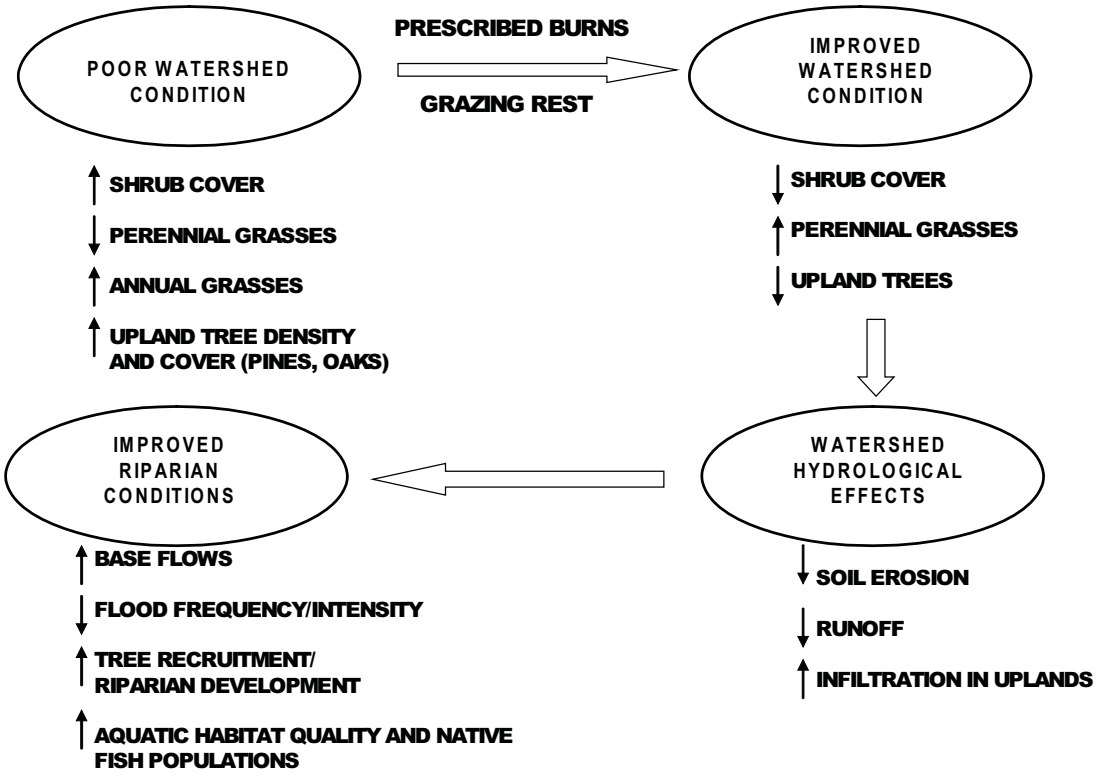


Figure 3-5. Watershed-riparian processes model. Reprinted from Brunson et al. (2001).

closed to livestock grazing for over 30 years. There are significant potentials for expansion of the deciduous riparian forest, especially where the water table is high, flooding is a regular event, and livestock management is the only real impediment.

Field surveys by TNC staff of Oak Grove and Turkey Creek canyons during 2004 provide current data on the extent of perennial flow in several tributaries. When compared to the delineation in the Arizona Land Resource Information System (ALRIS), it appears that perennial flow increased in Oak Grove Canyon from 453 yards in two reaches to 4,925 yards in three reaches. At the same time, perennial flow decreased in Turkey Creek from 2,273 to 464 yards. Following the extended drought in the watershed, we would expect reduced flows in the tributary canyons. The reduction of flow in Turkey Creek fits this, but the ten-fold increase in Oak Grove Canyon does not match that expectation. The presence of riparian-obligate trees along Oak Grove suggests that the observed flows were accurately identified, and were likely associated with improved watershed conditions.

The relationships between watershed vegetation, watershed hydrological processes, stream hydrology, and riparian condition have been studied at the Muleshoe Cooperative Management Area about 25 miles south of the Aravaipa ecosystem. It has seven perennial streams that each support up to five species of

native fish. The area is cooperatively managed by TNC, BLM, and U.S. Forest Service, guided by an Ecosystem Management Plan (BLM 1998).

That plan featured a conceptual model which links conditions of the watershed vegetation to those of the aquatic and riparian habitat through the mechanisms of sediment transport and runoff characteristics that affect flood magnitude and water storage (Figure 3-5). A key goal was to increase the land area dominated by perennial grasses while reducing the dominance of shrubs.

Implementation of the Muleshoe Plan included an aggressive program of prescribed burning. During the period 1998-2000, nearly 17,000 acres were treated with fire in three large burns. These caused immediate reductions of shrub cover by 77-83%, though some regrowth from rootstock showed the need for periodic burns to maintain reduced shrub cover. In most cases, the fires also resulted in increased ground cover, with increases in both annual and perennial grasses (Brunson et al. 2001). Since 1994, stream vegetative cover and the amount of undercut bank have increased dramatically in Hot Springs Creek, the major stream in the area being intensively managed. In addition, the mean maximum depth of aquatic habitats has increased as has the number of deep pools. Associated with these aquatic habitat changes, the population density of native fish increased significantly. These improvements occurred despite decreased base flows due to persistent drought (Gori and Backer 2005).

E. Wildlife

Aravaipa Creek's 22-mile-long perennial-flow stretch has one of the best remaining assemblages of desert fishes in Arizona. Several tributary canyons also have perennial stream reaches. The creek and its tributaries also support rich riparian communities of plants and animals. The uplands support a different, but also diverse, community. When these areas are considered together, the Aravaipa ecosystem has a documented presence of 529 plant and 353 animal species, including 233 birds, 50 reptiles, 48 mammals, 12 fish, and 10 amphibians (Johnson 1980; Appendix 1, 2).

The area includes five species currently listed under the Endangered Species Act, 13 BLM sensitive species, and 14 species on AGFD's list of Wildlife of Special Concern in Arizona (Table 3-5). The Arizona Heritage Data Management System identified 35 species of interest as occurring within the Aravaipa Creek watershed.

Photo by Heidi Blasius/BLM

Sonora sucker from Aravaipa Creek.

Aquatic Species

Aravaipa Creek supports seven native fish species: loach minnow, spikedace, roundtail chub, speckled dace, longfin dace, desert

Table 3-5. Species tracked by the Arizona Heritage Data Management System which occur in the Aravaipa Creek watershed. Endangered Species Act (ESA) status designations are: C-candidate, PT-proposed threatened, LE-listed endangered; LT-listed threatened; SC is species of concern, a former ESA status still maintained by AGFD. Bureau of Land Management sensitive species are noted by S. State status refers to the AGFD list of Wildlife of Special Concern in Arizona (WSC) or Native Plant Law (Highly Safeguarded or Salvage Restricted). Global rank (GRANK) and state rank (SRANK) are on a scale of 1-5 from most to least threatened, respectively, with taxonomic (T) ranks given for subspecies.

Scientific name	Common name	ESA	BLM	STATE	GRANK	SRANK
AMPHIBIAN						
Rana yavapaiensis	Lowland leopard frog	SC		WSC	G4	S4
BIRD						
Asturina nitida maxima	Northern gray hawk	SC		WSC	G5T3T4	S3
Buteo albonotatus	Zone-tailed hawk				G4	S4
Buteogallus anthracinus	Common black-hawk			WSC	G4G5	S3
Camptostoma imberbe	Northern beardless-tyrannulet				G5	S4
Caprimulgus ridgwayi	Buff-collared nightjar				G5	S2S3
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	C		WSC	G5T3	S3
Falco peregrinus anatum	American peregrine falcon	SC		WSC	G4T3	S4
Strix occidentalis lucida	Mexican spotted owl	LT		WSC	G3T3	S3S4
FISH						
Agosia chrysogaster	Longfin dace	SC	S		G4	S3S4
Catostomus (Pantosteus) clarkii	Desert sucker	SC	S		G3G4	S3S4
Catostomus insignis	Sonora sucker	SC	S		G3	S3
Cyprinodon macularius	Desert pupfish	LE		WSC	G1	S1
Gila robusta	Roundtail chub	SC		WSC	G2G3	S2
Meda fulgida	Spikedace	LT		WSC	G2	S1
Poeciliopsis occidentalis occidentalis	Gila topminnow	LE		WSC	G3T3	S2
Rhinichthys osculus	Speckled dace	SC	S		G5	S3S4
Tiaroga cobitis	Loach minnow	LT		WSC	G2	S1
MAMMAL						
Choeronycteris mexicana	Mexican long-tongued bat	SC	S	WSC	G4	S2
Idionycteris phyllotis	Allen's big-eared bat	SC	S		G3G4	S2S3
Lasiurus blossevillii	Western red bat			WSC	G5	S2
Sigmodon ochrognathus	Yellow-nosed cotton rat	SC			G4G5	S3S4
REPTILE						
Aspidoscelis burti stictogrammus	Giant spotted whiptail	SC	S		G4T3	S3
Gopherus agassizii	Sonoran desert tortoise	SC		WSC	G4	S4
Xantusia bezyi	Bezy's night lizard				G1G3	S?
INVERTEBRATE						
Cicindela oregona maricopa	Maricopa tiger beetle	SC	S		G5T3	S3
PLANT						
Agastache rupestris	Baboquivari giant hyssop				G3?	S2
Agave toumeyana **var**. *bella*	Tourney agave			SR	G4T3	S3
Carex ultra	Arizona giant sedge		S		G3?	S2
Erigeron piscaticus	Fish creek fleabane	SC	S	SR	G1	S1
Eriogonum capillare	San Carlos wild-buckwheat	SC		SR	G4	S4
Penstemon discolor	Catalina beardtongue			HS	G2	S2
Penstemon superbus	Superb beardtongue				G2G3	S2?
Salvia amissa	Aravaipa sage	SC	S		G2	S2
Thelypteris puberula **var**. *sonorensis*	Aravaipa wood fern		S		G5T3	S2
Tripsacum lanceolatum	Mexican gama grass				G4	S2S3

sucker, and Sonora sucker. All of these species have suffered reductions in their distribution, especially at lower elevations, and the loach minnow and spikedace are federally listed as threatened under the Endangered Species Act. While these species differ in some of their habitat requirements, they share a basic need for perennial stream flow free from pollution and habitat free from nonnative predatory and competitive fish. Due to its unique native fishery and the threatened and endangered species present, Aravaipa Creek is closed to fishing.

BLM file photo

Spikedace from Aravaipa Creek.

Two more native species, Gila topminnow and desert pupfish, were recently reestablished into three sites on the South Rim. Both are listed as endangered species, and both may have been present in the Aravaipa watershed but lost prior to the first fish sampling efforts (Stefferud and Reinthal 2005).

Eight nonnative fish species have been found in the canyon system during the last several decades: green sunfish, yellow bullhead, western mosquitofish, fathead minnow, red shiner, black bullhead, common carp, and largemouth bass. Three – red shiner, green sunfish, and yellow bullhead – have established self-sustaining populations, while the other five are known from isolated individuals which may have been deliberately introduced, escaped from ponds in the watershed, or moved upstream from the San Pedro River. Channel catfish have also been found but only in off-channel ponds (Stefferud and Reinthal 2005). These nonnative species are probably the greatest current threat to survival of the native fish. Red shiner are of particular concern, having been implicated in the decline of numerous native fishes in the Southwest (Bettaso et al. 1995).

A pair of fish barriers was constructed in 2000 downstream of the canyon mouth. These barriers should prevent invasion by nonnative fish from the San Pedro River but will not eliminate the existing nonnative species. Large flood events can temporarily reduce some nonnative species, but there are enough off-channel refugia that nonnative populations remain even after large floods (Bettaso et al. 1995, Dave Gori, pers. comm.).

Floods and barriers are also ineffective against the threat of new species washing down from stock tanks higher in the watershed, as apparently happened when green sunfish appeared at the eastern end of the canyon following a 1983 flood (Velasco 1994). The Arizona Game and Fish Department conducted a survey of stock tanks in the early 1990s. In 2005, BLM, TNC, and AGFD personnel conducted stock tank surveys along the North Rim of Aravaipa Creek. No nonnative fish were collected.

Population data exist for Aravaipa fish dating from 1943, with data for almost every year starting in 1963. Those data show large variations in population sizes of all species, but retention of all the native species for which there are historic records (Stefferud and Reinthal 2005). The relative proportion of species appears to have varied with base flow, flood events, and the introduction of nonnative fish species. The trend of greatest concern is a reduction during recent years in spikedace abundance in the lower reach (Eby et al. 2003).

Lowland leopard frogs in the Aravaipa watershed occupy the perennial stream through the canyon and wet reaches of several tributary canyons. We have a nearly-continuous record since 1977 of frog monitoring data collected by Klondyke biologist Jay Schnell and TNC staff. It suggests the population is relatively stable at a fairly low density, roughly ten times less than that seen during 1979-1981. It remains unclear whether there was a severe population crash or those were extraordinarily good years.

Historically, beaver likely played a major role in Aravaipa's aquatic systems. In 1867, William Bell observed beaver-felled trees throughout the canyon's length (Hadley et al. 1990). That may be the last historical account, since beaver were removed from the San Pedro River system by trappers in the late 1800s. Beaver reentered the system recently, having been reintroduced on the San Pedro in 1999-2002. At least one individual colonized Aravaipa and was living near the east end of the canyon for several years.

If beavers fully recolonize Aravaipa Canyon, effects would likely include development of a series of beaver dams and pools. This would probably benefit some native species such as roundtail chub, Sonora sucker, and lowland leopard frogs. However, other native species, such as loach minnow and spikedace, would lose habitat as a result, and some nonnative fish species might benefit. Floodwaters would likely remove the beaver dams on a regular cycle, creating significant variation in stream habitat over time.

Riparian Species

Most of the wildlife species in the Aravaipa ecosystem use the riparian areas as their primary habitat or as an important part of their life history. These include birds like vermilion flycatcher, yellow-billed cuckoo, common black-hawk, and zone-tailed hawk. Many species are riparian obligates, spending most of their time in these areas, while others are attracted to riparian areas for breeding, foraging, or traveling. A variety of insectivorous bats are attracted to riparian areas for the abundant insects there and roost sites in crevices of the canyon walls.

Upland Species

Photo © TNC

Gray hawk in Aravaipa Canyon.

The Aravaipa ecosystem supports a great diversity of wildlife due to its position at the interface between the Sonoran and Chihuahuan deserts, at the foot of sky island mountains and with a perennial stream running through it. The ecosystem provides habitat for permanent residents as well as transient animals, forming a critical linkage between mountain ranges and valleys. This linkage helps wildlife populations as a means of dispersion, genetic exchange and for buffering population-depressing factors such as drought, predation and human interaction.

The most obvious and recognizable upland species include mule deer, white-tailed deer, desert bighorn sheep, javelina, black bear, and mountain lion. These species support most of the wildlife-related recreational opportunities both in hunting and wildlife viewing. Desert bighorn sheep have become the highest profile species in the ecosystem, and the species most associated with the ecosystem. The herd is historic, being the first desert bighorn sheep reintroduction attempted in the state. The success of this reintroduced species into its former range is remarkable. The population has grown and expanded, and now provides what most hunters consider to be the premier trophy desert bighorn population in the state. Desert bighorn sheep can suffer when in close association with domestic livestock and pet or feral dogs, and they can also suffer from excessive human interactions.

Small game and upland game birds are also abundant. Rabbits, doves, Gambel's quail, and scaled quail represent the majority of the hunting opportunities. Also notable is the return of turkeys into the ecosystem, probably due to their translocation into the Pinaleño and Galiuro Mountains by AGFD.

Nongame species contribute to the diversity and provide an almost unlimited recreational viewing resource. Species such as ringtail cats, foxes, zone-tailed hawks, black-hawks, golden eagles, Gila woodpeckers, gopher snakes, and many species of rattlesnakes are just a short list representing the variety. The coati is a rather common species in the ecosystem that provides substantial viewing opportunities and which some visitors come specifically to see.

Small game and non-game species have stable populations within the ecosystem and will continue to be stable as long as their habitats remain relatively stable.

The large Aravaipa ecosystem provides a diversity of protected habitats that support special status species. The federally listed upland species occurring in

BLM file photo

Prehistoric cliff dwelling in Turkey Creek.

the ecosystem are lesser long-nosed bats and Mexican spotted owls. Species that are not listed but are of concern due to rarity, limited habitat, or declining populations include yellow-billed cuckoo, Gila monster, Sonoran desert tortoise, lowland leopard frog, and possibly Mexican garter snake. These species benefit from the habitat provided within the ecosystem and will continue to benefit with a commitment to maintain these habitats. Slow-moving upland species, primarily Gila monsters and Sonoran desert tortoises, are susceptible to human impact such as shooting and collection; they are also vulnerable to road mortality and unnatural fires. These impacts can be significant in depressing populations as a whole.

F. Air Quality

Air quality for the Aravaipa ecosystem is generally good and has been rated Class II by the state of Arizona. Class II standards allow for moderate deterioration of air quality associated with moderate, controlled industrial and population growth.

The nearest visibility measurements for a Class I area are taken at Muleshoe Ranch, about 35 miles to the south, and suggest that visibility is comparable to other Class I areas in the state (ADEQ 2004). The nearest source of urban air pollution is Tucson, 45 miles to the southwest. The copper smelter at Hayden, about 12 miles northwest, emits approximately 23,000 tons per year of sulfur dioxide but falls within national ambient air quality standards (ADEQ 2002, 2004). These sources may influence air quality depending on wind direction.

G. Visual Resources

Scenic qualities of the Aravaipa ecosystem were classified for protection in the Safford District RMP. The Aravaipa Canyon Wilderness was designated as Visual Resource Management Class I to preserve the existing character of the landscape. Turkey Creek Riparian Area of Critical Environmental Concern and the Aravaipa tablelands were designated as Class II areas to retain their existing character while allowing for low levels of modification. The remainder of the Aravaipa ecosystem, primarily lands north and east of the wilderness, were designated as Class IV, which allows management activities that require major modification of the existing character of the landscape.

H. Cultural Resources

Several ruins throughout the Aravaipa watershed indicate long-term widespread prehistoric occupation of the region (Bronitsky and Merritt 1986). Mexican and Anglo settlers occupied Aravaipa in the 1870s, and engaged in mining, goat and cattle ranching, and agriculture. The area reached its greatest historic population in the early 1900s, with almost 1,000 inhabitants. The Klondyke region was mined for lead, zinc, copper, molybdenum, and silver beginning in the late 1870s. This involved a large quantity of fuel-wood cutting for mining and processing operations which probably had an extensive but undocumented impact on the watershed. Termination of large-scale mining in 1957 caused a major population decline in the region (Hadley et al. 1991).

I. Socioeconomic Resources

Residents in the area affected by the Aravaipa Ecosystem Management Plan live in Pinal or Graham counties. However, as noted in the Recreation section, most visitors to the area come from metropolitan Tucson (Pima County) or Phoenix (Maricopa County). Thus, this discussion of the affected populations includes all of those.

The Phoenix and Tucson metropolitan areas are among the largest and fastest-growing in the country (Table 3-6). Maricopa County, dominated by metro Phoenix, has the fourth-largest county population in the country, while Pinal and Graham counties have relatively small populations. Among the four areas, Graham County has the highest proportion of residents under the age of 20, and the lowest median age.

Economically, Graham County has the lowest income levels, the highest unemployment rate, and the highest level of poverty, followed by Pinal County in all categories. The two urban areas have much higher income and employment levels. Average earnings per job has been declining in Graham and Pinal counties,

Table 3-6. Census data for affected populations. All data from the 2000 Census, unless otherwise indicated. Employment sectors do not total 100% due to rounding errors.

	Pinal County	Graham County	Tucson metro	Phoenix metro
1990 population	116,379	26,554	666,880	2,238,480
2000 population	179,727	33,489	843,746	3,251,876
Growth rate 1990-2000	54%	26%	27%	45%
Median age (years)	37.1	30.9	35.7	33.2
Under 20 years	28%	34%	28%	30%
65 years and over	16%	12%	14%	12%
White	70%	67%	78%	79%
Black or African American	3%	2%	4%	4%
Native American	8%	15%	4%	3%
Hispanic (of any race)	30%	27%	29%	25%
Per capita income	$16,025	$12,139	$19,785	$21,907
Median household income	$35,856	$29,668	$36,758	$44,752
Unemployment rate	8%	12%	5%	5%
Individuals below poverty level	17%	23%	15%	12%
Leading employment sectors (% of total jobs)				
Services & Professional	52%	55%	76%	74%
Government	28%	29%	6%	5%
Manufacturing	7%	3%	10%	12%
Construction	4%	4%	8%	9%
Farm & Agriculture	7%	9%	1%	1%
Mining	3%	0.2%	0%	0%

and average earnings are lower than in the rest of the state and the nation. Among the employment sectors, "Services and Professional" has been growing the fastest.

Development proposals currently under discussion suggest that Pinal County may experience dramatic population growth during the next decade. That would likely change the county's socioeconomic profile and bring significant increases in recreation pressure on Aravaipa Canyon.

J. Livestock Grazing

Commercial livestock grazing is a major use of the Aravaipa ecosystem, with eight BLM grazing allotments covering most of the planning area (Table 3-7). Among the public lands present, only Aravaipa Canyon itself is not contained within one of the allotments.

Aravaipa Grazing History

There are five distinct periods in the Aravaipa area where cattle and other nonnative grazers such as goats affected Aravaipa Canyon and the surrounding tablelands. Prior to Anglo-American influences in the late 1800s, there were few

Table 3-7. Federal grazing allotments in the Aravaipa ecosystem. Permitted use is measured in Animal Unit Months (AUMs). Permit data valid for grazing year 2007.

Allotment Name	Allotment Number	Public Land (acres)	State Land (acres)	Private Land (acres)	Active BLM AUMs	Suspended BLM AUMs
Painted Cave	45180	12,711	6,212	987	1,512	275
Dry Camp	45200	12,759		80	2,796	0
Aravaipa South	45210	1,157	6,565	800	168	67
Aravaipa	45220	8,272	710	150	1,068	704
Horse Mountain	45240	2,328			372	36
Hell Hole	45280	2,074		80	156	0
South Rim	45290	34,634		6,268	2,898	2,898
Brandenburg Mountain*	45300	520	4,237	3,241	24	44

* Grazing of Brandenburg Mountain allotment is on hold until Aravaipa Creek is fenced off.

cattle stocked in the Aravaipa area. The majority of these were Corriente cattle from Mexico. These cattle were more drought tolerant, able to graze steeper slopes and consume more browse than European varieties.

During the latter part of the 1800s, Anglo Americans brought large numbers of cattle into the area as a result of the market provided by Army forts and Indian reservations. The years 1885-1905 probably had the most detrimental effect on Aravaipa Canyon and surrounding tableland ecosystems. During this time, overstocking was the norm as cattle were sold on a per-head basis. Anglo-American cattlemen of this era were not familiar with the arid west and cattle were stocked as high as 50+ per section. The drought of 1896-1905 added to the loss of available forage.

From 1905 to the 1930s, ranches in Aravaipa were stocked with mixed herds of goats and cattle. A second major drought occurred in this period. And although a gradual shift from sale by the head to sale by the pound was occurring and cattle numbers were decreasing, the combination of cattle and goats utilized all available food niches. There were increased water developments during this period, as well as land cultivation for alternative feed sources for livestock.

The Taylor Grazing Act in 1934 initiated “modern” grazing and marked the end of the open-range era. Ranch boundaries were fenced, and subsidies were implemented for range improvements such as pasture fences and water developments. During the 1933-1934 drought, the first drought take-offs were practiced to remove drought-stricken cattle from overstocked rangelands. Grazing districts set up by the Taylor Grazing Act initially limited cattle to 10-13 head per section, thus reducing stocking rates by more than 50%. In the early 1940s the mohair market plummeted, causing all ranches that stocked goats to either switch solely to cattle or go out of business.

Up to and during this period wild horses and burros had become a problem in the

area. Animals left by miners and wood cutters had thrived in the area and were especially concentrated in the Sombrero Butte area on the South Rim and Dry Camp and on the slopes of the Santa Teresas to the north. Wild horses and burros around Aravaipa were removed during the 1930s after the Taylor Grazing Act was enacted. Area ranchers estimated that about 1,000 wild burros and 2,000 wild horses were removed.

The conservation and multiple-use era began in the late 1960s and continues today.

Current Management

Authorized active use on the eight allotments in the Aravaipa area is 9,306 AUMs on 74,455 public land acres. Range improvements are listed in Appendix 4.

Livestock management on public lands in Arizona is directed by a set of standards and guidelines (BLM 1997a). Only the Dry Camp allotment has been evaluated relative to the current standards and guidelines.

BLM guidelines suggest that there should be no domestic goat or sheep on grazing allotments within nine miles of a bighorn sheep herd, except where topographic features or other barriers prevent physical contact. The entire planning area falls within nine miles of Aravaipa's bighorn sheep herds.

K. Recreation

A variety of outdoor enthusiasts use the Aravaipa Ecosystem for hiking, hunting, picnicking, birding, horseback riding, primitive camping, off-highway vehicle driving, geocaching, and playing in the stream.

Wilderness Hiking and Backpacking

The Aravaipa Canyon Wilderness forms a major attraction for recreation within the planning area. A BLM permit is required for entry to the wilderness and entry levels are limited to 50 visitors per day within the canyon, 30 from the west end and 20 from the east end.

An average 4,710 visitors each year entered the wilderness for an average 8,215 visitor-days per year, for the period 2000-2004 (Figure 3-6). About 70% of the visitors were there for backpacking and about 30% for day hiking. Visitation was highest during April and October, often approaching the permitted limit in April (Figure 3-7).

For the year 2004, 80% of the permits were for Arizona residents, including 42% from Tucson and 21% from metropolitan Phoenix. The remainder were from

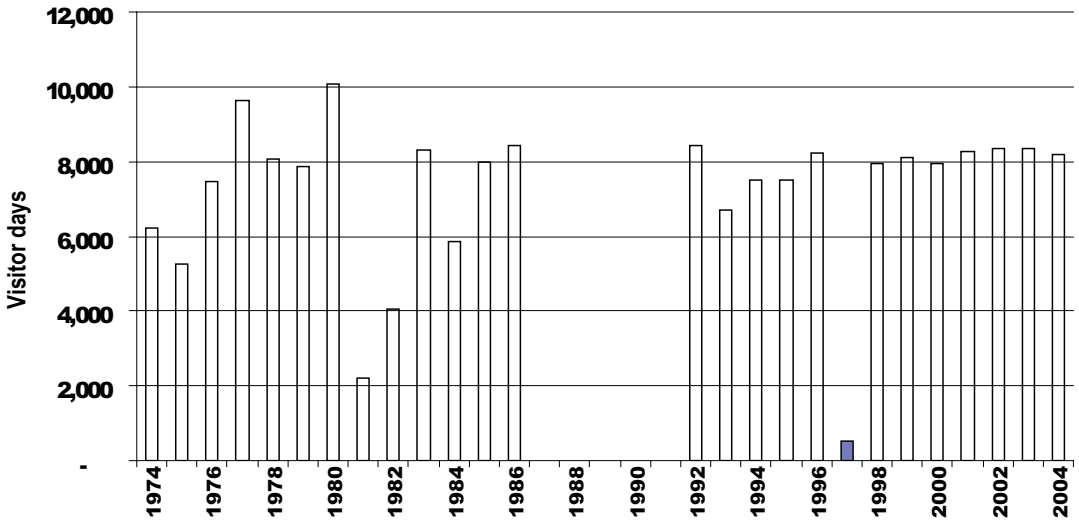


Figure 3-6. Total yearly visitor days, Aravaipa Canyon Wilderness. Data from Moore et al. (1989) for years 1974-1986 and BLM permit database for 1992-2004. Data incomplete for 1997.

scattered places around the country, especially California and New Mexico, with 1% from foreign countries.

No good record exists of recent wilderness use outside the main canyon, but a 1989 survey found that 63% of wilderness visitors explored at least one side canyon and 12% climbed up to the canyon rims (Moore et al. 1989).

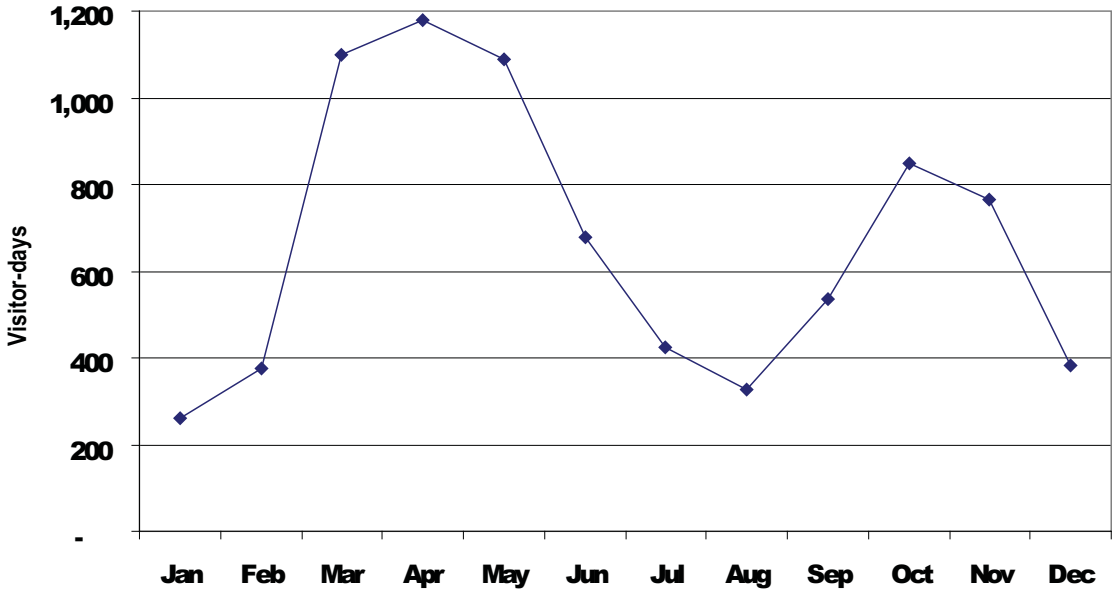


Figure 3-7. Average monthly visitor days, Aravaipa Canyon Wilderness. Data from BLM permit database for 1992-2004, excluding 1997 which had incomplete data.

Car Camping and Picnicking

Outside the wilderness, the east end of Aravaipa Canyon receives frequent recreational use by vehicle-based groups, with Turkey Creek Canyon as the primary destination. Data from traffic counters for calendar year 2004 show that 2,354 vehicles entered Aravaipa downstream from Bear Canyon, and 1,496 drove into Turkey Creek Canyon. These values use one-half the total vehicle counts, on the assumption that nearly all vehicles returned the way they came; we cannot distinguish vehicles that entered Turkey Creek from the south, but can assume that they made round-trip visits to Klondyke and back. Based on observations by BLM and TNC staff, most of those vehicles recorded in Turkey Creek Canyon brought people for day use or camping within that canyon.

If we assume that the 390 permit-holders for east-end access to the wilderness in 2004 came in single cars and all parked at the wilderness trailhead, then 468 additional vehicles stopped somewhere in Aravaipa Canyon. These include some mix of secondary vehicles accompanying primary permit-holders, BLM or TNC staff conducting management activities, visitors who are illegally entering the wilderness, and unauthorized day users on TNC land in Aravaipa Canyon.

Hunting

The Aravaipa ecosystem provides a popular destination for hunting, especially for deer and javelina. The area includes about 10% of each of two Game Management Units, 31 and 32, for which the Arizona Game and Fish Department (AGFD) issued 1,250 mule deer and 2,600 white-tailed deer tags in 2004. Javelina hunting permits for 2005 numbered 2,850. Because these permit numbers encompass the entire two hunt units, and in some cases other hunt units, we assume that approximately 10% or less of these tag holders actually hunt in the Aravaipa Ecosystem Management Plan area. These hunters typically camp at Fourmile Canyon Campground, lower Turkey Creek, and lower Bear Canyon, and utilize vehicular access to the uplands.

The area is also open to bear and mountain lion hunting. Unit specific information on hunter numbers is not available, but AGFD records indicate that 11 black bears and 28 mountain lions were taken in hunt units 31 and 32 in 2004. Of these, two bears and 14 mountain lions were removed due to depredations on livestock. Again, only a portion of these bears and lions were actually taken within the Aravaipa Ecosystem Management Plan area.

Other predators taken by hunters in the area include coyotes, foxes, and bobcats, but only a small number of hunters pursue these species.

Desert bighorn sheep were extirpated from Aravaipa Canyon in the 1920s. Reestablished in 1973, this population of bighorn sheep provides limited hunting

BLM file photo

Bighorn sheep at Aravaipa.

opportunities with only one or two permits offered to hunters each year. However, the area is known for the large bighorn rams that live in Aravaipa Canyon.

The small game season opener is popular for quail hunting in the Aravaipa ecosystem. Gambel's quail are generally abundant throughout the area with seasonal population fluctuations based on precipitation levels. Hunters traverse the desert washes looking for Gambel's quail, with the number of hunters peaking the opening weekend in October and tapering off through the end of the season in February. Statewide, the number of quail hunters in 2003 was approximately 51,000. Mearn's quail also occupy the Aravaipa Ecosystem Management Plan area, but densities are low and hunting for them not as popular.

To ensure public safety in the narrow confines of Aravaipa Canyon, the discharge of firearms is prohibited within the first 50 vertical feet of the streambed within the boundaries of the wilderness.

Due to its unique native fishery and the threatened and endangered species present, Aravaipa Creek is closed to fishing by Arizona Game and Fish Commission Order 40 and Arizona Revised Statute 17-309 A. 12.

Off-Highway Vehicle Use

Aside from the roads entering both ends of Aravaipa Canyon, most roads in the Aravaipa ecosystem are not maintained and are very rough. Local residents use them for livestock operations and other management purposes, but most public use is for hunting or recreational off-highway-vehicle (OHV) driving. There are no quantitative data on use levels of recreational OHV driving around Aravaipa. However, it is a growing form of recreation and areas within Aravaipa have received considerable use prior to roads being closed by recent private landowner actions.

Fourmile Canyon Campground

BLM file photo

Javelina.

The BLM campground at Fourmile Canyon provides an underused recreational resource. It has ten developed campsites plus overflow space, with a total capacity of about 50 people per day. The database of visitor use shows that for Fiscal Year 2001 (Oct. 2000 through Sept. 2001) it had 550 visitors; FY 2002 had 625 visitors, FY 2003 had 625 visitors, and FY 2004 had 725 visitors. Most visitors were campers during the hunting seasons.

Recreation Values

The social value of an area for recreational activities can be measured in several ways. One approach is to estimate levels of "consumer surplus value" which allow comparison of how much value people place on different activities or at different sites, beyond what they must pay to be there.

A recent study found that each visitor to the Aravaipa Canyon Wilderness sees a day's visit there as being worth between $17 and $25 more than it costs to travel to the area ($17.31 west end, $25.06 east end, in 2003 dollars; Weber and Berrens 2006). This is similar to or slightly below median values in the U.S. Forest Service Intermountain Region for a day of camping ($24.09), picnicking ($24.09), swimming ($24.62), small-game hunting ($27.71), and hiking ($29.66). It is higher than the value of off-road driving ($11.76) and sightseeing ($12.23), but well below the value of wildlife viewing ($32.22), big-game hunting ($36.40), or rock climbing ($45.34) (in 1996 dollars; Rosenberger and Loomis 2001).

An alternate method is to estimate total expenditures for an activity. Annual expenditures for wilderness recreation at Aravaipa Canyon was estimated at $384,000 per year, using the distance traveled from the zip code of the permit holder, the permit fee, and a time cost. This includes only Arizona visitors to the canyon (Matt Weber, personal communication). The overall economic impact of that recreation was $645,000 per year, assuming an economic multiplier of 1.68 (Orr and Colby 2002).

L. Travel Management

One of the major influences that shapes the character of the Aravaipa ecosystem has been its limited access. There are no useful through-roads connecting the east and west ends of Aravaipa Canyon, which has isolated much of the area from the

large urban centers of Tucson and Phoenix. The area has a sparse road network, none of it paved.

Road access to the west end of the canyon has improved over the last several decades, with a well-graded dirt road which has been shifted out of the floodplain to avoid the washouts that had been regular occurrences. The road ends at a trailhead maintained by BLM on property owned by TNC.

Photo © Mark Haberstich/TNC

Road into the east end of Aravaipa Canyon during a flood, August 2006.

Access to the east end of the canyon is a dirt road with numerous unimproved stream crossings, extending to the wilderness boundary at Turkey Creek. Spur roads provide access to the uplands at Turkey Creek, Bear Canyon, and Stowe Gulch. A series of extremely rough roads to the south connect Turkey Creek with the Copper Creek drainage, and eventually the San Pedro River valley.

Access across the uplands consists of a small set of rough roads.

The Safford District RMP designated Aravaipa Canyon Wilderness, Oak Grove Canyon and Turkey Creek above Oak Grove Canyon corral as closed to off-highway-vehicle use. For the remainder of the BLM lands, off-highway-vehicle use was limited to roads and trails existing at the time of the plan and any new roads approved for construction during the life of the RMP.

There is currently no permanent legal right-of-way across most private lands at either end of Aravaipa Canyon or across the scattered private parcels on the uplands. Long-term resolution of legal access is addressed within this plan.

M. Special Area Designations

Wilderness

Interest in protecting Aravaipa Canyon as a wilderness preserve and scientific study area was expressed by several organizations and individuals in the early 1950s. After a public hearing that showed strong local, state, and national support, Aravaipa Canyon Primitive Area was established by the Secretary of the Interior in 1969. That gave administrative protection to 3,957 acres, which changed with later boundary modifications to 4,044 acres.

The Aravaipa Canyon Wilderness was established by Congress in 1984 "for the preservation and protection of this relatively undisturbed but fragile complex of desert, riparian and aquatic ecosystems, and the native plant, fish, and wildlife communities dependent on it, as well as to protect the area's great scenic, geologic, and historical values" (Appendix 5). That gave legal protection to 6,699 acres and replaced the earlier Primitive Area designations. Even with the additional area, it contained primarily the canyon and the mouths of a few tributaries.

Much of the upland area around Aravaipa was transferred from the Arizona State Land Department to the BLM in 1986, adding 51,077 acres to BLM ownership and providing most of the land that is addressed by this plan.

The first wilderness management plan was completed in 1988 (BLM 1988).

Congress expanded the wilderness in 1990 to 19,410 acres, protecting roadless uplands and tributary canyons on both north and south rims (Map 3, Appendix 5).

A wilderness, in contrast with those areas where man and his works dominate the landscape, is an area "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain," according to the Wilderness Act of 1964. The primary management goal for wilderness, then, is the preservation of the wilderness character. Wilderness status allows for many uses of the land that do not damage its natural qualities. Non-motorized and non-mechanized recreation is allowed, along with hunting and livestock grazing. Actions necessary for management of wildlife, grazing, and recreation are allowed so long as managers also determine that an action is necessary to manage the area as wilderness and use the "minimum tool" – the device or technique which will have the least impact on wilderness resources while effectively accomplishing the management goal.

Certain motorized or mechanized activities may be necessary to restore wildlife populations that have been suppressed by human-caused habitat degradation. As described in the report accompanying the Arizona Desert Wilderness Act of 1990

Photo © Dale Turner/TNC

Aravaipa Canyon Wilderness, viewed from the southeastern boundary.

(H.R. 101-405): "Fish and wildlife management activities in wilderness will be planned and carried out in conformance with the Wilderness Act's purpose of securing an 'enduring resource of wilderness' for the American people… Fish and wildlife management activities will emphasize the protection of natural processes. Management activities will be guided by the principle of doing only the minimum necessary to manage the area as wilderness."

Prohibited activities include road building and timber cutting or similar commercial enterprises. Additionally, temporary roads, use of motor vehicles, motorized equipment or motorboats, landing of aircraft, other forms of mechanical transport, and structures or installations are prohibited except to meet minimum requirements for wilderness administration including measures required in emergencies involving the health and safety of persons within the area. Wilderness lands are withdrawn from new mineral entry, location, sale, or leasing under the mining laws.

Wilderness also affects fire management. "The objectives of fire management in wilderness are to: (a) permit lightning-caused fires to play, as nearly as possible, their natural ecological role within wilderness and (b) reduce, to an acceptable

Photo © Dale Turner/TNC

Alligator juniper savanna at the top of Table Mountain, with Sombrero Butte in the background.

level, the risks and consequences of wildfire within wilderness or escaping from wilderness" (H.R. 101-405).

Areas of Critical Environmental Concern

The Aravaipa ecosystem includes three Areas of Critical Environmental Concern (ACECs) which were established by the Safford District Resource Management Plan (Map 3; BLM 1991).

Turkey Creek Riparian ACEC contains 2,326 acres, including portions of Oak Grove and Maple canyons. It was established to protect and enhance riparian vegetation, wildlife, scenic values, and cultural resources. Maple Canyon contains big-tooth maple at its lowest-known elevation in Arizona. These sensitive resources require special management of recreation, livestock, access, and vegetation to improve ecological conditions.

Table Mountain Research Natural Area ACEC contains 1,220 acres. The top of Table Mountain supports an alligator juniper savanna, a plant community known in less than 20 locations. The ACEC includes Sycamore and Saddle canyons, which contain a white oak woodland containing Mexican blue oak at the northernmost limit of its range. These plant communities require special management of off-highway vehicles, woodcutting, fire, and livestock.

Desert Grasslands Research Natural Area ACEC, Pilares unit, contains 90 acres. This is one of three separate units within the ACEC; the other two (Mescal Ridge, Sombrero Butte) are outside the Aravaipa ecosystem and will not be addressed by this plan. The tops of the Pilares buttes contain minimally-disturbed relict desert grasslands which provide baseline conditions on which to establish management objectives and gauge management progress. These plant communities require special management of fire and livestock.

Wild and Scenic Rivers

The Aravaipa ecosystem includes two streams, Aravaipa Creek and Turkey Creek, that were analyzed for eligibility for the National Wild and Scenic Rivers System in the Safford District Resource Management Plan (BLM 1991). The RMP applied the eligibility criteria for determining whether each stream is free-flowing and possesses one or more outstandingly remarkable values. It also determined which classification – Wild, Scenic, or Recreational – would be most appropriate.

A segment of Aravaipa Creek covering 11.0 miles was determined to be eligible as a Wild river. That segment flows from the mouth of Turkey Creek to a point approximately 0.5 mile downstream of the confluence with Hell's Half Acre Canyon. It possesses outstandingly remarkable wildlife, fish, recreation, and scenic values, is free from impoundments, and the shoreline is undeveloped.

A segment of Turkey Creek covering 2.5 miles was determined to be eligible as a Recreational river. That segment stretches from near its confluence with Oak Grove Canyon down to Aravaipa Creek. It possesses outstandingly remarkable cultural, recreational, and scenic values. A Salado cliff dwelling interpreted for the public and access to the Aravaipa Canyon Wilderness provide excellent opportunities for historic preservation and recreation. A road parallels and occasionally crosses the creek, but some fences and a wooden corral are the only modern structures.

The Arizona Statewide Wild and Scenic Rivers Legislative EIS (BLM 1994) evaluated the suitability of the two stream segments for designation. Aravaipa Creek was found to be suitable. The Turkey Creek segment was found to be nonsuitable. In the Final Arizona Statewide Wild & Scenic River Study Report/ Record of Decision (BLM 1997b), BLM recommended to Congress that 10 miles of Aravaipa Creek be designated as Wild. Only Congress can designate a Wild and Scenic River.

The Aravaipa Creek stream segment must be given interim protection until Congress makes a final decision on designation. Management activities and authorized uses shall not be allowed to adversely affect the stream's free-flowing condition or outstandingly remarkable values or change the classification, subject to valid existing rights. As a nonsuitable stream segment, Turkey Creek was

released from Wild and Scenic River consideration by the Record of Decision and is managed according to direction in the Safford District RMP.

Aravaipa Canyon Wildlife Area

In 1982, the Arizona Game and Fish Commission (AGFC) established the Aravaipa Canyon Wildlife Area to incorporate specific regulations enacted by the Bureau of Land Management in their management of the Aravaipa Canyon Primitive Area. Under AGFC Rules, Wildlife Areas are established to provide protective measures for wildlife, habitat, or both; to allow for special management or research practices; and to enhance wildlife and habitat conservation. Though Wildlife Areas are usually lands owned or leased by the AGFC, or have a property interest conveyed to the AGFC, they can also be lands federally owned with unique wildlife habitat where cooperative agreements provide wildlife management and research implementation. Lands that qualify as Wildlife Areas: 1) have unique topographic or vegetative characteristics that contribute to wildlife, 2) are home to certain wildlife species that are confined because of habitat demands, 3) can be physically managed or modified to attract wildlife, or 4) are identified as critical habitat for certain wildlife species during critical periods of their life cycles.

The boundary of the Aravaipa Canyon Wildlife Area is that area within the flood plain of Aravaipa Creek and the first 50 vertical feet above the streambed within the boundaries of the Aravaipa Canyon Wilderness Area administered by the BLM, Graham and Pinal counties, Arizona. Restrictions associated with the Aravaipa Canyon Wildlife Area include: 1) access to Aravaipa Canyon Wilderness is by permit only, available through the Safford Field Office of the BLM, 2) it is closed to the discharge of all firearms, and 3) it is open to hunting in season with bow and arrow only.

CHAPTER 4.
PLANNING ISSUES AND MANAGEMENT CONCERNS

Photo © Jeanmarie Haney/TNC

Historic stream gage, east end of Aravaipa Canyon.

Development of the Aravaipa Ecosystem Management Plan focused on resolving an assortment of planning issues. Some issues were identified by the cooperating organizations during the preliminary planning phase. Additional issues were raised during the public scoping phase.

Scoping included a questionnaire about values, issues, and concerns related to the Aravaipa area. It was mailed to 140 individuals or organizations with an interest in the area, and was also distributed to attendees at open houses held in Klondyke, Winkelman, Tucson, Chandler, and Thatcher. Results from those questionnaires were summarized in a report to the BLM by a contractor, Logan Simpson Design Inc., and are incorporated here.

A. Planning Issues

Water and Riparian Resources

Aravaipa Creek and the riparian areas it supports form the vital core of the Aravaipa ecosystem. Some of the tributary canyons contain additional perennial streams and riparian zones. Properly functioning riparian areas reduce erosion, stabilize stream banks, improve floodwater retention, and maintain greater wildlife communities. The plan will address the following issues:

- What is the current status of riparian areas in the planning area, and what management actions are needed to maintain or enhance them?
- Does monitoring data show any reductions in streamflow due to upstream water use?
- How effective is the current water quality monitoring plan?
- What testing is not being done because funding is limited?
- What agencies are available and willing to participate in water quality monitoring and what opportunities would be available through a partnership?
- Are there water rights on any lands acquired for which BLM should file?
- Are there unappropriated waters upon which to make water filings?
- What can be done about pollution from the Klondyke mill tailings?
- Should the current planning process incorporate reclamation plans for the Grand Reef, Princess Pat, Headcenter, Tenstrike, or other mines in the watershed?

Upland Resources

Upland vegetation communities are largely an expression of the climate, geology, soil, ecological processes, and management history of an area. This plan is meant to integrate the full spectrum of legitimate activities within the Aravaipa ecosystem. Issues to be addressed by the plan include the following:

- How can we gain better understanding of the vegetation communities in the area?
- Where has fire burned in the past?
- Where should prescribed fires be set and naturally-ignited fires be allowed to burn?
- What level and methods of follow-up monitoring and evaluation should be conducted on fires?
- Are current levels and seasons of livestock use causing excessive impacts on riparian and upland ecosystems?
- Can livestock management serve to enhance wilderness values?
- Is there adequate monitoring data being collected to understand trends in natural resource conditions?
- How can livestock be managed to prevent disease transmission from domestic goats and sheep to bighorn sheep?

Wildlife Resources

Aravaipa Canyon is widely recognized as a critical refuge for native fish. The ecosystem also supports a variety of game animals and other species of special management status. Potential habitat exists to support reintroductions or supplemental stocking of several native species. The plan will answer the following questions related to wildlife management:

- What is the status of nonnative aquatic species and how can they be controlled in order to protect native fish and frogs?

Photo © Dale Turner/TNC

Juniper trees on Table Mountain show the effects of regular lightning-caused fires.

- What can be learned from the accumulated monitoring data on fish and their habitat, and what are future needs for data collection?
- What can we do to learn more about interactions between species, fish species interaction with aquatic invertebrates, and fish species interactions with their environment to ensure successful stockings?
- Should there be plans for additional species reintroductions?
- What are appropriate goals for bighorn sheep management, and what actions are needed to support the population?
- Should there be an explicit plan for desert tortoise management?
- What is the status of black-hawks and gray hawks, and what monitoring or management is needed?

Cultural Resources

Aravaipa has long been a magnet for people and thus has a rich assortment of historic and prehistoric resources. The plan will address the following cultural resource issues:

- What level of inventory is needed to provide a basis for understanding the distribution, importance, and potential uses of cultural resources?
- How should archaeological sites, landmarks, or use areas be allocated to scientific, public, and traditional uses?
- What measures are needed to protect cultural resources from vandalism, damage from OHV use, other uses, and natural deterioration?
- What are the possibilities for developing academic interest in the resources and developing educational programs involving regional schools?
- Is there adequate access by Native Americans for traditional cultural practices?

Environmental Justice and Socioeconomics

- Are there any known low-income or minority populations within the watershed that would be disproportionately affected by actions discussed in the management plan?
- If so, how do we include these communities in this planning effort to avoid any adverse impacts?

Recreation Resources

Outside the wilderness area, some recreation uses are concentrated in a few areas.

- Are the existing campground facilities adequate for current use levels?
- What are the maintenance or upgrade needs of the existing Fourmile Canyon Campground?
- How can visitor management in Turkey Creek Canyon be improved?

Travel Management

Public uses and impacts are also strongly affected by road access. The plan will answer the following questions about recreation and access:

- How much, what type, and where should vehicular access occur?
- Where it is appropriate, how can vehicular access to public lands be retained or restored across private lands?
- How should existing roads be managed?
- For each place where road access is allowed, what is the appropriate level of law enforcement and resource protection?
- What amendments to the Safford District RMP may be needed regarding designated roads and trails?
- How should we manage vehicle route proliferation caused by OHV trespass, particularly in the Table Mountain and Parsons Grove areas?

Special Area Designations

<u>Wilderness</u>

All wilderness uses are managed with the underlying principle that wilderness characteristics will be protected, as required by the Wilderness Act. To ensure these principles, the following issues will be addressed:

- How should visitor use be managed to preserve the integrity of natural and cultural resources?
- How should low-level aircraft use for wildlife surveys or other management purposes be coordinated to minimize effects on wilderness values?
- How effective and appropriate is the current permit system?
- Are the current visitor use levels still appropriate?
- Should there be development and designation of a trail through Aravaipa Canyon?

- Should there be trail development and maintenance in side canyons of the wilderness area to get visitors to the uplands?
- How should this plan incorporate construction of a new ranger station at Klondyke?
- How effective is the existing Limits of Acceptable Change framework for Aravaipa Canyon Wilderness?
- How extensive are vehicle incursions into the wilderness, and should there be additional management efforts to reduce these activities?
- What opportunities are available to keep the public informed of potential hazards?
- What actions regarding public safety and search and rescue are needed?

Other Special Area Designations

- Are there specific management actions needed to implement the goals of the three Areas of Critical Environmental Concern?
- What specific management actions are needed to maintain the status of the Aravaipa Creek segment recommended suitable for designation as part of the Wild and Scenic Rivers system?

General Management Concerns

This plan will address some issues about the general management approach:

- What level of services, interpretation, and site access does the public want, and how can these best be provided?
- Should the BLM maintain the current management strategy?
- How should adaptive management be incorporated into planning and monitoring?
- Should there be an area plan specific to canyon approaches?
- What other management guidance from the 1988 Wilderness Management Plan or the 1991 Resource Management Plan needs to be updated or restated?
- Is the level of BLM ranger patrols adequate for resource and visitor protection?
- Should Aravaipa Canyon continue to be managed as part of the Recreational Fee Program?
- Should there be a graduated fee schedule depending on use?
- Is funding of scientific monitoring adequate to understand natural resource trends?
- Should there be more opportunities for people to volunteer for work groups to improve the area?
- How can managers best communicate with the public about the natural and cultural values present in the Aravaipa area, as well as the hazards and regulations?

B. Issues Solved by Laws, Policy, or Other Planning, or Beyond the Scope of This Plan

The following issues were raised during the scoping process but are not appropriate to this planning process. They are resolved below and will not be addressed further in the plan:

- Should the South Rim allotment be managed for grazing?

The 1994 Partial Record of Decision II for the Safford District Resource Management Plan (RMP) set the direction to initiate an ecosystem management plan for lands within the Aravaipa watershed. As part of this process, allotment management plans (AMPs) would be re-evaluated. There are eight grazing allotments within the planning area, but only two have existing AMPs. For the South Rim allotment, the direction was to "evaluate and revise, if appropriate, resource management objectives in the existing South Rim Allotment Management Plan (dated 1989) to ensure that these objectives are measurable."

In 1998 the Statewide Land Use Plan Amendment for the Standards for Rangeland Health amended the Safford District RMP. The Arizona Resource Advisory Council developed the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration. Standards are goals for the desired condition of the biological and physical components and characteristics of rangelands. Guidelines are management approaches, methods, and practices. There are three standards for rangeland health: 1. Upland Sites: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform; 2. Riparian-wetland Sites: Riparian-wetland areas are in properly functioning condition; and 3. Desired Resource Condition: Upland and riparian-wetland plant communities meet desired plant community objectives. In 1998 the Statewide Land Use Plan Amendment for the Standards for Rangeland Health was approved, amending the Safford District RMP. Resource objectives in allotment management plans would now be addressed by applying Standard 3, which is the Desired Resource Condition. Allotment management plan objectives are now evaluated and revised through the Standards for Rangeland Health Evaluation process.

The directive to evaluate and revise AMP objectives as part of the Aravaipa Ecosystem Management Plan has been superseded by the Standards for Rangeland Health amendment, and will be addressed through the rangeland health evaluation process. Baseline resource data are not available to assess the standards for rangeland health on these eight grazing allotments. Once the rangeland health evaluations and the grazing decision processes are complete, recommendations for changes in grazing management would be incorporated into the management plan through adaptive management.

- Enforce hunting regulations.
- Reduce or eliminate hunting.
- The protection of animals should be the highest priority.
- Provide predator control.

The Arizona Game and Fish Commission is the legal entity with jurisdiction over wildlife management throughout most of Arizona. The Aravaipa ecosystem is managed as part of two Game Management Units, for which the Commission sets allowable hunting levels on an annual basis. Those levels are intended to provide hunting opportunities to the interested public while maintaining healthy populations of Arizona's wildlife. The BLM recognizes hunting as an appropriate use of public lands, and works cooperatively with the Commission to manage wildlife habitat and hunter access. Hunting is not allowed on The Nature Conservancy's private lands around Aravaipa, as that was a condition of the land's transfer to the Conservancy from Defenders of Wildlife.

Arizona state laws authorize the take of predators when damage is occurring to domestic livestock. Predator-control activities, in coordination with Arizona Game and Fish Department, can be conducted by Wildlife Services, part of the U.S. Department of Agriculture, on request by livestock operators. Such activities within designated wilderness areas or an Area of Critical Environmental Concern require special approval from the BLM.

- Expand the wilderness area.
- Don't expand the wilderness area.
- Provide wilderness areas for car camping.

Designation or expansion of a wilderness area, such as the Aravaipa Canyon Wilderness, is a legislative action that can only be done by the U.S. Congress.

All designated wilderness areas are managed under a consistent set of policies set forth in the Wilderness Act of 1964 and subsequent legislation. These include a prohibition on the use of motorized equipment unless it is justified by an important management need and can be proven to be the minimum tool necessary for that management action. Car camping does not constitute an allowable use of a designated wilderness area. However, the Aravaipa ecosystem includes about 50,000 acres of BLM land which is outside the designated wilderness and thus available for car camping along existing roads.

- Should there be a memorial to the Camp Grant massacre?

The Camp Grant massacre occurred outside the Planning Area; therefore, a memorial is not included in the plan.

CHAPTER 5.
OBJECTIVES AND MANAGEMENT ACTIONS

Photo © Mark Haberstich/TNC

Ignition of a prescribed fire, South Rim Allotment.

This plan constitutes an activity-level plan under the BLM's Safford District Resource Management Plan. Objectives and management actions described here are meant to address the issues raised during the planning process, and augment the more general directives in that document. Objectives and management actions are assumed to be valid for the life of this plan unless a more specific timeline is stated. All management actions that take place within the Aravaipa Canyon Wilderness must be conducted in accordance with BLM wilderness management standards.

A. Water Resources

Objective A.1: Protect Aravaipa Creek from excessive on-site and off-site pollutants and disturbances.

Rationale: There are several mine tailings that are exposed and have the potential to erode into Aravaipa Creek. These tailings are contaminated with excessive amounts of arsenic and lead and possibly other dangerous elements.

Management Actions

1. Develop a sampling plan to monitor water quality, macroinvertebrates, and sediment to ensure that lead and arsenic do not exceed acceptable standards.

Sampling methods should comply with standards established by the Arizona Department of Environmental Quality. If sampling identifies contamination problems then appropriate response actions will be taken.

Rationale: Lab tests will measure the rates of lead and arsenic from off-site mining dumps that flow into Aravaipa Creek. Human and animal health and safety are the overriding factors involved in this management action.

2. Post signs at both ends of the canyon and include messages in other public education materials to educate hikers to use trails away from the stream edge to protect the stream banks and reduce sedimentation of the stream.
3. Discourage stream edge trails by placing obstructions in trails.

Rationale: Stream bank degradation by human traffic can be as detrimental to obtaining wetland proper functioning condition as livestock traffic or vehicle traffic.

Objective A.2: Maintain adequate streamflow and manage upland waters to support natural communities and recreational uses of Aravaipa Creek and its tributaries.

Rationale: Perennial streamflow is a basic requirement for many wildlife and recreation values. A natural flood regime and appropriate levels of sediment transport through the system are also important for healthy aquatic and riparian communities.

Management Actions

1. Inventory and collect water data from Aravaipa Creek, its tributaries, and uplands waters including springs, seeps, and tanks to develop a comprehensive water rights strategy for the ecosystem to ensure this objective is met through filings with the Arizona Department of Water Resources.

Rationale: Obtaining instream flow rights for Deer Creek will ensure that flows remain to support two federally threatened fish species, spikedace and loach minnow. Instream flow rights are critical if imperiled native fish are to be conserved within their natural habitats.

B. Upland Resources

Objective B.1: Manage the landscape to maintain dynamic, sustainable natural conditions and diversity of native vegetation.

Rationale: The Aravaipa ecosystem currently supports diverse native plant communities including Sonoran Desert, riparian deciduous forest, and juniper woodlands. Management actions associated with the uplands in the Aravaipa area should be conducted in a way that maintains these resources.

Management Actions

1. Restrict vehicular use to designated roads.
2. Limit wood harvesting to dead and down trees only, and only for on-site use.

No dead trees larger than 10 inches in diameter shall be cut, even if down.

3. Prohibit vegetative product sales in the planning area. Traditional Native American uses would be allowed.
4. Woodcutting may be authorized through permits in the Horse Mountain harvest unit as designated by the Safford District Resource Management Plan.

Rationale: Uncontrolled vehicular use can lead to increased erosion, removal of native vegetation, and spread of nonnative weeds. Limiting vehicles to identified existing roads will help reduce erosion and protect the upland ecosystem. Limiting wood harvesting to dead and down only will provide an opportunity for campfires in the area while protecting the native woody plant species. Large dead trees provide important wildlife habitat and so should not be harvested for firewood. The Aravaipa ecosystem has a variety of unique vegetation. Restricting the harvest of these plants will help maintain sustainable populations. Traditional Native American vegetation uses include harvest of beargrass and acorns, and are allowed by BLM policy.

Objective B.2: Prepare the Standards for Rangeland Health evaluations on grazing allotments within the planning area, replacing the need for new allotment management plans.

Rationale: There are two grazing allotments with completed allotment management plans that need to be updated. The remaining six allotments do not have allotment management plans.

Management Actions

1. Continue assessments to determine if the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration are being met on each grazing allotment.

Rationale: Through the Standards for Rangeland Health evaluation process new allotment-specific objectives are developed and recommendations for changes in grazing management are made if needed. Since the evaluation process, conducted by an interdisciplinary team, includes recommendations for grazing management practices, the evaluations can substitute for allotment management plans.

2. Restrict livestock permits to cattle and horses on allotments within planning area.

Rationale: Diseases spread from domestic sheep and goats to desert bighorn sheep can devastate native wild populations.

Objective B.3: Maintain naturally occurring plant communities and shrub-grass ratios by returning fire to the landscape through prescribed and natural fires.

Rationale: Fire, at varying intervals, is a natural component of most ecosystems. Through the normal processes of succession, a disturbed site is colonized by grasses and forbs. Shrubs (and/or trees depending on the area) later move in and take over the site. Although it is natural for shrubs to encroach on sites in this area, it is also natural for a disturbance, such as fire, to remove the shrubs and allow for grass and forbs to dominate sites. Through these processes there is a

mix of grass, forbs, and shrubs throughout the ecosystem.

Management Actions

1. When appropriate conditions exist, manage wildland fire for resource benefit on BLM and TNC lands in the planning area on the South Rim south of Aravaipa Canyon and west of Turkey Creek Canyon, and on the North Rim within the wilderness. Suppress unplanned ignitions within the Aravaipa Canyon riparian zone, and in Sonoran desertscrub vegetation as characterized by the existence of saguaro and/or ironwoods. Use prescribed fire where appropriate throughout the planning area.

Rationale: Historically, fire played a critical ecological role in maintaining the health of many upland vegetation communities. Within the riparian canyons, suppression is needed for human safety and to protect the native fish community, and would be conducted using minimum impact suppression tactics. Sonoran desertscrub vegetation and desert tortoises are not fire-adapted, and should be protected from fire. Prescribed fire would be used only after completion and approval of a written plan, including analysis of existing conditions and resource objectives. In all cases, fire management will adhere to the "Biological and Conference Opinion for the BLM Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management" (USFWS 2004).

2. Use the Standards and Guidelines process to develop site-specific Desired Future Conditions and criteria for prescribed fire use.

Rationale: When assessing Standard #3 in the Arizona Standards for Rangeland Health and Guidelines for Grazing Management, a Desired Plant Community (DPC) is formulated. This DPC identifies what kind and how much of various plants will be managed for at a specific site. Using this concept, fire is an important tool that is available for potential brush removal or other vegetation manipulation.

Objective B.4: Manage uplands for the recovery, as appropriate, of all special-status species within the planning boundaries.

Rationale: Several special-status species live in the Aravaipa planning area. Although not all the species live in the uplands, the upland communities impact the health of the riparian and aquatic communities. Activities that occur on the uplands should not be detrimental to any special-status species and management actions should be taken to improve habitat for these species.

Management Actions

1. Use the Standards and Guidelines process to develop site-specific Desired Future Conditions and criteria for special-status species.

Rationale: Standard #3 in the Arizona Standards for Rangeland Health and Guidelines for Grazing Management includes guidelines for conservation of special-status species through maintenance or restoration of their habitats.

Objective B.5: Monitor and control, where feasible, invasive, nonnative species that pose a significant threat to the Aravaipa ecosystem.

Rationale: Invasive, nonnative species currently are very limited in the Aravaipa ecosystem. If allowed to spread, these species can replace native species. Control efforts are most effective before populations of invasive, nonnative species become widely established.

Management Actions

1. Require use of certified weed-free (and weed-seed-free) hay (feed) on public lands.

Rationale: Invasive and/or noxious weeds are easily moved from place to place through hay and other feed sources. When hay and other livestock feed are used on public lands that are not weed free, noxious or invasive weeds can be spread. In addition to normal livestock operations, there is also potential for recreational horseback riding opportunities in Aravaipa. If horses are used in the Aravaipa area, they should be fed weed-free hay. Arizona has a certified weed-free hay program in place that can provide a local source of weed-free hay.

Photo © Mark Haberstich/TNC

Lowland leopard frog, Aravaipa Creek

C. Riparian Resources

Objective C.1: Sustain and/or restore wetland ecosystems to proper functioning condition through land management actions both in the riparian corridors and the surrounding uplands for the life of this plan.

Rationale: The restoration and proper function of wetlands is an important goal for any land management agency. If riparian communities are properly cared for the uplands must be properly managed also. Riparian management means holistic management.

Management Actions

1. Maintain the restriction on livestock access, except for equestrian use and pack stock, to Aravaipa Creek from all grazing allotments.

Rationale: This action will support recovery of threatened and endangered species by maintaining streambank cover, canopy cover over the stream, herbaceous basal cover, streambank stability and instream habitat complexity; by enhancing post-flood recovery; and by reducing sediment production and transport.

2. Restrict livestock, except for equestrian use and pack stock, from riparian corridors throughout the growing season (April-October) on the following stretches:
   South of Aravaipa Creek – Turkey Creek, upper Oak Grove Canyon, Wire Corral Canyon, Parsons Canyon and Virgus Canyon

North of Aravaipa Creek – Black Canyon, Hell Hole, and upper Deer Creek
Rationale: Without active management and good fencing, livestock will concentrate in riparian areas during the growing season. This can cause significant damage to riparian plants and wetland structure and function.

3. Remove nonnative riparian species as is practical, in accordance with the Vegetation Treatments Programmatic Environmental Impact Statement (BLM 2005).

Rationale: Control of nonnative species is often best accomplished by allowing the native plants to compete without being overgrazed by ungulates. It is not practical to expect to remove all introduced species; therefore, it is important to understand which species are the targets for control efforts. Tamarisk is one candidate for control.

4. Keep the number of vehicle riparian crossings to a minimum.

Rationale: Vehicle crossings disrupt the proper functioning of any riparian corridor so any elimination of a vehicle crossing, either present or future, will help maintain proper functioning condition of that wetland.

5. Maintain the current average allocation of 40% use of current year's growth on uplands to promote the proper release of water to the riparian corridors through springs and prolonged flow events and reduced peak flow after each storm event.

Rationale: An average of 40% use is the amount that was adopted as acceptable through the Safford District Resource Management Plan.

6. Allow for a maximum of 20% use by livestock of perennial grasses, forbs, shrubs and trees in riparian areas that are not in proper functioning condition. Priorities for determining condition include upper Oak Grove Canyon, Wire Corral Canyon, Parsons Canyon, Virgus Canyon, Black Canyon, Hell Hole Canyon, and upper Deer Creek (area upstream of Dry Camp Allotment).

Rationale: Wetlands should have a different standard of use from the uplands because of their important and unique qualities. Wetlands that do not function properly should be given an opportunity to improve as quickly to proper functioning capacity as nature and active management will allow.

7. Implement erosion control and cienega restoration in the upper end of Turkey Creek and investigate other potential locations; if feasible, initiate erosion-control projects.
8. Evaluate functionality of any channel-constraining structures on public land and modify if necessary.

Rationale: Although the Aravaipa Ecosystem is virtually intact, there are missing components in which management can facilitate regeneration.

Objective C.2: Restore historic wetlands, including those in Oak Grove,

Parsons, Wire Corral, Virgus, Spring, Deer, upper Deer Creek, and Black canyons, through proper manipulation of vegetation and soil.

Rationale: The U.S. Fish and Wildlife Services estimated that 30-40% of the original wetlands in the United States have been lost and the destruction continues at an alarming rate (Tiner 1984). Research has been designed to improve methods to restore and enhance wetland functions.

Management Actions

1. Promote prescribed burns on the uplands so that naturally occurring fires will burn as rangeland condition improves.

Rationale: Prescribed burns offer an opportunity to advance ecological condition to a point where natural burns can become common.

2. Construct loose-rock gabions or cemented gabions outside the wilderness in Virgus, Parsons, Oak Grove, and Wire Corral canyons and dirt check dams in the tributaries to these canyons so that flood waters can be prolonged at a reduced peak flow. Exact sites will be determined and evaluated on a project-specific basis.

Rationale: These proposed improvements are planned to offset the degradation of the road crossings in Turkey Creek, Parsons and Virgus canyons.

D. Wildlife Resources

Objective D.1: Maintain and enhance the diversity of native fish and wildlife species and native habitats of the Aravaipa ecosystem.

Rationale: Loss of habitat for native wildlife has limited their distribution, abundance, and diversity. Nonnative aquatic species have caused population declines of most native fish species in southeastern Arizona. The Aravaipa ecosystem remains relatively intact and provides rich communities of plants and animals. Maintenance and recovery of natural healthy systems will prevent habitat loss and assist the recovery of threatened native populations. The BLM, AGFD, and TNC will jointly cooperate and coordinate to manage wildlife species and their habitat within the Aravaipa Creek ecosystem.

Management Actions

1. Monitor nonnative species and their impacts to the Aravaipa ecosystem and develop appropriate management actions to eliminate or control such species.
2. Where possible, remove nonnative aquatic species by direct means; where necessary, consider the use of chemical or other methods for nonnative removal or control. Prepare a contingency plan for such actions, with full review for environmental policy compliance, to allow a timely response in case of a predictable crisis.

Rationale: Aravaipa Creek supports seven native fish species, all of which have suffered reductions in their distribution. Two of these, loach minnow and spikedace, are federally listed as threatened under the Endangered Species Act.

While these species differ in some of their habitat requirements, they share a basic need for perennial streamflow free from pollution, All suffer from predation or competition from a variety of nonnative fish. Native species, both aquatic and terrestrial, may be adversely affected by nonnative species through competition for food and resources, consumption, hybridization, disease and parasites, and an altered ecosystem. Prevention is the best way to limit the spread of nonnative species; eradication may be necessary if these species are already established in order to protect our native species and ecosystems.

3. Reestablish viable populations of Gila topminnow and desert pupfish at Middle and Lower Oak Grove Canyon, Parsons Canyon and Virgus Canyon and consider reestablishment of topminnow and pupfish and other native fish populations in suitable habitats.
4. Maintain a viable population of desert bighorn sheep which may include supplemental translocations if the population falls below 50 animals. Translocation to potential release sites at Hell Hole or Horse Camp will be considered.
5. Institute year-round or seasonal closures of key roads in primary bighorn sheep habitat (Map 4), as described in Section G (actions G.1.1.g and G.1.2).
6. Evaluate potential habitat for supplementation and/or reestablishment of historic native species with emphasis on threatened, endangered, and special status species.
7. Coordinate with partners and support the establishment of refuge populations of Aravaipa Creek fish species.

Rationale: Presence of native species, including desert bighorn sheep, is a key recreational element of the public's enjoyment of the area and their presence contributes to the wilderness characteristic. Few intact ecosystems of this type remain in southeastern Arizona; they are therefore important to retain for their scientific and ecological value. Reestablishment and supplementation of threatened populations are important tools in species conservation. Translocation of individuals may be necessary to maintain healthy and genetically diverse populations in the event of disease, natural disaster, or other major losses.

8. Support the monitoring of native/nonnative parasites in fish populations.

Rationale: Isolated populations are susceptible to diseases and parasites that can devastate populations. Understanding the causative agents is important to formulate management approaches.

9. Retain, maintain and/or enhance all habitat essential to the recovery or survival of any threatened or endangered species including habitat historically used by the species.
10. Consider benefits to wildlife on any lands proposed for acquisition.

Rationale: Although the Aravaipa ecosystem is largely intact, there are missing components for which habitat restoration or acquisition can improve regeneration.

Objective D.2: Maintain and enhance healthy populations of native fish and wildlife species of the Aravaipa ecosystem.

Rationale: For maintenance and enhancement of native populations, a baseline understanding is necessary. Changes over time compared to the baseline provide information on population and habitat changes.

BLM file photo

Spikedace from Aravaipa Creek

Management Actions

1. Inventory stock tanks, tributaries and springs for fish and other key aquatic species.
2. Inventory/map existing fences. Remove unused fences; modify existing fences to meet BLM wildlife standards.
3. Coordinate and support monitoring of native/nonnative fish populations consistent with long-term data sets.
4. Coordinate and support monitoring of game species consistent with long-term data sets.
5. Coordinate and support monitoring of nongame species consistent with long-term data sets.
6. Support continued monitoring of amphibians in Aravaipa for chytrid fungus.
7. Inventory special-status species to determine their presence/absence and to establish baseline information on species such as Mexican spotted owl, cactus ferruginous pygmy-owl, Mexican garter snake, yellow-billed cuckoo, raptor species, and bats found around Virgus Canyon. Inventory/surveys will be done on these species for two years; continued monitoring will depend on detection, species' status in proximate areas and discretion of the BLM.

Rationale: Inventory of stock tanks, tributaries and springs will provide information on opportunities for and threats to native wildlife. Inventory of fences will provide a measure of risk reduction through modification and removal. Inventory and monitoring of species provide information about populations and health risk trends which assists in the development of management options. Continued inventory after two years will depend on detection of the species; if not detected, surveys may continue if existing data from known locations in southeastern Arizona reveals potential causal factors.

8. Maintain or enhance existing wildlife developments outside the wilderness to discourage the spread of nonnative species, secure water resources away from Aravaipa Creek, and allow for dispersal of native wildlife populations.

Rationale: Wildlife developments such as dams, barriers, water catchments, or fences are sometimes needed to ensure the success of native species populations.

9. Provide opportunities for research on wildlife.

Rationale: Aravaipa is a virtually intact ecosystem and provides unique opportunities for the study of natural systems.

10. Establish a scientific advisory committee to regularly review fish monitoring data and threats to the aquatic community, and to provide guidance on management actions to maintain and enhance the native fish species. This committee will be composed of scientists from the BLM, AGFD, TNC, USFWS, universities, and the public, supplemented by other experts, as appropriate, for particular issues, and should meet at least once per year.

Rationale: There is a long history of research conducted at Aravaipa but no clearinghouse to incorporate research into Aravaipa management. For example, there exists more than 40 years of fish monitoring data and more is gathered every year, but there is no established process for analyzing it or considering when to take significant new actions. An advisory committee would provide such a process and further allow interested parties to freely share data necessary for making appropriate management decisions.

E. Cultural Resources

Objective E.1: Provide opportunities for field investigations to identify significant cultural properties and determine effective research and protection strategies.

Photo © Dale Turner/TNC

Historic cabin in the Aravaipa uplands.

Rationale: In order to develop the database necessary to protect, study, and interpret the planning area's cultural resources, field surveys must be conducted. Since the planning area has not been intensively surveyed, the locations of only a few historic properties are known at this time. The known prehistoric sites span a time period of almost 7,000 years and have produced valuable information about the earliest human occupation of the area. Additional information will likely be recovered from other, yet to be discovered properties. The historical resources in the planning area represent an important era in the settlement of Arizona. The 1991 ethnoecological survey of Aravaipa Canyon documents the history of ecological change in the area, however, not all historical sites dating to the late 19th and early 20th centuries have been identified.

<u>Management Actions</u>

1. Conduct Class III intensive inventories in the following priority areas: Aravaipa Canyon, Virgus Canyon, Horse Camp, Cave Canyon, Oak Grove Canyon, Turkey Creek, Booger Canyon, Hell Hole, and Parsons Canyon, until each area has been inventoried 100 percent.

Rationale: Class III intensive field inventories will provide a complete record of historic properties occurring in the priority geographic areas. These areas include Aravaipa Canyon and its tributaries because it is believed that a majority

of archaeological and historical sites are located along riparian areas in the stream terraces and canyon walls. The goal is to conduct inventories to locate and precisely record historic properties. These properties will be documented and assessed. Based on the data collected, we can describe the distribution of historic properties in the planning area; determine their number, location and condition; determine the types present within the area; record the physical extent of specific properties; determine their eligibility for inclusion in the National Register; and allocate them to use categories.

2. Conduct Class II inventories outside the priority geographic areas.
Rationale: A Class II survey, combined with the existing regional overview and Aravaipa Canyon ethnoecological study, will provide a sample of information about historic properties found in the upland regions. Potentially, some significant properties may be found in the uplands. The goal of a statistically based sample survey is to characterize the probable density, diversity, and distribution of historic properties outside the priority geographic areas.

Objective E.2: Protect and preserve cultural resources eligible for the National Register of Historic Places to ensure that they are available for appropriate uses by present and future generations.

Rationale: The planning area contains significant archaeological and historical sites representing the diverse people who have lived in the area since ancient times. However, many of these invaluable sites are threatened by various natural forces and human activities. Meeting this objective will ensure that significant cultural resources will be protected to ensure that future generations will have an opportunity to discover and gain knowledge from our past.

Management Actions

1. Identify cultural resources that are being impacted or that are susceptible to vandalism, environmental effects, and permitted uses.
2. Revisit known archaeological and historical sites to update documentation, assess condition, evaluate for eligibility to the National Register, and allocate sites to use categories.

Rationale: In order to identify threats to the resource and develop maintenance and protection measures, the monitoring plan developed for the planning area will be implemented. The known archaeological and historical sites will be revisited to assess their condition, identify preservation and protection issues, and recommend measures to counter observed threats. Many of the known cultural resources in the planning area were identified several decades ago and visiting these sites will also update archaeological site information and use a Global Positioning System (GPS) to determine coordinates for permanent reference. This systematic monitoring program will provide an ongoing assessment of cultural property status and impacts, and permit a timely response to reducing or stopping most impacts.

3. Implement physical protection measures on sites that are being impacted (e.g. stabilization, fencing, signing, patrolling) to preserve resources that represent a range of time periods, cultural traditions, and functional types.
Rationale: Protection measures may include stabilizing structures, constructing fences, placing signs, and patrolling archaeological and historical sites. Signs placed will explain the social and scientific values of the planning area's cultural resources, the laws under which they are protected, and encourage visitors to cooperate in their preservation. Fencing significant cultural properties will prevent livestock from trampling properties and disturbing surface provenience, breaking surface artifacts, and compacting subsurface material.

4. Process Archaeological Resource Protection Act (ARPA) violations.
Rationale: Any act prohibited under ARPA will be processed. These acts, or the attempt to commit them, include excavation, removal, and damaging or otherwise altering or defacing archaeological resources on public lands.

5. Establish collaborative research partnerships with academic institutions, professional and nonprofit organizations, and avocational organizations, and support research projects that would benefit the public.
Rationale: Establish support for research activities including assistance in securing grants for data collection and research. Educational partnerships provide an opportunity for university and college students to participate in formal research projects, interact with the U.S. government and gain valuable knowledge that they can use after they graduate.

6. Provide opportunities for volunteer training and participation in site documentation, research, protection, and educational projects.
Rationale: Continue volunteer participation in monitoring and protection of cultural resources.

7. Continue maintaining the Turkey Creek Cliff Dwelling site for public visitation. Other sites appropriate for public use that may be discovered through inventory in the future will also be developed and maintained for public visitation.

Objective E.3: Provide opportunities to Indian Tribes to identify, conserve, and protect places of traditional use which are of continuing importance to Native Americans.

Rationale: An ethnographic study of the planning area is recommended to give an opportunity to Indian Tribes to identify places of traditional use that are of continuing importance to Native Americans. Little is known about the prehistoric and protohistoric people who occupied the planning area.

<u>Management Actions</u>

1. Conduct ethnographic studies to identify places of traditional importance.

2. Provide opportunities for tribal participation in research and interpretation of ancestral sites.

Rationale: The goal of ethnographic studies is to elicit information and collect oral historical accounts for religious practices and beliefs that may relate to places of traditional importance. The existence and significance of such locations often can be ascertained only through interviews and consultation with traditional cultural practitioners. This will include documentation and inventory of ethnographic resources such as sacred, subsistence, and other natural and cultural resources with which peoples are traditionally associated. Additionally, it will provide opportunities for tribal participation in research and interpretation of ancestral sites.

3. Continue to consult with Indian Tribes to identify places of traditional use, tribal needs for access and natural resources use, and measures for protecting places of traditional importance that might be identified by tribes during the life of the plan.

Rationale: Continue consultation with Indian Tribes to identify significant religious or cultural properties that may be eligible for the National Register, to understand tribal concerns, and to consider terms and conditions to protect tribal religious or cultural locations.

F. Recreation Resources

Recreation management within the Aravaipa Canyon Wilderness and Turkey Creek Riparian ACEC is addressed in Section H.

Objective F.1: Provide opportunities outside the Aravaipa Canyon Wilderness boundary for a diversity of recreational activities that have minimal impact on natural and cultural resources.

Rationale: Increased interest in using the Aravaipa Ecosystem Management Plan area for recreational purposes will continue due to population growth and emerging forms of recreation. The management plan should be based on monitoring the type and amount of recreational activity and developing policies to ensure that these uses are compatible with management goals for both the wilderness and non-wilderness areas.

<u>Management Actions</u>

1. Visitor use will be monitored and managed to provide a safe recreational experience and to provide access to recreational areas in a manner that minimizes damage to the natural environment. Apply Limits of Acceptable Change standards to the monitoring of roads and trails. Monitor camping activities to determine impacts on the natural environment. If appropriate, close sites or redirect use to designated sites. Permits for specific areas or uses may be required if there is evidence that overuse is resulting in significant resource damage, or if visitor use exceeds the capacity of the BLM to monitor impact.

Rationale: In the event of significant growth in the popularity of an area or activity, the BLM has the obligation to enact regulations to protect the resources and to ensure a high quality of recreational experience for a variety of users.

2. Maintain Fourmile Canyon Campground and Brandenburg Campsite near the primary access roads to each end of Aravaipa Canyon.

Rationale: Most of the land along the primary access roads to Aravaipa Canyon is privately owned. These campgrounds on public land allow visitors to camp near the East and West trailheads.

3. Develop recreational infrastructure only at sites that do not encourage non-permitted access to the wilderness.

Rationale: Increased use of the uplands should be managed in a way that does not compromise the wilderness values of the Aravaipa Canyon Wilderness. Roads, trails, campsites, and other developments should not place increased pressure on the wilderness area.

4. Prohibit campfires during times of heightened fire risk.

Rationale: Temporary fire restrictions may be necessary in all or part of the management area during times of heightened fire danger.

5. Establish sign-in registers at entry points crossing private land: Copper Creek, Painted Cave Road, Turkey Creek, Bear Canyon, and the old Aravaipa road. The registers will be monitored by the AGFD, TNC, and BLM. This action will be reviewed and reconsidered during the adaptive management process.

Rationale: Sign-in registers should increase visitor compliance with private land restrictions.

G. Travel Management

The planning team used the Evaluation Tree Method to analyze every vehicular route within the planning area, including some which were proposed as new construction projects. The routes addressed here were raised as management issues during the planning process. Out of approximately 255 miles of existing routes that were considered, this plan will leave 89% open to public use, 4% limited to administrative use only, and 7% closed to meet legal obligations or management objectives. Full details are provided in Appendix 6.

Objective G.1: Provide a variety of motorized travel corridor options consistent with other resource values.

Rationale: With the demand for OHV opportunities increasing, it is important that a balance be maintained between providing semi-primitive outdoor experiences and ensuring the protection of resources. The Federal Land Policy and Management Act of 1976, Executive Orders 11644 and 11989, and BLM

Manual 8342 state that all public lands will be designated as open, closed or limited to off-highway vehicle use to meet public demands, protect resources and public safety and minimize conflicts. The Evaluation Tree process was utilized to determine the designation of each route. Some routes were kept open with specific mitigation actions identified, designated as "mitigate open" and with the mitigation described in Appendix 6.

BLM file photo

Management actions

1. Motorized vehicles will be restricted to designated roadways (Map 5).

Rationale: Motorized and mechanized vehicles provide increased access for the public to public lands, while also contributing to degradation of natural resources and increased noise. These factors must be balanced in order to effectively manage the land according to multiple use principles.

2. Roads and trails in the non-wilderness area will be minimally constructed to retain the natural values of the area. Interpretive and directional signs should be unobtrusive and kept to a minimum.

Rationale: Roads, trails, and signs may be established for visitor convenience and safety, but should not compromise the rugged and isolated nature of the landscape.

3. Close or keep as closed and rehabilitate the following routes:

a. Turkey Creek beyond Oak Grove Canyon and Desert Grasslands ACEC – designation: closed.

Rationale: Turkey Creek beyond Oak Grove Canyon and Desert Grasslands are already designated as closed in the Safford District RMP.

b. White Wash Road (5012) – designation: closed for 1.0 mile from Aravaipa Creek crossing to top of ridge.

Rationale: This abandoned route is mostly on private land.

c. The north rim at Dry Camp and Painted Cave. No through routes. (proposed AC1121 and AC1114) – designation: No new routes will be constructed on the north rim.

Rationale: A new route connecting the east and west ends of the Aravaipa planning area along the north rim will not be constructed because the increase in traffic along this route is not consistent with other resource objectives and the vision for the planning area. Also, the proposed route raised trespass and use concerns from private landowners.

d. Upper Oak Grove (5019a) – designation: closed.
Rationale: Closure of this route was due to resource damage on private land.

e. Close all intrusions into the Aravaipa Canyon Wilderness.
Rationale: All routes that intruded into the wilderness were designated as closed per the Wilderness Act of 1964.

f. Basin Road (Lower)(5010) – designation: limited to motorized administrative and private property use.
Rationale: Closed to the public due to resource damage on private and state trust land. The Upper Basin Road (5014) would remain open, as it is a primary access road for recreation, administrative and commercial ranching facility use.

g. Routes 5000 (part), 5017 (part), 5017a, 5019a, 5020 (part), 5021 (part), 5021a, 5027a, 5029, 5029a – designation: closed.
Rationale:

- *Route 5020 (part) – designated closed for 0.85 miles due to an eroding segment within the ACEC and as directed by the Safford RMP.*
- *Route 5021 (part) and 5021a – designated closed for 0.87 miles with access limited to administrative use and public non-motorized use past the last campsite to protect riparian values as directed by the Safford RMP.*
- *Routes 5029, 5029a, 5027a, and 5000 – designated closed for 1.59, 0.24, 0.23, and 0.58 miles. These are redundant or unnecessary routes in or adjacent to primary bighorn sheep habitat.*
- *Route 5017 – designated closed for 1.91 miles. Closed beyond Don Jose Corral due to resource damage. Road not used by permittee or adjacent ranch.*
- *Routes 5017a and 5019a – designated closed due to resource damage on private land and to protect occupied habitat for federally protected species.*

4. Institute a seasonal closure to public use of routes 5028 (2.66 miles) and 5006 (3.23 miles) during bighorn sheep lambing season, January 15 to June 15.

Rationale: These routes go through primary bighorn sheep habitat. Seasonal closure will prevent disturbance during the most critical period, but keep these routes open for public use during the rest of the year.

5. Manage 0.32 miles of route 5022, 0.18 miles of route 5021, and 0.40 miles of route 5021a as trails for non-motorized use.

Rationale: During the Evaluation Tree process, each road was reviewed regarding the determination of motorized and non-motorized use. Part of route 5022 was determined to be severely eroded and a safety hazard for motorized use. Part of route 5021 and all of 5021a was limited to administrative use and public non-motorized use past the last campsite to protect riparian values as directed by the Safford RMP.

6. Keep the following routes open and maintained as primitive:

a. Rug Road (Copper Creek to Klondyke)

- (5015, Copper Creek to Parsons Canyon) – designation: mitigate open.

Rationale: This route will be kept rough and unmaintained to limit traffic volume and to provide a diversity of recreational opportunities.

- (5019, Parsons Canyon to Turkey Creek) – designation: open.

Rationale: This route is a primary access for administrative and commercial ranching facility use.

- (5021, Turkey Creek ACEC between the intersections with 5019 and 5018) – designation: open

Rationale: This route carries a higher traffic volume providing access to the east entry to the Aravaipa Canyon Wilderness and traditional recreation sites in Turkey Creek. It is subject to flood events and needs to be maintained on an as-needed basis to a level that allows for continued public use.

- (5018, Klondyke Road from Turkey Creek to Bear Canyon) – designation: open.

Rationale: This route is a primary access for administrative and commercial ranching facility use. It carries a higher traffic volume providing access to the east entry to the Aravaipa Canyon Wilderness, and traditional recreation sites in Turkey Creek. This segment of 5018 is subject to flood events and needs to be maintained on an as-needed basis to a level that allows for continued public use.

b. Painted Cave Road (5000, 5007) – designation: mitigate open.

Rationale: To prevent route proliferation into the wilderness, 0.58 miles of 5000 designated as closed because it is adjacent to primary bighorn sheep habitat and unnecessary.

c. White Wash Road (5012)

- designation: open for 4.40 miles, from top of ridge above Aravaipa Creek to Virgus Canyon.

Rationale: This route is a primary access road for administrative and commercial ranching facility use.

- designation: closed for 1.0 mile, from Aravaipa Creek crossing to top of ridge.

Rationale: This is an abandoned route, mostly on private land.

7. Improve the North Rim Road (5027) just past reservoir to eliminate new headcut.

Rationale: All roads will be monitored for safety and erosion issues to protect both users and resources.

8. Apply Limits of Acceptable Change to all routes.

Rationale: Baseline conditions will be established over 3-5 years of monitoring (see Chapter 6). The baseline will be used to determine LAC guidelines.

9. Do not allow cross-country game retrieval with motorized vehicles.
Rationale: Motorized cross-country game retrieval is currently not allowed per BLM Arizona policy.

Other management actions in this plan which address this objective:
H.3.4

Objective G.2: Secure motorized access to public lands within the planning area.
Rationale: Historically, access availability has varied due to the discretion of private landowners and as a result of issues such as vandalism and littering. Securing motorized access would ensure continued access to the planning area for administrative and/or public use.

Management Actions
1. Obtain legal access to the east Aravaipa Canyon trailhead for public and/or administrative use along the Klondyke Road (5018).
Rationale: Provide access to BLM lands. If easement through private property is not obtained, pursue new routes listed as FS277, 5030, and 5026, or AC1116, AC1123, and FS94.

2. Obtain legal access for public and/or administrative use on the west end access road (5001).
Rationale: Provide access to BLM lands.

3. Obtain legal access for public and/or administrative use on the road to Fourmile Canyon Campground (5025).
Rationale: Provide access to BLM lands for recreational and commercial purposes.

4. Obtain access for public and/or administrative use on Dry Camp Road (5026)
Rationale: Pursue easement through private property or construct route AC1112 or other alternative route that bypasses Dry Camp private property. This would allow access to road network beyond the private land. Construct alternative route only if unable to obtain legal access through Dry Camp private property.

5. Obtain access for public and/or administrative use on Rug Road (5015).
Rationale: Pursue easement through private land.

6. Obtain access for public and/or administrative use on the road to the old town of Aravaipa (FS277 and 5043).
Rationale: Pursue easement through private property if access not available on Klondyke Road (5018).

7. Obtain access for public and/or administrative use on Copper Creek Road.
Rationale: Pursue legal access.

8. Obtain access for public and/or administrative use on Sand Wash Road (5041).
Rationale: This route is currently closed to public across private land to prevent riparian damage. Pursue legal access only if other access options to east wilderness trailhead are unavailable.

9. Obtain access for public and/or administrative use to Parsons Grove.
Rationale: Pursue legal access on the Rug Road (5015). Routes 5014 and 5019 designated as open to continue to provide administrative and commercial access.

H. Special Area Designations

Objective H.1: Manage the Aravaipa Creek segment determined suitable and recommended for inclusion into the National Wild and Scenic Rivers System to maintain the qualities which led to those determinations, until it is addressed by Congress.

Rationale: Only Congress can designate Wild and Scenic Rivers. Until such action, the BLM must provide interim protection as described in the Safford District RMP (BLM 1991).

Management Actions

1. Implement interim management guidelines from BLM policy, as described in the Safford RMP (BLM 1991). These include maintaining the free-flowing characteristics of a stream and limiting construction activities in its corridor.

Objective H.2: Manage visitor use in Aravaipa Canyon Wilderness (ACW) to preserve the wilderness characteristics of the canyon, minimize impacts on resources, maintain an environment with few traces of human presence, and preserve a unique place for solitude and appreciation of nature.

Rationale: The attractiveness of Aravaipa Canyon as a recreation destination, along with continuing population growth in the region, will continue to put pressure on the resources and on the unique wilderness character of the canyon. The guiding principle of management of ACW is to protect the values that make the canyon worthy of wilderness designation. Specific actions relevant to this wilderness objective are described in several places through this plan, but are consolidated and listed here.

Management Actions

1. Continue the current wilderness permit system. Limit the number of permits issued for ACW to no more than 30 persons per day on the west side and 20 persons per day on the east side. Limit the size of hiking and camping groups to ten persons. Limit the length of stay in the canyon to no more than three days (two nights). A permit is required for Aravaipa Canyon and its side canyons. No permit is needed for the uplands (see Map 3).

Rationale: A permit system is necessary to preserve the natural experience of

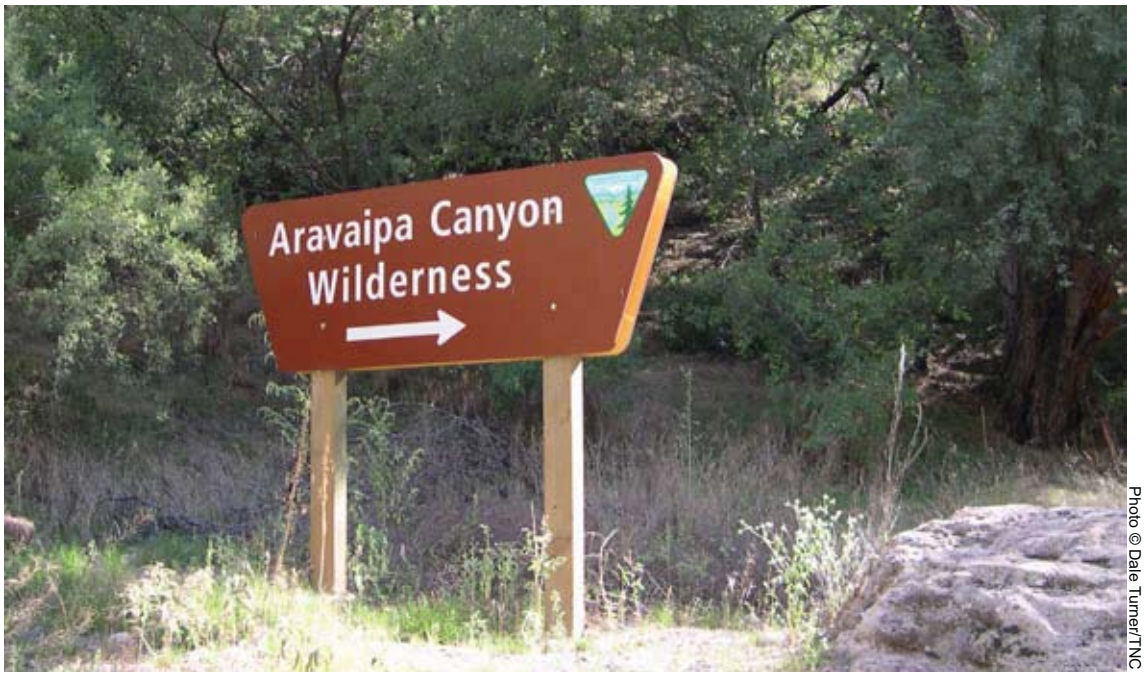


Photo © Dale Turner/TNC

visitors and minimize impact on resources. Demand for recreational use of ACW far exceeds the capacity of the canyon. Overuse threatens natural resources and diminishes the wilderness experience for users.

2. Review the wilderness permit system periodically to determine ways in which the system can be improved for the end user, or to address potential abuses of the system by users. Provide an opportunity for visitor response to provide data on the quality of experience, wildlife observations, and disturbance of solitude.

Rationale: The permit system should serve both the management needs of the BLM and the recreational needs of the public.

3. Require all providers of commercial services in ACW to operate under a Special Recreation Permit issued by the BLM. Permits for such groups will be obtained through the regular permit system. Commercial Special Recreation Permit holders may be subject to permit limitations.

Rationale: Commercial operators taking guests into the canyon must be subject to BLM monitoring and review. Because of the relative scarcity of ACW permits, commercial operators should not be allowed to hold excessive numbers of permits during peak use times.

4. Camping in ACW will be dispersed in order to reduce the impact of continual use at sites. Trails will not be constructed in ACW. Interpretive and directional signs will not be used in the Wilderness, except at trailheads and to direct traffic between the trailheads and the canyon.

Rationale: Recreational use of ACW should be managed to promote wilderness values, including the minimization of traces of human presence.

5. Discourage the use of campfires and the construction of campfire rings. Encourage alternatives to campfires, such as portable stoves. All traces of campfires and fire rings must be eliminated before the campsite is vacated. Establish restrictions on fire use if necessary for safety or resource protection.

Rationale: Fire rings are permanent signs of human presence. Established fire rings inevitably become depositories for garbage. Fire restrictions are necessary during times of drought or high fire danger.

6. Inform visitors that the preferred method of disposing of human waste is to pack it out. At a minimum, waste should be buried in a six- to eight-inch hole away from water. Toilet paper will be packed out. Monitor human waste disposal practices in the canyon and revise policies as necessary.

Rationale: Human waste tends to accumulate near popular campsites. Packing waste out is preferable to burying it in a desert climate.

7. Maintain trailhead facilities at each end of the canyon, including information kiosks, trail registers, restrooms, and trash disposal.

Rationale: Providing information to the public, especially at the site, educates users in the preferred hiking and camping techniques for ACW. Visitor facilities at the trailheads allow for trash and waste disposal and monitoring of visitor use.

8. Prohibit pets, except for ADA-assist animals, in Aravaipa Canyon and its side canyons. Pets are allowed in the upland zones of the wilderness area.

Rationale: In the narrow canyon areas of ACW, pets may pose threats to wildlife, vegetation, and the wilderness experience of other users.

9. Limit pack stock to day use in the canyon. No more than ten animals per day may be in the canyon. Limit allowed pack stock to horses, mules, and donkeys. Feed brought into ACW must be certified weed-free in accordance with current BLM guidelines.

Rationale: Overnight grazing is detrimental to the riparian vegetation. Large numbers of stock animals may negatively impact vegetation and stream banks. Some domestic livestock can transmit diseases to wildlife. Feed should not be a vehicle for the introduction of nonnative vegetation.

10. Conduct regular inventory and monitoring of campsites in ACW in accordance with Limits of Acceptable Change procedures.

Rationale: Regular and systematic monitoring of campsites is necessary to evaluate human impact and to determine whether actions are necessary to restore specific sites.

11. Prohibit the discharge of firearms within 50 vertical feet of the Aravaipa Creek streambed. Enact further restrictions on the discharge of firearms, if necessary, to protect visitor safety.

Rationale: Because of the confined nature of Aravaipa Canyon, the discharge of

firearms along the canyon bottom is not compatible with hiking, camping, and wildlife observation. This restriction was established by the Arizona Game and Fish Commission for the Aravaipa Canyon Wildlife Area.

12. Maintain present administrative sites and residences and staff with full-time rangers at Aravaipa Canyon east and west entrances. Monitor the condition of the East Aravaipa residence and plan for its replacement.

Rationale: Enforcement of the permit system is essential to the maintenance of the wilderness characteristics of Aravaipa Canyon. Maintaining the present administrative sites and residences that are staffed with full-time rangers will enable the BLM to monitor resource conditions and visitor use, provide visitors with information, administer the permit system and render assistance when needed.

Other management actions in this plan which address this objective
A.1.2, A.1.3

Objective H.3: Maintain and improve wilderness values of naturalness and outstanding opportunities for solitude and primitive, non-motorized types of recreation in the Aravaipa Canyon Wilderness by preventing unauthorized intrusions and minimizing authorized impacts.

Rationale: Uses of wilderness are managed with the underlying principle to protect wilderness values of naturalness and outstanding opportunities for solitude and primitive recreation. Specific actions relevant to this wilderness objective are described in several places through this plan, but are consolidated and listed here.

Management Actions

1. In accordance with the Memorandum of Understanding between the BLM and Arizona Game and Fish Commission, the AGFD will conduct up to four annual low-level big-game species survey flights. Flights will be conducted between October 1 and January 31 on weekdays, except for occasional bighorn sheep population estimate surveys which may occur on weekends.

Rationale: Allowing the wildlife operations as outlined will ensure that necessary wildlife data is gathered to ensure proper management with the least impact to the naturalness of the wilderness. Bighorn sheep population estimates are rare one-day events which involve volunteer surveyors on the ground and thus may be conducted on weekends.

2. Work with appropriate agencies to minimize low-altitude (less than 2,000 feet) flights over ACW, except in emergencies or AGFD surveys described above.

Rationale: The noise generated by low-flying aircraft in not compatible with the wilderness experience.

3. Inspect and maintain all existing range, wildlife and cultural developments

within the wilderness using non-motorized and non-mechanized means.
Rationale: Non-motorized and non-mechanized means are the minimum tools necessary to maintain existing developments within the wilderness. This method will have the least impact to naturalness of the wilderness. Range improvements within the wilderness are shown in Appendix 4.

4. Post and maintain carsonite signs along the boundary and cherry-stem roads at quarter-mile intervals. Maintain one larger sign at each of the east and west main entrances.

Rationale: Installing and maintaining boundary signs will prevent unintentional unauthorized vehicle entry and allow visitors to know when they are entering the wilderness.

5. Continue efforts to acquire private inholdings within the Aravaipa Canyon Wilderness.

Rationale: The Safford District RMP identifies private inholdings within wilderness for acquisition. Obtaining these inholdings would eliminate potential negative impacts from non-wilderness inholdings on wilderness values.

6. No recreation developments, including trails, will be maintained or built in the wilderness.

Rationale: The wilderness will be managed with an emphasis on protecting wilderness values of naturalness and outstanding opportunities for solitude and primitive recreation.

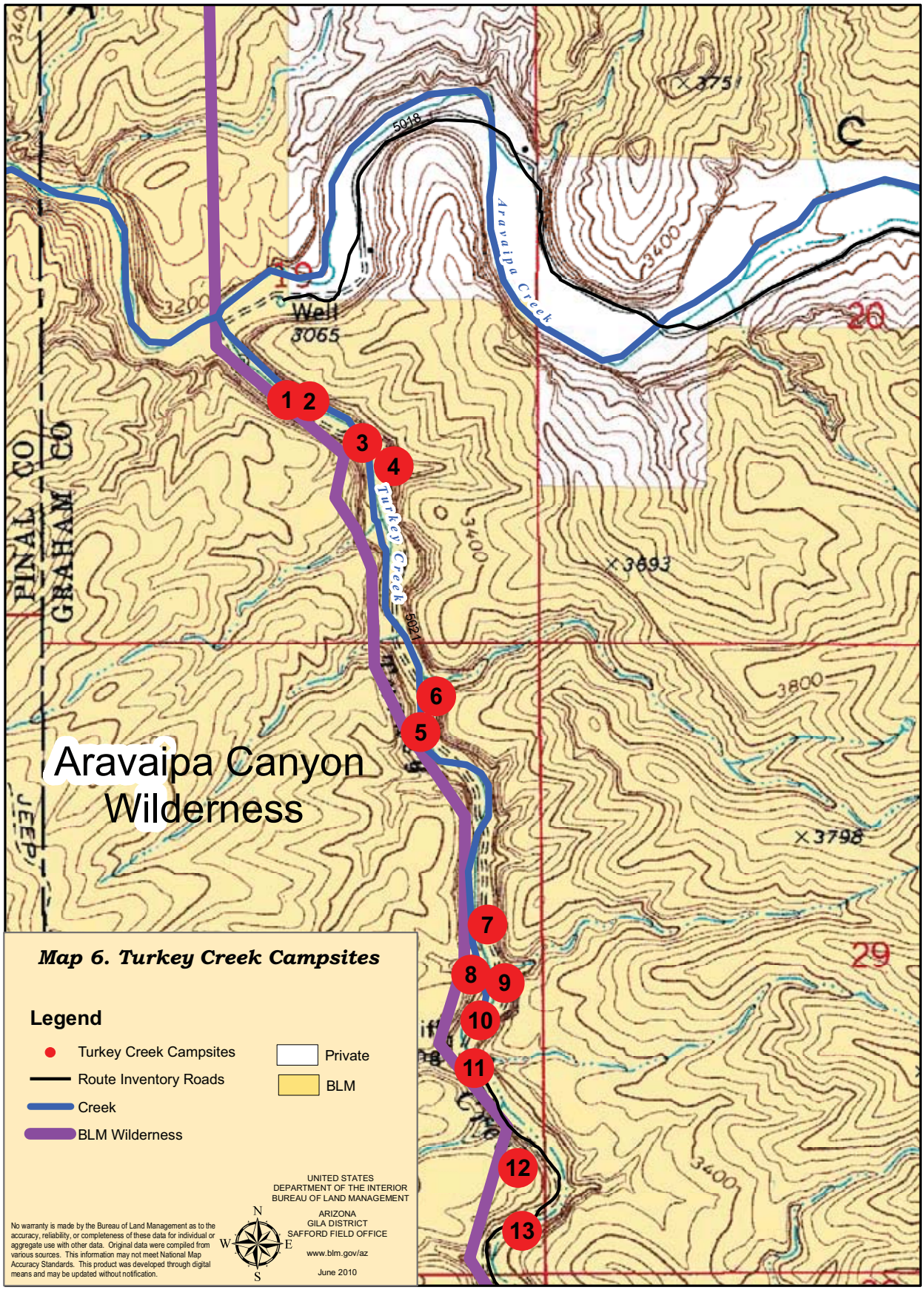
<u>Other management actions in this plan which address this objective</u>
A.2.1, B.3.1, B.4.1, C.1.1, C.1.3, D.1.1, D.1.2, D.1.4, D.2.3, D.2.4, D.2.5, D.2.6, D.2.7, D.2.9, E.1.1, G.1.3.e, I.1.3, I.1.4

Objective H.4: Manage the Turkey Creek Riparian ACEC to maintain and protect the important cultural, scenic and wildlife values for which it was designated.

Rationale: The BLM established this ACEC and prescribed certain management actions in the Safford District RMP (BLM 1991). This Ecosystem Management Plan serves as the activity plan for the ACEC. Specific actions relevant to the ACEC are described in several places through this plan, but are consolidated and listed here.

<u>Management Actions from the Safford District RMP</u>

1. Designate the area limited to off-highway vehicle use. Limit vehicular use to existing roads and trails. (This is addressed in Section G, the Travel Management actions of this plan. "Limited to off-highway use" is no longer a valid term.)
2. Close Turkey Creek Canyon and Oak Grove Canyon (in ACEC) to vehicle use beyond the Oak Grove Canyon corral. (This is addressed in Section G, the



Map 6. Turkey Creek Campsites

Travel Management actions of this plan.)

3. Manage livestock to avoid yearlong use, consistent with the goals of the Aravaipa watershed Coordinated Resource Management Plan. (This Aravaipa Ecosystem Management Plan will serve as the Coordinated Resource Management Plan.)
4. Monitor water quality and provide input to activity plans to maintain the desired water conditions.
5. Manage the area to accelerate recovery of riparian vegetation to reach good ecological condition by 1997. (This date is carried forward from the Safford RMP.)
6. Acquire adjacent riparian areas and lands within the watershed as they become available.
7. Prohibit woodcutting and gathering for home use. Gathering dead and down wood for campfires is permitted.
8. Manage the area as a Visual Resource Management Class II area to preserve scenic quality.

Additional Management Actions

1. Limit camping along Turkey Creek road to designated campsites (Map 6). Temporary closures may be placed on individual campsites to protect sensitive resources.

Rationale: Overuse of Turkey Creek has contributed to erosion and degradation of the riparian zone. Campsite restrictions will allow areas to regenerate and will reduce the overall human impact on the natural resources.

Other management actions in this plan which address this objective

B.1.2, C.1.1, C.1.2, C.1.3, C.1.4, C.1.7, E.1.1, E.2.7, F.1.5, G.1.3.a

Objective H.5: Manage the Table Mountain Research Natural Area ACEC to maintain and protect the two important plant communities for which it was designated.

Rationale: The BLM established this ACEC and prescribed certain management actions in the Safford District RMP (BLM 1991). This Ecosystem Management Plan serves as the activity plan for the ACEC. Specific RMP actions relevant to the ACEC are described in several places through this plan, but are consolidated and listed here.

Management Actions from the Safford District RMP

1. Designate the area limited to off-highway vehicle use. Limit vehicular use to existing roads and trails. (This is addressed in Section G, the Travel Management actions of this plan. “Limited to off-highway use” is no longer a valid term.)
2. Prohibit woodcutting and gathering for home use. Gathering dead and down wood for campfires is permitted.

Photo © Dale Turner/TNC

The Pilares, as seen from Aravaipa Canyon.

3. Prepare a prescribed burn plan that will allow fire to continue its role in the ecology of the ACEC. (According to current national policy, burn plans will be prepared only after specific burn objectives have been identified. This is addressed in Section B, the Upland Resources actions of this plan.)
4. Manage livestock to limit concentrated use.
5. Withdraw the area from mineral entry.
6. Close the area to vegetation sales.
7. Limit research to the effects of natural processes on this plant community.

<u>Other management actions in this plan which address this objective</u>
B.3.1

Objective H.6: Manage the Desert Grasslands Research Natural Area ACEC (Pilares unit) to maintain and protect the relic grasslands for which it was designated.

Rationale: The BLM established this ACEC and prescribed certain management actions in the Safford District RMP (BLM 1991). This Ecosystem Management Plan serves as the activity plan for the ACEC. Specific actions relevant to the ACEC are described in several places through this plan but are consolidated and listed here.

Management Actions from the Safford District RMP

1. Acquire adjacent state and private parcels as they become available.
2. Prepare a prescribed burn plan that will allow fire to continue its role in the ecology of the ACEC. (According to current national policy, burn plans will be prepared only after specific burn objectives have been identified. This is addressed in Section B, the Upland Resources actions of this plan.)
3. Limit research to the effects of natural processes on the grasslands.
4. Exclude livestock on lands not currently accessible to livestock or not presently being used for grazing.

Other management actions in this plan which address this objective

B.3.1

I. Public Information and Education

Objective I.1: Educate land users by providing brochures, maps, and point-of- contact (at access points, trailheads, etc) information and signage to protect resources.

Rationale: Visitors who lack knowledge of environmental ethics often negatively impact the environment through actions such as littering, vandalism, and cross-country driving. Brochures, signage, and maps, can assist in educating visitors and, through education, help in minimizing impacts to natural resources.

Management Actions

1. Develop an Interpretative Plan including signage along the wilderness boundary, directional and road signs, brochures, maps, and kiosks.

2: Provide outreach to hunters, ATV users, clubs, youth groups, etc.

Rationale: Well-designed support facilities such as route markers, interpretive signage, maps and brochures increase the user's experience and satisfaction while protecting resources. In addition, meetings with the actual users, such as ATV groups, can emphasize the importance of balancing the outdoor experience with the preservation of natural resources.

3. Encourage Leave No Trace camping and hiking practices through kiosks, brochures, public information sites, and visitor contacts.

Rationale: Providing information to the public, especially at the site, educates users in the preferred hiking and camping techniques for Aravaipa Canyon Wilderness.

4. Use the wilderness permit system as a vehicle for educating visitors about low-impact use and protection of natural and cultural resources.

Rationale: The permit process affords an opportunity to inform the public of the unique nature of Aravaipa Canyon Wilderness, the need for users to protect its resources, and current preferred camping practices. The online permit website provides a wealth of information.

Objective I.2: Develop and maintain an active program of public education on the nature and values of cultural resources and the need to preserve them.

Rationale: Providing educational information enhances public benefit and appreciation of cultural resources and enlists the aid of some of the public in the BLM's efforts to protect these resources. It ensures that visitors to the public lands know how to respect and appreciate heritage resources without impacting them.

Management Actions

1. Provide resources for the development of educational materials geared toward the general public for community outreach.
2. Provide signage within the Aravaipa area with an overview of the history and prehistory of the area.
3. Enhance the Aravaipa website by adding information on the cultural resources of the area.

J. Law Enforcement and Public Safety

Objective J.1: Provide an adequate level of monitoring and law enforcement to prevent vandalism, off-road driving, trespass, theft, littering, and poaching.

Rationale: Enforcement of existing rules and regulations assists in protecting both resources and visitors.

Management Actions

1. Monitor recreation use with agency personnel and volunteer groups, and through cooperative agreements and partnerships, including "Adopt-A-Trail" peer patrol, mountain bikers, OHV groups, hunting groups, and an Adopt-A-Ranch (clean up) program.

Rationale: Involving users in monitoring ensures a more comprehensive process, gives those involved ownership, and assists the BLM, which doesn't have the staff to adequately monitor the entire planning area as often as needed.

2. Provide adequate law enforcement through BLM law enforcement patrols and partnerships with the Forest Service, Arizona Game and Fish Department, and other agencies.

Rationale: Enforcement of rules and regulations assists in protecting both visitors and resources. Involving partners increases communication between the agencies and assists in meeting monitoring compliance issues.

CHAPTER 6.
MONITORING AND ADAPTIVE MANAGEMENT

Photo © TNC

Seining in Aravaipa Creek to monitor fish population levels.

Adaptive management is a systematic approach to learning from the outcomes of management actions, accommodating change, and improving management. It involves synthesizing existing knowledge, exploring alternative actions, and making explicit forecasts about their outcomes.

Management actions and monitoring programs are designed to generate reliable feedback and clarify the reasons underlying outcomes. Monitoring results are compared to measurable thresholds for resource conditions which may trigger specific new actions. Existing management actions and objectives are then adjusted based on this feedback and improved understanding. In addition, decisions, actions and outcomes are carefully documented and communicated to others so that knowledge gained through experience is passed on, rather than being lost when individuals move or leave the organization.

This plan incorporates an adaptive management strategy that generally involves four phases: planning, implementation, monitoring, and evaluation. As managers obtain new information, they will compare monitoring data and other resource information against established goals and thresholds to determine need for changes in management. This allows for the continual refinement and improvement of management prescriptions and practices.

A. Monitoring

Monitoring is an essential component of an adaptive management strategy. Monitoring data is used to assess resource conditions, identify resource conflicts, determine if resource objectives are being met, and periodically refine and update desired conditions and management strategies.

The monitoring actions described in Table 6-1 will be established or continued under the approved ecosystem management plan and additional monitoring will be established as needed. All monitoring efforts conducted within the Aravaipa Canyon Wilderness will be performed in ways consistent with wilderness restrictions and the wilderness permit system.

B. Plan Evaluation

The BLM, TNC, and AGFD will conduct evaluations of the monitoring data and resource conditions every second year during a coordination meeting for managers of the Aravaipa Ecosystem. This evaluation will include the following steps:

1. Document management actions that have been completed.
2. Analyze monitoring data to determine if plan objectives are being met.
3. Identify and prioritize management actions for future implementation.
4. Propose new management actions if objectives are not being met.
5. Identify new issues or concerns that may have arisen for the Aravaipa ecosystem, and determine whether modifications to the plan are needed to address them.
6. Determine if new information is needed to resolve a new or existing issue.

New issues or proposals not contained in this plan will be analyzed to determine if they are consistent with the objectives. If they are, an environmental analysis will be conducted and the actions implemented.

Newly developed actions identified for implementation will become plan amendments. Plan amendments will be available for public review 45 days before being implemented.

C. Information Needs

During the course of this planning process, several questions were raised which could not be answered with currently available information. As part of an adaptive management framework, these were identified as information needs that will be addressed through research or other focused efforts. The results of that information gathering may trigger future management actions.

- Does the sediment load coming into Aravaipa Canyon threaten the long-term health of the aquatic community? If so, what are the sources of sediment and the causes of its movement?

- What is the impact of nonnative species on the Aravaipa ecosystem?

- What would be an appropriate and effective response to nonnative crayfish entering the canyon?

- What are the advantages and disadvantages of installing additional barriers to movement of nonnative fish through the canyon? If more barriers seem desirable, where should they be placed?

- When they are completed, acquire from NRCS the final digitized soil maps for the Pinal County portion of the ecosystem.

- Help NRCS complete mapping of soils in Graham County portion of the ecosystem.

- Develop state and transition models for vegetative communities in the Graham County portion of the ecosystem based on soil mapping.

- What is the current condition of the roads?

Table 6-1. Monitoring tasks for the Aravaipa Ecosystem. The description of each task continues on the facing page.

Monitoring Task	Plan Objective Addressed	Organizations Involved	Timeframe	Indicator to be Monitored
Monitor fish and macro-invertebrate contamination with heavy metals	A.1, D.2	BLM	Every 3 years	Heavy metal levels within fish and macro-invertebrate body tissue
Water quality monitoring	A.1	BLM	Every 3 years	various pollutants
Heavy metals in stream sediment	A.1	BLM	Every 3 years	various pollutants
Aravaipa stream flow, west end	A.2	USGS	continuous	streamflow
Aravaipa stream flow, east end	A.2	TNC	monthly	streamflow
Monitor upland vegetation utilization levels (if livestock grazing on allotment)	B.1, C.1	BLM, AGFD, TNC	Every year for Improve allotments, every 3-5 years for Maintain allotments, as needed for Custodial allotments	Forage utilization
Rangeland Health	B.2	BLM, AGFD, TNC	Standards & Guidelines assessments will be done every 10 years for each allotment. Trend studies will be conducted every 3-5 years. Utilization studies will be performed when determined necessary	ground cover, production, grazing utilization and composition
Monitor riparian vegetation conditions	C.1	BLM, AGFD, TNC	Every 5 years	Proper Functioning Condition

Methods	Thresholds for Management Changes	Regulatory Issues Addressed
Collect samples during fish monitoring, submit for lab analysis	Levels sufficient to cause reproductive failure, based on the best available information.	Endangered Species Act, BLM sensitive species, Wildlife of Special Concern in Arizona
Collect samples, submit for lab analysis	Surface water standards are published in Arizona Administrative Code Title 18, Chapter 11	Arizona water quality standards for unique waters
Collect samples, submit for lab analysis		
gaging station		Instream flow water rights
instantaneous measurement		Instream flow water rights
Technical Reference 1734-3 (BLM 1996)	Greater than 40% utilization of current year's growth.	
Qualitative data will be collected through the Indicators of Rangeland Health worksheets. Composition: Dry Weight Rank method. Production: Comparative Yield or an equivalent method. Trend: Frequency, photo points, ground cover using point intercept transects.	When trend studies indicate that significant changes have occurred, BLM's Ecological Site Inventory (ESI) procedures will be used to determine the new ecological site condition rating.	43 CFR 4180 - Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration
Technical Reference 1737-15 (BLM 1998)	When assessment shows a riparian area is not in Proper Functioning Condition and not in an upward trend.	

Monitoring Task	Plan Objective Addressed	Organizations Involved	Timeframe	Indicator to be Monitored
Native and nonnative fish distribution, presence, absence, and abundance	D.1, D.2	BLM, TNC, UA, AGFD	Bi-annual, in spring and autumn	Distribution, presence, absence, and abundance of native and nonnative fish species
Monitor lowland leopard frog populations	D.2	TNC, BLM	Annually, September or October	Abundance and distribution of leopard frogs
Monitor desert bighorn sheep populations	D.2	AGFD	Every 3 years in October	Abundance and distribution of desert bighorn sheep.
Monitor deer populations (mule deer and white-tailed deer)	D.2	AGFD	Annually, Dec. 1– Jan. 31	Numbers and distribution
Monitor javelina populations	D.2	AGFD	Annually, Dec. 1– Feb. 28	Numbers and distribution

Methods	Thresholds for Management Changes	Regulatory Issues Addressed
Methods include, but are not limited to seines, backpack electrofishers, trammel nets, minnow nets, hoop-nets, and dip-nets.	A scientific advisory committee will review data and current status of threats at least annually, and recommend management actions based on observed trends or events.	Endangered Species Act, BLM sensitive species, Wildlife of Special Concern in Arizona.
Visual encounter surveys to detect presence, absence, and abundance	Population declines should trigger a wide variety of water quality and habitat assessments, along with testing specimens for disease.	BLM Special Status Species, Wildlife of Special Concern in Arizona.
Helicopter visual survey	If surveys indicate that the desert bighorn sheep population has fallen below 50 animals, the BLM and AGFD will: 1) Re-evaluate past habitat assessments and associated information from the project area to aid in determining causative factors contributing to population declines, and 2) coordinate efforts to conduct a population translocation of at least 25 bighorn sheep to augment and preserve the existing population.	
Helicopter visual survey, vehicular, horseback, and foot transect routes.	If the mule deer or whitetail deer populations, or the female segment of those population experience a decrease of greater than 30% from the mean survey index for three consecutive years, then the BLM and AGFD will conduct an accelerated habitat evaluation to determine causative factors contributing to population declines and implement habitat improvements to reduce or eliminate any limiting factors.	
Helicopter visual survey/mark-recapture population estimate. Vehicular, horseback, and foot transect routes.	If the javelina population experiences a decrease of greater than 30% from the mean survey index, then the BLM and AGFD will conduct an accelerated habitat evaluation to determine causative factors contributing to population declines and implement habitat improvements to reduce or eliminate any limiting factors.	

Monitoring Task	Plan Objective Addressed	Organizations Involved	Timeframe	Indicator to be Monitored
Monitor raptor species, including common blackhawk, zone-tailed hawk, gray hawk	D.2	BLM, volunteers	Annually, mid-March – April when birds are returning to territories and nests are visible	Nesting pairs
Monitor desert tortoise	D.2	BLM	Monitor for presence of tortoise in known occupied habitat every five years. Monitor roads for associated mortality. Monitor for presence of tortoise after habitat disturbing events in known occupied habitat (fire, change in livestock use etc.).	Monitor for trend in the presence, absence, and mortality of desert tortoise in known occupied habitat.

Methods	Thresholds for Management Changes	Regulatory Issues Addressed
Nest/breeding pair identification and information	If there are population declines or if flooding causes a reduction in the number/availability of mature trees, then temporary or seasonal closures in camping areas or prohibition of camping near nest trees may be needed. Existing common blackhawk data should be analyzed within 3-5 years and thresholds set at that time based on numbers of breeding pairs. Baseline for new species should be established within five years and thresholds for numbers of breeding pairs set at that time within a normal range of variation. Poor conditions may trigger a reassessment of management actions which may include, but not limited to, temporary or seasonal closures in camping areas or prohibition of camping near nest trees if there are populations declines or if flooding causes a reduction in the number and/or availability of mature trees.	BLM Special Status Species (common blackhawk and gray hawk; all raptor nests are treated as Special Status), Wildlife of Special Concern in Arizona.
Presence, absence and mortality along a three-mile loop transect (no handling of individuals) (Johnson et al. 1990: pp 40-41). Opportunistic monitoring of roads (when employees are traveling them) for evidence of tortoise injury or mortality.	Satisfactory population levels can be maintained as long as habitat conditions remain relatively stable and population depressing factors (shooting, collecting, road mortality, unnatural fire etc,) are reduced to the extent possible. If no evidence of tortoise presence is found on a three mile loop transect in known occupied habitat, additional transects in the area, annual tortoise presence monitoring, and habitat assessments would be triggered. All information would be evaluated to determine if the causal factors can be identified and eliminated or reduced. Levels of mortality will be documented along three mile loop transects and opportunistic road surveys. If a trend to more mortalities or excessive mortality is documented, additional surveys would be triggered. All information would be evaluated to determine if the causal factors can be identified and eliminated or reduced.	BLM Special Status Species, Wildlife of Special Concern in Arizona.

Monitoring Task	Plan Objective Addressed	Organizations Involved	Timeframe	Indicator to be Monitored
Monitor peregrine falcon	D.2	AGFD, BLM, TNC	According to Monitoring Plan, (USFWS 2003) - Every three years, for a total of five surveys. Two visits per site per year – once during courtship and again during the nestling stage.	Verify territory occupancy and nest success
Monitor Turkey Creek Cliff Dwelling	E.2	BLM, Arizona Site Stewards	Annual	Condition of structure, trail, and interpretive sign
Monitor cultural resources	E.2	BLM, Arizona Site Stewards	10 historic properties per year until all properties have been monitored. Thereafter, those properties susceptible to vandalism, environmental effects, and permitted uses will be monitored once each year.	Condition of historic properties in the planning area
Turkey Creek recreational impacts	F.1, H.4	BLM	annual	Campsite size, condition of vegetation and litter, soil erosion
Fourmile Canyon Campground visitor use	F.1	BLM	annual	Use levels, peak seasons of use

Methods	Thresholds for Management Changes	Regulatory Issues Addressed
Visual surveys done at historic eyries	Changes in management will be based on results from range-wide surveys and recommendations from the USFWS.	Endangered Species Act, Wildlife of Special Concern in Arizona.
Visual monitoring and patrols	When deterioration or damage occur to the structure or trail due to vandalism or environmental effects, maintenance will be performed to keep its existing condition.	BLM Manual 8140-Protecting Cultural Resources
Inspect, assess condition, update information, use GPS to establish coordinates, identify protection and preservation issues, and photograph	BLM archaeologists and the Arizona Site Stewards will be able to collect site information and establish a data base which will then be used to develop guidelines for protecting cultural resources.	BLM Manual 8140-Protecting Cultural Resources
Limits of Acceptable Change	Campsite size will be maintained at established baseline for disturbed area. Sites that exceed baseline size will be rehabilitated.	Safford RMP
Permit system		

Monitoring Task	Plan Objective Addressed	Organizations Involved	Timeframe	Indicator to be Monitored
Vehicle use and road conditions.	B.1, F.1, G.1, H.3, J.1	BLM, TNC, AGFD, site hosts at the east end of Aravaipa, volunteer groups	At least once per year. Observations will be recorded as to the conditions of roads and vegetation removal whenever BLM personnel are in the planning area.	Wilderness intrusion, off-road driving, road conditions, types and amount of litter, vandalism such as sign damage, and evidence of unauthorized removal of live wood and other plant materials
Aravaipa Canyon recreational impacts	H.2	BLM or contractor	Formal monitoring annually, ongoing informal monitoring by staff.	Expansion of established campsites, loss of or damage to vegetation, impacts on stream banks, fire rings, human waste depositories
Wilderness visitor use	H.2	BLM	Database is updated in real-time as changes occur.	Daily and annual visitor use levels, peak seasons of use
Monitor Wilderness for unauthorized intrusions.	H.3	BLM, TNC, AGFD and volunteers	Monthly at a minimum with more frequency during hunting seasons and other high use periods.	Evidence of unauthorized vehicle entry into the wilderness
Pre- and post-burn monitoring for fire effects	B.3	BLM Range and Fire Staff	Before a burn (or use existing long term monitoring transects if in burn area), and at least 1 growing season after the burn event	Basal and canopy point cover, and plant composition

Methods	Thresholds for Management Changes	Regulatory Issues Addressed
Driving the roads. A spreadsheet will be developed which will list all the roads and monitoring requirements such as off-road driving, erosion, vandalism, trespass, and wilderness intrusion.	1. When conditions caused by weather events or erosion on existing roads causes vehicular travel to make an unauthorized route, maintenance should be performed on the road to keep it to the original track. 2. Unauthorized vehicular use should be noted and if unauthorized trails or paths are made they should be blocked off and reclaimed as appropriate. 3. Over a 3-5 year period a monitoring baseline will be established which will then be used to determine Limits of Acceptable Change guidelines for the roads (Ch. 5, action G.1.8).	Safford RMP
Limits of Acceptable Change	Increasing number of large campsites, beyond the current baseline of 24.	Wilderness Act of 1964; Arizona Desert Wilderness Act of 1990.
Visitor use data is entered in electronic permit system database		Wilderness Act of 1964; Arizona Desert Wilderness Act of 1990.
Patrols will be conducted around the wilderness perimeter focusing on convenient entry points into the wilderness.	Satisfactory conditions would be no evidence of vehicle entry into the wilderness. Installing and maintaining wilderness boundary signs will help to eliminate vehicle entry. Also rehabbing area disturbed in the past will also help in this effort. If signing and rehabbing is not successful in eliminating vehicle entry then physical barriers will be installed outside the wilderness to control vehicles.	Wilderness Act of 1964; Arizona Desert Wilderness Act of 1990.
Point intercept method: incl. % litter, bare ground, gravel (<3”), rock (>3”); live vegetation basal and canopy cover. Plant composition data, using the Dry Weight Rank Method. A minimum of 100 points at each location.		

CHAPTER 7.
PLAN IMPLEMENTATION AND COST ESTIMATES

Photo © TNC

Realization of the resource objectives will be met as management actions are implemented over time and through adaptive management. Due to financial, environmental, and human resource constraints, full implementation of the management plan may take 10-15 years. Every three years, the core team will develop a budget and implementation strategy and update the strategy each year using the BLM Arizona's Planning Target Allocation Database (PTA)*. By using this database, the core team can describe tasks, allocate resources, schedule monitoring, and estimate costs for each action. Monitoring efforts would be described within each budget and implementation strategy and planned for in the PTA.

*The PTA database is used by BLM field offices in Arizona to develop the annual work plan and for out-year Resource Management Plan (RMP) budget implementation planning. This database is subject to change and not accessible outside the Bureau of Land Management.

CHAPTER 8. CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

Photo by Diane Drobka/BLM

Aravaipa planning workshop, Willcox.

The Aravaipa Ecosystem Management Plan was prepared by an interagency and interdisciplinary team from the Bureau of Land Management, Arizona Game and Fish Department, and The Nature Conservancy. The process involved public meetings, interagency coordination, and consultation with key stakeholders.

A. Scoping and Public Participation

The planning team invited public participation at multiple points through the planning process. The following list summarizes major public events.

October 2004	Scoping questionnaire mailed to 140 local residents and stakeholder groups.
October 5-14, 2004	Scoping meetings held in Klondyke, Winkelman, Tucson, Chandler, and Thatcher, Arizona, attended by 85 members of the public.
March 5, 2005	Public workshop in Willcox, Arizona, to develop draft objectives and management actions, attended by 41 members of the public.
April-September 2005	Follow-up meetings of public work groups to refine objectives and management actions.
Fall 2009	Draft Ecosystem Management Plan sent to public for comment.

B. List of Preparers

Many people made substantial contributions to development of this plan, including members of the public and staff from all three cooperating organizations. Plan objectives and management actions were drafted by seven workgroups, each led by a BLM staff member and comprised of members of the public and staff from BLM, AGFD, and TNC. Those workgroups were asked to develop objectives and actions that would address issues raised during the scoping process. The workgroup leaders, along with the BLM planning coordinator and representatives from AGFD and TNC, formed the core planning team which refined the objectives and actions and wrote the remainder of the plan. Some turn over of BLM staff increased the number of core team members shown here. The Environmental Assessment was prepared by Logan Simpson Design under contract with the BLM.

Core Team

Duane Aubuchon	AGFD Field Supervisor
Michelle Bailey	BLM Aravaipa Wilderness Ranger
Bridget Blair	BLM GIS Specialist
Heidi Blasius	BLM Fishery Biologist
Jony Cockman	BLM Lead Natural Resource Specialist
Philip Cooley	BLM Lead Rangeland Management Specialist
Marlo Draper	BLM Planning & Environmental Coordinator
Diane Drobka	BLM Public Affairs Specialist
Russell Fox	BLM Rangeland Management Specialist
Tim Goodman	BLM Wildlife Biologist
Mark Haberstich	TNC Aravaipa Preserve Manager
Amy Humphrey	BLM Rangeland Management Specialist
Heidi Kuska	BLM Wildlife Biologist
Dan McGrew	BLM Archaeologist
Ted McRae	BLM Natural Resource Specialist – Riparian
Chris Morris	BLM Hydrologist
Deborah Morris	BLM Outdoor Recreation Planner
Patrick O'Neill	BLM Aravaipa Wilderness Ranger
Mark Pater	BLM Fire Ecologist
Anna Rago	BLM Archaeologist
Tom Schnell	BLM Assistant Field Manager, Nonrenewable Resources
Devin Skinner	AGFD Wildlife Manager
Dale Turner	TNC Conservation Planner

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APPENDIX 1.
ANIMALS OF THE ARAVAIPA ECOSYSTEM

This includes species lists compiled at TNC's Aravaipa Canyon Preserve, based on Johnson (1980b) and subsequent observations. Bird list includes both resident and migrant species, sorted according to the 2003 American Ornithological Union list. Nonnative species are indicated by an asterisk (*).

BIRDS

	Scientific name	Common name
	Ducks, Geese, Swans (Anatidae)	
	Dendrocygna autumnalis	Black-bellied Whistling-Duck
	Chen caerulescens	Snow Goose
	Branta canadensis	Canada Goose
	Aix sponsa	Wood Duck
	Anas strepera	Gadwall
	Anas americana	American Wigeon
	Anas platyrhynchos	Mallard
	Anas discors	Blue-winged Teal
	Anas cyanoptera	Cinnamon Teal
	Anas clypeata	Northern Shoveler
	Anas acuta	Northern Pintail
	Anas crecca	Green-winged Teal
	Aythya valisineria	Canvasback
	Aythya americana	Redhead
	Aythya collaris	Ring-necked Duck
	Aythya affinis	Lesser Scaup
	Bucephala albeola	Bufflehead
	Oxyura jamaicensis	Ruddy Duck
	Partridges, Grouse, Turkeys (Phasianidae)	
*	*Alectoris chukar*	Chukar
	Meleagris gallopavo	Wild Turkey
	New World Quail (Odontophoridae)	
	Callipepla gambelii	Gambel's Quail
	Colinus virginianus	Northern Bobwhite
	Cyrtonyx montezumae	Montezuma Quail
	Grebes (Podicipedidae)	
	Podilymbus podiceps	Pied-billed Grebe
	Podiceps nigricollis	Eared Grebe
	Herons, Bitterns (Ardeidae)	
	Ardea herodias	Great Blue Heron
	Egretta thula	Snowy Egret
	Egretta tricolor	Tricolored Heron
	Butorides virescens	Green Heron
	Nycticorax nycticorax	Black-crowned Night-Heron
	Ibises (Threskiornithidae)	
	Plegadis chihi	White-faced Ibis
	New World Vultures (Cathartidae)	
	Cathartes aura	Turkey Vulture
	Hawks, Kites, Eagles (Accipitridae)	
	Pandion haliaetus	Osprey
	Haliaeetus leucocephalus	Bald Eagle
	Circus cyaneus	Northern Harrier
	Accipiter striatus	Sharp-shinned Hawk
	Accipiter cooperii	Cooper's Hawk
	Accipiter gentilis	Northern Goshawk
	Asturina nitida	Gray Hawk
	Buteogallus anthracinus	Common Black-Hawk
	Buteo swainsoni	Swainson's Hawk
	Buteo albonotatus	Zone-tailed Hawk
	Buteo jamaicensis	Red-tailed Hawk
	Aquila chrysaetos	Golden Eagle
	Falcons (Falconidae)	
	Caracara cheriway	Crested Caracara
	Falco sparverius	American Kestrel
	Falco peregrinus	Peregrine Falcon
	Falco mexicanus	Prairie Falcon
	Rails, Coots (Rallidae)	
	Fulica americana	American Coot
	Cranes (Gruidae)	
	Grus canadensis	Sandhill Crane
	Lapwings, Plovers (Charadriidae)	
	Charadrius vociferus	Killdeer
	Stilts, Avocets (Recurvirostridae)	
	Recurvirostra americana	American Avocet
	Sandpipers, Phalaropes (Scolopacidae)	
	Tringa melanoleuca	Greater Yellowlegs
	Tringa flavipes	Lesser Yellowlegs
	Tringa solitaria	Solitary Sandpiper
	Actitis macularius	Spotted Sandpiper
	Calidris mauri	Western Sandpiper
	Calidris minutilla	Least Sandpiper
	Calidris bairdii	Baird's Sandpiper
	Limnodromus scolopaceus	Long-billed Dowitcher
	Gallinago gallinago	Common Snipe
	Phalaropus tricolor	Wilson's Phalarope
	Pigeons, Doves (Columbidae)	
*	*Columba livia*	Rock Pigeon
	Patagioenas fasciata	Band-tailed Pigeon
	Zenaida asiatica	White-winged Dove
	Zenaida macroura	Mourning Dove
	Columbina inca	Inca Dove
	Columbina passerina	Common Ground-Dove
	Cuckoos, Roadrunners (Cuculidae)	
	Coccyzus americanus	Yellow-billed Cuckoo
	Geococcyx californianus	Greater Roadrunner
	Barn-owls (Tytonidae)	
	Tyto alba	Barn Owl
	Owls (Strigidae)	
	Megascops kennicottii	Western Screech-Owl
	Bubo virginianus	Great Horned Owl
	Micrathene whitneyi	Elf Owl
	Athene cunicularia	Burrowing Owl
	Strix occidentalis	Spotted Owl
	Nighthawks, Nightjars (Caprimulgidae)	
	Chordeiles acutipennis	Lesser Nighthawk
	Phalaenoptilus nuttallii	Common Poorwill
	Caprimulgus ridgwayi	Buff-collared Nightjar
	Swifts (Apodidae)	
	Chaetura vauxi	Vaux's Swift
	Aeronautes saxatalis	White-throated Swift

Scientific name	Common name
Hummingbirds (Trochilidae)	
Cynanthus latirostris	Broad-billed Hummingbird
Archilochus alexandri	Black-chinned Hummingbird
Calypte anna	Anna's Hummingbird
Calypte costae	Costa's Hummingbird
Selasphorus platycercus	Broad-tailed Hummingbird
Selasphorus rufus	Rufous Hummingbird
Trogons (Trogonidae)	
Trogon elegans	Elegant Trogon
Kingfishers (Alcedinidae)	
Ceryle alcyon	Belted Kingfisher
Woodpeckers (Picidae)	
Melanerpes lewis	Lewis's Woodpecker
Melanerpes formicivorus	Acorn Woodpecker
Melanerpes uropygialis	Gila Woodpecker
Sphyrapicus thyroideus	Williamson's Sapsucker
Sphyrapicus varius	Yellow-bellied Sapsucker
Picoides scalaris	Ladder-backed Woodpecker
Picoides stricklandi	Strickland's Woodpecker
Colaptes auratus	Northern Flicker
Tyrant Flycatchers (Tyrannidae)	
Camptostoma imberbe	Northern Beardless-Tyrannulet
Contopus cooperi	Olive-sided Flycatcher
Contopus pertinax	Greater Pewee
Contopus sordidulus	Western Wood-Pewee
Empidonax traillii	Willow Flycatcher
Empidonax hammondii	Hammond's Flycatcher
Empidonax wrightii	Gray Flycatcher
Empidonax oberholseri	Dusky Flycatcher
Empidonax occidentalis	Cordilleran Flycatcher
Empidonax fulvifrons	Buff-breasted Flycatcher
Sayornis nigricans	Black Phoebe
Sayornis phoebe	Eastern Phoebe
Sayornis saya	Say's Phoebe
Pyrocephalus rubinus	Vermilion Flycatcher
Myiarchus cinerascens	Ash-throated Flycatcher
Myiarchus tyrannulus	Brown-crested Flycatcher
Tyrannus vociferans	Cassin's Kingbird
Tyrannus verticalis	Western Kingbird
Pachyramphus aglaiae	Rose-throated Becard
Shrikes (Laniidae)	
Lanius ludovicianus	Loggerhead Shrike
Vireos (Vireonidae)	
Vireo bellii	Bell's Vireo
Vireo vicinior	Gray Vireo
Vireo plumbeus	Plumbeous Vireo
Vireo huttoni	Hutton's Vireo
Vireo gilvus	Warbling Vireo
Crows, Jays (Corvidae)	
Cyanocitta stelleri	Steller's Jay
Aphelocoma californica	Western Scrub-Jay
Aphelocoma ultramarina	Mexican Jay
Corvus cryptoleucus	Chihuahuan Raven
Corvus corax	Common Raven
Larks (Alaudidae)	
Eremophila alpestris	Horned Lark
Swallows (Hirundinidae)	
Progne subis	Purple Martin
Tachycineta bicolor	Tree Swallow
Tachycineta thalassina	Violet-green Swallow
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Riparia riparia	Bank Swallow
Petrochelidon pyrrhonota	Cliff Swallow
Hirundo rustica	Barn Swallow
Chickadees, Titmice (Paridae)	
Baeolophus wollweberi	Bridled Titmouse
Baeolophus ridgwayi	Juniper Titmouse
Verdins (Remizidae)	
Auriparus flaviceps	Verdin
Bushtits (Aegithalidae)	
Psaltriparus minimus	Bushtit
Nuthatches (Sittidae)	
Sitta canadensis	Red-breasted Nuthatch
Sitta carolinensis	White-breasted Nuthatch
Creepers (Certhiidae)	
Certhia americana	Brown Creeper
Wrens (Troglodytidae)	
Campylorhynchus brunneicapillus	Cactus Wren
Salpinctes obsoletus	Rock Wren
Catherpes mexicanus	Canyon Wren
Thryomanes bewickii	Bewick's Wren
Troglodytes aedon	House Wren
Dippers (Cinclidae)	
Cinclus mexicanus	American Dipper
Kinglets (Regulidae)	
Regulus satrapa	Golden-crowned Kinglet
Regulus calendula	Ruby-crowned Kinglet
Old World Warblers, Gnatcatchers (Sylviidae)	
Polioptila caerulea	Blue-gray Gnatcatcher
Polioptila melanura	Black-tailed Gnatcatcher
Thrushes (Turdidae)	
Sialia mexicana	Western Bluebird
Sialia currucoides	Mountain Bluebird
Myadestes townsendi	Townsend's Solitaire
Catharus ustulatus	Swainson's Thrush
Catharus guttatus	Hermit Thrush
Turdus migratorius	American Robin
Mockingbirds, Thrashers (Mimidae)	
Mimus polyglottos	Northern Mockingbird
Oreoscoptes montanus	Sage Thrasher
Toxostoma curvirostre	Curve-billed Thrasher
Toxostoma crissale	Crissal Thrasher
Starlings (Sturnidae)	
* *Sturnus vulgaris*	European Starling
Wagtails, Pipits (Motacillidae)	
Anthus rubescens	American Pipit
Waxwings (Bombycillidae)	
Bombycilla cedrorum	Cedar Waxwing
Silky-flycatchers (Ptilogonatidae)	
Phainopepla nitens	Phainopepla
Wood-Warblers (Parulidae)	
Vermivora peregrina	Tennessee Warbler
Vermivora celata	Orange-crowned Warbler
Vermivora ruficapilla	Nashville Warbler
Vermivora virginiae	Virginia's Warbler
Vermivora luciae	Lucy's Warbler
Dendroica petechia	Yellow Warbler
Dendroica coronata	Yellow-rumped Warbler
Dendroica nigrescens	Black-throated Gray Warbler
Dendroica townsendi	Townsend's Warbler
Dendroica occidentalis	Hermit Warbler
Setophaga ruticilla	American Redstart
Seiurus noveboracensis	Northern Waterthrush
Oporornis tolmiei	MacGillivray's Warbler
Geothlypis trichas	Common Yellowthroat
Wilsonia pusilla	Wilson's Warbler

Scientific name	Common name
Myioborus pictus	Painted Redstart
Icteria virens	Yellow-breasted Chat
Tanagers (Thraupidae)	
Piranga flava	Hepatic Tanager
Piranga rubra	Summer Tanager
Piranga ludoviciana	Western Tanager
Emberizids (Emberizidae)	
Pipilo chlorurus	Green-tailed Towhee
Pipilo maculatus	Spotted Towhee
Pipilo fuscus	Canyon Towhee
Pipilo aberti	Abert's Towhee
Aimophila cassinii	Cassin's Sparrow
Aimophila ruficeps	Rufous-crowned Sparrow
Spizella passerina	Chipping Sparrow
Spizella pallida	Clay-colored Sparrow
Spizella breweri	Brewer's Sparrow
Spizella atrogularis	Black-chinned Sparrow
Pooecetes gramineus	Vesper Sparrow
Chondestes grammacus	Lark Sparrow
Amphispiza bilineata	Black-throated Sparrow
Calamospiza melanocorys	Lark Bunting
Passerculus sandwichensis	Savannah Sparrow
Ammodramus savannarum	Grasshopper Sparrow
Melospiza melodia	Song Sparrow
Melospiza lincolnii	Lincoln's Sparrow
Zonotrichia albicollis	White-throated Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Junco hyemalis	Dark-eyed Junco
Calcarius ornatus	Chestnut-collared Longspur
Cardinals (Cardinalidae)	
Cardinalis cardinalis	Northern Cardinal
Cardinalis sinuatus	Pyrrhuloxia
Pheucticus ludovicianus	Rose-breasted Grosbeak
Pheucticus melanocephalus	Black-headed Grosbeak
Passerina caerulea	Blue Grosbeak
Passerina amoena	Lazuli Bunting
Passerina cyanea	Indigo Bunting
Passerina versicolor	Varied Bunting
Blackbirds (Icteridae)	
Agelaius phoeniceus	Red-winged Blackbird
Sturnella magna	Eastern Meadowlark
Sturnella neglecta	Western Meadowlark
Xanthocephalus xanthocephalus	Yellow-headed Blackbird
Euphagus cyanocephalus	Brewer's Blackbird
Quiscalus mexicanus	Great-tailed Grackle
Molothrus aeneus	Bronzed Cowbird
Molothrus ater	Brown-headed Cowbird
Icterus cucullatus	Hooded Oriole
Icterus bullockii	Bullock's Oriole
Icterus parisorum	Scott's Oriole
Finches (Fringillidae)	
Carpodacus mexicanus	House Finch
Carduelis pinus	Pine Siskin
Carduelis psaltria	Lesser Goldfinch
Carduelis lawrencei	Lawrence's Goldfinch
Carduelis tristis	American Goldfinch
Old World Sparrows (Passeridae)	
* *Passer domesticus*	House Sparrow

AMPHIBIANS

Scientific name	Common name
Frogs and toads	
Bufo alvarius	Sonoran Desert Toad
Bufo cognatus	Great Plains Toad
Bufo punctatus	Red-spotted Toad
Bufo woodhousei	Woodhouse's Toad
Hyla arenicolor	Canyon Treefrog
Rana yavapaiensis	Lowland Leopard Frog
Scaphiopus couchii	Couch's Spadefoot
Spea hammondii	Western Spadefoot
Spea multiplicata	New Mexico Spadefoot
Salamanders	
* *Ambystoma tigrinum*	Tiger Salamander

FISH

Agosia chrysogaster	Longfin Dace
* *Ameiurus natalis*	Yellow Bullhead
Catostomus (Pantosteus) clarkii	Desert Sucker
Catostomus insignis	Sonora Sucker
* *Cyprinella lutrensis*	Red Shiner
Cyprinodon macularius	Desert Pupfish
Gila robusta	Roundtail Chub
* *Lepomis cyanellus*	Green Sunfish
Meda fulgida	Spikedace
Poeciliopsis occidentalis	Gila Topminnow
Rhinichthys (Tiaroga) cobitis	Loach Minnow
Rhinichthys osculus	Speckled Dace

MAMMALS

Insectivores	
Notiosorex crawfordi	Desert Shrew
Bats	
Antrozous pallidus	Pallid Bat
Eptesicus fuscus	Big Brown Bat
Eumops perotis	Western Mastiff Bat
Idionycteris phyllotis	Allen's Big-eared Bat
Lasiurus blossevillii	Western Red Bat
Lasiurus cinereus	Hoary Bat
Myotis thysanodes	Fringed Myotis
Myotis velifer	Cave Myotis
Pipistrellus hesperus	Western Pipistrelle
Plecotus townsendii	Townsend's Big-eared Bat
Tadarida brasiliensis	Brazilian Free-tailed Bat
Rabbits	
Lepus californicus	Black-tailed Jack Rabbit
Sylvilagus audubonii	Desert Cottontail
Sylvilagus floridanus	Eastern Cottontail
Rodents	
Ammospermophilus harrisii	Harris' Antelope Squirrel
Castor canadensis	American Beaver
Chaetodipus intermedius	Rock Pocket Mouse
Chaetodipus penicillatus	Desert Pocket Mouse
Eutamias dorsalis	Cliff Chipmunk
Neotoma albigula	White-throated Woodrat
Onychomys torridus	Southern Grasshopper Mouse
Perognathus baileyi	Bailey's Pocket Mouse
Peromyscus boylii	Brush Mouse
Peromyscus eremicus	Cactus Mouse
Reithrodontomys sp.	Harvest Mouse
Sigmodon arizonae	Arizona Cotton Rat
Sigmodon ochrognathus	Yellow-nosed Cotton Rat
Spermophilus spilosoma	Spotted Ground Squirrel
Spermophilus variegatus	Rock Squirrel
Thomomys bottae	Botta's Pocket Gopher
Carnivores	
Bassariscus astutus	Ringtail
Canis latrans	Coyote
Conepatus mesoleucus	Hog-nosed Skunk

Scientific name	Common name
Erethizon dorsatum	Porcupine
Felis concolor	Mountain Lion
Felis rufus	Bobcat
Mephitis mephitis	Striped Skunk
Nasua nasua	Coati
Procyon lotor	Raccoon
Spilogale gracilis	Western Spotted Skunk
Urocyon cinereoargenteus	Gray Fox
Ursus americanus	Black Bear
Ungulates	
Cervus canadensis	Elk
Odocoileus hemionus	Mule Deer
Odocoileus virginianus	White-tailed Deer
Ovis canadensis	Bighorn Sheep
Pecari tajacu	Collared Peccary

REPTILES

Lizards	
Aspidoscelis burti	Giant Spotted Whiptail
Aspidoscelis exsanguis	Chihuahuan Spotted Whiptail
Aspidoscelis flagellicaudus	Gila Spotted Whiptail
Aspidoscelis sonorae	Sonoran Whiptail
Aspidoscelis tigris	Western Whiptail
Callisaurus draconoides	Zebratail Lizard
Coleonyx variegatus	Tucson Banded Gecko
Cophosaurus texanus	Greater Earless Lizard
Crotaphytus collaris	Collared Lizard
Elgaria kingii	Arizona Alligator Lizard
Eumeces obsoletus	Great Plains Skink
Gambelia wislizenii	Longnose Leopard Lizard
Heloderma suspectum	Gila Monster
Phrynosoma hernandesi	Short-horned Lizard
Phrynosoma solare	Regal Horned Lizard
Sceloporus clarkii	Sonoran Spiny Lizard
Sceloporus jarrovii	Yarrow's Spiny Lizard
Sceloporus magister	Desert Spiny Lizard
Sceloporus undulatus	Eastern Fence Lizard
Urosaurus ornatus	Tree Lizard
Uta stansburiana	Side-blotched Lizard
Xantusia bezyi	Bezy's Night Lizard
Snakes	
Arizona elegans	Glossy Snake
Chilomeniscus cinctus	Banded Sand Snake
Crotalus atrox	Western Diamondback Rattlesnake
Crotalus molossus	Blacktail Rattlesnake
Crotalus scutulatus	Mojave Rattlesnake
Crotalus tigris	Tiger Rattlesnake
Crotalus viridis	Arizona Black Rattlesnake
Diadophis punctatus	Ringneck Snake
Hypsiglena torquata	Night Snake
Lampropeltis getula	Common Kingsnake
Leptotyphlops humilis	Western Blind Snake
Masticophis bilineatus	Sonoran Whipsnake
Masticophis flagellum	Red Coachwhip
Micruroides euryxanthus	Arizona Coral Snake
Phyllorhynchus browni	Pima Leafnose Snake
Pituophis melanoleucus	Gopher Snake
Rhinocheilus lecontei	Longnose Snake
Salvadora hexalepis	Western Patchnose Snake
Sonora semiannulata	Ground Snake
Tantilla atriceps	Mexican Blackheaded Snake
Tantilla hobartsmithi	Smith's Blackheaded Snake
Thamnophis cyrtopsis	Blackneck Garter Snake
Thamnophis marcianus	Checkered Garter Snake
Trimorphodon biscutatus	Lyre Snake
Turtles	
* *Apalone spinifera*	Spiny Softshell
Gopherus agassizii	Desert Tortoise
Kinosternon sonoriense	Sonoran Mud Turtle
Terrapene ornata	Desert Box Turtle

APPENDIX 2.
PLANTS OF THE ARAVAIPA ECOSYSTEM

This includes species lists compiled at The Nature Conservancy's Aravaipa Canyon Preserve, based on Johnson (1980a) and subsequent observations. Nonnative species are indicated by an asterisk (*).

Family		Scientific Name	Common Name
Acanthaceae		*Anisacanthus thurberi*	Desert Honeysuckle
"		*Carlowrightia arizonica*	
"		*Carlowrightia linearifolia*	
"		*Siphonoglossa longiflora*	Longflower Tubetongue
"		*Tetramerium hispidum*	
"		*Tetramerium nervosum*	
Aceraceae		*Acer grandidentatum*	Big Tooth Maple
Aceraceae		*Acer negundo*	Box Elder
Agavaceae		*Agave chrysantha*	Century Plant, Mescal
"		*Agave parryi*	Century Plant
"		*Agave schotti*	Shindagger
"		*Agave toumeyana*	
"		*Yucca baccata* var. *brevifolia*	Soap Weed
Amaranthaceae		*Amaranthus albus*	
"		*Amaranthus fimbriatus*	Pig weed
"		*Amaranthus palmeri*	Palmer's Pig Weed, Careless Weed
"		*Guilleminea densa*	Small Matweed
"		*Iresine heterophylla*	Blood Leaf
"		*Tidestromia lanuginosa* ssp. *eliassonii*	Woolly Tidestromia
Anacardiaceae		*Rhus radicans*	Poison Ivy
"		*Rhus trilobata*	Squaw Bush, skunkbush
Apiaceae		*Apium graveolens*	
"		*Bowlesia incana*	
"		*Bowlesia lobata*	
"		*Chaerophyllum tainturieri*	
"		*Conium maculatum*	Poison Hemlock
"		*Hydrocotyle verticillata*	Whorled Marshpennywort
Apocynaceae		*Apocynum medium*	Dogbane
"		*Haplophyton crooksii*	
Arecaceae	*	*Phoenix dactylifera*	Date Palm
Aristolochiaceae		*Aristolochia watsonii*	
Asclepiadaceae		*Asclepias asperula*	Antelope Horns
"		*Asclepias linaria*	Milkweed
"		*Asclepias subverticillata*	Poison Milkweed
"		*Matelea productus*	
"		*Sarcostemma crispum*	Climbing Milkweed
"		*Sarcostemma cynanchoides*	
Aspleniaceae		*Asplenium resiliens*	
Asteraceae		*Ambrosia ambrosioides*	Canyon Ragweed
"		*Ambrosia confertiflora*	Slimleaf Bursage
"		*Ambrosia deltoidea*	Triangle-leaf Bursage
"		*Ambrosia trifida* var. *texana*	
"		*Artemisia dracunculoides*	False Tarragon
"		*Artemisia ludoviciana*	
"		*Aster bigelovii*	Wild Aster
"		*Aster tagetinus*	Wild Aster
"		*Baccharis salicifolia*	Seepwillow
"		*Baccharis sarothroides*	Desert broom
"		*Bahia absinthifolia*	
"		*Bahia biternata*	
"		*Baileya multiradiata*	Desert Marigold
"		*Bebbia juncea*	Sweetbush
"		*Bidens leptocephala*	
"		*Bidens pilosa*	Spanish Needles, Beggar Ticks
"		*Brickellia baccharidea*	Brickellbush
"		*Brickellia californica*	Brickellbush
"		*Brickellia coulteri*	

Family	Scientific Name	Common Name
“	*Brickellia venosa*	
“	*Carphochaete bigelovii*	
“	*Centaurea melitensis*	
“	*Chrysopsis foliosa*	
“	*Chrysopsis villosa*	
“	*Conyza canadensis*	
“	*Eclipta alba*	
“	*Encelia farinosa*	Brittlebush
“	*Ericameria cuneata*	Desert Rock Goldenbush
“	*Ericameria laricifolia*	Turpentine Bush
“	*Erigeron colomexicanus*	
“	*Erigeron divergens*	Fleabane, Wild Daisy
“	*Erigeron oreophilus*	Fleabane, Wild Daisy
“	*Erigeron piscaticus*	Fish Creek Fleabane
“	*Eupatorium pycnocephalum*	
“	*Gnaphalium chilense*	Cudweed
“	*Gnaphalium wrightii*	
“	*Grindelia aphanactis*	
“	*Gutierrezia microcephala*	
“	*Gutierrezia sarothrae*	Snakeweed
“	*Haplopappus spinulosus*	
“	*Haplopappus tenuisectus*	Burro Weed
“	*Helenium thurberi*	
“	*Heterotheca psammophila*	Telegraph Plant, Camphor Weed
“	*Heterotheca villosa*	Telegraph Plant
“	*Hymenoclea monogyra*	Burro Brush, Burro-bush
“	*Hymenoclea salsola*	
“	*Hymenothrix loomisii*	
“	*Hymenothrix wislizenii*	
“	*Hymenothrix wrightii*	
“	*Layia glandulosa*	
“	*Machaeranthera asteroides*	
“	*Machaeranthera gracilis*	
“	*Machaeranthera pinnatifida*	
“	*Machaeranthera tagetina*	
“	*Malacothrix glabrata*	
“	*Melampodium leucanthum*	Black Foot
“	*Microseris linearifolia*	
“	*Parthenium incanum*	Mariola
“	*Pectis filipes*	Fetid Marigold
“	*Pectis papposa*	Fetid Marigold, Cinchweed
“	*Perityle coronopifolia*	Rock Daisy
“	*Perityle lemmoni*	
“	*Porophyllum gracile*	
“	*Psilostrophe cooperi*	Paper Flower
“	*Rafinesquia neomexicana*	
“	*Sanvitalia abertii*	
“	*Senecio lemmoni*	
“	*Solidago altissima*	
“	*Solidago wrightii*	Goldenrod
“	*Sonchus oleraceus*	
“	*Stephanomeria exigua*	Wire Lettuce
“	* *Taraxacum officinale*	Dandelion
“	*Thelesperma megapotamicum*	
“	*Trixis californica*	
“	*Verbesina encelioides*	
“	*Verbesina rothrockii*	
“	*Xanthium saccharatum*	Cocklebur
Azollaceae	*Azolla filiculoides*	Pacific Mosquitofern
Berberidaceae	*Berberis haematocarpa*	Red Barberry
Betulaceae	*Alnus oblongifolia*	Arizona Alder
“	*Alnus rhombifolia*	Alder
Bignoniaceae	*Chilopsis linearis*	Desert Willow
Boraginaceae	*Amsinckia intermedia*	Coast Fiddleneck
“	*Cryptantha decipiens*	
“	*Cryptantha maritima*	

Family		Scientific Name	Common Name
“		*Cryptantha muricata*	
“		*Heliotropium curassavicum*	
“		*Lappula redowskii*	
“		*Pectocarya recurvata*	Arch-nutted Comb-bur
Brassicaceae		*Arabis perennans*	Rock Cress
“		*Athysanus pusillus*	
“	*	*Capsella bursa-pastoris*	Shepherd’s Purse
“		*Caulanthus lasiophyllus*	
“		*Descurainia pinnata*	
“		*Descurainia sophia*	
“		*Dimorphocarpa wislizeni*	
“		*Lepidium lasiocarpum*	
“		*Lepidium thurberi*	
“		*Lepidium thurberi*	
“		*Lepidium virginicum*	
“		*Lesquerella gordoni*	Gordon Bladderpod
“		*Lesquerella purpurea*	Bladderpod
“	*	*Nasturtium officinale*	Watercress
“		*Schoenocrambe linearifolia*	
“	*	*Sisymbrium irio*	London Rocket
“		*Sisymbrium linifolium*	
“		*Thelypodium wrightii*	
“		*Thlaspi montanum* var. *fendleri*	Fendler’s Pennycress
“		*Thysanocarpus curvipes*	Lace Pod
Cactaceae		*Carnegia gigantea*	Saguaro
“		*Coryphantha vivipara*	
“		*Echinocereus engelmannii*	Hedgehog Cactus
“		*Echinocereus fasciculatus*	Magenta-flower Hedgehog Cactus
“		*Ferocactus wislizenii*	Barrel Cactus
“		*Mammilaria microcarpa*	Pincushion Cactus, Fishhook Cactus
“		*Opuntia acanthocarpa* var. *thornberi*	Buckhorn Cholla
“		*Opuntia bigelovii*	Teddy Bear Cholla
“		*Opuntia emoryi*	
“		*Opuntia fulgida*	Jumping Cholla, Chainfruit Cholla
“		*Opuntia leptocaulis*	Christmas Cactus
“		*Opuntia phaeacantha*	Engelmann Prickly Pear
“		*Opuntia spinosior*	Cane Cholla
Campanulaceae		*Lobelia cardinalis*	Cardinal Flower
“		*Triodanis biflora*	
Capparaceae		*Polanisia dodecandra*	Clammy Weed
Caprifoliaceae		*Lonicera interrupta*	Chaparral Honeysuckle
Celastraceae		*Canotia holocantha*	Crucifixion Thorn
Chenopodiaceae	*	*Salsola iberica*	Tumbleweed
Commelinaceae		*Commelina erecta*	Dayflower
“		*Tradescantia occidentalis*	Spiderwort
Convolvulaceae	*	*Convolvulus arvensis*	Field Bindweed
“		*Ipomoea coccinea*	Scarlet Morning Glory
“		*Ipomoea hederacea*	
“		*Ipomoea leptotoma*	
Crassulaceae		*Graptopetalum rusbyi*	Hen and Chickens
San Francisco River Leather-petal			
“		*Sedum cockerellii*	Stonecrop
Crossosomataceae		*Crossosoma bigelovii*	Ragged Rock Flower
Cucurbitaceae		*Cucurbita digitata*	Finger-leaved Gourd
“		*Cucurbita foetidissima*	Buffalo Gourd
“		*Echinopepon wrightii*	
“		*Marah gilensis*	
“		*Sicyosperma gracile*	
“		*Sicysosperma gracile*	
Cupressaceae		*Juniperus coahuilensis*	Redberry Juniper
“		*Juniperus deppeana*	Alligator Juniper
“		*Juniperus monosperma*	One-seed Juniper
“		*Juniperus osteosperma*	Utah Juniper
Cuscutaceae		*Cuscuta gronovii*	
“		*Cuscuta indecora*	
“		*Cuscuta tuberculata*	Dodder

Family		Scientific Name	Common Name
Cyperaceae		*Carex ultra*	Arizona Giant Sedge
"		*Cyperus odoratus*	Flat Sedge
Dryopteridaceae		*Phanerophlebia auriculata*	
Ephedraceae		*Ephedra nevadensis*	Mormon Tea
Equisetaceae		*Equisetum* sp.	Horsetail
Ericaceae		*Arctostaphylos pungens*	Manzanita
Euphorbiaceae		*Argythamnia neomexicana*	
"		*Croton texensis*	Dove Weed
"		*Euphorbia albomarginata*	Spurge
"		*Euphorbia capitellata*	Spurge
"		*Euphorbia chamaesula*	
"		*Euphorbia florida*	Spurge
"		*Euphorbia heterophylla*	Painted Spurge
"		*Euphorbia melandenia*	Spurge
"		*Euphorbia pediculifera*	Spurge
"		*Tragia nepetaefolia*	Noseburn
Fabaceae		*Acacia angustissima*	Fern Acacia
"		*Acacia constricta*	White-thorn Acacia
"		*Acacia greggii*	Catclaw Acacia
"		*Amorpha fruticosa*	False Indigo
"		*Astragalus allochrous*	
"		*Astragalus arizonicus*	
"		*Astragalus cobrensis*	
"		*Astragalus nuttallianus*	
"		*Astragalus thurberi*	
"		*Astragalus wootonii*	
"		*Calliandra eriophylla*	Fairy Duster
"		*Cercidium floridum*	
"		*Dalea candida* var. *oligophylla*	
"		*Dalea formosa*	Indigo Bush
"		*Dalea pogonathera*	
"		*Dalea wrightii*	
"		*Desmodium batocaulon*	
"		*Desmodium neomexicanum*	Tick Clover
"		*Desmodium rosei*	Tick Clover
"		*Galactia wrightii*	
"		*Hoffmannseggia densiflora*	
"		*Hoffmanseggia glauca*	Hog Potato, Camote de Raton
"		*Lotus greenei*	
"		*Lotus oroboides*	
"		*Lupinus brevicaulis*	
"		*Lupinus palmeri*	Lupine
"		*Lupinus sparsiflorus*	
"		*Marina parryi*	
"	*	*Medicago hispida*	Bur Clover
"		*Medicago polymorpha*	
"		*Melilotus indicus*	
"		*Mimosa biuncifera*	Wait-a-minute-bush
"		*Phaseolus acutifolius* var. *tenuifolius*	
"		*Prosopis glandulosa*	Honey Mesquite
"		*Prosopis velutina*	Velvet Mesquite
"		*Psoralea tenuiflora*	Scurf Pea
"		*Rhynchosia senna* var. *texana*	Texas Snoutbean
"		*Robinia neomexicana*	New Mexican Locust
"		*Senna bauhinioides*	Senna
"		*Senna covesii*	Senna, Coves' Cassia
"		*Trifolium wormskioldii*	
"		*Vicia exigua*	
Fagaceae		*Quercus arizonica*	Arizona Oak
"		*Quercus hypoleucoides*	Silverleaf Oak
"		*Quercus turbinella*	Scrub Oak
Fumariaceae		*Corydalis aurea*	Scrambled Eggs
Fouquieriaceae		*Fouquieria splendens*	Ocotillo
Garryaceae		*Garrya wrightii*	Silk Tassel
Gentianaceae		*Centaurium calycosum*	
Geraniaceae	*	*Erodium cicutarium*	Storksbill

Family		Scientific Name	Common Name
“		*Geranium eremophilum*	Crane’s bill
Grossulariaceae		*Ribes cereum* var. *inebrians*	
Hydrangeaceae		*Fendlera rupicola*	Fendlerbush
Hydrophyllaceae		*Hydrophyllum occidentale*	Western Waterleaf
“		*Nama hispidum*	
“		*Phacelia ramosissima*	Phacelia
Juglandaceae		*Juglans major*	Arizona Walnut
Krameriaceae		*Krameria grayi*	White Ratany
Lamiaceae		*Agastache rupestris*	Giant Hyssop
“		*Hedeoma nanum*	
“		*Hedeoma oblongifolia*	Mock Pennyroyal
“		*Lamium amplexicaule*	Henbit Deadnettle
“	*	*Marrubium vulgare*	Horehound
“	*	*Mentha spicata*	Spearmint
“		*Salvia amissa*	Aravaipa Sage
“		*Salvia arizonica*	Arizona Sage
“		*Salvia columbariae*	Chia
“		*Stachys coccinea*	
Lemnaceae		*Lemna* sp.	Duckweed
Liliaceae		*Allium macropetalum*	Onion
“		*Calochortus ambiguus*	Mariposa Lily
“		*Calochortus kennedyi*	Desert Mariposa
“		*Dasylirion wheeleri*	Sotol
“		*Dichelostemma capitatum*	Bluedicks
“		*Nolina microcarpa*	Bear Grass
Linaceae		*Linum lewisii*	Blue Flax
Loasaceae		*Mentzelia multiflora*	
“		*Mentzelia pumila*	Stick Leaf
Lythraceae		*Lythrum californicum*	
Malpighiaceae		*Janusia gracilis*	Desert Vine
Malvaceae		*Abutilon abutiloides*	
“		*Abutilon mollicomum*	
“		*Abutilon parvulum*	Indian Mallow
“		*Gossypium thurberi*	Desert Cotton
“		*Hibiscus coulteri*	
“	*	*Malva parviflora*	
“		*Sphaeralcea emoryi* var. *variabilis*	
“		*Sphaeralcea laxa*	Caliche Globe Mallow
Moraceae		*Morus microphylla*	Texas Mulberry
Nyctaginaceae		*Allionia incarnata*	Trailing Four O’Clock
“		*Boerhavia coccinea*	Red Spiderling
“		*Boerhavia scandens*	Climbing Wartclub
“		*Mirabilis bigelovii*	Four O’Clock
“		*Mirabilis coccineus*	
“		*Mirabilis multiflora*	Colorado Four O’Clock
Oleaceae		*Forestiera pubescens*	Tangle Brush
“		*Fraxinus anomala*	
“		*Fraxinus lowelli*	Lowell Ash
“		*Fraxinus pennsylvanica*	Velvet Ash
“		*Fraxinus velutina*	
“		*Menodora scabra*	Twinberry
Onagraceae		*Epilobium canum* ssp. *angustifolium*	Hummingbird Trumpet
“		*Epilobium ciliatum*	Willow Weed
“		*Gaura parviflora*	
“		*Oenothera elata* ssp. *hirsutissima*	
“		*Oenothera hookeri*	Evening Primrose
“		*Oenothera pallida* ssp. *runcinata*	
“		*Oenothera primiveris*	
Orobanchaceae		*Orobanche fasiculata*	Broom Rape
Oxalidaceae		*Oxalis albicans*	Wood Sorrel
“		*Oxalis stricta*	Yellow Wood Sorrel, Chanchaquilla
Papaveraceae		*Argemone platyceras*	Prickly Poppy
“		*Platystemon californicus*	Cream Cups
Passifloraceae		*Passiflora mexicana*	Passion Flower
Pedaliaceae		*Proboscidea arenaria*	Devil’s Claw
“		*Proboscidea parviflora*	Devil’s Claw, Small-flower Unicorn Plant

Family		Scientific Name	Common Name
Phytolaccaceae		*Rivina humilis*	Pigeon Berry, Rouge Plant
Pinaceae		*Pinus edulis*	
"		*Pinus monophylla*	Pinyon Pine
Plantaginaceae		*Plantago insularis*	Indian Wheat
"		*Plantago purshii*	Indian Wheat
Platanaceae		*Platanus racemosa*	California Sycamore
"		*Platanus wrightii*	Arizona Sycamore
Plumbaginaceae		*Plumbago scandens*	Herba de Alacran, Pitillo
Poaceae		*Agrostis semiverticilata*	Bent Grass
"		*Andropogon barbinodis*	Bluestem
"		*Andropogon glomeratus*	
"		*Aristida adscensionis*	
"		*Aristida glauca*	
"		*Aristida hamulosa*	
"	*	*Avena fatua*	Wild Oats
"		*Bouteloua aristidoides*	Needle Grama
"		*Bouteloua chondrosioides*	Spruce-top Grama
"		*Bouteloua curtipendula*	Side-oats Grama
"		*Bouteloua eriopoda*	Black Grama
"		*Bouteloua filiformis*	Slender Grama
"		*Bouteloua gracilis*	Blue Grama
"		*Bouteloua hirsuta*	Hairy Grama
"		*Bouteloua radicosa*	Purple Grama
"		*Bouteloua repens*	
"		*Brachiaria arizonica*	
"		*Brachiaria fasciculata*	
"		*Bromus arizonicus*	
"	*	*Bromus rubens*	Red Brome
"	*	*Chloris virgata*	Feather Fingergrass
"	*	*Cynodon dactylon*	Bermuda Grass
"		*Echinochloa colonum*	Jungle Rice
"	*	*Echinochloa crusgalli*	Barnyard Grass
		Elymus elymoides	Squirreltail
"		*Elymus glaucus*	
"		*Elymus triticoides*	
"		*Enneapogon desvauxii*	
"		*Eragrostis cilianensis*	
"		*Eragrostis intermedia*	Plains Lovegrass
"	*	*Eragrostis megastachya*	Stinkgrass
"		*Eragrostis pectinacea*	
"		*Eragrostis spectabilis*	Purple Lovegrass
"		*Heteropogon contortum*	Tanglehead
"		*Hilaria berlangeri*	Curly Mesquite
"	*	*Hordeum murinum* ssp. *glaucum*	Smooth Barley
"		*Hordeum pusillum*	Little Barley
"		*Koeleria macrantha*	Prairie Junegrass
"	*	*Leptochloa dubia*	Green Sprangletop
"		*Leptochloa mucronata*	
"		*Lycurus phleoides*	Wolf Tail
"		*Muhlenbergia appressa*	
"		*Muhlenbergia emersleyi*	Bullgrass
"		*Muhlenbergia fragilis*	Delicate Muhly
"		*Muhlenbergia microsperma*	Littleseed Muhly
"		*Muhlenbergia porteri*	Bush Muhly
"		*Muhlenbergia rigens*	Deergrass
"		*Muhlenbergia tenuifolia*	Slender Muhly
"		*Panicum bulbosum*	
"		*Panicum hirticaule*	
"		*Panicum lepidulum*	
"		*Panicum plenum*	Switch Grass
"	*	*Paspalum dilatatum*	Dallis Grass
"		*Poa bigelovii*	
"		*Poa pratensis*	
"	*	*Polypogon monspeliensis*	Rabbitfoot Grass
"		*Polypogon viridis*	
"	*	*Schismus barbatus*	Mediterranean Grass

Family	Scientific Name	Common Name
“ *	*Setaria macrostachya*	Large-spike Bristlegrass
“	*Sporobolus airoides*	Alkali Sacaton
“	*Sporobolus cryptandrus*	
“	*Tridens muticus*	Fluff Grass
“	*Vulpia microstachys* var. *pauciflora*	
Polemoniaceae	*Allophyllum gilioides*	
“	*Eriastrum diffusum*	Miniature Woollystar
“	*Gilia flavocinacta*	
“	*Ipomopsis longiflora*	
“	*Ipomopsis multiflora*	
“	*Linanthus aureus*	
“	*Phlox gracilis*	
“	*Phlox longiflora*	
“	*Phlox tenuifolia*	
Polygonaceae	*Eriogonum abertianum*	Wild Buckwheat
“	*Eriogonum arizonicum*	Wild Buckwheat
“	*Eriogonum capillare*	San Carlos Wild Buckwheat
“	*Eriogonum deflexum* var. *deflexum*	
“	*Eriogonum ericifolium*	
“	*Eriogonum fasciculatum* var. *polifolium*	
“	*Eriogonum microthecum* var. *simpsonii*	
“	*Eriogonum palmerianum*	
“	*Eriogonum polycladon*	
“	*Eriogonum trichopes*	
“	*Eriogonum wrightii*	Wild Buckwheat
“	*Polygonum aviculare*	
“	*Polygonum lapathifolium*	
“	*Polygonum pennsylvanicum*	
“	*Polygonum punctatum*	
“	*Polygonum sawatchense*	
“	*Pterostegia drymarioides*	
“	*Rumex altissimus*	
“	*Rumex conglomeratus*	
“	*Rumex crispus*	
“	*Rumex dentatus*	
“	*Rumex hymenasepalus*	
Polypodiaceae	*Pellaea longimucronata*	Cliff Brake
“	*Pellaea truncata*	
Portulacaceae	*Claytonia perfoliata*	Miner’s Lettuce
“	*Claytonia rosea*	Spring Beauty
“	*Portulaca suffrutescens*	Purslane
“	*Talinum aurantiacum*	Flame Flower
Primulaceae	*Samolus parviflorus*	
Pteridaceae	*Adiantum capillus-veneris*	Maidenhair Fern
“	*Cheilanthes eatoni*	
“	*Cheilanthes wootoni*	
“	*Notholaena cochisensis*	
“	*Notholaena standleyi*	
Ranunculaceae	*Anemone tuberosa*	Desert Windflower
“	*Aquilegia chrysantha*	Golden Columbine
“	*Clematis drummondii*	Virgin’s Bower
“	*Delphinium nuttallianum*	Larkspur
“	*Myosurus cupulatus*	Mousetail
Rhamnaceae	*Ceanothus greggii*	
“	*Condalia correllii*	Correll’s Snakewood
“	*Condalia ericoides*	Javelina Bush
“	*Condalia globosa*	Bitter Snakewood
“	*Rhamnus californica*	California Buckthorn
“	*Rhamnus crocea*	Hollyleaf Buckthorn
“	*Sageretia wrightii*	Wright’s Mock Buckthorn
“	*Ziziphus obtusifolia*	Graythorn
Rosaceae	*Amelanchier crenata*	
“	*Amelanchier oreophila*	
“	*Amelanchier utahensis*	
“	*Cercocarpus montanus*	Mountain Mahogony
“	*Rubus arizonensis*	

Family		Scientific Name	Common Name
Rubiaceae		*Galium aparine*	Bedstraw
"		*Galium fendleri*	
"		*Galium microphyllum*	Bedstraw
Rutaceae		*Choisya arizonica*	Arizona Star Leaf, Zorillo
"		*Ptelea trifoliata*	Hop Tree
"		*Thamnosma montana*	Turpentine Broom
Salicaceae		*Populus fremontii*	Fremont Cottonwood
"		*Salix bonplandiana*	Bonpland Willow
"		*Salix exigua*	Coyote Willow
"		*Salix gooddingii*	Goodding's Willow
"		*Salix taxifolia*	Yewleaf Willow
Santalaceae		*Comandra pallida*	Bastard Toadflax
Sapindaceae		*Dodonaea viscosa*	Hop Bush
"		*Sapindus saponaria*	Soapberry
Scrophulariaceae		*Antirrhinum nuttallianum*	
"		*Castilleja exserta*	
"		*Castilleja lanata*	White-Woolly Indian Paintbrush
"		*Castilleja minor*	Indian Paintbrush
"		*Collinsia parviflora*	Chinese Houses
"		*Cordylanthus laxiflorus*	Bird-beak
"		*Linaria texana*	
"		*Maurandya antirrhinifolia*	Snapdragon Vine
"		*Mimulus cardinalis*	Crimson Monkey Flower
"		*Mimulus dentilobus*	
"		*Mimulus glabratus*	
"		*Mimulus guttatus*	Monkey Flower
"		*Mimulus pilosus*	
"		*Mimulus rubellus*	Monkey Flower
"		*Penstemon barbatus*	Beardtongue
"		*Penstemon discolor*	Catalina Beardtongue
"		*Penstemon linarioides*	Toadflax Beardtongue
"		*Penstemon parryi*	Beardtongue
"		*Penstemon subulatus*	
"		*Penstemon superbus*	Superb Beardtongue
"		*Scrophularia parviflora*	Figwort
"		*Stemodia durantifolia*	
"		*Veronica americana*	American Brooklime
"		*Veronica anagallis-aquatica*	Water Speedwell
"	*	*Veronica persica*	Persian Speedwell
Simaroubaceae	*	*Ailanthus altissima*	Tree-of-heaven
Simmondsiaceae		*Simmondsia chinensis*	Jojoba
Solanaceae		*Calibrachoa parviflora*	
"		*Datura wrightii*	Jimson Weed, Thorn Apple
"		*Lycium exsertum*	Wolfberry, Desert Thorn
"		*Lycium pallidum*	Rabbit Thorn
"	*	*Nicotiana glauca*	Tree Tobacco
"		*Nicotiana obtusifolia*	Desert Tobacco
"		*Petunia parviflora*	Wild Petunia
"		*Physalis hederaefolia*	Ground Cherry, Husk Tomato
"		*Physalis pubescens*	
"		*Solanum douglasii*	Nightshade
"		*Solanum elaeagnifolium*	Silverleaf Nightshade
"		*Solanum heterodoxum*	Melonleaf Nightshade
"	*	*Solanum nodiflorum*	Nightshade
Sterculiaceae		*Ayenia compacta*	
"		*Ayenia filiformis*	
Tamaricaceae	*	*Tamarix pentandra*	Salt Cedar
Thelypteridaceae		*Thelypteris puberula* var. *sonorensis*	Aravaipa Wood Fern
Typhaceae		*Typha domingensis*	Cattail
Ulmaceae		*Celtis pallida*	Desert Hackberry, Granjeno
"		*Celtis reticulata*	Netleaf Hackberry
Urticaceae		*Parietaria pennsylvanica*	
Valerianaceae		*Plectritis ciliosa*	Longspur Seablush
Verbenaceae		*Aloysia wrightii*	Oreganillo
"		*Glandularia ambrosifolia*	
"		*Glandularia wrightii*	

Family	Scientific Name	Common Name
“	*Verbena bracteata*	
“	*Verbena gooddingii*	Goodding Vervain
“	*Verbena neomexicana*	Hillside Vervain
Violaceae	*Hybanthus attenuatus*	
Viscaceae	*Phoradendron californicum*	
“	*Phoradendron capitellatum*	
“	*Phoradendron macrophyllum*	
“	*Phoradendron tomentosum*	
Vitaceae	*Vitis arizonica*	Canyon Grape
Zygophyllaceae	*Larrea tridentata*	Creosote Bush
“ *	*Tribulus terrestris*	Puncture Vine

APPENDIX 3. STATE AND TRANSITION MODELS FOR ECOLOGICAL SITES IN THE ARAVAIPA REGION

State and transition models consist of diagrams, photos, text, and associated data that describe hypothesized changes in vegetation and soils for particular ecological sites. They support land management decisions by summarizing the potential effects of different management actions. Models are developed and maintained by the USDA Natural Resources Conservation Service (NRCS) in association with their Ecological Site Descriptions and are revised as information accumulates.

The following four state and transition models were developed by 25 personnel from NRCS, BLM, TNC, and other agencies during a four-day workshop in 2004. It focused on the Mogollon Transition Area, NRCS Major Land Resource Area 38. It was built on recently completed soil surveys for the Pinal County portion of the Aravaipa region, along with ecological knowledge of the assembled rangeland managers. Models were developed for two different ecological sites – clayey upland and volcanic hills – in two precipitation zones (available online at http://www.nrcs.usda.gov/technical/efotg/).

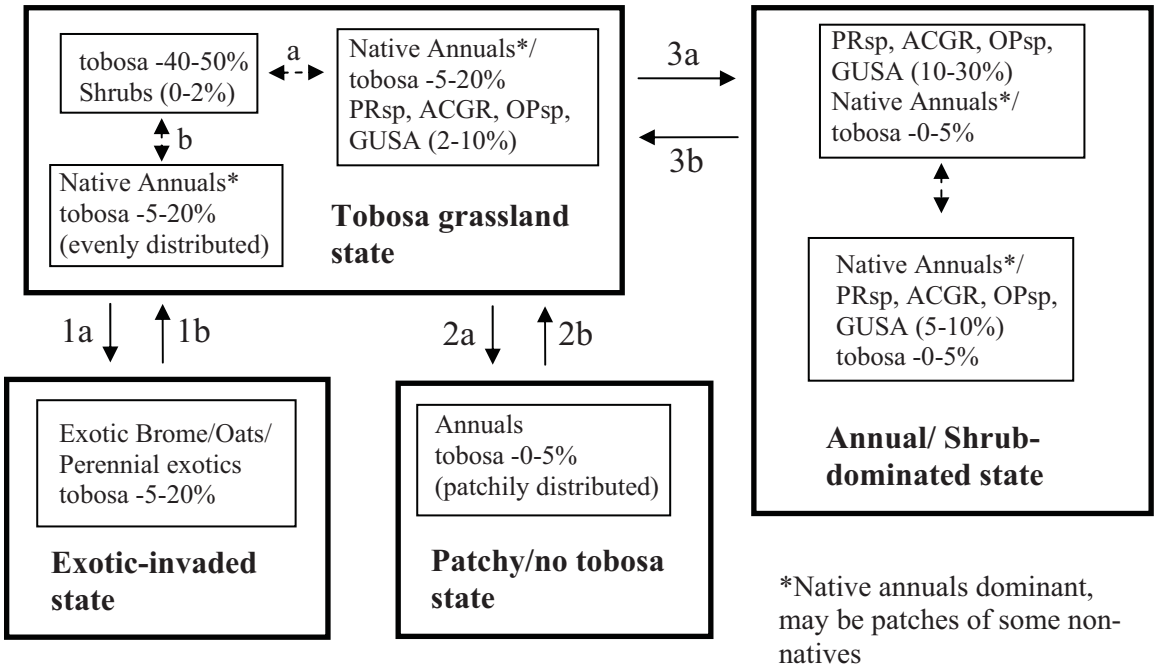
These models describe and classify three kinds of vegetation/soil change:

- Changes in plant abundance that are reversed with changes in rainfall or disturbance pattern, such as grazing or fire (community pathway within a state);
- Changes in plant abundance that cannot be reversed until competitors or fire-adapted species are removed (transition between states);
- Changes in plant abundance that cannot be reversed until erosion is stabilized and soil fertility, soil physical properties, or previous hydrology is restored (transition between states).

By identifying the processes which cause transitions or prevent recovery, these models help clarify the practices needed to set the system into a desired state. They also provide a framework for interpreting future monitoring data and for adapting management based on those data.

Some ecological state descriptions here include four-letter codes for common plant species (Appendix 2), including a lower-case “sp” where there may be several related species (e.g., PRsp = *Prosopis glandulosa* (honey mesquite) or *Prosopis velutina* (velvet mesquite)).

State and Transition Model for Aravaipa uplands with Clayey Upland soils and 12-16 inches annual precipitation (MLRA 38.1)



*Native annuals dominant, may be patches of some non-natives

TRANSITIONS

1a. Proximity to seed source, introduction of seeds, possibly management related to tobosa cover

1b. Not known. Herbicide may remove perennial exotics

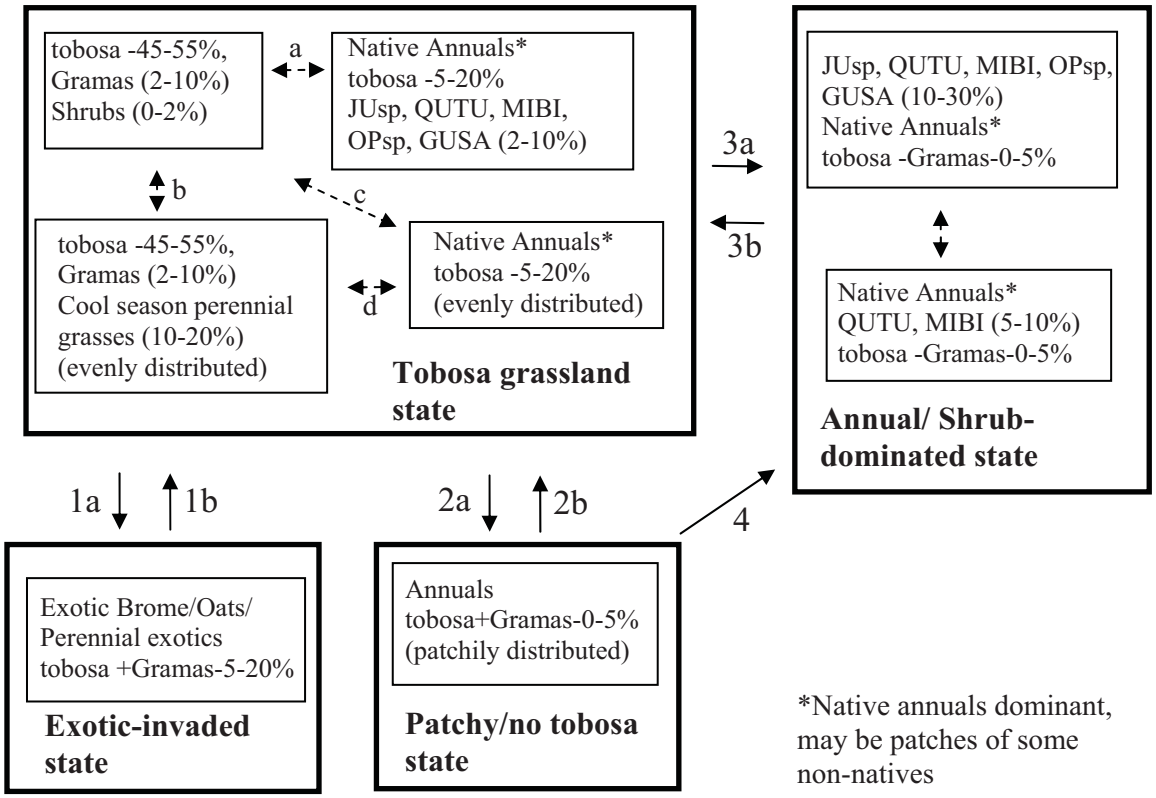
2a. Continuous heavy grazing (managing for annuals), persistent low tobosa cover, 1. Reduction of A horizon organic matter and litter, persistent reduced infiltration or 2. Limited recruitment of tobosa

2b. Managed grazing or no grazing, seeding or planting of tobosa, possibly herbicide of annuals

3a. Continuous heavy grazing (managing for annuals), persistent low tobosa cover, 1. Reduction of A horizon organic matter and litter, persistent reduced infiltration or 2. Limited recruitment of tobosa

3b. Mechanical/herbicide treatment of shrubs, Managed grazing or no grazing, seeding or planting of tobosa, maintenance treatments for shrubs

State and Transition Model for Aravaipa uplands with Clayey Upland soils and 16-20 inches annual precipitation (MLRA 38.2).



TRANSITIONS

1a. Proximity to seed source, introduction of seeds, possibly management related to tobosa cover

1b. Not known. Herbicide may remove perennial exotics

2a. Continuous heavy grazing (managing for annuals), persistent low tobosa cover, 1. Reduction of A horizon organic matter and litter, persistent reduced infiltration or 2. Limited recruitment of tobosa

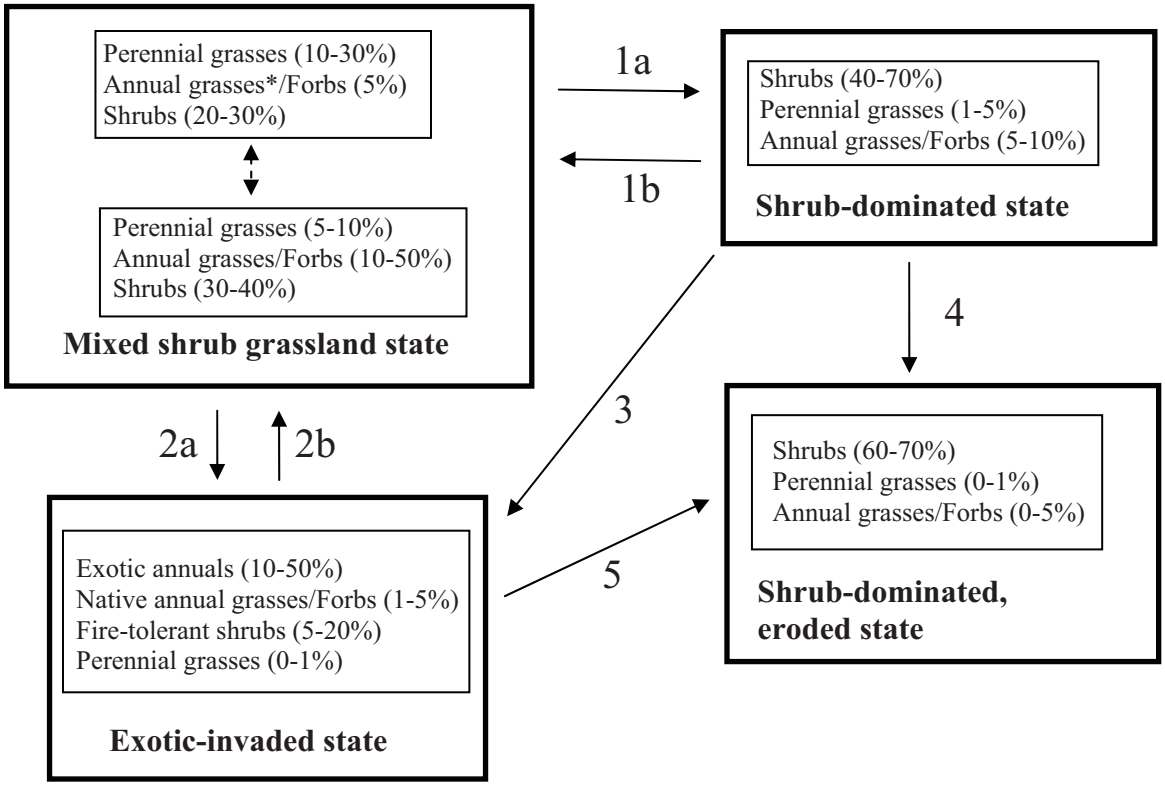
2b. Managed grazing or no grazing, seeding or planting of tobosa, possibly herbicide of annuals

3a. Continuous heavy grazing (managing for annuals), persistent low tobosa cover, 1. Reduction of A horizon organic matter and litter, persistent reduced infiltration or 2. Limited recruitment of tobosa

3b. Mechanical/herbicide treatment of shrubs, Managed grazing or no grazing, seeding or planting of tobosa, maintenance treatments for shrubs

4. Addition of shrub seeds

State and Transition Model for Aravaipa uplands with Volcanic Hills soils and 12-16 inches annual precipitation (MLRA 38.1)



*Annual grasses include natives and non-natives

TRANSITIONS

1a. Lack of fire, Continuous heavy grazing and drought that reduced fuel loads. Patchy erosion.

1b. Herbicide followed by prescribed fire as maintenance

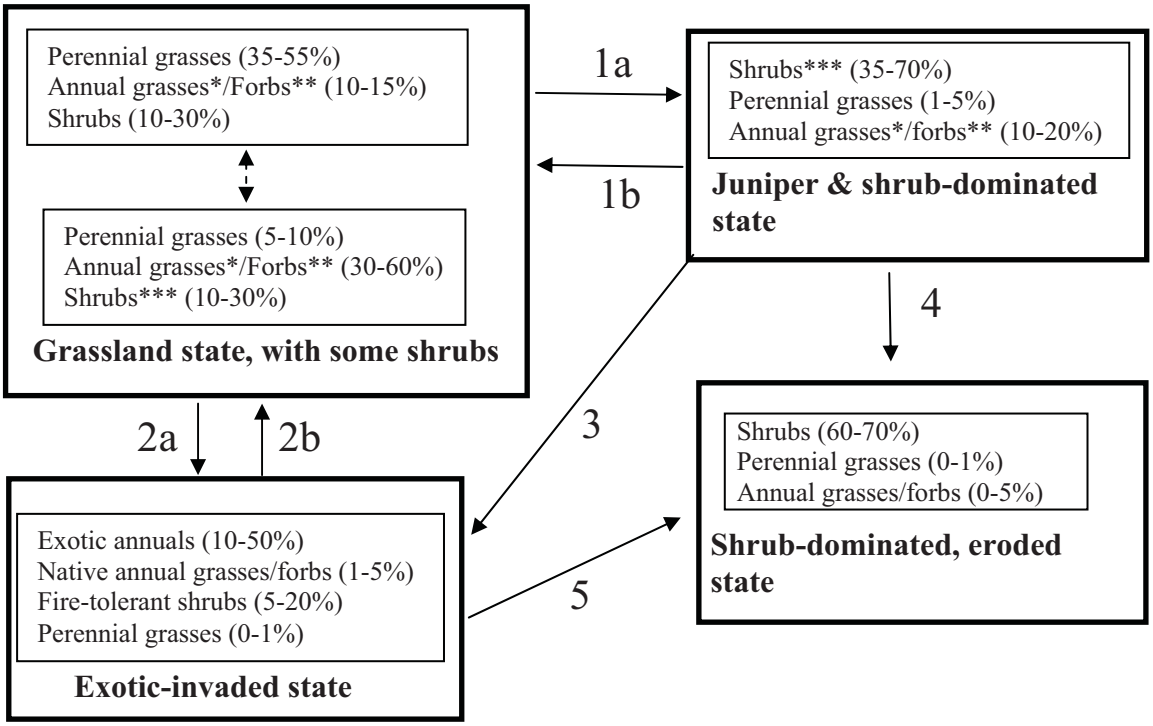
2a. Introduction of seed source, increased fire frequency (every 5 years)

2b. Unknown

3. Introduction of seed source, El Nino type event, catastrophic fire.

4, 5. Accelerated soil erosion may occur where herbaceous patches are absent.

State and Transition Model for Aravaipa uplands with Volcanic Hills soils and 16-20 inches annual precipitation (MLRA 38.2).



*Annual grasses include natives and non-natives

** Forbs includes both annuals and perennials

*** Juniper threshold level is thought to be 30% canopy with size class of 6 to 8 feet.

TRANSITIONS

1a. Lack of fire; grazing and drought that reduced fuel loads. Patchy erosion.

1b. Herbicide followed by prescribed fire as maintenance

2a. Introduction of seed source, increased fire frequency (every 5 years)

2b. Unknown

3. Introduction of seed source for exotic annuals, El Niño type event, catastrophic fire.

4, 5. Accelerated soil erosion may occur where herbaceous patches are absent.

APPENDIX 4. RANGE IMPROVEMENTS IN THE ARAVAIPA ECOSYSTEM

The following are known range improvements on BLM grazing allotments within the Aravaipa Ecosystem planning area. In the Type column, RI stands for range improvement. Improvements which fall within the Aravaipa Canyon Wilderness are identified with an X in the final column.

Painted Cave Allotment

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Earthen Reservoir		6S	17E	3	SESW	
Cluff Boundary Fence		6S	16E	15	SWSE	
Mesa Pipeline	RI Permit	6S	17E	9	NESE	
Wilderness Comp. Fence	BLM, no agreement	6S	17E	13	NWSE	X
Brandenburg Bighorn Water	BLM, no agreement	6S	17E	27	NENE	
Buzan Bighorn Water	BLM, no agreement	6s	17E	14	N1/2N1/2	

Dry Camp Allotment

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Az Canyon Pipeline/Storage	Cooperative Agreement	6S	19E	8	NWNW	
AZ Canyon Fence	Cooperative Agreement	6S	19E	5	NESE	
Horse Canyon Fence	Cooperative Agreement	5S	19E	30	NWSE	
Deer Creek Storage	Cooperative Agreement	6S	19E	5	NENW	
Assoc. Tank Fence	Cooperative Agreement	6S	18E	12	SWSW	
Haught Tank	RI Permit	5S	18E	27		
Big Tank	RI Permit	5S	18E	35		
Chet Tank	RI Permit	6S	18E	2		
Chet Tank Pipeline	RI Permit	6S	18E	2		
Double Tank	RI Permit	6S	18E	2		
Cement Dam	RI Permit	6S	18E	11		X
Pipeline Troughs	RI Permit	6S	18E	1		
Dirt Tank	RI Permit	6S	18E	1		

Dry Camp Allotment continued

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Middle Corral	RI Permit	6S	18E	1		
Second Mill	RI Permit	5S	18E	36		
Jack's Tank	RI Permit	6S	18E	6		
Twin Tank	RI Permit	6S	18E	9		X
Frank Allen Tank	RI Permit	6S	18E	1		
Trap Tank	RI Permit	6S	18E	3		
Trap Tank Fence	Cooperative Agreement	6S	18E	2		
Jick Tank	RI Permit	6S	19E	9		
Silt Tank	RI Permit	6S	19E	8		
Deer Creek Well	RI Permit	6S	19E	5		
Deer Creek Pipeline	RI Permit	6S	19E	5		
Sand Tank	RI Permit	6S	18E	11		
Cement Tank Corrals	RI Permit	6S	18E	3		
Cement Tank	RI Permit	6S	18E	3		
Sand Trap	RI Permit	5S	18E	23	NESW	
Horse Canyon Dams	RI Permit	5S	18E	32		
Coal Spring	RI Permit	5S	18E	26		
Mine Spring	RI Permit	5S	18E	26		
Allotment Boundary Fence 4520/4522	Cooperative Agreement	5S	18E	24	NWSW	
Allotment Boundary Fence 4520/4529	Cooperative Agreement	6S	19E	5	NWSW	
Allotment Boundary Fence 4520/4528	Cooperative Agreement	6S	18E	11	SESW	X
Allotment Boundary Fence 4520/4518	Cooperative Agreement	5S	18E	33	SWNW	
Registered Herd Division Fence	Cooperative Agreement	6S	19E	5		
Paddock 1 East Division Fence	Cooperative Agreement	5S	19E	30		
Paddock 1 West Division Fence	Cooperative Agreement	5S	18E	30		
Paddock 2 West Division Fence	Cooperative Agreement	6S	18E	1		
Paddock 3 West Division Fence	Cooperative Agreement	5S	18E	25		
Paddock 3 South Division Fence	Cooperative Agreement	6S	18E	1	SENW	

Dry Camp Allotment continued

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Paddock 4 West Division Fence	Cooperative Agreement	6S	18E	2		
Paddock 5 West Division Fence	Cooperative Agreement	5S	18E	27		
Paddock 6 West Division Fence	Cooperative Agreement	5S	18E	28		
Paddock 8 West Division Fence	Cooperative Agreement	6S	18E	3		X
Paddock 8 West Division Fence	Cooperative Agreement	6S	18E	3		
Paddock 9 East Division Fence	Cooperative Agreement	6S	18E	2		
Paddock 10 East Division Fence	Cooperative Agreement	6S	18E	1		
Paddock 1 South Division Fence	Cooperative Agreement	6S	19E	6		X
DC Chet Tank Fence	RI Permit	6S	18E	3		
Double Tank Waterlot	Cooperative Agreement	6S	18E	2	SWSE	

Aravaipa Allotment

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Aravaipa Tank		5S	19E	24	SWNW	
Johns Springs Dev.		5S	19E	30	NESE	
Juniper Spring Dev.		5S	19E	30	SESE	
Cottonwood Spring Dev.		5S	19E	29	SENW	
Oak Spring Dev.		5S	19E	29	NWSW	
Black Canyon Spring Dev.		5S	19E	29	SWSE	
AZ Canyon Pasture		5S	19E	33	SWNE	
AZ Holding Reservoir		5S	19E	33	SWNE	
AZ Concrete Holding Reservoir		5S	19E	23	SWSE	
Warm Spring Pipeline		5S	19E	23	NESW	
Warm Spring Corral		5S	19E	22	SWSE	
Holdup Corral		5S	19E	26	NENW	
Deer Creek Corral	RI Permit	5S	19E	28	SESE	
Anderson Spring Corral	RI Permit	5S	19E	17	SWSW	

Aravaipa Allotment continued

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Warm Springs Corral		5S	19E	23	SENW	
Anderson Spring Pasture		5S	19E	17	NESE	
Claridge Pipeline	RI Permit	5S	19E	22	SESE	
Interior Fence	RI Permit	5S	19E	23	NWNE	
Black Canyon Res. West	RI Permit	5S	19E	20	SENW	
Black Canyon Res. East	RI Permit	5S	19E	21	SWNW	
Claridge Trail	RI Permit	5S	19E	21	SESW	
Aravaipa Pipeline Addition	Cooperative Agreement	5S	19E	25	SESE	
Deer Creek Wildlife Dev.	BLM, no agreement	5S	19E	22	SWSE	
Deer Creek Road Reroute	Cooperative Agreement	5S	19E	33	SE1/4E1/ 2E1/2	

Aravaipa South Allotment

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Claridge-Bowman Fence		5S	19E	14	NWNE	
Middle Deer Creek Corral		5S	19E	28	SWSE	
Cement Reservoir		5S	19E	26	NENW	
Brushy Spring		5S	19E	11	SESW	
Deer Creek Fence		5S	19E	14	NWNE	
Sanford-Claridge Fence		5S	19E	29	NWNE	
Earthen Reservoir		5S	19E	19	NENE	
Earthen Reservoirs		5S	19E	21	NENE	
Aravaipa Fence	Cooperative Agreement	5S	19E	23	NWSE	
Aravaipa Fence	BLM, no agreement	5S	19E	25	NENE	

South Rim Allotment

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Squirrel Dam	RI Permit	6S	18E	15		X
Wero Corral	RI Permit	6S	18E	16	NESE	X
	RI Permit	6S	18E	23	NENW	
	RI Permit	6S	18E	23	SWNW	

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Red Tank	RI Permit	6S	17E	23	NWNE	X
Adolpho Tank	RI Permit	6S	18E	15	SESE	X
Stone Cabin Tank	RI Permit	6S	18E	27	SWSW	
Stone Cabin Tank	RI Permit	6S	18E	27	SWSW	
Goat Corral	RI Permit	6S	18E	27	SWSW	
Digger Tank	RI Permit	6S	18E	29	SWSW	
Little Windmill Corral	RI Permit	6S	18E	31	SESE	
Virgus Canyon Water Tank	RI Permit	6S	18E	34	NESW	
White Tank	RI Permit	6S	18E	35	SWNW	
Botamote Tank	RI Permit	6S	18E	35	SWNW	
Moore Tank	RI Permit	7S	18E	1	NESW	
Wire Corral	RI Permit	7S	18E	1	SESE	
Dead Cow Tank	RI Permit	7S	18E	2	SENW	
Big Windmill Corral	RI Permit	7S	18E	4	NENE	
Dirt Tank	RI Permit	7S	18E	11	SENW	X
Dirt Tank	RI Permit	7S	18E	12	SWNW	X
Don Jose Corral	RI Permit	7S	18E	24	NWSW	
Wire Corral Cement Tank	RI Permit	7S	19E	1	NWSE	
Black Butte Tank	RI Permit	7S	19E	7	SESE	
Upper Bear Tank	RI Permit	6S	19E	10	SWNE	
Martinez Tank No. 1	RI Permit	6S	19E	15	SWNE	
Martinez Tank No. 2	RI Permit	6S	19E	15	SENE	
Pilares Tank	RI Permit	6S	19E	16	NENE	
Turkey Creek Tank 1	RI Permit	6S	19W	29	NWNE	
Turkey Creek Tank 2	RI Permit	6S	19E	29	SENW	
Indian House Corral	RI Permit	6S	19E	30	NESE	X
Teacup Tank	RI Permit	6S	19E	31	SESE	
Mescal Tank	RI Permit	6S	19E	31	NWSW	X
Oak Grove Corral	RI Permit	6S	19E	32	SESW	
Turkey Creek Tank 3	RI Permit	6S	19E	33	SWNW	
Turkey Creek Tank 4	RI Permit	6S	19E	33	SWSE	
Matazana Tank	RI Permit	6S	19E	33	SENE	
Coffeepot Trail Fence	Cooperative Agreement	7S	18E	12		X
Oak Grove Trail Fence	Cooperative Agreement	7S	18E	6	SE	
Virgus Canyon Fence		7S	18E	22	SWSE	
Adolpho Reservoir		6S	18E	24	SWSE	X
Salazar Pipeline	RI Permit	6S	18E	14	SWSE	X

South Rim Allotment continued

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Turkey Creek Corral	Cooperative Agreement	6S	19E	30	NESE	
Adolpho Pasture Fence	Cooperative Agreement	6S	19E	30	SESE	
Aravaipa Alt. Water	BLM, no agreement	6S	18E	26	NESW	

Hell Hole Allotment

Improvement Name	Type	Township	Range	Section	Subsection	Inside Wilderness
Salazar Corral		6S	18E	23	NENW	
Polerock Corral	RI Permit	6S	18E	14	SESE	X
Salazar Fence	RI Permit	6S	19E	19	NESE	

APPENDIX 5. ARAVAIPA WILDERNESS LEGISLATION

Two laws created or expanded the Aravaipa Canyon Wilderness. The full text that applies to Aravaipa is included below. Asterisks mark where irrelevant sections have been omitted.

PUBLIC LAW 98-406—AUG. 28, 1984 98 STAT. 1485

Public Law 98-406
96th Congress

An Act

To designate certain national forest lands in the State of Arizona as wilderness, and for other purposes.

Aug. 28, 1984
[H.R. 4707]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Arizona Wilderness Act of 1984".

Arizona Wilderness Act of 1984.

TITLE I

National Wilderness Preservation System.
National Forest System.

SEC. 101. (a) In furtherance of the purposes of the Wilderness Act (16 U.S.C. 1131-1136), the following lands in the State of Arizona are hereby designated as wilderness and therefore as components of the National Wilderness Preservation System:

***

TITLE II

Aravaipa Canyon Wilderness.

SEC. 201. The Congress finds that—

(1) the Aravaipa Canyon, situated in the Galiuro Mountains in the Sonoran desert region of southern Arizona, is a primitive place of great natural beauty that, due to the rare presence of a perennial stream, supports an extraordinary abundance and diversity of native plant, fish, and wildlife, making it a resource of national significance; and

(2) the Aravaipa Canyon should, together with certain adjoining public lands, be incorporated within the National Wilderness Preservation System in order to provide for the preservation and protection of this relatively undisturbed but fragile complex of desert, riparian and aquatic ecosystems, and the native plant, fish, and wildlife communities dependent on it, as well as to protect and preserve the area's great scenic, geologic, and historical values, to a greater degree than would be possible in the absence of wilderness designation.

16 USC 1132 note.

SEC. 202. In furtherance of the purposes of the Wilderness Act of 1964 (78 Stat. 890, 16 U.S.C. 1131 et seq.) and consistent with the policies and provisions of the Federal Land Policy and Management Act of 1976 (90 Stat. 2743; 43 U.S.C. 1701 et seq.), certain public lands in Graham and Pinal Counties, Arizona, which comprise approximately six thousand six hundred and seventy acres, as generally depicted on a map entitled "Aravaipa Canyon Wilderness—Proposed" and dated May 1980, are hereby designated as the Aravaipa Canyon Wilderness and, therefore, as a component of the National Wilderness Preservation System.

16 USC 1131 note.

SEC. 203. Subject to valid existing rights, the Aravaipa Canyon Wilderness shall be administered by the Secretary of the Interior in accordance with the provisions of the Wilderness Act governing areas designated by that Act as wilderness. For purposes of this title, any references in such provisions to the effective date of the Wilderness Act shall be deemed to be a reference to the effective date of this Act and any reference to the Secretary of Agriculture with regard to administration of such areas shall be deemed to be a reference to the Secretary of the Interior, and any reference to wilderness areas designated by the Wilderness Act or designated national forest wilderness areas shall be deemed to be a reference to the Aravaipa Canyon Wilderness. For purposes of this title, the reference to national forest rules and regulations in the second sentence of section 4(d)(3) of the Wilderness Act shall be deemed to be a reference to rules and regulations applicable to public lands, as defined in section 103(e) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701, 1702).

16 USC 1133.

Public availability.

SEC. 204. As soon as practicable after this Act takes effect, the Secretary of the Interior shall file a map and a legal description of the Aravaipa Canyon Wilderness with the Committee on Energy and Natural Resources of the United States Senate and with the Committee on Interior and Insular Affairs of the United States House of Representatives, and such map and description shall have the same force and effect as if included in this Act: *Provided,* That correction of clerical and typographical errors in the legal description and map may be made. The map and legal description shall be on file and available for public inspection in the offices of the Bureau of Land Management, Department of the Interior.

SEC. 205. Except as further provided in this section, the Aravaipa Primitive Area designations of January 16, 1969, and April 28, 1971, are hereby revoked.

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Public Law 101–628
101st Congress

An Act

To provide for the designation of certain public lands as wilderness in the State of Arizona.

Nov. 28, 1990
[H.R. 2570]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.—Titles I through III of this Act may be cited as the "Arizona Desert Wilderness Act of 1990".

Arizona Desert Wilderness Act of 1990.
16 USC 460ddd note.
National Wilderness Preservation System.
16 USC 1132 note.

TITLE I—DESIGNATION OF WILDERNESS AREAS TO BE ADMINISTERED BY THE BUREAU OF LAND MANAGEMENT

SEC. 101. DESIGNATION AND MANAGEMENT.

(a) DESIGNATION.—In furtherance of the purposes of the Wilderness Act, the following public lands are hereby designated as wilderness and therefore, as components of the National Wilderness Preservation System:

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(39) certain lands in Pinal and Graham Counties, Arizona, which comprise approximately 12,711 acres, as generally depicted on a map entitled "Aravaipa Wilderness Additions" and dated February 1990, and which are hereby incorporated in and shall be deemed to be a part of the Aravaipa Canyon Wilderness (designated in Public Law 98–406, 98 Stat. 1491).

(b) MANAGEMENT.—Subject to valid existing rights, the wilderness areas designated by this title shall be administered by the Secretary of the Interior (hereinafter in this title referred to as the "Secretary") in accordance with the provisions of the Wilderness Act governing areas designated by that Act as wilderness, except that any reference in such provisions to the effective date of the Wilder-

ness Act (or any similar reference) shall be deemed to be a reference to the date of enactment of this Act.

(c) MAP AND LEGAL DESCRIPTION.—As soon as practicable after enactment of this Act, the Secretary shall file a map and a legal description of each wilderness area designated under this title with the Committee on Interior and Insular Affairs of the United States House of Representatives and with the Committee on Energy and Natural Resources of the United States Senate. Such map and description shall have the same force and effect as if included in this title, except that correction of clerical and typographical errors in such legal description and map may be made. Copies of such map and legal description shall be on file and available for public inspection in the Office of the Director, Bureau of Land Management, United States Department of the Interior, and in the appropriate office of the Bureau of Land Management in Arizona.

(d) NO BUFFER ZONES.—The Congress does not intend for the designation of wilderness areas in the State of Arizona pursuant to this title to lead to the creation of protective perimeters or buffer zones around any such wilderness area. The fact that nonwilderness activities or uses can be seen or heard from areas within a wilderness shall not, of itself, preclude such activities or uses up to the boundary of the wilderness area.

(e) FISH AND WILDLIFE.—As provided in paragraph (7) of section 4(d) of the Wilderness Act, nothing in this title or in the Wilderness Act shall be consumed as affecting the jurisdiction or responsibilities of the State of Arizona with respect to wildlife and fish on the public lands located in that State.

(f) LIVESTOCK.—(1) Grazing of livestock in wilderness areas designated by this title, where established prior to the date of the enactment of this Act, shall be administered in accordance with section 4(d)(4) of the Wilderness Act and the guidelines set forth in Appendix A of the Report of the Committee on Interior and Insular Affairs to accompany H.R. 2570 of the One Hundred First Congress (H. Rept. 101–405).

(2) The Secretary is directed to review all policies, practices, and regulations of the Bureau of Land Management regarding livestock grazing in Bureau of Land Management administered wilderness areas in Arizona in order to insure that such policies, practices, and regulations fully conform with and implement the intent of Congress regarding grazing in such areas, as such intent is expressed in this title.

(g) WATER.—(1) With respect to each wilderness area designated by this title, Congress hereby reserves a quantity of water sufficient to fulfill the purposes of this title. The priority date of such reserved rights shall be the date of enactment of this Act.

Claims.

(2) The Secretary and all other officers of the United States shall take steps necessary to protect the rights reserved by paragraph (1), including the filing by the Secretary of a claim for the quantification of such rights in any present or future appropriate stream adjudication in the courts of the State of Arizona in which the United States is or may be joined and which is conducted in accordance with the McCarran Amendment (43 U.S.C. 666).

(3) Nothing in this title shall be construed as a relinquishment or reduction of any water rights reserved or appropriated by the United States in the State of Arizona on or before the date of enactment of this Act.

(4) The Federal water rights reserved by this title are specific to the wilderness areas located in the State of Arizona designated by this title. Nothing in this title related to reserved Federal water rights shall be construed as establishing a precedent with regard to any future designations, nor shall it constitute an interpretation of any other Act or any designation made pursuant thereto.

(h) WILDLIFE MANAGEMENT.—In furtherance of the purposes and principles of the Wilderness Act, management activities to maintain or restore fish and wildlife populations and the habitats to support such populations may be carried out within wilderness areas designated by this title, where consistent with relevant wilderness management plans, in accordance with appropriate policies and guidelines such as those set forth in Appendix B of the Report of the Committee on Interior and Insular Affairs to accompany H.R. 2570 of the One Hundred First Congress (H. Rept. 101–405).

(i) MILITARY ACTIVITIES.—Nothing in this title shall preclude low level overflights of military aircraft, the designation of new units of special airspace, or the use or establishment of military flight training routes over wilderness areas designated by this title.

(j) MINERAL EXCHANGES.—It is the intent of Congress that private mineral rights within wilderness areas designated by this title be acquired as expeditiously as possible by the Secretary using existing authority to acquire such rights by exchange.

16 USC 1132 note.

(k) BLACK ROCK WASH ROAD ACCESS.—(1) Section 101(a)(23) of the Arizona Wilderness Act of 1984 (98 Stat. 1487) is amended by striking "the governmental agency having jurisdictional authority may authorize limited access to the area, for private and administrative purposes, from U.S. Route 70 along Black Rock Wash to the vicinity of Black Rock;

(2)(A) In order to permit adequate public and private access to Federal, State, and private lands on the east side of the Santa Teresa Mountains, the Secretary, acting through the Bureau of Indian Affairs, shall administer that portion of Black Rock Wash Road located within the boundaries of the San Carlos Apache Reservation so as to allow reasonable use of the road for private and administrative purposes and may permit limited public use of such road for the purpose of access to the public lands outside of the reservation boundary.

(B) The Secretary, acting through the Bureau of Indian Affairs, is authorized, subject to the provisions of the Act of June 18, 1934, chapter 576, section 16 (25 U.S.C. 476; 48 Stat. 987), to enter into cooperative agreements with the Bureau of Land Management, the Forest Service, and Graham County, Arizona, for signing, fencing, and maintenance of the portion of Black Rock Wash Road referred to in paragraph (A). The entering into of cooperative agreements as authorized by this subsection shall not be construed in any way as a determination of the ownership of such portion of Black Rock Wash Road.

Appropriation authorization.

(3) There are authorized to be appropriated such sum as may be necessary to carry out this subsection.

(1) ALAMO DAM.—Nothing in this title shall be construed to affect the operation for flood control purposes of the Alamo Dam located on the Bill William River.

SEC. 102. AREAS RELEASED.

Excepting for the Baker Canyon area (AZ–040–070), and the approximately 57,800 acres of public land as generally depicted on a

map entitled "Cactus Plain Wilderness Study Area" dated February, 1990, the Congress hereby finds and directs that all public lands in Arizona, administered by the Bureau of Land Management pursuant to the Federal Land Policy and Management Act of 1976 not designated as wilderness by this title, or previous Acts of Congress, have been adequately studied for wilderness designation pursuant to section 603 of such Act and are no longer subject to the requirement of section 603(c) of such Act pertaining to the management of wilderness study areas in a manner that does not impair the suitability of such areas for preservation as wilderness.

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APPENDIX 6. TRANSPORTATION ROUTE DECISIONS

The Route Evaluation Tree process was used as the basis for the following travel management decisions. Using this process, route evaluations and designations were based on issues such as statutory authority, variety of recreational users, desired future condition, effects of route designation on biological, cultural and recreational resources, general access requirements of commercial and private property interests, public use conflicts, seasonal use, and public safety.

Decision categories included "Open" (to all vehicles), "Mitigate Open" (open but with prescribed mitigation actions), "Limited" (open to specified users), and "Closed" (to all vehicles).

Most routes identified here to be kept open qualify under BLM guidelines as a "primitive road" (a linear route managed for use by four-wheel drive or high-clearance vehicles). Routes 5001 and 5018 qualify as a "road" (managed for use by low-clearance vehicles having four or more wheels, and maintained for regular and continuous use). Some of the Closed or Limited routes will be managed as trails for non-motorized use, as described below.

EXISTING ROUTES

Route Name	Route Number	Length (miles)	Draft Plan Decision	Justification
	5000	12.23	Open	
	5000	4.57	Mitigate Open	Prevent route proliferation into wilderness.
	5000	0.58	Closed	Unnecessary route, adjacent to primary bighorn habitat.
	5000a	0.47	Limited- Administrative use only	Route needed only for maintenance of stock water tank.
Painted Cave Ranch	5000b	0.12	Open	
Aravaipa Road	5001	12.25	Open	
	5002	2.74	Open	
	5003	0.64	Open	
	5004	0.85	Open	
Trail's End	5005	1.36	Open	
Trail's End	5005	2.27	Limited- Administrative use only	Close to public on private land.
	5006	3.29	Open	
	5006	3.23	Mitigate Open	Close to public during bighorn lambing season, Jan. 15 - June 15.
	5006a	0.36	Closed	Unnecessary route; closed to prevent resource damage.

Route Name	Route Number	Length (miles)	Draft Plan Decision	Justification
	5007	3.97	Mitigate Open	Prevent route proliferation into wilderness.
	5008	1.93	Open	
Oak Spring	5009	2.19	Mitigate Open	Monitor for resource damage; close to public access if damage reaches significant level.
Basin Road	5010	2.91	Limited- Administrative use only	Closed to public due to resource damage on private and state trust land.
	5011	0.40	Open	
	5011	0.34	Closed	Unauthorized wilderness intrusion.
	5011	0.84	Limited- Administrative use only	This section closed to public because difficult to close road at wilderness boundary. Place gate on hillside where road descends from ridge.
Whitewash Canyon	5012	4.40	Open	
Whitewash Canyon	5012	1.00	Closed	Abandoned route, mostly on private land. Close from creek crossing to top of ridge.
Wilderness cherrystem	5013	3.31	Mitigate Open	Close spur roads that intrude on wilderness. Monitor for new wilderness intrusions.
Wilderness cherrystem	5013	0.38	Closed	Unauthorized wilderness intrusion.
	5014	11.47	Open	
	5014a	0.83	Closed	Redundant route.
Rug Road	5015	9.10	Mitigate Open	Route to be kept rough and unmaintained, to limit traffic volume and provide diversity of recreational opportunities.
	5015a	0.62	Closed	Closed due to resource damage on private land.
	5016	0.62	Limited- Administrative use only	Provides access only to stock tank not currently used by permittee.
	5017	1.41	Open	

Route Name	Route Number	Length (miles)	Draft Plan Decision	Justification
	5017	1.91	Closed	Closed beyond Don Jose Corral due to resource damage. Road not used by permittee or adjacent ranch.
	5017a	1.18	Closed	Closed due to resource damage on private land.
Klondyke Road	5018	42.27	Open	
	5019	6.26	Open	
	5019a	1.28	Closed	Closed due to resource damage on private land.
	5019b	0.14	Closed	Redundant route. Field check to determine which route best meets the needs of public uses and minimizes habitat damage and close the remaining braided routes.
	5020	0.92	Open	
	5020	0.85	Closed	Eroding segment within ACEC, closed as directed by RMP.
Turkey Creek	5021	2.81	Open	Open to last campground.
Turkey Creek	5021	0.18	Closed	Limit to admin use and public non-motorized use past the last campsite, to protect riparian values as directed by RMP.
Turkey Creek	5021	0.29	Closed	Eroding segment within ACEC, closed to protect riparian values as directed by RMP.
	5021a	0.40	Closed	Limit to admin use and public non-motorized use, to protect riparian values as directed by RMP.
	5022	0.44	Mitigate Open	Install barrier at end to prevent use of hazardous section.
	5022	0.32	Limited- Nonmotorized use only	Limited to non-motorized use due to safety hazard and erosion.
	5023	8.29	Open	
	5023a	0.38	Mitigate Open	Install barrier at end to prevent route proliferation.

Route Name	Route Number	Length (miles)	Draft Plan Decision	Justification
	5024	0.70	Mitigate Open	Install barrier at end to prevent route proliferation.
Fourmile Canyon Road	5025	4.00	Open	
	5026	9.85	Open	
	5026	1.03	Mitigate Open	Pursue easement through private property or alternative route around private on proposed route AC1112.
	5026a	0.19	Closed	Redundant route. Field check to determine which route best meets the needs of public uses and minimizes habitat damage and close the remaining braided routes.
	5026b	0.32	Limited- Administrative use only	Close to public to prevent riparian damage. Open to admin use to maintain windmill and water tank.
	5026c	0.32	Mitigate Open	Install barrier at end to prevent route proliferation.
	5026c	0.04	Open	
	5026d	0.14	Open	
	5026e	0.05	Open	
	5027	5.97	Open	
	5027	0.26	Closed	Unauthorized wilderness intrusion.
	5027a	0.23	Closed	Unnecessary route, adjacent to primary bighorn habitat.
	5027b	0.18	Closed	Unnecessary route; closed to prevent resource damage.
	5028	1.04	Open	
	5028	2.66	Mitigate Open	Close to public during bighorn lambing season, Jan. 15 - June 15.
	5028a	0.18	Closed	Unauthorized wilderness intrusion.
	5028b	0.26	Closed	Unauthorized wilderness intrusion.

Route Name	Route Number	Length (miles)	Draft Plan Decision	Justification
	5029	1.59	Closed	Redundant route, adjacent to primary bighorn habitat.
	5029a	0.24	Closed	Unnecessary route, adjacent to primary bighorn habitat.
	5030	4.13	Mitigate Open	Pursue legal access across private land.
	5031	1.64	Open	
	5031	0.01	Closed	Unauthorized wilderness intrusion.
	5032	1.65	Open	
	5033	1.19	Open	
	5033a	0.07	Open	
	5034	1.77	Open	
	5035	1.84	Mitigate Open	Mitigate for erosion.
	5036	1.20	Mitigate Open	Pursue easement through private property.
	5037	1.01	Closed	Unnecessary route; closed to prevent resource damage.
	5038	3.00	Mitigate Open	Sign reservation boundary.
	5039	4.90	Open	
	5040	2.54	Open	
Sand Wash	5041	3.40	Limited- Administrative use only	Closed to public across private land to prevent riparian damage. Pursue legal access only if other access options to east wilderness trailhead are unavailable.
	5043	3.97	Open	
	5043a	0.51	Closed	Unnecessary route; closed to prevent resource damage.
	5045	0.84	Closed	Unnecessary route; closed to prevent resource damage.
	5047	0.63	Open	
	5049	0.58	Open	
	5051	2.92	Open	
Forest Service Route 277	FS277	5.55	Mitigate Open	Pursue easement through private property to access Deer Creek and Landsman Camp, and if access not available on Klondyke Road.

Route Name	Route Number	Length (miles)	Draft Plan Decision	Justification
Forest Service Route 277	FS277	7.14	Open	

PROPOSED ROUTES

Forest Service Route 68	FS68	5.85	Open	
Forest Service Route 94	FS94	9.79	Mitigate Open	Use as primary access only if unable to obtain access on Klondyke Road.
	AC1033a	1.01	Closed	Unauthorized wilderness intrusion.
	AC1112	0.81	Mitigate Open	Construct this route only if unable to obtain legal access through Dry Camp private property.
	AC1114	1.75	Closed	Do not construct this route, due to anticipated resource damage.
	AC1114	2.35	Closed	Do not construct this route, due to anticipated resource damage.
	AC1116	0.38	Mitigate Open	Construct this route only if unable to obtain access on Klondyke Road.
	AC1116	0.56	Mitigate Open	Construct this route only if unable to obtain access on Klondyke Road.
	AC1116	1.38	Mitigate Open	Construct this route only if unable to obtain access on Klondyke Road.
	AC1121	2.31	Closed	Do not construct this route, due to anticipated resource damage.
	AC1123	1.85	Mitigate Open	Construct this route only if unable to obtain access on Klondyke Road.

APPENDIX 7. ABBREVIATIONS AND ACRONYMS

ACEC Area of Critical Environmental Concern
ACW Aravaipa Canyon Wilderness
ADA Americans with Disabilities Act
ADEQ Arizona Department of Environmental Quality
ADHS Arizona Department of Health Services
ADWR Arizona Department of Water Resources
AEPA Aravaipa Ecosystem Planning Area
AGFC Arizona Game and Fish Commission
AGFD Arizona Game and Fish Department
ALRIS Arizona Land Resource Information System
AMP Allotment Management Plan
ARPA Archaeological Resources Protection Act
ARS Arizona Revised Statute
ASU Arizona State University
ATV All-Terrain Vehicle
AUM Animal Unit Month
BLM Bureau of Land Management
CFR U.S. Code of Federal Regulations
CFS Cubic feet per second
DOI Department of the Interior
DPC Desired Plant Community
EA Environmental Assessment
EIS Environmental Impact Statement
EMP Ecosystem Management Plan
ESA Endangered Species Act
FLPMA Federal Land Policy and Management Act
FMP Fire Management Plan
FMZ Fire Management Zone
FONSI Finding of No Significant Impact
FR Federal Register
FY Fiscal Year
GPS Global Positioning System
HR House Report
LAC Limits of Acceptable Change
MLRA Major Land Resource Area
MOU Memorandum of Understanding
NEPA National Environmental Policy Act
NHPA National Historic Preservation Act
NRCS Natural Resources Conservation Service
NRHP National Register of Historic Places
OHV Off-Highway Vehicle
PFC Proper Functioning Condition
PRIA Public Rangelands Improvement Act

RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision
S&G	Standards for Rangeland Health and Guidelines for Grazing Administration
TES	Threatened and Endangered Species
TNC	The Nature Conservancy
UA	University of Arizona
USDI	United States Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VRM	Visual Resource Management

Draft Aravaipa Ecosystem Management Plan Environmental Assessment

AZ-0410-2006-040

December 2009

CHAPTER 1. INTRODUCTION

A. Background

The Aravaipa ecosystem, defined as the Aravaipa Ecosystem Planning Area (AEPA), encompasses approximately 77,400 acres of land located around Aravaipa Canyon, along the borders of Graham and Pinal counties, Arizona. The planning area includes approximately 69,600 acres of land managed by the Bureau of Land Management (BLM) and approximately 7,800 acres of adjacent land owned by The Nature Conservancy (TNC). Aravaipa Creek, a perennial stream that hosts seven species of native desert fish and one of Arizona's lushest riparian habitats, is located within the planning area. The Aravaipa Canyon Wilderness (ACW), Desert Grasslands Research Natural Area (RNA) Area of Critical Environmental Concern (ACEC), Turkey Creek Riparian ACEC, and Table Mountain RNA ACEC are also within the planning boundaries.

The Aravaipa Ecosystem Management Plan (Aravaipa EMP) was developed to establish guidance, objectives, policies, and management actions for the AEPA – including the three ACECs within its boundary – while integrating management directions for TNC properties and management goals of the Arizona Game and Fish Department (AGFD), in compliance with the BLM's 1991 Safford District Resource Management Plan and Final Environmental Impact Statement (Safford District RMP/EIS, as amended) and applicable amendments.

Detailed background information is provided in Chapter 1, "Purpose and Need," of the Aravaipa EMP (incorporated by reference). Abbreviations and acronyms are defined in Appendix 7.

B. Purpose and Need for the Proposed Action

The purpose of the action proposed in the Aravaipa EMP is to (1) establish guidance, objectives, policies, and management actions for public land managed by the BLM in and around the Aravaipa Canyon area; (2) implement decisions made in the BLM Safford District RMP; (3) keep the natural environment healthy, diverse, and productive for continued public benefit; (4) protect and preserve wilderness areas for the use and enjoyment of future generations; (5) integrate management efforts by BLM, TNC, and AGFD; and (6) meet the requirements of the Arizona Desert Wilderness Act of 1990.

C. Conformance to Land Use Plans

The proposed Aravaipa EMP conforms to the approved 1991 Safford District RMP/EIS,

as amended. The Safford District RMP directs the BLM to prepare a coordinated resource management plan for the Aravaipa Creek watershed, as well as a cooperative management agreement for the area between BLM and TNC lands.

D. Relationship to Statutes, Regulations, or Other Plans

The actions proposed in the Aravaipa EMP are in accordance with the Federal Land Policy and Management Act (FLPMA) of 1976, which requires the BLM to manage public lands for multiple uses on a sustained-yield basis.

The Aravaipa EMP is a coordinated plan that meets the requirements for plans addressing wilderness, ACECs, wildlife, grazing, recreation, and cultural resources management. The Aravaipa EMP integrates specific resource objectives with management directives, which include suggested actions to achieve the designated resource objectives as well as limitations to achieve compatible and sustainable levels of public land uses.

Actions pertaining to the ACW comply with the Wilderness Act of 1964, the Arizona Wilderness Act of 1984, and the Arizona Desert Wilderness Act of 1990. In addition, the actions follow the wilderness management policy as outlined in BLM Manual 8560 (1983) and in 43 Code of Federal Regulations (CFR) 6300.

The laws expanding the ACW (as described above) withdrew wilderness lands from new entry, location, sale, or leasing under the mining laws. Guidance for managing mineral resources outside the ACW is outlined in the following documents: General Mining Law of 1872 (as amended); Mining and Minerals Policy Act of 1970; the Federal Land Policy and Management Act of 1976; National Materials and Minerals Policy, Research and Development Act of 1980; State of Arizona statutes and rules; and the BLM's 1984 Mineral Resources Policy.

The BLM's management guidelines for rangelands within the planning area are directed by FLPMA, the Taylor Grazing Act of 1934, Public Rangelands Improvement Act (PRIA) of 1978, Safford District RMP, Eastern Arizona Grazing EIS (BLM 1986), and Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (BLM 1997a). The actions in the Aravaipa EMP conform to the 2006 revised grazing regulations for public lands (43 CFR 4100).

The legal authority for the BLM's management of riparian-wetland areas is derived from the Taylor Grazing Act of 1934, Endangered Species Act (ESA) of 1973, FLPMA, Emergency Wetland Resources Act of 1986, Water Quality Act of 1987, and Executive Orders 11988 and

11990. BLM riparian area management policies are provided in BLM Manual 1737 (1992).

Chapter 5, "Objectives and Management Actions," of the Aravaipa EMP details the proposed water quality management actions and monitoring strategies. Each objective in this plan complies with the requirements of the Arizona Department of Environmental Quality (ADEQ) and the Clean Water Act for state water quality certification. The management actions detailed in Chapter 5 of the Aravaipa EMP for grazing and recreation are consistent with the best management practices outlined by the ADEQ for maintaining and improving surface-water quality.

The BLM is directed to manage habitats based on legislation, including FLPMA, the ESA of 1973, PRIA of 1978, and Sikes Act (as amended in 2004). In addition, the Aravaipa EMP is consistent with the BLM's Arizona Fish and Wildlife 2000: A Plan for the Future (1987) and with the AGFD's Wildlife 2012 Strategic Plan (2007). All the proposed actions pertaining to threatened and endangered species (T&E species) wildlife management conform to the ESA, BLM Manual 6840 (2001), and relevant endangered species recovery plans, including the Loach Minnow Recovery Plan (U.S. Fish and Wildlife Service [USFWS] 1991a), Spikedace Recovery Plan (USFWS 1991b), Gila Topminnow Revised Recovery Plan (USFWS 1998), and Desert Pupfish Recovery Plan (USFWS 1993).

Actions relating to cultural resources management are set forth by a number of regulations, laws, and acts, including FLPMA, the National Historic Preservation Act of 1966, Archaeological Resources Protection Act (ARPA) of 1979, Native American Graves Protection and Repatriation Act of 1990 (as amended), and a management policy specified in BLM Manual 8100 (2004). In Arizona, the BLM also operates under the terms of the Programmatic Memorandum of Agreement between the BLM, Arizona State Historic Preservation Officer, and Advisory Council on Historic Preservation.

CHAPTER 2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

A. Proposed Action Alternative

The Proposed Action is the adoption and implementation of the Aravaipa EMP. In general, the Proposed Action would provide for the protection and enhancement of ecosystem resources,

processes, and functions - including water, upland, riparian, wildlife, cultural, and recreation resources; travel management; special area designations; public information and education; and law enforcement and public safety - while allowing sustainable use.

Proposed management actions were identified to address issues raised during the planning process and to augment general directives included in the BLM's Safford District RMP. Proposed management actions that may have effects on the natural, social, and cultural environment are listed below. All management actions that take place within the ACW must be conducted in accordance with BLM wilderness regulations and directives. More detailed descriptions of these actions are presented in Chapter 5, "Objectives and Management Actions," of the Aravaipa EMP.

1. Water Resources Objectives

There are two objectives for water resources:

- Protect Aravaipa Creek from excessive on-site and off-site pollutants and disturbances by developing a sampling plan to monitor water quality, macroinvertebrates, and sediment to ensure that lead and arsenic do not exceed acceptable standards established by the ADEQ. If sampling identifies contamination problems, appropriate response actions would be taken.
- Maintain adequate streamflow in Aravaipa Creek and its tributaries to support natural communities and recreational uses.

2. Upland Resources Objectives

There are five objectives for upland resources:

- Manage the landscape to maintain dynamic, sustainable natural conditions and diverse native vegetation by restricting vehicular use to designated roads, limiting wood harvesting to dead and down trees only, and prohibiting vegetative product sales within the planning area (other than for traditional Native American uses).
- Prepare Standards for Rangeland Health Evaluations on grazing allotments within the planning area to continue to assess whether grazing management guidelines are being met on each grazing allotment. In addition, livestock permits within the planning area would be restricted to cattle and horses.
- Maintain naturally occurring plant communities and shrub-grass ratios throughout upland landscapes through the use of prescribed fire and wildland fire use.
- Manage uplands for the recovery of all special-status species within the planning boundaries by using the Standards and Guidelines process to develop site-specific desired future conditions and criteria for special-status species.

- Monitor and control invasive and nonnative plant species that pose a significant threat to the Aravaipa ecosystem by requiring use of certified weed-free (and weed-seed-free) hay on public lands.

3. Riparian Resources Objectives

There are two objectives for riparian areas within the AEPA:

- Maintain or restore wetland ecosystems to proper functioning condition[1] through land management actions both in the riparian corridors and in the surrounding uplands. Proposed actions to achieve this objective:
  - – restrict livestock, except for equestrian use and pack stock, from moving through the riparian corridors during the growing season,
  - – remove nonnative riparian species,
  - – limit vehicle crossings through riparian areas,
  - – limit livestock use of vegetation in riparian areas that are not in proper functioning condition,
  - – maintain the current average allocation of 40 percent use of current year's growth on uplands to promote the proper release of water to riparian corridors (and a maximum of 20 percent use applied to riparian areas not in proper functioning condition to allow for improvement),
  - – implement erosion-control projects and wetland restoration in the upper end of Turkey Creek and other potential locations, and
  - – evaluate the functionality of any channel-constraining structures and modify them if necessary.
- Restore historic wetlands through proper manipulation of vegetation and soil. Proposed actions to achieve this objective:
  - – promote prescribed burns on the uplands to restore the natural cycle of wildland fires so that natural burns would become more common, and
  - – construct channel-constraining structures (gabions) outside the wilderness to release floodwaters at a reduced peak flow.

4. Wildlife Resources Objectives

1 Proper Functioning Condition: (1) An element of the Fundamental of Rangeland Health for watershed, and therefore a required element of State or regional standard and guidelines under 43 CFR § 418-.2(b). (2) Condition in which vegetation and ground cover maintain soil conditions that can sustain natural biotic communities. For riparian areas, the process of determining function is described in the BLM Technical Reference TR 1737-9. FEIS at 26, 72. (3) Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The functioning condition of riparian-wetland areas is influenced by geomorphic features, soil, water, and vegetation.

There are two objectives for wildlife resources:

- Maintain and enhance the diversity of native fish and wildlife species and native habitats of the Aravaipa ecosystem. Proposed actions to achieve this objective:
  - monitor nonnative species and their impacts to help develop management actions to control nonnative species;
  - remove nonnative aquatic species by direct means (chemical or other methods);
  - reestablish populations of Gila topminnow and desert pupfish;
  - maintain a viable population of desert bighorn sheep by instituting either year-round or seasonal closures of key roads located in primary bighorn sheep habitat;
  - evaluate potential habitat to supplement or reestablish historical native species;
  - support the establishment of refuge populations of Aravaipa Creek fish species;
  - support monitoring of parasites in fish populations;
  - retain, maintain, and enhance habitat essential to the recovery of any T&E species; and
  - weigh potential benefits to wildlife on any lands proposed for acquisition.
- Maintain and enhance healthy populations of native fish and wildlife species of the Aravaipa ecosystem. Proposed actions to achieve this objective:
  - inventory existing stock tanks, tributaries, and springs for fish and other key aquatic species;
  - inventory and map existing fences throughout the AEPA;
  - remove unused fences and modify existing fences to meet BLM and AGFD wildlife standards;
  - monitor fish populations and nongame and game species;
  - maintain or enhance existing wildlife developments outside the wilderness;
  - monitor amphibians for chytrid fungus;
  - conduct a two-year inventory of special-status species;
  - provide opportunities for research on wildlife; and
  - establish a scientific advisory committee to review fish monitoring data and threats to the aquatic community.

5. Cultural Resources Objectives

There are three objectives for cultural resources within the AEPA:

- Provide opportunities for field investigations to identify significant cultural properties and to determine effective research and protection strategies. Class III intensive inventories (pedestrian surveys covering 100 percent of a specific area) would be conducted in priority geographic areas, and Class II inventories (pedestrian surveys covering a sample area) would be conducted on areas located outside the priority geographic areas.

- Preserve and protect cultural resources eligible for the National Register of Historic Places (NRHP) by identifying resources that are susceptible to vandalism, environmental effects, or damage through permitted uses. Other measures for protecting and preserving cultural resources within the AEPA:
  – revisit known sites to update documentation;
  – assess the condition of sites;
  – evaluate sites for NRHP eligibility;
  – implement physical protection measures (e.g., fences) on sites that are being impacted;
  – process ARPA violations;
  – establish research partnerships with academic institutions and professional and nonprofit organizations;
  – provide opportunities for volunteer training and participation in site documentation;
  – perform research and educational projects, and maintaining the Turkey Creek site for public visitation.
- Provide opportunities for Native American tribes to identify, conserve, and protect places of traditional use that are of continuing importance to Native Americans:
  – conduct ethnographic studies to identify places of traditional importance;
  – provide opportunities for tribal participation in research and interpretation of ancestral sites;
  – continue to consult with Native American tribes to identify places of traditional use, tribal needs for access and natural resources use, and measures for protecting places of traditional importance that might be identified by tribes during the life of the plan.

6. Recreation Objective

The objective for recreation is as follows:

- Provide opportunities for diverse recreational activities outside the ACW boundary that would have minimal impacts on natural and cultural resources. Proposed actions to meet this objective:
  – monitor and manage visitor use and activities to provide access to recreational areas in a manner that minimizes damage to the natural environment;
  – maintain Fourmile Canyon Campground and Brandenburg Campsite near the primary access roads to each end of Aravaipa Canyon;
  – develop recreational infrastructure only at sites that do not encourage nonpermitted access to the wilderness;
  – prohibit campfires at times of heightened fire risk;
  – establish sign-in registers at entry points crossing private land;

– apply Limits of Acceptable Change standards. If monitoring determines that visitor use is exceeding resource capacity, recreational areas could be closed, use could be redirected to designated sites, and visitor permits could be required.

7. Travel Management Objectives

There are two travel management objectives:

- Provide a variety of motorized travel corridor options consistent with other resource values:
  – keep most roads open and in their current condition while closing or limiting access to certain roads within the Aravaipa Ecosystem;
  – restrict motorized vehicles to designated roadways;
  – construct roads and install informational signs in the nonwilderness areas;
  – retain the natural values of the area;
  – apply Limits of Acceptable Change standards to all routes;
  – prohibit cross-country game retrieval with motorized vehicles; and
  – implement a travel management plan that closes, rehabilitates, seasonally closes, or improves certain roads within the Aravaipa ecosystem, or converts roads into nonmotorized trails.
- Secure motorized access to public lands within the planning area by obtaining appropriate legal access.

8. Special Area Designations Objectives

Six objectives for special area designations have been identified within the AEPA:

- Manage the Aravaipa Creek segment determined suitable and recommended for inclusion in the National Wild and Scenic Rivers System to maintain the qualities that led to this determination until Congress decides whether to make this designation. Management would include maintaining the free-flowing characteristics of the streams and limiting construction activities within their corridors.
- Manage visitor use in the ACW, including the Aravaipa Canyon Wildlife Area, to preserve the wilderness characteristics of the canyon, minimize impacts on resources, maintain an environment with limited traces of human presence, and preserve a unique place for solitude and the appreciation of nature. Proposed management actions to meet these objectives:
  – continue the current wilderness permit system;
  – review the current permit system periodically to determine ways in which the system

can be improved;
– require all commercial service providers to operate under a Special Recreation Permit;
– encourage dispersed camping;
– prohibit the construction of new trails;
– discourage the use of campfires;
– limit sign usage in the ACW;
– inform visitors of the preferred methods for disposing of human waste;
– maintain trailhead facilities at each end of the canyon;
– prohibit pets in Aravaipa Canyon and its side canyons;
– restrict pack stock to day use;
– monitor campsites regularly for unacceptable signs of human impact;
– prohibit discharge of firearms within 50 vertical feet of a streambed;
– station rangers at the east and west entrances of Aravaipa Canyon; and
– maintain present administrative sites and residences.

- Maintain and improve the natural qualities of and opportunities for solitude in the ACW. The AGFD would continue to be allowed to conduct up to four low-level species survey flights on weekdays between October 1 and January 31, with the exception of bighorn sheep population-estimate surveys, which may occur on weekends. The BLM would work with the appropriate agencies to minimize low-altitude flights (less than 2,000 feet) over the ACW. All existing range, wildlife, and cultural developments within the wilderness would be monitored and inspected using non-motorized and non-mechanized means. Posted signs would be maintained along the boundary and along cherry-stem roads at quarter-mile intervals. One larger sign would also be maintained at each of the main trailhead entrances, located on the east and west ends of the ACW. Efforts to acquire privately owned parcels within the boundaries of the ACW would be continued. No recreational developments, including trails, would be maintained or constructed in the wilderness.
- Manage the Turkey Creek Riparian ACEC to maintain and protect the important cultural, scenic, and wildlife values for which it was designated. The Turkey Creek riparian area would be protected by limiting vehicle use to designated roads. In addition, livestock would be managed to avoid yearlong use, water quality would be monitored, and the area would be managed to accelerate the recovery of riparian vegetation. Adjacent riparian areas and lands within the watershed would be acquired; woodcutting and wood gathering would be prohibited except for gathering dead and down wood for campfires; the area would be managed as a Visual Resource Management (VRM) Class II area to preserve scenic quality; camping along Turkey Creek Road would be limited to

designated campsites.

- Manage the Table Mountain RNA ACEC to maintain and protect the two important plant communities for which it was designated. Proposed actions:
  – limit vehicle use to designated roads,
  – prohibit woodcutting and wood gathering except for gathering dead and down wood for campfires,
  – utilize fire as a management tool,
  – manage livestock to limit concentrated use,
  – withdraw the area from mineral entry,
  – close the area to vegetation sales, and
  – limit research efforts to the effects of natural processes on these plant communities.
- Manage the Desert Grasslands RNA ACEC (Pilares Unit) to maintain and protect the relict grasslands for which it was designated:
  – acquire adjacent state and private parcels as they become available,
  – utilize fire as a management tool to allow fire to continue its role in the ecology of the ACEC,
  – limit research efforts to the effects of natural processes in the grasslands, and
  – exclude livestock on lands not currently accessible to livestock or not presently being used for grazing.

9. Public Information and Education Objectives

There are two objectives for public information and education:

- Educate land users, recreational users, and others about how to protect natural and cultural resources. An interpretation plan would be developed and would include the following: informative signs along the wilderness boundary, directional and road signs, brochures, maps, kiosks, and website updates. The interpretation plan would also address outreach to groups that use the area for recreational purposes and would encourage the *Leave No Trace* camping and hiking practice through use of kiosks, brochures, public information sites, and visitor contacts. In addition, the wilderness permit system would be used to educate visitors about low-impact recreation and the protection of both natural and cultural resources.
- Develop and maintain an active public education program regarding the nature and values of cultural resources and the need to preserve them. The program would provide resources for developing educational materials geared toward the general public for community outreach, provide signage within the Aravaipa area that contains an overview of the history and prehistory of the area, and update the Aravaipa website with additional

information on the cultural resources located in the area.

10. Law Enforcement and Safety Objective

The law enforcement and public safety objective of the AEPA is as follows:

- Provide an adequate level of law enforcement to prevent vandalism, off-road driving, trespassing, theft, littering, and poaching. This objective would be accomplished by using agency personnel and volunteer groups to monitor recreational activities within the area, developing and implementing cooperative agreements and partnerships, and providing adequate law enforcement through BLM law enforcement patrols and partnerships with recreational organizations and other agencies.

B. No Action Alternative

Under the No Action Alternative, current management would continue under the guidance of the Safford District RMP, as amended, and the ACW Management Plan (BLM 1988). An integrated and interdisciplinary approach for the Aravaipa ecosystem would not specifically be pursued. Individual resource plans would be prepared as needed and required, and implementation of those plans would be focused solely on specific resources rather than on the Aravaipa ecosystem as a whole.

1. Current Water Management

Under the No Action Alternative, current management objectives and actions for water management in the AEPA would continue. In addition to the current objectives, water conservation practices (groundwater management) and the preparation of a management plan for the use and conservation of water (quantity and quality) would also continue. The BLM would continue to evaluate watercourses in the planning area – including some intermittent streams – to determine suitability for Unique Water designations, nominate those watercourses that meet the standards, and continue to pursue the purchase of water rights to protect threatened resource values when necessary. The BLM would also continue to manage water resources in accordance with Standard 2 of the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (BLM 1997a).

2. Current Upland Management

The BLM would continue its current management policies for soil and vegetation. The goal of soil management would remain the same: minimize erosion, rehabilitate eroded areas to maintain and enhance conditions of watersheds, and reduce the potential for nonpoint source pollution. This goal would continue to be pursued through the installation of erosion-control structures, management of livestock and wildlife vegetation use, and use of control and mitigation measures

for activities that may contribute to soil erosion. The BLM would continue to manage uplands in accordance with Standards 1 and 2 of the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (BLM 1997a).

The BLM would also continue to manage vegetation to maintain the necessary groundcover required for maintenance and enhancement of watershed conditions, and reduce nonpoint source pollution. The BLM would continue current livestock management directions based on the Safford District RMP. In accordance with the BLM's 2004 Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management, prescribed fires would be used where appropriate in accordance with preapproved burn plans. Prescribed fire would not be allowed in riparian canyons.

3. Current Riparian Management

Current management directions for riparian areas located in the AEPA would continue, as detailed in the Safford District RMP, Arizona Riparian-Wetland Area Management Strategy (BLM 1990), and ACW Management Plan (BLM 1988). The BLM would also continue to manage riparian resources in accordance with Standard 2 of the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (BLM 1997a) to maintain and promote proper functioning condition of riparian areas. No management policies specific to Turkey Creek or other riparian areas other than Aravaipa Creek would be developed or implemented.

4. Current Wildlife Management

The BLM would continue to cooperate with the AGFD to manage wildlife and wildlife habitat in the planning area. The BLM would also cooperate with the USFWS to develop and implement recovery plans for T&E species. The BLM's policy to manage candidate species and their habitats to prevent the need for threatened or endangered listing would continue. In addition, the BLM would continue to manage wildlife resources in accordance with Standard 3 of the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (BLM 1997a).

5. Current Cultural Resources Management

Under the No Action Alternative, cultural resources would continue to be managed for potential information, public uses, and conservation. The BLM would continue to manage these resources in accordance with its cultural resources management program, which is designed to identify, plan the use of, and manage all cultural resources on its lands.

6. Current Recreation Management/Visual Resource Management

The BLM would continue to provide dispersed and resource-dependent outdoor recreational opportunities and to address rare situations when special or intense types of recreation

management are required. The BLM would also continue to evaluate, and mitigate if necessary, every BLM action for its impact on the overall scenic quality of the AEPA.

7. Current Travel Management

The BLM would continue to implement decisions regarding the locations of legal access (vehicular, equestrian, pedestrian), construction or closure of roads and trails, and designation of OHV use based on the Safford District RMP. Additionally, the BLM would continue providing private property owners reasonable access to their respective properties.

8. Current Special Area Designations Management

Individual management plans for the designated ACECs and RNAs would continue to be required under the No Action Alternative. Until the individual management plans are completed, these areas would be managed in conformance with the Safford District RMP. The ACW area would continue to be managed in accordance with both the Safford District RMP and the ACW Management Plan (BLM 1988). In addition, because 10 miles of Aravaipa Creek have been recommended to Congress for designation as "Wild" under the Wild and Scenic Rivers Act, the BLM would continue to provide adequate interim protection and management for this creek as identified in the Final Arizona Statewide Wild and Scenic Rivers Study Report/Record of Decision (BLM 1994a).

9. Current Public Information and Education Management

The BLM would continue to use information and education, when feasible, before relying on regulations and facilities to achieve management objectives. The BLM would provide information on management (especially wilderness management) without promoting or advertising the area. Printed information would be concise, current, and easily understood; information from various sources would be reviewed to ensure accuracy and consistency. Environmental education and nature studies would continue to be appropriate activities within the wilderness within the AEPA.

10. Current Law Enforcement and Safety Management

The BLM would continue to monitor resource conditions, supervise visitor use, monitor permit and fee systems, investigate unauthorized use, and render assistance primarily through regular patrol by rangers. Assistance would continue to be obtained from BLM special agents and the Safford District law enforcement ranger, or by request through the Pinal County Sheriff's Office, Graham County Sheriff's Office, Arizona Department of Public Safety, or AGFD.

C. Description of Other Alternatives Considered

Representatives from the BLM, AGFD, and TNC developed the ecosystem plan with extensive public input. The team chose the planning area to reflect common management issues, including the uplands which have the most direct effects on the perennial reach of Aravaipa Creek, and those lands managed by the BLM and TNC. A vision for the area was developed, based on the mission of the three organizations and the agencies' experience with the area. As detailed in Chapter 8 of the Aravaipa EMP, the planning effort involved concerned members of the public that participated in the workshop and many that continued to participate in seven workgroups. These workgroups reviewed issues raised during scoping, discussed these issues, and drafted management objectives that were presented to the core team. The core planning team compiled information on current ecosystem resources, refined the objectives, and developed management actions, connecting these to the described issues. Objectives and management actions that did not meet the vision (purpose) of the planning area, as determined by the core team, were not proposed in the plan and therefore are not alternatives carried forward for further consideration and analysis.

Alternative Action for Travel Management

Based on issues raised during scoping, three alternatives, in addition to the current management, were considered for travel management. Each of these alternatives included different designation combinations to classify roads in the planning area. Roads in the planning area were evaluated, and the three alternatives were developed considering different levels of road closures or road construction. These three alternatives were developed using a Route Evaluation Tree Process to recommend route designations by evaluating the management area to identify concerns regarding resource protection, recreation, and commercial access (Appendix 6). Related issues such as law enforcement, maintenance, road safety, access to private property, and user conflicts were also identified and evaluated in the context of management goals and the desired future condition. Recommended alternative road designations included the following: "limited to administrative use," "limited to non-motorized use," "mitigate open," "open," and "closed."[2] Based on legal constraints, allowing motorized travel into the ACW area was not considered. Elements of the three alternatives were considered to develop the Preferred Alternative, based on management objectives and public and agency input. Information on the other considered alternatives is available from the BLM Safford Field Office.

2 Limited = open to specified users; Mitigation Open = open, but with prescribed mitigation actions; Open = open to all vehicles; and Closed = closed to all vehicles.

CHAPTER 3.
AFFECTED ENVIRONMENT

A description of the affected environmental can be found in Chapter 3, "Ecosystem Resources," of the Aravaipa Ecosystem Management Plan.

CHAPTER 4.
ENVIRONMENTAL CONSEQUENCES

The following critical elements[3] have been considered and would not be affected by implementing either the Proposed Action or No Action Alternative: air quality; prime and unique farmland; floodplains; and visual resources. Additionally, based on scoping input, geographic setting of the project area, and preliminary investigations, the following resource concerns were eliminated from further evaluation: energy, environmental justice, hydrology, lands/realty, and paleontology. Neither alternative would result in any socio-economic impacts, or any impacts that were disproportionate to any specific group of users.

Based on agency and public input, initial investigations, discussions with BLM resource specialists, and the geographic context of the project area, the following critical elements may be present or potentially affected by the Proposed Action or No Action Alternative: ACECs, cultural resources, Native American religious concerns, wildlife (T&E and non-T&E species), wastes (hazardous or solid), water quality, wetlands/riparian areas, wild and scenic rivers, wilderness, and invasive and nonnative species. Additional elements that may be affected, but are not identified as critical elements, include upland resources, recreation, travel management, soils/minerals, and law enforcement.

A. Impacts of the Proposed Action

1. ACECs

The Turkey Creek Riparian ACEC, Table Mountain RNA ACEC, and Desert Grasslands RNA ACEC were established in the 1991 Safford District RMP; the RMP also prescribed certain management actions for these ACECs. The Aravaipa EMP serves as an activity plan for these areas.

3 "Critical elements" are defined in BLM NEPA Handbook (H-1790-1) and BLM Instruction Memorandum No. 99-178.

a. Turkey Creek Riparian ACEC

In addition to continuation of the management actions prescribed as part of the 1991 Safford District RMP for the Turkey Creek Riparian ACEC, the Proposed Action would also limit camping along Turkey Creek Road to designated campsites (Refer to Map 6). Camping restrictions in this area would allow areas along Turkey Creek's riparian zone to regenerate.

In addition, management actions identified for other resource management objectives (i.e., upland, riparian, cultural, recreation, and transportation resources) would assist in protecting the important cultural, scenic, and wildlife values of the Turkey Creek Riparian ACEC, minimizing existing impacts on the values for which it was designated. For example, the Proposed Action would restrict plant harvesting and remove nonnative riparian species (as is practical); this restriction and removal would be expected to maintain the diverse native plant communities in the planning area as a whole. Livestock access to Aravaipa Creek and riparian corridors along Turkey Creek would be restricted throughout the growing season (except for equestrian use and pack stock); this would help sustain or restore riparian plants and stream and wetland structure and function.

Erosion control and cienega restoration activities would be implemented in the upper end of Turkey Creek; this would assist in sustaining or restoring wetland ecosystems to proper functioning condition. Any specific erosion-control features would be evaluated on a case-by-case basis for compliance with all applicable federal laws, including the National Environmental Policy Act (NEPA) and ESA, and to ensure that any features are in compliance with applicable objectives.

The Proposed Action would also designate Turkey Creek as a priority area for the completion of Class III intensive cultural resources inventories, which would identify all cultural properties in the Turkey Creek area. The BLM would use these data to determine effective and applicable research and protection/preservation strategies, while continuing to maintain the Turkey Creek Site for public visitation. Additionally, the Turkey Creek route beyond Oak Grove Canyon, which is currently designated as closed, would be kept closed and rehabilitated. Implementation of the proposed Aravaipa EMP would help protect or enhance the important cultural, scenic, and wildlife values for which the Turkey Creek Riparian ACEC was designated.

b. Table Mountain RNA ACEC

Although the Aravaipa EMP does not include new management actions specific to the Table

Mountain RNA ACEC, it would continue the management actions prescribed as part of the 1991 Safford District RMP, as amended. Additionally, management actions identified in the Aravaipa EMP for wildlife, riparian, and upland resource management objectives are relevant to the ACEC and would help maintain and protect the two important plant communities for which it was designated (refer to Chapters 4.A.4, Wildlife (T&E); 4.A.7, Wetlands/Riparian Areas; and 4.A.10, Upland Resources). For example, the BLM would manage fire in the planning area with wildland fire use on the south rim - south of Aravaipa Canyon and west of Turkey Creek Canyon - including the area within the Table Mountain ACEC. Any prescribed fire in the ACEC would be used only after completion and approval of a written plan, including analysis of existing conditions and resource objectives specific to the special management needs of this ACEC. Implementation of the proposed Aravaipa EMP would assist in protecting or enhancing the important plant communities for which the Turkey Creek Riparian ACEC was designated.

c. Desert Grasslands RNA ACEC (Pilares Unit)

As with the Table Mountain RNA ACEC, the Aravaipa EMP does not include new management actions specific to the Desert Grasslands RNA ACEC (Pilares Unit), but would continue the management actions prescribed as part of the 1991 Safford District RMP/EIS. Additionally, management actions associated with upland and transportation objectives (refer to Chapters 4.A.10, Upland Resources, and 4.A.12, Travel Management) include actions to manage the ACEC to maintain and protect the relict grasslands for which it was designated. Prescribed fire would be used only after completion/approval of a written plan, which would include analysis of existing conditions and resource objectives specific to the special management needs of this ACEC. Implementation of the proposed Aravaipa EMP would help protect or enhance the relict desert grasslands in the Pilares Unit for which the Desert Grasslands RNA ACEC was designated.

2. Cultural Resources

Under the Proposed Action, Class III cultural resources inventories would be conducted in the Aravaipa Canyon, Virgus Canyon, Horse Camp Canyon, Cave Canyon, Oak Grove Canyon, Turkey Creek, Booger Canyon, Hell Hole Canyon, and Parsons Canyon areas, which have all been identified as priority areas for cultural resources surveys. Class III inventories in these high-priority areas would be conducted until each area has been 100 percent surveyed. Additionally, the Proposed Action would include Class II cultural resources inventories outside the priority areas mentioned above. The identification of cultural resource properties would provide valuable information about the earliest human occupation of the area, as well as provide information pertinent to historic-era activities. The completion of additional cultural resources field surveys

would help to identify and assess historic cultural properties within priority geographic areas and to characterize model the probable density, diversity, and distribution of historic cultural properties outside the priority geographic areas within the AEPA. This data would then be used to predict site density, variability, and use categories, thus helping minimize disturbance to cultural resources in the AEPA.

As part of the Proposed Action, known archaeological and historic sites would be revisited to update documentation, assess condition, evaluate NRHP eligibility, and categorize sites by use categories. Systematically revisiting and monitoring known archaeological and historic sites within the planning area would provide an ongoing assessment of cultural property status and impacts, and would permit a timely response to reducing or stopping most adverse impacts on historic properties.

Under the Proposed Action, where applicable, the BLM would implement physical protection measures (e.g., stabilization, fencing, signing, patrolling) to preserve cultural resources on sites that are currently being impacted by various activities. These protection measures would make visitors more aware of the social and scientific value of sites and the applicable laws protecting cultural resources and would prevent livestock and visitors from disturbing significant cultural properties.

If new travel routes were to be pursued, as allowed by the Proposed Action (refer to Chapter 4.A.12, Travel Management), the routes would be surveyed for cultural resources. Significant cultural resources would be avoided, when feasible, in planning the proposed routes. Testing and data recovery efforts, as appropriate, would be conducted before any ground-disturbing activities if the routes could not avoid cultural resources sites. These actions would mitigate any potential adverse effects of road construction on cultural resources.

The BLM would include general information about cultural resources in the planning area on the Aravaipa website. Increased monitoring of visitor use and developing outreach programs and educational brochures/signs focused on the protection of planning-area resources would be expected to increase awareness of cultural resources laws and to diminish ongoing adverse impacts, such as unauthorized collection and unintentional damage, on cultural sites.

3. Native American Religious Concerns

Under the Proposed Action, an ethnographic study of the AEPA would be conducted to identify places of traditional use that are of continuing importance to Native American tribes.

The identification of sacred places would minimize unintentional disturbance to these places. Additionally, the BLM would continue to provide opportunities for tribal participation in research and interpretation of ancestral sites and would continue to consult with tribes to identify places of traditional use, tribal needs for access and natural resources use, and measures for protecting places of traditional importance that might be identified by tribes during the life of the plan. Additionally, although vegetative product sales would continue to be prohibited in the planning area, traditional Native American uses would be allowed.

4. Wildlife (T&E Species)

The BLM would retain, maintain, or enhance habitat essential to the recovery or survival of any T&E species, including habitat historically used by these species. For example, the Aravaipa EMP maintains the restriction on livestock access (except for equestrian use and pack stock) to Aravaipa Creek and the restriction of livestock from certain riparian corridors throughout the growing season (April-October). These restrictions would support recovery of T&E species by maintaining streambank cover, canopy cover over the stream, herbaceous basal cover, streambank stability, and instream habitat complexity; enhancing post-flood recovery by reducing sediment production and transport; and eliminating the potential for damage to riparian plants and wetland structure/function from concentrated livestock use.

The BLM would also evaluate potential habitat for supplementing or reestablishing historical native species with emphasis on T&E and special-status species. This would include consideration of wildlife benefits on any lands proposed for acquisition. Although the Aravaipa ecosystem is largely intact, there are components for which habitat restoration or acquisition can improve regeneration.

The BLM would inventory and map existing fences, remove unused fences, and modify existing fences to meet BLM and AGFD standards, which would reduce the number of obstacles (fences) that may currently function as wildlife movement barriers. The Proposed Action would also limit wood harvesting to dead and down trees smaller than 10 inches in diameter and 42 inches in length. This would protect native woody plant species and the wildlife dependent on them and ensure that large dead trees, which provide important wildlife habitat, are not harvested for firewood or other purposes.

Native species, both aquatic and terrestrial, may be adversely affected by nonnative species through competition for food and resources, consumption, hybridization, diseases and parasites, and an altered ecosystem. Preventing introduction is the best way to limit the spread of nonnative

species; however, reduction of nonnative species may be necessary to protect native species and ecosystems where nonnative species are already established. With the Proposed Action, the BLM, AGFD, and TNC would monitor nonnative species, and the impacts of these species on the Aravaipa ecosystem, and develop appropriate management actions to control these species. Nonnative aquatic species would be removed by direct means, where possible. The BLM, AGFD, or TNC may, however, consider chemical use or other methods of nonnative removal and control where necessary. The BLM, AGFD, and TNC would prepare a contingency plan for such removal and control actions.[4]

The BLM would restrict vehicular access to designated roads to minimize erosion, removal of native vegetation, and introduction of nonnative species. Invasive and noxious weeds are easily moved from place to place through hay and other feed sources; therefore, under the Proposed Action, the BLM would also require the use of hay or feed that is certified to be free of weeds (and weed seed), and remove nonnative riparian species, as is practical, in accordance with the Vegetation Treatments Programmatic EIS (BLM 2005). Although the Aravaipa ecosystem remains relatively intact and provides rich communities of plants and animals, monitoring, preventive measures, and removal of nonnative species would assist in the maintenance and recovery of natural healthy systems. This would prevent habitat loss and help with the recovery of threatened native populations, as well as general wildlife, in the planning area.

With implementation of the Proposed Action, the BLM would monitor for native/nonnative parasites in the seven native fish species living in Aravaipa Creek. Because isolated populations, such as those present in the Aravaipa ecosystem, are susceptible to devastating losses because of diseases and parasites, understanding the causative agents is important to formulate management approaches. Therefore, parasite monitoring and appropriate responses would be expected to reduce parasites and decrease the risk of devastation to native fish species populations.

In addition to monitoring native/nonnative parasites in fish, the BLM would support continued monitoring of amphibians in Aravaipa Creek for chytrid fungus (a skin infection that is often fatal). As part of the Proposed Action, the BLM would also develop a sampling plan to monitor water quality, macroinvertebrates, and sediment to ensure that lead and arsenic do not exceed acceptable standards in Aravaipa Creek (refer to Chapter 4.A.6, Water Quality). Monitoring the presence of chytrid fungus, water quality, and sedimentation in Aravaipa Creek, and taking appropriate response actions to contamination problems, would enhance habitat for aquatic species, as well as other wildlife that use the creek as a water source.

4 The contingency plan would undergo a full review for environmental policy compliance, and therefore, impacts associated with the actions of this plan are not discussed in detail in this document.

The Proposed Action would reestablish viable populations of Gila topminnow and desert pupfish at middle and lower Oak Grove Canyon, Parsons Canyon, and Virgus Canyon and would consider reestablishment of topminnow and pupfish and other native fish populations consistent with AGFD and USFWS management plans in suitable habitats. Reestablishment and supplementation of threatened populations is an important tool in species conservation. In addition to cooperating and coordinating with the AGFD and TNC on the management of wildlife species and their habitat within the Aravaipa Creek ecosystem, the BLM would support the establishment of refugia populations of Aravaipa Creek fish species.

The Proposed Action includes maintaining a viable population of desert bighorn sheep; this may include supplemental translocations if the population falls below 50 animals. Translocation to potential release sites at Hell Hole Canyon or Horse Camp Canyon would be considered. In the event of disease, natural disasters, or other substantial threats to the desert bighorn sheep population, translocation of individuals would be expected to help maintain healthy and genetically diverse populations. An unnecessary segment of Painted Cave Road, located adjacent to primary bighorn sheep habitat, would be closed as part of the Proposed Action. The BLM would also institute year-round or seasonal closures of 5.89 miles of road segments in primary bighorn sheep habitat as described in Chapter 4.A.12, Travel Management. These route restrictions would result in decreased disturbance and a reduction in the potential for vehicular-wildlife conflicts, especially during the critical lambing season. If the Proposed Action were implemented, the BLM would restrict livestock permits within the planning area to cattle and horses. Bighorn sheep are more susceptible to disease transmitted from domestic sheep and goats than from cattle. Because diseases spreading from domestic sheep and goats to desert bighorn sheep can have substantial negative impacts on native sheep populations, restricting livestock permits would minimize the potential for disease to spread from livestock to the desert bighorn sheep population.

Aravaipa Creek supports seven native fish species: longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus [Pantosteus] clarkii*), Sonora sucker (*Catostomus insignis*), roundtail chub (*Gila robusta*), spikedace (*Meda fulgida*), speckled dace *(Rhinichthys osculus*), and loach minnow (*Tiaroga cobitis)*. All of these species have suffered reductions in their distribution. Two of these species, loach minnow and spikedace, are federally listed as threatened. While these species differ in some of their habitat requirements, they share a basic need for perennial streamflow that is free from pollution. Elevated levels of arsenic, cadmium, lead, and selenium have been found in fish tissue in Aravaipa Creek (King and Martinez 1998); this contamination is believed to be from mine tailings located north of Klondyke transported to the creek by stormwater runoff or wind. Under the Proposed Action, the BLM would develop a sampling plan to monitor water

quality to determine if lead and arsenic levels exceed acceptable standards and to respond appropriately if sampling identifies contamination problems. Monitoring and appropriately addressing contaminates in the creek would enhance habitat for all species dependent on Aravaipa Creek.

Excessive sediment deposition has reduced the diversity of aquatic habitat in Aravaipa Creek, most noticeably at the canyon's upstream end. The Proposed Action includes several measures to protect streambanks, such as placing obstructions in trails along stream edges to reduce streambank disturbance from visitors, educating hikers to use trails away from the stream edge, maintaining livestock restrictions in Aravaipa Creek and other select riparian corridors during the growing season, and minimizing vehicle crossings in riparian habitat.

To maintain and enhance native populations in the planning area, baseline data must be acquired to compare population and habitat changes over time. The BLM would coordinate and support monitoring of native/nonnative fish populations, game species, and nongame species consistent with long-term datasets. The Proposed Action would also include an inventory of fish and other key aquatic species in stock tanks, tributaries, and springs to obtain information on opportunities for and threats to native aquatic life. The BLM would also inventory special-status species to determine their presence or absence and to establish baseline information on species such as the Mexican spotted owl, desert tortoise, cactus ferruginous pygmy-owl, Mexican garter snake, yellow-billed cuckoo, raptor species, and bat species found around Virgus Canyon. These data would provide information about populations and health risk trends which, in turn, would help to develop management options.

The Proposed Action may include the establishment of a scientific advisory committee to regularly review fish monitoring data and threats to the aquatic community, and to provide guidance on management actions to maintain and enhance the native species. This committee may be composed of scientists from the BLM, AGFD, TNC, USFWS, universities, and the public, and supplemented by other experts as appropriate for particular issues. The committee would meet annually to discuss data analyses and adaptive management. The advisory committee would allow interested parties to freely share the data necessary for making appropriate management decisions. Any specific actions recommended by the committee would be analyzed for compliance with all applicable management plans, laws, regulations (including ESA and NEPA), and policies on a case-by-case basis. This committee may be subject to the Federal Advisory Committee Act, which would be dependent on the outcome of a Memorandum of Understanding (MOU).

In areas where sensitive biological resources are identified adjacent to existing campsites, the BLM may temporarily close individual campsites in order to protect these resources. This would minimize the potential for disturbance to T&E species from visitors during species-specific periods of high sensitivity.

Because private land is located within the planning area, as part of the Proposed Action, the BLM would also obtain legal motorized access across this private land to public lands in the AEPA (refer to Appendix 6; Map 5). The legal access to be pursued would be for public and administrative use. In certain cases, if easement to public lands is not obtained, the BLM would pursue new routes, if needed, to provide administrative access to public land. This would consist of up to three new routes to provide access to the east Aravaipa Canyon trailhead. The establishment of new routes, if needed, could result in wildlife mortality, increased noise disturbance (to wildlife as well as to the public), soil disturbance, and the elimination of habitat. Additionally, new routes could have the potential to introduce invasive species to portions of the planning area through the introduction of vehicles that may be contaminated with noxious weed seeds. Because the exact location or length of these routes is unknown, the BLM would analyze potential effects of the Proposed Action to determine if T&E species may be affected, and complete a Biological Evaluation – if needed – prior to any route construction to determine impacts on wildlife (including T&E or sensitive species) and appropriate mitigation. Although the Proposed Action may include up to three new routes (for a total of approximately five miles of new road), it would also close approximately 17 miles (seven percent) of existing routes. In these areas, impacts on wildlife from wildlife mortality, noise disturbance, and spread of invasive species due to vehicles would substantially diminish and long-term restoration of habitat would be expected.

If the Proposed Action were implemented, the BLM would initiate Section 7 consultation with the USFWS for all impacts on federally listed species.

5. Wastes (Hazardous or Solid)

As previously discussed, existing historic mine tailings associated with mine sites and an ore-processing mill are located northwest of Klondyke. These tailings are contaminated with high amounts of arsenic and lead and may contain other hazardous materials. As part of the Proposed Action, the BLM would develop a sampling plan to monitor water quality and sediment to ensure that lead and arsenic do not exceed acceptable standards in Aravaipa Creek. The sampling methods would measure rates of lead and arsenic that flow into Aravaipa Creek and would comply with ADEQ standards. The BLM would ensure that all sampling and other contact with known

hazardous contaminants would be conducted in a manner to protect human health and safety. If the sampling identifies contamination problems, the BLM would work with the state, due to the tailings pile (source) being located on state and/or private land. By monitoring and protecting Aravaipa Creek from excessive on-site and off-site pollutants, the Proposed Action would minimize contamination from these known hazardous waste sites.

Under the Proposed Action, the BLM would close approximately 17 miles of existing roads, which would eliminate motor vehicle use in these areas and would decrease the potential for oil, gasoline, and other hazardous materials spills. Conversely, if the BLM pursued new routes to secure public access, areas that would be newly opened to vehicular use would be potentially impacted by such releases. Minimizing vehicle crossing in riparian areas would minimize the potential for such materials to contaminate watercourses in the planning area.

6. Water Quality

Under the Proposed Action, the BLM would post signs at both ends of Aravaipa Canyon and would include messages in other public education materials to educate hikers to use trails away from the stream edge to protect the streambanks and reduce sedimentation of the stream. In addition, obstructions would be placed in trails to discourage stream-edge trail use. By minimizing disturbance from human traffic at stream edges, streambank degradation would be lessened, therefore reducing impacts on proper functioning of wetlands and riparian areas and, therefore, water quality.

In addition, as discussed in Chapter 4.A.5, Wastes (Hazardous or Solid), management actions identified to monitor water quality to ensure that lead and arsenic do not exceed acceptable standards in Aravaipa Creek would also enhance water quality in Aravaipa Creek. This would be accomplished by identifying the problem(s), locating the source and, depending on the ownership, working with the appropriate agencies. Minimizing vehicular crossings in riparian areas would also minimize the potential for oil or petroleum to leak into watercourses. Therefore, by increasing protection of Aravaipa Creek from excessive disturbance and pollutants, the Proposed Action would result in improvements to water quality in the planning area.

7. Wetlands/Riparian Areas

Management actions associated with the Proposed Action would include the collection of flow data in Deer Creek and the application for instream flow rights for Deer Creek. Collection of flow data would allow for the application of instream flow rights with the Arizona Department of Water Resources. Obtaining these rights would ensure that adequate streamflows are maintained;

perennial streamflow is the basic requirement for many wildlife and recreation values. A natural flood regime and appropriate levels of sediment transport through the system are also important for healthy aquatic and riparian communities. The instream flow rights would help ensure that streamflows remain to support the federally listed spikedace and loach minnow. Maintaining adequate streamflow would also support riparian areas and would maintain or enhance the recreational uses of Aravaipa Creek and its tributaries.

Restricting livestock in specific reaches of riparian corridors throughout the growing season (April-October) would minimize the potential damage of livestock trampling and grazing on riparian plants and wetland structure and function. For riparian areas that are currently not in proper functioning condition, the Proposed Action would include management actions to allow for a maximum of 20 percent use of perennial grasses, forbs, shrubs, and trees by livestock. By limiting livestock use in these areas, currently nonfunctioning riparian/wetland areas would have an opportunity to regain their proper functioning capacity as quickly as nature and active management allow. Continuing the restriction on livestock access (except for equestrian use and pack stock) to Aravaipa Creek from all grazing allotments would maintain streambank cover, canopy cover over the stream, herbaceous basal cover, streambank stability, and instream habitat complexity by enhancing post-flood recovery and by reducing sediment production and transport.

The Proposed Action would include establishing erosion control and cienega restoration in the upper end of Turkey Creek and other potential locations, minimizing vehicle crossings in riparian areas, limiting camping along Turkey Creek Road, and constructing erosion-control features (e.g., gabions and dirt check dams) outside the wilderness at existing riparian crossings such as those in Turkey Creek and Parsons Canyon. These actions would be expected to contribute to long-term improvements to riparian areas. Additionally, as part of the Proposed Action, the BLM would designate segments of Routes 5021 and 5021a as closed to protect riparian values. Furthermore, as discussed in Chapter 4.A.6, Water Quality, improvements to water quality within riparian areas would also result in corresponding improvements to overall wetland/riparian health.

8. Wild and Scenic Rivers

Segments of Aravaipa and Turkey creeks were determined eligible for inclusion in the National Wild and Scenic Rivers System in the Safford District RMP. The RMP also dictated that the BLM would manage these segments to maintain the qualities that led to the determination of eligibility until Congress designates the creek segments as Wild and Scenic or removes them from

consideration. In the Final Arizona Statewide Wild and Scenic Rivers Study Report/Record of Decision (BLM 1997b), Turkey Creek was determined to be unsuitable for designation. However, 10 miles of Aravaipa Creek was identified as suitable for designation as a Wild river.

Under the Proposed Action, no additional management actions specific to Wild and Scenic Rivers have been identified for these segments beyond those listed in the RMP. However, other management actions identified as part of the Proposed Action are anticipated to enhance the following remarkable values of Aravaipa Creek that make it suitable for listing in the National Wild and Scenic Rivers System: scenic quality, fish and wildlife, hydraulic values, and recreational opportunities. Refer to Chapters 4.A.4, Wildlife (TES); 4.A.6, Water Quality; 4.A.7, Wetlands/Riparian Areas; and 4.A.11, Recreation, for a discussion of impacts on these resources as a result of the Proposed Action.

9. Wilderness

As part of the Proposed Action, the BLM would mandate dispersed camping in the ACW. No trails or other recreation developments would be maintained or constructed in the ACW, continuing the current management approach. Prohibiting new trails and allowing existing trails to deteriorate would minimize traces of human presence, which would promote wilderness values. Allowing only dispersed camping and hiking would reduce the impact and visibility of continued use of specific sites/trails. Because fire rings become depositories for garbage, and encourage repeat camping at a specific site, the BLM would increase restrictions on the use of campfires and associated fire rings. The BLM would require that all traces of campfires/fire rings be eliminated before a campsite is vacated.

The BLM would also inform visitors of the preferred methods (i.e., pack out) and minimum requirements for disposing human waste. The BLM would monitor human waste disposal practices in the canyon and revise policies as necessary. Human waste also tends to accumulate near popular campsites. The BLM would continue to conduct regular inventory and monitoring of campsites in the ACW, in accordance with Limits of Acceptable Change procedures, to evaluate human impacts and determine whether additional actions are necessary to restore specific sites. Dispersing camping and eliminating fire rings would minimize traces of human presence in the wilderness, and, therefore, improve wilderness values in the ACW. As part of the Proposed Action, the BLM would develop recreational infrastructure outside the ACW only at sites that do not encourage nonpermitted access to the wilderness; managing recreation in upland areas to avoid unauthorized use of the ACW would enhance wilderness values.

The BLM would also continue to limit pack stock to day use in Aravaipa Canyon. Under the Proposed Action, no more than 10 pack animals per day would be allowed in the canyon, and all feed brought into the ACW would be certified weed- and weed-seed-free. According to BLM Safford Field Office staff, the number of animals per day does not currently exceed this threshold. Therefore, this would be consistent with existing use in the canyon. Prohibiting overnight grazing and limiting the number of stock animals would minimize impacts on vegetation and streambanks. Certified weed-free feed would minimize the introduction of nonnative vegetation from feed, which would promote native vegetation health and abundance in the planning area. Restrictions on pack stock in the canyon would promote the health of vegetation and streambanks in the planning area, specifically in the ACW, where preserving the wilderness characteristics is the primary management objective.

Pets, except for service animals that assist visitors, would continue to be prohibited in Aravaipa Canyon and its side canyons; however, pets would be allowed in the upland zones of the wilderness. As identified in the ACW Management Plan (BLM 1988) and by the Arizona Game and Fish Commission for the Aravaipa Canyon Wildlife Area (AGFD Commission Rule R12-4-802.3), the BLM would continue to prohibit the discharge of firearms within 50 vertical feet of the Aravaipa streambed and would enact further restrictions on the discharge of firearms if necessary to protect visitor safety. Prohibiting pets and the discharge of firearms in the narrow canyon areas of the ACW would minimize threats to wildlife and vegetation, and avoid uncontrolled noise and disruption, which would assist in preserving a unique place for solitude and appreciation of nature.

The BLM would continue to work with appropriate agencies to minimize low-altitude flights (less then 2,000 feet above ground level) over the ACW, except in emergencies or for AGFD surveys (as outlined in an existing MOU with the Arizona Game and Fish Commission). Because noise generated by low-flying aircraft is not compatible with the wilderness experience, minimizing these rare occurrences would continue to provide solitude in the ACW.

If the Proposed Action were to be implemented, the BLM would continue the current wilderness permit system, including current limits on the number of permits issued and on the size and duration of hiking and camping groups in the ACW. The BLM would also continue to require all providers of commercial services in the ACW to operate under a Special Recreation Permit issued by the BLM. Commercial Special Recreation Permit holders may be subject to permit limitations, consistent with current requirements. Additionally, with the Proposed Action, the

BLM would periodically review this system either to identify ways to improve it for the end user or to address potential user abuse of the system.

Consistent with the ACW Management Plan (BLM 1988), the BLM would station full-time rangers at Aravaipa Canyon's east and west entrances and would maintain present administrative sites and residences. This would enable the BLM to monitor resource conditions and visitor use, provide visitor information, administer and enforce the permit system, and provide oversight to maintain the wilderness characteristics of Aravaipa Canyon.

In addition to increased oversight and management through the permit system and ranger/administrative stations, the BLM would maintain trailhead facilities at each end of the canyon, including information kiosks, trail registers, restrooms, and trash receptacles. The BLM would post and maintain signs along the ACW boundary and cherry-stem roads and would maintain larger signs at both the east and west main entrances. The trailheads, outside the boundary of the ACW, would educate users in preferred hiking and camping techniques, allow and encourage waste disposal outside the ACW , and allow for additional monitoring of visitor use. Posted wilderness boundary signs would prevent unintentional unauthorized use of the ACW by informing visitors of the location of the wilderness boundary. Increased user education and monitoring would be expected to correspond with increased compliance with wilderness requirements.

10. Invasive and Nonnative Species

Invasive, nonnative species are currently very limited in the planning area. Preventing introduction is the best way to limit the spread of nonnative species; and control efforts are most effective before populations become widely established. Therefore, the BLM would continue to monitor and control, where feasible, invasive, nonnative species that pose a substantial threat to the Aravaipa ecosystem.

With the Proposed Action, the BLM would monitor nonnative species, and the impacts of these species on the Aravaipa ecosystem, and develop appropriate management actions to control these species. However, reduction/removal of nonnative species may be necessary to protect native species and ecosystems where nonnative species are already established. The BLM would remove nonnative riparian species, as is practical, in accordance with the Vegetation Treatments Programmatic EIS (BLM 2005).

Invasive and noxious weeds are easily moved from place to place through hay and other feed sources. Under the Proposed Action, the BLM would require the use of hay or feed that is

certified to be free of weed (and weed seed). This would include hay and feed for pack stock and for the livestock of those visitors who engage in recreational horseback riding. Certified weed-free feed would minimize the introduction of nonnative vegetation from feed, which would promote native vegetation health and abundance in the planning area.

Under the Proposed Action, the BLM would continue to manage invasive/nonnative species in accordance with the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (BLM 1997). Through this process, new allotment-specific objectives would be developed, and guidelines for management practices that would target noxious weed populations that could be controlled or eliminated by approved methods would continue to be followed.

The BLM would also restrict vehicular access to designated roads to minimize the introduction of nonnative species. New routes could have the potential to introduce invasive species to portions of the planning area through the use of vehicles that may be contaminated with noxious weed seeds. Because the exact location or length of these routes is unknown, the BLM would complete a Biological Evaluation prior to any route construction to determine impacts on wildlife (including T&E or sensitive species) and appropriate mitigation. Although the Proposed Action may include up to three new routes, it would also close approximately 17 miles of existing routes. In these areas, spread of invasive species due to vehicle use would substantially diminish and long-term restoration of native habitat would be expected.

11. Upland Resources

In addition to continuing restrictions of vehicular access to designated roads, the BLM would investigate potential locations of erosion problems and, if feasible, initiate erosion-control projects. The Proposed Action would limit wood harvesting to dead and down wood that is smaller than 10 inches in diameter and less than 42 inches in length, and to on-site use only. The Proposed Action would prohibit vegetative product sales in the planning area.[5] Continuing to allow vehicular access only on designated roads would limit erosion, removal of native vegetation, and introduction of invasive species; these actions would continue to help protect upland ecosystems in the AEPA. If completed, erosion-control projects would enhance this protection. The proposed limitations for wood harvesting would allow for campfire use, while protecting the native woody plant species and eliminating harvest of large dead trees, which provide important wildlife habitat. Additionally, prohibiting vegetative product sales would result in less disturbance to vegetation; this would help maintain sustainable populations of the unique vegetation in the Aravaipa ecosystem.

5 Restrictions to vegetative sales associated with the Proposed Action would not prohibit traditional Native American uses.

The BLM has completed allotment management plans for two of the eight allotments within the planning area; however, these two plans need to be updated. The BLM would prepare the Standards for Rangeland Health Evaluations on grazing allotments within the planning area, replacing the need for new or updated allotment management plans. The evaluations would determine if the BLM's 1997 Arizona Standards for Rangeland Health and Guidelines for Grazing Administration are being met on each of the eight allotments. Through this process, new allotment-specific objectives would be developed; recommendations for changes in grazing management would be made if needed.

If the Proposed Action were implemented, the BLM would restrict livestock permits within the planning area to cattle and horses, and no permits for domestic sheep and goats would be issued. There are no current livestock permits for domestic sheep and goats issued in the AEPA. Therefore, eliminating these permits would not affect current users of these permits.

Site-specific desired future conditions for uplands, and tools for achieving these conditions, such as prescribed fire and invasive species treatments, would be established through the land health evaluation process, in accordance with Bureau policies. The Proposed Action would continue the current use of prescribed fires, where appropriate, following preapproved burn plans, in accordance with the 2004 Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management.[6] Prescribed fire would continue to be restricted in riparian canyons.

This would assist the BLM in managing uplands for the recovery, as appropriate, of all special-status species within the planning boundaries. Although not all special-status species in the planning area live in the uplands, the upland communities affect the health of the riparian and aquatic communities.

Invasive, nonnative species currently are very limited in the Aravaipa ecosystem. If allowed to spread, these species can replace native species in upland areas as well as in the planning area as a whole. Therefore, the BLM would continue to monitor and control, where feasible, invasive, nonnative species that pose a substantial threat to the Aravaipa ecosystem. Control efforts are most effective before populations of invasive, nonnative species become widely established. Invasive and noxious weeds are easily moved from place to place through hay and other feed sources; therefore, under the Proposed Action, the BLM would require the use of certified

6 Prescribed fire would be used only after completion and approval of a written plan, including analysis of existing conditions, and resource objectives. In all cases, fire management will adhere to the *Biological and Conference Opinion for the BLM Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management* (USFWS 2004)

weed-free (and weed-seed–free) hay and feed. Arizona has a certified weed-free hay program in place that can provide a local source for weed-free hay; therefore, permittees would not be substantially affected by this requirement.

12. Recreation

The Proposed Action would include several changes to visitor use that would change the recreational experience for some users. The number of campers along Turkey Creek Road would be limited and require some visitors to camp in other locations. However, this impact is not anticipated to be substantial because of numerous other opportunities, with similar settings, for camping in the AEPA. Camping areas may also be temporarily closed (up to six months) to protect sensitive resources; these closures could occur during periods of high visitor use and result in the temporary reduction of camping opportunities in the AEPA. However, the temporary closures would minimize long-term degradation and disturbance to adjacent resources, which would enhance the recreational experience in the planning area. The Fourmile Canyon Campground and Brandenburg Campsite, located near the primary access roads to each end of Aravaipa Canyon, would be maintained to allow visitors to camp near the east and west trailheads.

While the Proposed Action includes new stipulations on wood harvesting, these requirements would continue to allow for gathering of dead and down wood for on-site campfire use. Those visitors who engage in recreational horseback riding would be required to use weed-free hay to feed horses. Arizona has a certified weed-free hay program in place that can provide a local source for weed-free hay. Therefore, although some equestrians may not use the planning area to avoid the need to purchase special hay, this action would not be expected to place substantial constraints on equestrian use of the area. Existing trails along stream edges would be obstructed as part of the Proposed Action. While this may result in some inconvenience to hikers since they must take alternate routes that are not along a streambank, the potential regeneration of wetlands and streambanks would provide stream views that are unencumbered by evidence of human use and provide a more natural setting for recreation.

Management actions associated with the Proposed Action include the application for instream flow rights for Deer Creek. Obtaining these rights would help ensure that adequate streamflows are maintained; perennial streamflow is the basic requirement for many wildlife and recreation values. Maintaining adequate streamflow would also support riparian areas and maintain or enhance the recreational uses of Aravaipa Creek and its tributaries.

Pets would be allowed in upland areas of the ACW, which would increase recreational opportunities for those who choose to recreate with pets. However, noise disturbance from pets may result in minor disturbance of solitude values for other recreational users in the immediate vicinity of pets. If the Proposed Action were to be implemented, pets would continue to be prohibited from canyon areas where potential noise impacts would be the most noticeable and amplified.

New recreational infrastructure would be developed only at sites that do not encourage nonpermitted access to the wilderness. This would allow for future recreational development to accommodate the projected increase in recreational use of the AEPA without increasing pressure on, or compromising, values of the ACW. As part of the Proposed Action, the BLM would also obtain legal motorized access to public lands in the AEPA (refer to Chapter 4.A.12,Travel Management) for public (recreational and commercial uses) and administrative use. Providing controlled public access to the planning area would give recreational visitors greater access to the public lands to participate in permitted activities without passing through private property. If constructed, roads would be minimally constructed to retain the natural values of the area.

The BLM would develop an interpretation plan; provide outreach to hunters, ATV (all-terrain vehicle) users, clubs, youth groups, and other recreational visitor groups; encourage *Leave No Trace* camping and hiking practices; provide educational materials regarding cultural resources in the planning area; and use the wilderness permit system to educate visitors. Educating land users on environmental ethics, the need to preserve natural resources (e.g., streambank protection), and preferred hiking and camping techniques is expected to minimize impacts on the environment from visitors who may not know how to minimize impacts during recreational use. Information programs would not eliminate existing recreational activities. Well-designed support facilities, such as route markers, interpretive signs, maps, and brochures, would be expected to enhance user experience and satisfaction while protecting resources. Interpretive and directional signs would be established where appropriate for visitor convenience and safety, but would be designed to be unobtrusive and kept to a minimum, preserving the rugged and isolated nature of the landscape.

Visitor use would be monitored and managed to provide a safe recreational experience and access to recreational areas in a manner that minimizes damage to the natural environment. The BLM would apply Limits of Acceptable Change standards to the monitoring of roads and trails, and to monitor camping activities to determine human impacts on the natural environment. If appropriate, the BLM would close sites or redirect use to designated sites to minimize impacts on

the natural environment. Permits for specific areas or uses may be required if there is evidence that overuse is resulting in significant resource damage, or if the visitor use exceeds the capacity of the BLM to monitor impacts. The BLM would also establish and monitor sign-in registers at entry points crossing private land at Copper Creek, Painted Cave Road, Turkey Creek, Bear Canyon, and the old Aravaipa Road. The sign-in registers may increase visitor compliance with private land restrictions by increasing accountability of visitors. This action would be reviewed and reconsidered during the adaptive management process. By providing holistic management of the ecosystem resources, the BLM would maintain the characteristics of the area that draw the recreating public.

13. Travel Management

As the demand for OHV use increases, the BLM must maintain a balance between providing access to the planning area and opportunities for semiprimitive outdoor experiences and ensuring the resources in the planning area are protected. FLPMA, Executive Orders 11644 and 11989, and BLM Manual 8342 state that all public lands would be designated as "open," "closed," or "limited" OHV use to meet public demands, protect resources and public safety, and minimize conflicts. The Route Evaluation Tree Process was used to determine the designation of each road in the AEMP (refer to Appendix 6).

Under the Proposed Action, the BLM would close (or keep as closed) road segments designated as, or directed to be, closed in the 1991 Safford District RMP/EIS as amended and 1964 Wilderness Act (e.g., Turkey Creek beyond Oak Grove Canyon, any intrusion into the ACW, part of Route 5020), abandoned route segments (e.g., one mile of Route 5012), road segments that have resulted in resource damage (e.g., upper Oak Grove, lower Basin Road, Route 5017), or redundant or unnecessary road segments (e.g., Route 5000). Several segments of existing routes (e.g., 0.3 mile of Route 5022, 0.2 mile of Route 5021, and 0.4 mile of Route 5021a) would be closed to motorized vehicles but would be managed as trails for recreational use.

As part of the Proposed Action, the BLM would institute seasonal closures (to public use) of Routes 5028 (2.7 miles) and 5006 (3.2 miles) during bighorn sheep lambing season, January 15 to June 15. Temporary closures of these routes would restrict public access to specific areas of the planning area during the three months of highest visitation (March-May). Both of these roads currently have use levels characterized as "light."

To maintain primary access roads for administrative and commercial ranching use, the BLM would keep open existing road segments currently used primarily for those purposes (e.g., Route

5041). These road segments would be closed to the general public.

If the Proposed Action were implemented, no through routes would be constructed on the north rim of Aravaipa Canyon. Although a route had been proposed to connect the east and west ends of the planning area (proposed Route 1121), traffic along this route would not have been consistent with other resource objectives; the proposed route raised trespass concerns from private landowners. However, the existing North Rim Road (Route 5027) would be improved to eliminate a recent head-cut (a break in the slope at the uphill end of a wash); this improvement would ensure the safety of users and minimize erosion issues. The road may be closed during improvements, but this impact would be temporary.

As part of the Proposed Action, the BLM would also obtain legal motorized access to public lands in the AEPA (refer to Appendix 6). The legal access to be pursued would be for public (recreational and commercial uses) and administrative use. In certain cases, if an easement through private lands is not obtained, the BLM would pursue new routes if needed to provide administrative access to BLM land. This would consist of up to three new routes to provide access to the east Aravaipa Canyon trailhead. Historically, access availability has varied due to the discretion of private landowners and as a result of issues such as vandalism and littering. Roads and trails would be minimally constructed to minimize impacts on natural and scenic resources; directional signs would be minimal and unobtrusive, ensuring that the rugged and isolated nature of the landscape is uncompromised by these features. Vehicular riparian crossings would be kept to a minimum to avoid disruption of riparian corridors. Securing motorized access would ensure continued access to the planning area for administrative and public use.

In addition to actions specific to existing and proposed routes, the Proposed Action would include the implementation of actions applicable to all roads in the planning area. For example, the BLM would monitor routes for three to five years to establish baseline conditions. These data would then be used to determine Limits of Acceptable Change guidelines for all roads, which would assist the BLM in providing access to recreational areas in a manner that minimizes damage to the natural environment.

Of the approximately 257 miles of existing routes that were evaluated, 89 percent would be left open to public use, four percent would be limited to administrative use, and seven percent would be closed. Public access would be affected by the elimination of 11 percent of the travel routes.

14. Soils/Minerals

Implementation of erosion control and cienega restoration in the upper end of Turkey Creek and other potential locations would occur as part of the Proposed Action. Restricting vehicular access to designated roads, minimizing vehicle crossings in riparian areas, and constructing erosion-control features (e.g., gabions and dirt check-dams) at existing riparian crossings outside the wilderness such as those in Turkey Creek and Parsons Canyon, would minimize soil loss and could improve soil conditions in the long term.

Placing obstructions in trails and encouraging the recreating public to use trails away from the stream edge would further minimize soil erosion by allowing stream-edge trails to recover from past human impacts. The development of a sampling plan to monitor the overall water quality in Aravaipa Creek would also provide information on sedimentation and, therefore, provide additional data on soil erosion. The management actions identified in the Proposed Action would be expected to minimize excessive erosion.

The BLM would continue to assess the fundamentals of rangeland health on grazing allotments to determine attainment of the Rangeland Health Standards. When standards are not being met, the causal factor would be determined, if possible, and sufficient measures taken to ensure that the resources are making progress towards meeting Standards. If current livestock activity is determined to be the causal factor, adjustments would be made under the guidelines of the Rangeland Health Standards. Otherwise, causal factors and appropriate adjustments may be addressed through the adaptive management process.

Because a substantial increase in traffic on open routes would not be expected as a result of the closures, closing routes and eliminating public access to other routes may decrease overall soil erosion from vehicular travel. In addition, the BLM would monitor routes for three to five years to establish baseline conditions. These data would then be used to determine Limits of Acceptable Change guidelines to all roads, which would assist the BLM in providing access to recreational areas in a manner that minimizes damage to the natural environment. However, the BLM may also open new routes, if required, to provide sufficient public access to public lands. If these routes were to be constructed, increased soil erosion would be expected from the new ground disturbance along the routes.

The Proposed Action would have no impact on minerals.

15. Law Enforcement

Under the Proposed Action, the BLM would monitor use through cooperative agreements with public organizations and would provide adequate law enforcement through partnerships with other agencies. Increased monitoring of use in the AEPA through cooperation with other agency law enforcement staff (e.g., Forest Service, AGFD) and public organizations (e.g., Adopt-A-Trail, hunting groups) would be expected to help protect resources and visitors by supplementing efforts of existing BLM staff. Involving current users and other agencies in the planning area would also increase the frequency and area of monitoring activities, which would be expected to support management objectives for natural and cultural resources in the planning area. Involving public organizations in monitoring may give these groups a stronger incentive to ensure members of their organizations and other visitors are complying with established visitor rules.

B. Impacts of the No Action Alternative

1. ACECs

If the No Action Alternative were implemented, individual management plans for the designated ACEC would be required. Until the individual management plans are completed, these areas would be managed in conformance with the Safford District RMP/EIS. Management actions specifically identified for the protection and enhancement of these areas would not be implemented until the individual plans are completed.

a. Turkey Creek Riparian ACEC

The No Action Alternative, as with the Proposed Action, would impact the Turkey Creek Riparian ACEC by improving ecological conditions, and the resources for which it was established. However, camping along Turkey Creek Road would not be restricted, and impacts of overuse on the riparian area would continue. Although regeneration of this area would occur, it would take longer under the No Action Alternative than under the Proposed Action.

b. Table Mountain RNA ACEC

Because an individual management plan would still be developed with the No Action Alternative, impacts on the Table Mountain RNA ACEC from the No Action Alternative are similar to those from the Proposed Action. The No Action Alternative would protect and enhance the values of this ACEC; however, this would occur at a slower rate than that of the Proposed Action.

c. Desert Grasslands RNA ACEC (Pilares Unit)

As with the Table Mountain RNA ACEC, the No Action Alternative would enhance and protect the resources in the ACEC; however, this would occur at a slower rate than that of the Proposed Action.

2. Cultural Resources

Under the No Action Alternative, the BLM would continue to manage cultural resources for potential information, public uses, and conservation. However, additional priority areas for Class III cultural resources surveys (to be inventoried at 100 percent) and Class II inventories would not be established, nor would efforts be identified to revisit known sites specifically for inventory information. Without an active public education program, the public's appreciation and understanding of cultural values would not be increased, which may contribute to increased disturbance to significant cultural resources sites. Without additional oversight, monitoring, and education, this impact could be exacerbated by the projected increase in pressure for visitor use in the planning area.

3. Native American Religious Concerns

No impacts on Native American religious concerns are anticipated from current management practices.

4. Wildlife

The No Action Alternative would continue the wildlife trends that are occurring as a result of the current management of fish and wildlife populations, as identified in the 1991 Safford District RMP/EIS, as amended. This alternative would continue to maintain and enhance priority species and their habitats. Baseline information inventories of stock tanks, tributaries, springs, and existing fences that are elements of the Proposed Action may not be conducted. Existing unused fences would not be removed; these fences would continue to be impediments to wildlife movement. Harvesting of large dead trees would be allowed to continue, removing habitat components for some wildlife.

Reestablishment of viable Gila topminnow and desert pupfish populations would be pursued through other projects. This would, therefore, decelerate the overall reestablishment of these species. Under the No Action Alternative, the eradication of nonnative aquatic species according to a contingency plan would not be conducted, nor would the BLM establish a sampling plan to identify and respond to sedimentation and pollution levels in Aravaipa Creek. Therefore, overall improvements to aquatic habitat and reduction in competition for native aquatic species would

occur at the current rate.

Access along Painted Cave Road, which is located adjacent to primary bighorn sheep habitat, would be allowed. Additionally, public use of routes that go through this habitat would not be seasonally closed. Therefore, motorists would continue to disturb this species unnecessarily, especially during the critical lambing season. Bighorn sheep would also continue to be threatened by potential disease spread from domestic sheep and goats.

Although wildlife data would continue to be collected from within the AEPA, no special-status inventories would be mandated. Information on wildlife research would continue to be available through current means. However, no scientific advisory committee would be formed. The lack of additional baseline data and a clearinghouse to analyze existing data would result in less effective adaptive management. Therefore, the impacts on wildlife would not occur as quickly or as extensively as they would under the Proposed Action.

5. Wastes (Hazardous or Solid)

Without the creation of a specific water-sampling plan designed to identify, monitor, and respond to potential impacts from exposed mine tailings, hazardous materials would continue to be deposited in Aravaipa Creek in unknown quantities. Without appropriate response, contamination of the creek would be expected to occur and possibly increase.

6. Water Quality

Under the No Action Alternative, current management objectives and actions for water management in the AEPA would continue. Water conservation practices (groundwater management) and the preparation of a management plan for the use and conservation of water (quantity and quality) would also continue. Additionally, the BLM would continue to evaluate watercourses in the planning area to determine suitability for Unique Waters designations and to pursue the purchase of water rights. However, a specific water-sampling plan designed to identify and monitor potential impacts from exposed mine tailings in Aravaipa Creek would not be developed, and contamination from the tailings would continue.

Continued use of routes that are eroding (e.g., part of Route 5020) would result in sedimentation and runoff continuing to flow into waterways. Because additional routes would not be closed under the No Action Alternative, this impact would be greater than if the Proposed Action were to be implemented.

7. Wetlands/Riparian Areas

Wetland and riparian areas in the planning area are expected to generally improve in functioning condition under the No Action Alternative. However, these improvements would take longer to occur than under the Proposed Action, because additional management actions that would accelerate this development, such as seasonal restrictions of livestock from riparian corridors and construction of channel-constraining structures, would not be undertaken. In addition, livestock use of perennial grasses, forbs, shrubs, and trees would be allowed to exceed 20 percent use in riparian areas that are classified as not in proper functioning condition (e.g., Upper Oak Grove Canyon, Parsons Canyon, Hell Hole Canyon). This would allow for a decrease in groundcover and vegetation along riparian corridors and would exacerbate the slower pace of wetland/riparian resource improvement in the planning area.

8. Wild and Scenic Rivers

Values of the segment of Aravaipa Canyon determined to be eligible for listing in the National Wild and Scenic Rivers System would continue to be protected with management actions identified in the 1991 Safford District RMP and the 1997 Final Arizona Statewide Wild and Scenic Rivers Study Report/Record of Decision, as part of the No Action Alternative. This alternative would have no impact on Wild and Scenic Rivers.

9. Wilderness

Currently, wilderness values are impacted by repeated camping in the same locale, improper disposal of human waste, and visitors who unknowingly enter wilderness areas and inadvertently conduct nonpermitted uses in the ACW. The lack of sufficient boundary signs, sign-in registers, and wilderness information/education exacerbates this situation, and can lead to unintentional noise increases and visual reminders of the human presences that are in conflict with wilderness values. The No Action Alternative would continue the current permitting system and would not include a periodic review of the system to identify improvements for ACW users or potential abuses of the system, which could allow for abuse to continue unidentified and unaddressed.

Without set limits on the number of pack stock in the canyon, numbers would be expected to increase to accommodate additional pressures for increased use. Vegetation and streambanks may be correspondingly disturbed, and the potential for disease transmittal to wildlife may also increase. This affects the components that contribute to wilderness values.

10. Invasive and Nonnative Species

As part of the No Action Alternative, the BLM would continue to monitor and control, where

feasible, invasive, nonnative species that pose a substantial threat to the Aravaipa ecosystem. The BLM would not, however, require the use of hay or feed that is certified to be free of weed (and weed seed). Without mandated use of certified weed-free feed, additional introduction of nonnative vegetation from feed would be expected to continue. Additionally, use of existing roads would continue to potentially spread invasive species seed.

11. Upland Resources

The BLM would continue to manage upland areas to minimize erosion, rehabilitate eroded areas, maintain necessary groundcover, and reduce nonpoint source pollution. Additionally, the BLM would continue current livestock management directions based on the 1991 Safford District RMP/EIS, as amended, and the 1997 Arizona Standards for Rangeland Health and Guidelines for Grazing Administration amendment. Continued use of prescribed fires in accordance with the 2004 Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management would also continue. As with other natural resources in the planning area affected by the No Action Alternative, current management actions and objectives would continue current trends of upland resources. This alternative would not include restrictions to wood harvesting based on tree size, use, and vitality. Additionally, no restrictions of vegetation product sales would be implemented, and livestock permits would not be restricted only to cattle and horses on allotments within the AEPA. Because these additional management actions would not occur, improvements to upland resources would continue at the current pace.

12. Recreation

Current management actions that provide long-term benefits to natural resources in the AEPA would continue to improve the characteristics of the ecosystem (e.g., diverse wildlife, wildlife habitat) that are a draw for naturalists, birders, hunters, and general recreational users. Pets would continue to be prohibited in upland areas of the ACW, which would minimize disturbance to solitude; however, this prohibition may affect those who recreate with pets, by limiting areas of potential use in the AEPA. Under the No Action Alternative, travel routes and campsites would not be closed as a result of resource impacts. In the short-term, this would provide recreational opportunities consistent with what is currently available. However, it would be expected to result in long-term degradation of adjacent resources and correlating recreational use.

The lack of an active public education program and additional interpretive information reduce enjoyment of the visiting public interested in cultural sites and the history of the area.

Insufficient boundary signs and information related to the ACW, and the potential for inadvertent

intrusion into the wilderness by users conducting nonpermitted use (e.g., motor vehicle use), may affect the wilderness recreational experience of others.

13. Travel Management

The No Action Alternative would continue to implement transportation decisions identified from the 1991 Safford District RMP/EIS and other applicable planning requirements (i.e., wilderness restrictions). Access to public lands may be impeded by private landowners; for example, access to the east Aravaipa Canyon trailhead may not be secured. Limits of Acceptable Change standards not being applied to the monitoring of roads/trails would result in an increased number of routes remaining open. However, because routes and individual campsites would not be closed as a result of resource impacts, the quality of resources along the routes and at these sites would be expected to decline and subsequently decrease the quality of the recreational experience of visitors.

14. Soils/Minerals

Soils in the planning area would continue to be managed through existing policies that minimize erosion, rehabilitate eroded areas, maintain necessary groundcover, and manage livestock use in accordance with the 1991 Safford District RMP/EIS, as amended, and the 1997 Arizona Standards for Rangeland Health and Guidelines for Grazing Administration amendment. However, the rehabilitation and protection of soils in the project area would occur at a slower pace than if the Proposed Action were implemented, because additional actions such as closing redundant or eroded roads, obstructing streambank trails, and implementing specific erosion-control projects at Turkey Creek would not occur.

The No Action Alternative would have no impact to minerals.

15. Law Enforcement

The BLM would continue current monitoring, assistance, and enforcement practices that are primarily accomplished through regular ranger patrol. Because additional assistance from the public and user groups would not be systematically initiated and encouraged, and an interpretation plan would not be prepared, increased education about permitted and preferred practices would not be expected to occur. With the projected increase in demand for use of the planning area, increased pressure would be placed on already limited law enforcement resources. This pressure could result in increased vandalism, litter, and nonpermitted use, which would disturb cultural and natural resources in the planning area.

C. Cumulative Impacts

The Coronado National Forest, AGFD, TNC, Graham County, Pinal County, San Carlos Apache Tribe, and USFWS were contacted to identify past, present, and reasonably foreseeable future actions within or near the study area. The temporal horizon for past projects was determined to be 1979, which corresponds with the Aravaipa Canyon Wilderness Management Plan (BLM 1979). The following were identified:

Past Projects

- Grazing on the Turkey Creek allotment, which ended in 1996.
- Past prescribed fires in conjunction with BLM (four separate fires totaling more than 14,200 acres).
- Two apron water catchments: one on Brandenburg Mountain constructed in 1984 and one in Buzan Canyon constructed in 1989. Both have been nonfunctional since 1996. Prescribed fire damaged the Buzan Catchment in 2004, and heavy rains/floods damaged the Brandenburg Catchment in 2006. Both have been reconstructed.
- Redevelopment of the Buzan and Brandenburg catchments occurred in 2007.

Present Projects

- Current periodic big-game surveys and fishery surveys that AGFD conducts within the AEPA, which are expected to continue.
- Current maintenance of boundary fencing to prevent livestock trespass, which is expected to continue.
- Maintenance and use of two small corrals on private land within the planning area.
- Current grazing management for eight BLM allotments in the planning area.
- Monitoring of fish populations within Aravaipa Canyon (completed in conjunction with BLM at least twice a year, since 1975, and expected to continue in the future).
- Visitor use of TNC's Aravaipa Preserve, located on the east end of Aravaipa Canyon (estimated at 200 visitor days/year).
- Continued release of Gila topminnow and desert pupfish onto BLM and TNC lands.
- Continued efforts by AGFD to acquire road access agreements (including acquired right-of-way) on private lands to provide legal vehicular access to Aravaipa Canyon.

Reasonably Foreseeable Future Actions

- Proposed reauthorization of livestock grazing on the Turkey Creek allotment in the Safford Ranger District of the Coronado National Forest.

- Implementation of an approved master plan that addresses preservation of open space and trails within Pinal County.

Nearly all of these past, present, and reasonably foreseeable future actions have occurred or may occur within the AEPA, although the actions may have been conducted by entities other than the BLM and TNC. Past actions and ongoing present activities are largely accounted for as components of the affected environment.

1. ACECs

Turkey Creek Riparian ACEC was established to protect and enhance riparian vegetation, wildlife, scenic values, and cultural resources. The actions proposed in the Aravaipa EMP would further the objectives to protect and enhance these resources. Ongoing livestock grazing, while restricted seasonally in the riparian corridors, would continue to have some effect on the values associated with this ACEC although these effects would be less than past levels of effect.

Table Mountain RNA ACEC, which supports an alligator juniper savanna, is also within the South Rim grazing allotment and could experience minor effects from grazing.

Established for its relict desert grasslands, Desert Grasslands RNA ACEC would not be adversely affected by any of the past, present, or reasonably foreseeable future actions in the planning area.

2. Cultural Resources

While there is some potential to affect cultural resources though ongoing recreational activities, prescribed fire, erecting fences, and developing water catchments, the effects would be negligible. Cultural resource surveys are routinely conducted in advance of ground-disturbing activities on federal land and the fencing could prevent unauthorized access into areas with known cultural sites. There could be inadvertent damage to cultural resources from dispersed recreation or livestock grazing, although such effects are expected to be minimal and rare. The management activities to preserve and protect cultural resources in the project area would offset some of these effects.

3. Native American Religious Concerns

The Forest Service and BLM routinely seek input and provide opportunities for tribal participation in research and interpretation of ancestral sites, and will continue to consult with tribes to identify places of traditional use, tribal needs for access and natural resources use, and

measures for protecting places of traditional importance that might be identified by tribes. When available, this type of information is typically used by federal, state, and local agencies to avoid areas of religious concerns to Native Americans or to mitigate effects when avoidance is not possible. None of the past, present, or reasonably foreseeable future actions are known to be a concern to Native Americans for their potential to affect religious places or practices.

4. Wildlife (T&E Species)

The Aravaipa EMP is intended to improve management strategies so that the natural resources within the ecosystem are generally maintained in a natural condition and better protected from potential future degradation. The continuation of big-game and fish surveys and the monitoring of native fish contribute to natural resource management decision making by providing additional information that may be used for ongoing management decisions as well as for making decisions about adaptive management. Efforts to reestablish or enhance the Gila topminnow and desert pupfish populations and to promote healthy vegetation through prescribed fires contribute to restoration of the ecosystem. Boundary fencing to prevent livestock trespass helps to prevent certain types of potential degradation. Pinal County has developed and approved a master plan to address the preservation of open space and trails within the county; the preservation of open space would contribute to natural ecosystem preservation on a more regional scale, particularly in the context of some of the land preservation objectives exercised by the other state and federal agencies administering land in the area.

Fences associated with grazing allotments and the Aravaipa Canyon Wilderness boundary have mixed effects. The fences may help to preserve natural habitat to the extent that these fences prevent unauthorized trespass of livestock and humans, and unauthorized uses such as driving OHVs off designated roads. This also pertains to other fences that were erected before 1979 but that remain in existence, such as an abandoned bighorn sheep enclosure. However, fences may also hinder wildlife movement if not properly designed to be friendly to wildlife.

To the extent that visitors review and apply the educational materials at the BLM ranger stations and trailheads, and TNC's Aravaipa Preserve, there is potential to increase ecological awareness, which would potentially prevent some otherwise inadvertent disturbances of natural resources. Improved visitor behavior that results from better education contributes to the cumulative effect of managing the area for natural resources and preservation of cultural resources. This helps to offset the intrusions of humans at these areas, which may include small-scale losses of habitat associated with buildings and parking facilities and temporary disturbances to wildlife when people are in the area. However, human use of the AEPA, Aravaipa Preserve, and other state and federal

lands in the vicinity is so limited that these human influences are essentially imperceptible on a regional scale.

5. Wastes (Hazardous and Solid)

Visitor use of TNC's Aravaipa Preserve and ongoing recreational activities in the planning area are the only actions that would be expected to generate solid waste and no activities are projected to generate hazardous wastes. Trash receptacles at the Aravaipa Preserve, information at kiosks on natural resource protection and the need to pack out trash, and restroom facilities at trailheads or other key public destination areas are expected to mitigate waste management associated with recreational activities.

6. Water Quality

Storm events following prescribed fires have the potential to affect water quality in streams if the magnitude of the storm washes sediments from disturbed areas into natural drainages and streams. In contrast, actions to protect and restore riparian areas, including limiting livestock grazing and recreational activities near streams may help to prevent water quality degradation. Overall, any cumulative effects on water quality are expected to be negligible.

7. Wetlands/Riparian Areas

While past recreational activities and grazing practices may have affected wetlands or riparian areas, the proposed actions to limit these activities near streams are expected to minimize ongoing cumulative effects.

8. Wild and Scenic Rivers

None of the past, present, or reasonably foreseeable future actions are expected to affect the 10-mile segment of the Aravaipa Creek that is eligible for designation as a Wild river.

9. Wilderness

The ongoing management actions and adoption of a Limits of Acceptable Change policy would be expected to further reduce evidence of man's influence within the landscape. Effects to the ACW from past, present, and reasonably foreseeable future actions would be expected to be negligible.

10. Invasive and Nonnative Species

Ongoing recreation, water catchment development and maintenance, periodic big-game and fishery surveys, and other activities that may involve motor vehicle use within the planning have the

potential to carry seeds from invasive and nonnative species. Livestock, pets, and pack animals may also transport seeds in their fur. Such inadvertent spread of seeds is expected to occur infrequently and in small quantities so no long-term adverse effects are anticipated. Should problems emerge, Limits of Acceptable Change standards could be used to close or limit use of some roads or further limit animal use within the planning area. Fences to prevent livestock trespass would continue to minimize the introduction of unwanted animal species in the planning area. Fish monitoring and surveying activities would provide data to monitor unwanted species introductions.

11. Upland Resources

Ongoing livestock grazing, prescribed fires, construction and maintenance of wildlife water catchments, ongoing recreation, road access, and fences have the potential to affect upland resources, depending on where these activities occur. As grazing allotments are evaluated through the Standards and Guidelines or Allotment Management Plan processes, changes in grazing management could be made if the BLM's 1997 Arizona Standards for Rangeland Health and Guidelines for Grazing Administration are not being met. New and redeveloped wildlife water catchments would be subject to an evaluation of effects through the NEPA process. If recreation, road use, or fences are determined to be adversely affected within the BLM land, Limits of Acceptable Change standards could be used to prevent or minimize the effects.

12. Recreation

Actions that affect the visual setting may influence the recreational experience, particularly for visitors seeking a natural setting. Actions that may affect the visual setting include natural and prescribed fire resulting in burned areas, corrals on private land, and wildlife water catchments. In the short term, burned areas may detract from the natural visual landscape, but fire may also provide open vistas and healthier vegetation for enhanced landscape views in the long term. Fire is also part of the natural ecosystem and should be viewed as such. The corrals and water catchments are small and few in number and would only affect the views for recreationists using the immediate areas in which these are located. The plans to protect Aravaipa Creek from excessive pollutants, to maintain or restore wetland ecosystems, to maintain healthy and diverse native fish populations, and to limit livestock grazing in riparian areas that are not functioning properly all contribute to offsetting effects that would enhance the natural landscape and recreational experience in the long term.

The development or redevelopment of water catchments may attract wildlife to site-specific areas. This may provide a wildlife-viewing recreational opportunity.

13. Travel Management

The Aravaipa EMP would keep most of the existing travel routes open to public use, although approximately seven percent of the routes would be closed and four percent would be limited to administrative use. The AGFD is continuing efforts to acquire road access agreements on private lands to provide legal vehicular access to Aravaipa Canyon, and the BLM proposes to obtain legal motorized access to public lands in the AEPA,. Pinal County also proposes to implement a master plan that addresses recreational trail use within the county. With each agency, if new access roads or trails are developed, they would be designed to be unobtrusive and blend with the features within the natural landscape. While access within the planning area may change with the implementation of the BLM, AGFD, and Pinal County plans, the public would retain access to most places that have historically been accessible and may benefit from legalized access that is currently lacking.

14. Soils/Minerals

Of the past, present, and reasonably foreseeable future actions in the planning area, livestock grazing, prescribed fires, construction of water catchments, vehicular use, and some recreational activities have the potential to affect vegetative cover or result in ground disturbance. Loss of ground cover may lead to wind or water erosion of soils. Such effects are expected to be negligible as the extent and frequency of these activities are so minimal that vegetative damage would generally recover before soil loss starts. In addition, the Limits of Acceptable Change standards associated with the proposed Aravaipa EMP would allow the BLM to restrict or limit activities if soil losses are occurring or likely to occur. No effects to mineral resources are anticipated from past, present, or reasonably foreseeable future actions.

15. Law Enforcement

Projected increases in public demand for recreational opportunities in the planning area and on adjacent public lands are expected to continue to add to the workload of law enforcement resources. Because law enforcement resources are already limited, this could potentially result in increased vandalism, litter, and nonpermitted use, although educational materials at kiosks and public interaction with agency personnel at range stations may help to minimize the unauthorized activities. Within the AEPA, implementation of the Limits of Acceptable Change standards may be used to limit public use if natural and cultural resource damage cannot be controlled through law enforcement.

16. Socioeconomics

The species surveying and monitoring, fish restocking, and prescribed fire activities provide a

small-scale socioeconomic benefit by providing jobs and the purchase of tools to execute this work. Most of these benefits would likely be outside of the region because agency personnel and contractors conducting this work may be based in other parts of the state. The elimination or reintroduction of grazing on the Turkey Creek allotment could also have a socioeconomic effect in the study region, but the magnitude of the effect would be very small. Annual expenditures from visitors for wilderness recreation in Aravaipa Canyon is estimated at $384,000 per year. The overall economic impact of that recreation was projected at $645,000 per year. Temporary reductions in campsite availability and seasonal closures (to public use) of Routes 5028 and 5006 may occur during months of highest visitation (March-May) for resource protection. The economic impact of these temporary closures would be minimal, as recreational opportunities would be present elsewhere in the area.

D. Mitigation

1. When feasible, maintenance and construction activities would be planned to avoid cultural properties. If such properties cannot be avoided, appropriate consultation and mitigation as set forth in Section 106 of the National Historic Preservation Act would be completed prior to any disturbance of these properties.
2. Construction of any roads, road features, and erosion-control structures (e.g., gabions) would be evaluated to ensure that any improvements comply with visual quality objectives, as well as the National Environmental Policy Act and Endangered Species Act.
3. Prior to the construction of any new routes, the BLM would analyze potential effects of the proposed action to determine if T&E species may be affected, and will complete a Biological Evaluation, if needed, to determine impacts on wildlife (including threatened, endangered, or sensitive species) and appropriate mitigation.
4. The BLM would initiate Section 7 consultation with the USFWS for all impacts to federally listed species.
5. The BLM would ensure that all sampling and other contact with known hazardous contaminants would be conducted in a manner to protect human health and safety.

CHAPTER 5. CONSULTATION AND COORDINATION

Information about consultation, coordination, and public participation is included in Chapter 8 of the Aravaipa EMP.

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FINDING OF NO SIGNIFICANT IMPACT

EA Number: AZ-0410-2006-040

BLM Office: Safford Field Office

Finding of No Significant Impact:

I have reviewed the July 2010 Environmental Assessment, AZ-0410-2006-040 prepared for the Aravaipa Ecosystem Management Plan, and have found that there are no potentially significant environmental impacts caused by the proposed project. I have determined that the proposed action, with the mitigation measures listed below, will not have any significant impacts on the human environment and that an Environmental Impact Statement (EIS) is not required. I have determined that the proposed action is in conformance with the Safford District Resource Management Plan and Final Environmental Impact Statement approved in Record of Decision Part I dated September 1992 and Record of Decision Part II dated July 1994.

Below are the substantive reasons for finding no significant impact:

1. When feasible, maintenance and construction activities would be planned to avoid cultural properties. If such properties cannot be avoided, appropriate consultation and mitigation as set forth in Section 106 of the National Historic Preservation Act would be completed prior to any disturbance of these properties.

2. Construction of any roads, road features, erosion-control structures (e.g., gabions) would be evaluated to ensure that any improvements comply with visual quality objectives, as well as the National Environmental Policy Act and Endangered Species Act.

3. Prior to the construction of any new routes, the BLM would analyze potential effects of the proposed action to determine if threatened and endangered species may be affected. The BLM would complete a Biological Evaluation, if needed, to determine impacts on wildlife (including threatened, endangered, or sensitive species) and appropriate mitigation.

4. The BLM would initiate Section 7 consultation with the U. S. Fish and Wildlife Service for all impacts to federally listed species.

5. The BLM would ensure that all sampling and other contact with known hazardous contaminants would be conducted in a manner to protect human health and safety.

Attachments: AZ-0410-2006-040

_____ _____

Scott C. Cooke Date
Field Manager