



United States
Department of
Agriculture

Forest
Service

June 2013



Draft Environmental Assessment

Red Creek, Six Bar, Skeleton Ridge Allotments

Cave Creek Ranger District, Scottsdale, Arizona

Yavapai County, Arizona

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Summary

The Tonto National Forest proposes to reauthorize permitted livestock grazing on Red Creek, Six Bar, and Skeleton Ridge allotments, collectively managed by two permittees. The project area is located in the Cave Creek area along the Verde River and is within the Cave Creek Ranger District, Tonto National Forest, Arizona. This action is needed to determine if livestock term grazing permits for the allotments should be reissued and in what manner, and to consider alternatives to the proposed action that would comply with the Tonto National Forest Plan management prescriptions for the Cave Creek Ranger District.

The proposed action is to continue cattle grazing and associated rangeland management activities on the allotments. Livestock grazing would be managed using an adaptive management strategy as described in this document, with monitoring and mitigation measures designed to maintain satisfactory rangeland conditions and improve less than satisfactory rangeland conditions.

In addition to the proposed action, the Forest Service also evaluated the following alternatives:

- *No Grazing* - all rangeland management activities would cease on the allotment and the term grazing permit would be cancelled one year from the date of decision. Structural range improvements would be evaluated for agency maintenance or removal.
- *Current Management* - Red Creek Allotment current term grazing permit authorizes 519 cow/ calf pairs yearlong and 339 yearlings from January 1 through May 31. Skeleton Ridge Allotment current term grazing permit authorizes 260 cow/ calf pairs yearlong and 170 yearlings January 1 through May 31. Six Bar Allotment permit authorizes grazing from November 15 through June 15 annually with either 700 calves or November 1 through April 1 with 539 adult livestock. Pastures east of the Verde River and Pipeline and Cedar Basin holding pastures are excluded from grazing.
- *Proposed Action* - to reauthorize livestock grazing on all three allotments, incorporating relevant management direction to meet agency objectives. Allotments would be managed under one ranching operation with permitted livestock belonging to one entity administered under one term grazing permit. Total permitted numbers proposed include up to 989 adult cattle (cows, bulls) with up to 705 yearlings yearlong. Annual authorized livestock numbers, stocking rates, and scheduled rotations would be identified through annual operating instructions, taking into consideration monitoring results from previous multiple seasons' use, production of palatable forage, availability of livestock water, and current resource conditions. All pastures would be utilized including east of the Verde River. Cattle will be herded across the Verde River, with Sheep Bridge as an alternative when river flows are too high for livestock to cross.
- *Common to All Three Alternatives* - Tonto NF also proposed to collaborate with Arizona Game and Fish Department, Region 6 to stock new populations of Gila topminnow, desert pupfish, and northern Mexican garter snake into Mud Spring, Thicket Spring, and White Rock Spring and its tributary, and augment an existing population of Gila topminnow at Dutchman Grave Spring.

Based upon effects of the alternatives, the Cave Creek District Ranger will issue a decision notice that includes a determination of the significance of environmental effects and whether an environmental impact statement (EIS) will be prepared. Implementation of a decision to continue livestock grazing would occur through a term grazing permit. Management actions such as adjustments to annual stocking rates, season of use, timing and duration of use, and allowable utilization standards would be specified in an allotment management plan and annual operating instructions.

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Chapter 1: Purpose Of and Need for Action

Document Structure

The Forest Service has prepared this environmental assessment in compliance with the *National Environmental Policy Act* (NEPA) and other relevant Federal and State laws and regulations. This environmental assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

Chapter 1: Purpose and Need for Action: includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2: Alternatives, Including the Proposed Action: provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Chapter 3: Affected Environment and Environmental Consequences: describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.

Chapter 4: Consultation and Coordination: provides a list of preparers and agencies consulted during the development of the environmental impact statement.

Appendices: provide more detailed information to support the analyses presented in the environmental impact statement.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at Cave Creek Ranger District.

Background

Grazing Allotment History

Red Creek, Six Bar, and Skeleton Ridge allotments are located in Yavapai County on the Tonto NF with a portion of the Mazatzal Wilderness in Red Creek Allotment in Gila County and a portion of Pine Wilderness in Yavapai County (figure 1 in appendix A). Red Creek Allotment covers approximately 78,356 acres. Skeleton Ridge covers approximately 43,098 acres and Six Bar Allotment covers approximately 28,445 acres.

The most recent allotment management plan (AMP) and decision notice (DN) for Red Creek Allotment were signed May 18, 1982. An EA was completed in 1999, but a decision notice was never signed. The last AMP for Skeleton Ridge with a decision notice was signed November 28, 1990. A DN for Six Bar was signed by the District Ranger on June 7, 1995, and an AMP was developed at that time. The current permittees for all three allotments are operating under limited liability corporations (LLCs). One LLC holds the permit for Skeleton Ridge and one LLC holds the permit for Red Creek and Six Bar allotments.

The Verde River and its perennial tributaries were the primary source of water for largely unsuccessful small ranching operations in the early 1870s, and more successful efforts of larger, better financed ranchers who followed. Livestock had undesirable impacts on vegetation and soils in the Verde River corridor as a result of heavy, unregulated grazing of this era. Numbers of livestock declined in the drought of the 1890s, but remained high until fencing of National Forest lands beginning in the 1920s. This fencing allowed for improved grazing management including removal of nonpermitted (unauthorized) livestock, and development of livestock waters away from the Verde River. Stocking levels have been reduced and management changes have been made that apply to domestic livestock grazing (VWSR 2004). Red Creek Allotment has extensive riparian areas occurring along portions of Roundtree, Tangle, and Red creeks and the Verde River.

Red Creek Allotment was given its name in 1982, when it was created from a combination of the LX Bar and Red Hills allotments and Soda Springs and Long Mesa pastures of the Skeleton Ridge Allotment. The herd was generally separated from the Skeleton Ridge Allotment herd, but the two allotments were managed under one set of annual operating instructions (AOI). A management system in the 1970 consisted of a five pasture, rest-rotation system, where one pasture was rested yearlong, and the other four were grazed that year. Of the four units grazed, one was used winter only. In 1977, Long Mesa and Soda Springs/Yellow Jacket units from Skeleton Ridge Allotment were incorporated into a new management system for the LX Bar Allotment (currently Red Creek Allotment). In 1983, a memorandum of understanding (MOU) was signed that reflected new term permit numbers for Red Creek Allotment, based upon development of Red Hills unit and incorporation of Long Mesa and Soda Springs units from the Skeleton Ridge Allotment. In 1984, a new AMP was written for both Red Creek and Skeleton Ridge that incorporated changes in allotment boundaries. In 1999 NEPA work was completed on the Red Creek Allotment; however, a decision was never signed. By 1986 a new fence was constructed that separated Yellow Jacket from Long Mesa Pasture and Long Mesa Pasture was again included with Skeleton Ridge Allotment.

Prior to 1963, LX Bar and Red Hills were separate allotments and managed as distinct units. In 1958, a new permittee obtained a temporary permit for winter seasonal calves instead of sheep, which had been previously authorized. In 1959, a permittee plan for LX allowed 700 head of calves. In 1960 the Red Hills permit was transferred. In 1962, the new permittee applied for a permit switching Red Hills from sheep to cattle. In 1962 to 63, the permittee used a combination of Red Hills and LX Bar pastures for a new system grazing cattle. The permit changed hands again in 1963, and LX Bar and Red Hills (combined) were permitted for 400 cattle yearlong. In 1974, yet another new permittee acquired the permit. A rotation system was in effect that utilized every pasture during the grazing year. Based on 4,820 AUMs actual use, it was calculated that the allotment was overstocked by not less than 940 AUMs and possibly as much as 2,810 AUMs. In 1976, the permit was transferred again. In the 1970s, Red Hills Unit was grazed November through the end of April to mid-May. It was originally intended that the unit be grazed by yearlings, but at first, cows were not cycling properly for yearlings to be ready for weaning by November. The plan for this type of use on the river was never implemented. Red Hills Unit was grazed by adult cattle plus yearlings from 1977 through 1997. Numerous difficulties were encountered and documented: overutilization, lack of available waters, and cattle concentrating close to the Verde River. Presence of razorback sucker and southwestern willow flycatcher (flycatcher) and designated critical habitat for both species adjacent to the Verde River increased the need for improved management to address species concerns and requirements. Red Hills Unit

was excluded from grazing in the winter of 1998, because it contains the Verde River and lower two miles of Red Creek. Current livestock numbers have not been adjusted to reflect the loss of acres resulting from removal of Red Hills Pasture.

Since August 1999, use in Red Creek Pasture has been deferred until an exclosure fence on the upper two miles of Red Creek is completed. This portion of Red Creek was determined to be suitable habitat for Gila topminnow in 1999. Additionally, this portion of the Verde River was excluded from grazing pending completion of consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the *Endangered Species Act* to comply with the VWSC decision. Consultation with U.S. Fish and Wildlife Service was not completed at that time, because the river pastures were not being grazed, thus removing direct impacts.

During a 1999 NEPA analysis, it was recommended that Red Hills Unit be excluded from use and Red Creek pasture and Tangle Creek Pasture converted to winter-use pastures to address concerns for razorback sucker and flycatcher. It was recognized that, on the Verde River and also in other riparian areas, it is difficult to stay within utilization guidelines for riparian vegetation as livestock are much more likely to spend time in riparian areas and utilize woody riparian vegetation after bud break in spring.

With the addition of Six Bar Allotment in 2001, it was recognized that new opportunities for management existed, and there was less need for Red Hills Unit. That, coupled with the difficulties on grazing livestock in the unit (as discussed later in the document) resulted in Red Hills Unit being excluded from the Red Creek Allotment management system, but livestock numbers were not adjusted at that time. Finally, the VWSR Decision in June 2004 excluded Red Hills from being grazed, because of access to the Verde River.

In an August 2002 EA, alternatives recommended that Cedar Push Pasture would be used for gathering and shipping in April and May of each year. A decision notice was never signed. It was documented that using this pasture every year could inhibit recovery of unsatisfactory soil condition. In the past ten years, Cedar Push Pasture has often been used twice in any given year to facilitate gathering and working with cattle. The corral and loading chute have been used even more frequently to work with cattle for various reasons, such as a sick animal doctoring, shipping animals, and other similar activities.

Skeleton Ridge Allotment was permitted to Red Creek Ranch starting in 1975. In 1984, Skeleton Ridge Allotment was under permit to Red Creek Ranch Partnership, who was also the permittee for the LX Bar/Red Hills Allotment to the south. This permittee had just acquired the north end of the Chalk Mountain Allotment, which had previously been a sheep allotment. This allotment is on the east side of the Verde River, while the Skeleton Ridge Allotment is on the west side. Skeleton Ridge Allotment Management Plan was modified to include the north end of Chalk Mountain Allotment as a winter-use pasture. Beginning in 1984, Skeleton Ridge Allotment was grazed as a four-pasture modified Santa Rita rest-rotation system, with one winter-use pasture (Pete's Cabin), and three pastures used in a rotation with the following schedule: 3½ months early summer, 3½ months late summer, rest. The term permit for Skeleton Ridge was 185 adult cattle yearlong with natural increase January 1 to May 31 of each year.

In 1989, Skeleton Ridge permit was transferred. At the same time, a large pasture that had been grazed by the former LX Bar/Red Hills Allotment (now called Red Creek Allotment), was combined with Skeleton Ridge Allotment, adding significant capacity. In 1989, Ike's Backbone

Allotment (4,378 acres) on the Coconino NF was transferred to the Tonto NF for range administration purposes. At that time, the permittee on Skeleton Ridge Allotment had acquired Ike's Backbone Allotment, so it was included in the management and permit with Skeleton Ridge Allotment.

The portion of Ike's Backbone Allotment that lies to the northeast of Childs on the Coconino NF began to be grazed by 20 yearlings for the summer season from April 1 to October 31 of each year, in conjunction with Skeleton Ridge Allotment. In 1989 a new permit was issued for 260 adult cattle yearlong plus their natural increase from January 1 to May 31 of each year; 20 head of adult cattle from April 1 to October 31; and an additional 20 head on Skeleton Ridge from November 1 to March 31 of each year for Ike's Backbone cattle, which are no longer included. Pete's Cabin Pasture was maintained as a winter-use only pasture, with livestock normally moved into spring/summer pastures in April or May.

In 1997, the Tonto NF entered into formal consultation with USFWS for current management on Skeleton Ridge and Ike's Backbone allotments. A Biological Opinion was issued that set allowable use standards of 40 percent on woody and herbaceous vegetation and 20 percent bank alteration by livestock.

A new term permit was issued in 1999. In 2001, the four allotments, including Ike's Backbone Allotment, fewer than three permits were transferred to new permittees. In April 2001, all three permits were acquired by the current permittees. In 2002 to 2003 the drought was so severe that overall numbers on all three allotments were reduced to a single combined herd of 150 cows, 10 bulls, plus yearling progeny. Due to this, the permittees were able to keep their herd on the allotments during and after the 2005 Cave Creek Complex Fire and throughout the extended drought. Numbers have fluctuated slightly since then.

In April 2008, Ike's Backbone Allotment was transferred back to the Coconino NF at the permittee's request, to be combined with a separate permit they had acquired on the Coconino NF.

Six Bar Allotment was under permit to a single family from the time the Tonto NF was created in 1907 until 1959. The allotment was grazed by sheep from November 15 through May 31. In 1960 the allotment was permitted to run 700 calves from November 15 through June 31. The permittee requested nonuse for personal reasons from 1991 until the base property was sold in 2001, with the exception of 1992, when 68 cattle were authorized to graze for one month. From 1999 to 2001 Red Creek Allotment cattle grazed Six Bar Allotment as an additional pasture. In April 2001, Six Bar Allotment was acquired by the current permittee and the practice of using one herd rotating through Red Creek and Six Bar allotments began. Beginning in 2005, one herd rotated through Red Creek, Six Bar, and Skeleton Ridge allotments, allowing for improved resource management.

The current permit for Six Bar Allotment is for either 700 calves from November 15 through June 15 or 539 adult livestock from November 1 through April 1. Earlier permits indicated calves could be converted to adult cattle for the same season for a total of 539 adult cattle from November 15 through April 1. It was recognized that permitted numbers for adult cattle yearlong could be made once sufficient range improvements were in place, but a lack of sufficient water in warmer months could be a problem. For the past ten years, the permittee has grazed his entire herd on Six Bar Allotment typically from November 15 through June 15 of each year.

A decision from a 1994 analysis required construction of several new structural range improvements and reconstruction of many existing improvements. The purpose of these improvements was to improve livestock distribution to achieve improved vegetative conditions in riparian areas, near water developments, and in areas easily accessible to livestock. Construction of approximately ten miles of new interior fence, developing six undeveloped springs, exclosures around the head of proposed spring developments, and reconstruction of ten existing spring developments were included in the decision. Maintenance of existing developments and reconstruction of all dirt stock tanks was also required. None of these were completed as the permittee had taken nonuse for personal reasons from 1991 until the permit was transferred in 2001. In the Six Bar Allotment the improvements listed in the 1994 Decision have not been constructed by the previous or current permittee.

Figure 2, appendix A, displays allotment and pasture boundaries and names.

Management areas (figure 3 in appendix A) within the allotment boundaries include the following:

1A Pine Mountain Wilderness and 1B 4A Mazatzal Wilderness

Emphasis is to manage for wilderness values, wildlife habitats, and natural ecological processes, while allowing livestock grazing and recreation opportunities which are compatible with maintaining these values and processes.

1C and 1D Verde Wild and Scenic River

Emphasis is to administer use of the river to protect and enhance its designated outstandingly remarkable scenic, fish and wildlife, and historical/ cultural values (ORVs), while protecting the river's free flowing character and water quality.

1F General Management Area

Emphasis is to manage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, livestock forage production, and dispersed recreation. Watersheds will be managed to improve them to a satisfactory or better condition. The included riparian areas will be improved and managed to benefit riparian dependent resources.

Verde Wild and Scenic River Corridor

A segment of the Verde River became a National Wild and Scenic River (VWSR) through the *Arizona Wilderness Act* of 1984 (VWSR 2004). This Act amended the *Wild and Scenic Rivers Act* of 1968 and required the Tonto NF to develop a comprehensive river management plan (CRMP). The CRMP was designed to protect and enhance values, which caused the river to be designated, and to allow other uses that do not substantially interfere with public use and enjoyment of the river's values. The segment of river covered by the CRMP lies within the administrative boundaries of the Coconino, Prescott, and Tonto national forests in Gila and Yavapai counties of central Arizona. The area included is generally a half mile wide, a quarter mile each side of, and parallel to the river. Livestock grazing is excluded from the corridor, water sources are to be developed only outside the riparian habitat of the corridor, and livestock cannot be herded across the river within the corridor on Red Creek and Skeleton Ridge allotments.

Purpose and Need for Action

The three allotments in the project area contain lands identified in the Tonto National Forest Land Management Plan (Forest Plan) as suitable for domestic livestock grazing. Continued domestic livestock grazing is consistent with goals, objectives, standards, and guidelines of the Forest Plan.

The purpose of this effort is to improve ecological conditions within the project area using tools, such as adaptive grazing and wildlife habitat improvement, to meet desired future conditions as described in the Forest Plan, while balancing multiple uses. Forest Service Handbook (FSH) 2209.13, Chapter 90, provides guidance to authorize livestock grazing using adaptive management strategies to move ecosystems toward desired conditions.

Permits for livestock grazing will soon expire and ecological conditions in some areas on these allotments have not moved towards desired future conditions, as outlined in the Forest Plan. For example, diversity of current vegetation (including where it is located and how it functions) does not meet desired conditions in all locations within the project area. Past management practices have not always proven effective. In addition, knowledge and strategies for ecosystem management have changed over time, providing an opportunity to improve vegetative conditions using current science, methods, and strategies. As a result, there is a need to develop new management strategies and complete site-specific analysis for ecosystems within the three allotments, including proposed access to portions of the Verde River.

Proposed Action

Tonto NF, in collaboration with the allotments permittee, proposes to reauthorize livestock grazing on all three allotments, incorporating relevant management direction to meet agency objectives. Allotments would be managed under one ranching operation with permitted livestock belonging to one entity administered under one term grazing permit. Total permitted numbers proposed include up to 989 adult cattle (cows, bulls) with up to 705 yearlings yearlong. Annual authorized livestock numbers, stocking rates, and scheduled rotations would be identified through annual operating instructions, taking into consideration monitoring results from previous season's use, production of palatable forage, availability of livestock water, and current resource conditions.

Tonto NF, through coordination with Arizona Game and Fish Department, Region 6 (AZGFD), proposes to stock new populations of Gila topminnow, desert pupfish, and northern Mexican garter snake into Mud Spring, Thicket Spring and White Rock Spring and its tributary, and augment an existing population of Gila topminnow at Dutchman Grave Spring. See chapter 2 for a more detailed description of the proposed action.

Decision Framework

The Cave Creek District Ranger is the official responsible for a decision regarding management of allotments in this analysis. As a result of this analysis process, the District Ranger will issue a decision notice as to whether or not livestock grazing will continue to be authorized. Implementation of a decision to continue to authorize livestock grazing would occur through an allotment management plan and annual operating instructions. These would include any management actions, mitigation measures, and monitoring requirements necessary to the

decision. These documents would also describe permitted numbers of animals, season of use, allowable utilization standards, and the terms of the grazing permit.

Public Involvement

Cave Creek RD range personnel worked with the permittee and ranch managers, along with a variety of specialists, over several years to collect data across the allotments. Cave Creek RD personnel collaborated with Arizona Game and Fish Department to include proposals for wildlife and fisheries habitat on the allotments. Cave Creek RD personnel worked with the permittee to develop a proposed action that incorporated allotment management objectives along with Forest Plan goals and objectives. In November 2012, a scoping letter was sent to 194 individuals, including state and federal agencies, environmental organizations, local government, tribes, and residents in communities within or adjacent to the project area. Comments received from the scoping process were analyzed and considered in developing alternatives to the proposed action.

Issues

The Forest Service separated issues identified during scoping into two groups: significant and nonsignificant issues. Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Nonsignificant issues are identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)...." A list of nonsignificant issues and reasons regarding their categorization as nonsignificant may be found in the project record.

Following public scoping, the interdisciplinary team met to review comments, determine issues, and develop alternatives. Summarized below are issues carried forward for further analysis:

- Invasive species
- Verde River access, campsites, crossings
- Wildlife habitat
- Heritage resources
- Wild and Scenic River corridor
- Streams, riparian habitat, springs
- Soil conditions
- Vegetation conditions
- Stocking rates and carrying capacity
- Game species
- Climate, including drought
- Livestock access
- Range improvements
- Cumulative impacts of fire
- Threatened, endangered, and sensitive species
- Wilderness
- Water quality and instream flow characteristics

Chapter 2: Alternatives, Including the Proposed Action

Introduction

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (*40 CFR 1502.14*). Public comments received in response to the proposed action, as well as concerns raised by the project interdisciplinary team, provided suggestions for alternative methods for achieving the purpose and need. The interdisciplinary team reviewed scoping comments and determined that issues identified above would be adequately addressed through the following three alternatives.

This chapter describes and compares alternatives considered for the Red Creek, Six Bar, and Skeleton Ridge (allotments) analysis. It includes a description of each alternative considered. This section also presents alternatives in comparative form, sharply defining differences between each alternative and providing a clear basis for choice among options by the decision maker and public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., seasonal grazing versus yearlong grazing) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of riparian impact caused by seasonal grazing versus yearlong grazing).

Alternatives Considered in Detail

Alternative 1 - No Action/ No Grazing

Under this alternative term grazing permits on all three allotments within the project area would be cancelled following guidance in *36 CFR 222.4* and *FSM 2231.62*. Existing improvements no longer functional or needed for other purposes, including interior fences, cattle guards, and water developments would be evaluated for continued usefulness and removed as necessary.

Alternative 2 - Current Management

Adaptive management has been used on Red Creek, Six Bar, and Skeleton Ridge allotments since 2001 in cooperation with permittee needs. The past two years the permittees have not used Skeleton Ridge Allotment. Red Creek Allotment has sustained the most consistent use of the three allotments. It has been grazed every year, since it was given its name in 1982.

Over the past ten years, grazing management on Red Creek, Six Bar, and Skeleton Ridge allotments has consisted of rotating livestock through the three allotments based on a pasture schedule proposed by the permittees considering available water and forage and ease of movement. The combined rotation incorporates use of Six Bar during winter months. Skeleton Ridge also has larger pastures that were grazed successfully for longer periods of time in the winter. Using Skeleton Ridge and/or Six Bar for winter use successfully addressed concerns with available waters and management of larger pastures. Under current management, bulls are generally not separated out, but stay with the main herd throughout the year.

Red Creek Allotment current term grazing permit authorizes 519 cow/ calf pairs yearlong and 339 yearlings from January 1 through May 31. Skeleton Ridge Allotment current term grazing permit authorizes 260 cow/ calf pairs yearlong and 170 yearlings January 1 through May 31. Annual authorized use has varied due to ongoing drought and resource concerns.

Under current management Skeleton Ridge Allotment is composed of the following primary pastures (figure 4, appendix A): Long Mesa, Houston Basin, Cold Water/West Cold Water, and Mud Springs. It also has smaller management areas: Lancaster and Horse Camp, and Long Mesa Holding area. A natural boundary between Houston Basin and Black Ridge pastures has not been effective and is in need of drift fence to separate pastures. One mile of fence at either end of Black Ridge Pasture would be needed before Black Ridge Pasture could be grazed, due to VWSR corridor restrictions.

Pete's Cabin Pasture is a large pasture and only has a couple of small springs in the uplands. It is excluded from grazing for a number of reasons: lack of water sources for livestock other than the river; potential for poor forage years; an inability to accurately monitor livestock use and move livestock before use limits are reached; difficulty in moving cattle across the Verde River during high river flows; and a need to exclude approximately 8.5 miles of the Verde River, which runs near the middle of the pasture. Limitations affecting construction in the Mazatzal Wilderness make fencing or water lanes unfeasible. Cedar Basin (103 acres) and Pipeline (330 acres) pastures were excluded from grazing through the VSWR decision.

The VWSR decision recognized that it would be necessary to cut stocking on Skeleton Ridge Allotment by approximately one third and natural increase would be reduced comparably due to reduced pastures and resource concerns. Stocking rates have not yet been reduced. Although Long Mesa Pasture has also been identified as possibly needing drift fence to keep livestock off the Verde River, it was grazed in 2009 with the understanding that the permittee would keep cattle off the Verde River. The Forest Service rode the east boundary of Long Mesa Pasture in 2013 and determined that two areas of fencing are required.

Mud Springs Pasture in the Skeleton Ridge Allotment has been usually used in the winter in an attempt to reduce utilization in the riparian area. Due to the terrain of the pasture, cattle trail along the riparian area even in winter months.

At the end of 2002, cattle were consolidated into one herd to rotate through the three allotments in an attempt to maintain a core herd in spite of the drought conditions and lack of water. Skeleton Ridge was not grazed for two years (2003 and 2004) until consultation was completed with USFWS on effects of grazing on spikedace and loach minnow critical habitat.

Cold Water and West Cold Water are one pasture. A fence was considered to separate them to provide two pastures, but was never constructed. This unit is usually grazed in winter months. In 2001, the Pine Fire burned a large portion of this pasture and a number of the range improvements.

During the Cave Creek Complex Fire in 2005, approximately five miles of fence on the northwest side of Mustang Pasture was burned (plus numerous miles of fence in other locations on all three allotments). Tonto NF rebuilt the approximately five miles of fence in 2006 and 2007. An exclosure around LX Spring and riparian area was completed in the winter of 2012. In 2011, the permittees built an exclosure fence around Dog Springs. A trough supplies water outside the spring area to the cattle. The other fence locations burned in the Cave Creek Complex Fire have not yet been rebuilt.

A Yavapai County grant provided funding for a contract to enlarge the exclosure around Picnic Spring and riparian area. It was built in December 2012. A trough exists outside the spring for

livestock water. Efforts are being made to acquire funding to fence White Rock Spring and a nearby riparian area. Water troughs are already in place to provide water for the livestock.

Cedar Push Pasture is used to facilitate gathering and working with cattle. The corral and loading chute (Cedar Holding) are used to work with cattle for branding, sorting and other purposes, and are located on a small area separated outside the pasture. However, when working cattle of any number, the majority of the cattle are in Cedar Push Pasture as the facilities are in a small corral area (Cedar Holding). Although Cedar Push Pasture and the Cedar Holding Area are only connected with Red Creek Allotment, it has been used more often in the past twelve years, since the three allotments were combined in grazing one herd. All three allotments do have areas designated for separating or branding cattle, but the better chute is located at Cedar Holding.

There is a designated portion of Red Creek just north of private land that was fenced as an exclosure in 1999. The main disturbance in the exclosure along Red Creek is due to a dispersed recreation site just off Forest Road (FR) 16. A biological assessment and evaluation (BAE) for this exclosure fence stipulates that the permittee make daily checks east of the exclosure to ensure livestock do not access the lower portion of Red Creek, when in the northwest portion of Red Creek Pasture. Cattle have occasionally been found in the exclosure area.

West Soda, East Soda, and Monroe are small pastures that have been over utilized in the past. Monroe Pasture usually requires water hauling, when it is being used.

Soda Springs Pasture is fairly large and not easily accessible for moving cattle out of sensitive riparian locations. A large portion of this pasture is in Pine Mountain Wilderness area.

Yellow Jacket Pasture also has a portion of Pine Mountain Wilderness. A number of dirt stock tanks are the source of water for cattle in this pasture. Some years there is insufficient water for cattle. A need for fence maintenance has led to utilization issues. In 2012 the permittee elected to not use the pasture due to insufficient water.

Both Tangle Mountain and Red Creek pastures have the Verde River flowing on their east side. The VWSR decision requires fencing along the Verde River although none has currently been constructed. Drift fencing could be built on the ridge above the Verde River thus requiring fewer miles of fence and still eliminating the Verde riparian area from grazing. When fences are constructed, winter grazing may be an option. Dependable water sources are needed in Tangle Creek Pasture. Dirt tanks are difficult to seal, as the ground in this pasture has exceedingly porous parent material. One trick tank was installed in 2000. The possibility of other trick tanks or wells has been discussed. Portions of Red Creek and Tangle Creek have been identified as restorable or regenerating (potential) flycatcher habitat. The potential habitat will not be grazed during any time of the year in order to meet requirements of the Southwestern Willow Flycatcher Recovery Plan. Fencing may be required in order to keep livestock out of flycatcher potential habitat.

Six Bar Allotment permit authorizes grazing from November 15 through June 15 annually with 700 calves on November 1 through April 1 with 539 adult livestock. Currently the allotment is used as a two-pasture system based on cattle movement and a lack of constructed features to keep cattle restricted to more than two units. Steep topography has resulted in use patterns that are excessive on mesa tops and in canyon bottoms.

The current permittee has grazed cattle in Mud Springs, Hutch (Wood Camp), and Middle Fork (east and west of FR 58). Middle Fork Unit, both east and west of FR 58 is not separated by fence

or natural barriers. Attempts to keep the cattle on just one side of FR 58 have been unsuccessful. The 1995 decision notice limits grazing in Jack's/Cavness Pasture to one two-month spring period and one two-month late summer period in five years; and to three three-month winter periods in five years in Squaw Creek Pasture. Both are in the Middle Fork Unit. Adaptive management has been used during the past ten years to alter this grazing period and has resulted in less rest for the pastures.

Stock tanks need maintenance. During winter months, water can be plentiful in canyons and functional stock tanks; but as the weather warms up, stock tanks begin to dry out and water flowing in the canyons disappears, leaving springs and potholes in major drainages as the main sources of water on the allotment.

The Forest Service through coordination with AZGFD, proposes to stock new populations of Gila topminnow, desert pupfish, and northern Mexican garter snake into Mud Spring, Thicket Spring, and White Rock Spring and its tributary (figure 6c, appendix A).

Alternative 3 - Proposed Action

Tonto NF, in collaboration with the project area permittees, proposes to reauthorize livestock grazing on all three allotments, incorporating relevant management direction to meet agency objectives (figure 5, appendix A). Red Creek, Six Bar, and Skeleton Ridge allotments would be managed under one ranching operation with permitted livestock belonging to one entity administered under one term grazing permit. Total permitted numbers proposed include up to 989 adult cattle (cows, bulls) with up to 705 yearlings yearlong, using deferred/rest rotational grazing systems to move livestock in single or multiple herds through pastures on all three allotments (table 1). Annual authorized livestock numbers, stocking rates, and scheduled rotations would be identified through annual operating instructions, taking into consideration monitoring results from previous season's use, production of palatable forage, availability of livestock water, and current resource conditions.

All pastures would be utilized including east of the Verde River. Cattle will be herded across the Verde River, with Sheep Bridge as an alternative when river flows are too high for livestock to cross.

Pastures requiring fence built (before grazing is allowed) to keep livestock from the Verde River:

In Skeleton Ridge Allotment:

- Black Ridge Pasture requires fence in two locations approximately one mile each;
- Long Mesa Pasture has two locations with short pieces of fence required;
- The natural boundary between Houston Basin and Black Ridge pastures require areas of drift fencing, approximately 1.5 miles
- Powerhouse Pasture, approximately 1 mile
- Headquarters Pasture, approximately 1 mile
- Hot Springs Pasture, approximately 1.5 mile

In Red Creek Allotment:

- Red Creek Pasture requires approximately three locations of one to two miles each;

- Tangle Creek Pasture requires approximately three locations of one to two miles each.
- Currently the Forest Service is seeking funding to build two exclosures around (1) White Rock Springs and (2) White Rock Tributary in the Cedar Mountain Pasture of Red Creek. Without the fencing, Cedar Mountain should be a winter-use only pasture (combined approximately 1.5 miles).

At a later date, all fence locations plus required specialists' studies will be completed in the field with the permittee(s).

Table 1: Proposed Permitted Numbers

Allotment	Permitted Number	Season of Use	AU Factor	Animal Unit Months
Six Bar	210 adult cattle	Yearlong	1.00	2,520
	136 yearlings	1/1 to 5/31	0.70	476
Red Creek	519 adult cattle	Yearlong	1.00	6,228
	339 yearlings	1/1 to 5/31	0.70	1,186
Skeleton Ridge	260 adult cattle	Yearlong	1.00	3,120
	170 yearlings	1/1 to 5/31	0.70	595
Totals	989 adult cattle 705 yearlings			14,125

At a minimum, three pasture moves per year should be planned. These moves should occur in the fall, in the spring, and near as possible to the midpoint of the summer growing season.

The fall pasture move should coincide with the fall gather, where all but very young calves are weaned. The cow herd should be assessed and poor condition/dry cows culled at this time of year. The fall gather and move should be timed so that the warm season perennial grasses in pastures the cattle are leaving will be able to store some root reserves prior to the first freeze, while the warm season perennial grasses in the pastures the cattle are moving into have already set seed.

The spring pasture move should occur as the spring green up is taking place. At this time of the year the cows are changing from grazing browse, perennial forbs, and dormant perennial grasses to chasing spring annuals and cool season grasses. At this time of year most grazing animals will move into areas that are producing the first green plants of the year, which are usually riparian areas. During spring until midsummer is the most important time of the year to keep livestock out of riparian areas. The spring gather is the opportune time to brand the young calves and to wean/remove any older hold-over yearlings from the previous year.

When possible, the midsummer growing season's pasture move should occur after warm season perennial grasses have started growing, but not so late in the season that the plants grazed during this period do not have sufficient time to recover and complete flowering/seed production. Every effort should be made during the second half of the growing season to limit the use of the forage plants to a one time grazed of the plants. It is during this period that having multiple water sources in a pasture, placing small quantities of salt and moving the salting location often, and riding and herding the cattle into ungrazed areas will be most beneficial. The midsummer move is the best time to spray the cattle for insects and treat for parasites.

The following table 2 shows the pastures/units, the best time of the year for use (based upon past use records) and characteristics that have limited use of the pasture/unit.

Table 2: Proposed Use

Allotment/Pasture/Unit Name	Most Appropriate Season of Use	Limiting Characteristics
Six Bar Allotment		
Mud Springs Unit	Winter/Spring	Limited Water and Riparian Issues
Middle Fork East Unit	Winter/Spring	Limited Water and Riparian Issues
Middle Fork West Unit	Yearlong	No limitation
Middle Fork South Unit	Yearlong	No limitation
Six Bar Pasture	Yearlong	Small Management/Holding Trap
Red Creek Allotment		
Roundtree Pasture	Yearlong	Riparian
Cedar Push Pasture	Yearlong	Small Management/Holding Trap
Dugan Trap	Yearlong	Small Management/Holding Trap
Peso Pasture	Spring/Summer	Limited Water
Tangle Mountain Pasture	Yearlong	Lack of east boundary fence*
Palo Verde Holding Trap	Yearlong	Small Management/Holding Trap
Red Hills Pasture	Winter/Spring	River Management/limited water uplands
North Red Hills Pasture	Winter	River Management/limited water uplands
Red Creek East Pasture	Winter	Riparian
Red Creek West Pasture	Yearlong	Riparian
Horse Pasture	Yearlong	Small Management/Holding Trap
Cedar Mountain Pasture	Yearlong	Limited Water and Riparian Issues
Mustang Pasture	Yearlong	Riparian
West Soda Pasture	Yearlong	Small Management/Holding Trap
East Soda Pasture	Yearlong	Small Management/Holding Trap
Monroe Pasture	Yearlong	Small Management/Holding Trap
Rugged Mesa Pasture	Yearlong	Small Management/Holding Trap
Yellow Jacket Pasture	Yearlong	No limitation
Horse Camp Pasture	Yearlong	Small Management/Holding Trap
Soda Springs Pasture	Yearlong	No limitation
Skeleton Ridge Allotment		
Long Mesa Pasture	Yearlong	No limitation
Long Mesa Tank Trap	Yearlong	Small Management/Holding Trap
Long Mesa Holding Trap	Yearlong	Small Management/Holding Trap

Allotment/Pasture/Unit Name	Most Appropriate Season of Use	Limiting Characteristics
Pete's Cabin Pasture	Winter	River Management/limited water uplands
Cedar Basin Holding Trap	Yearlong	Small Management/Holding Trap
Houston Basin Pasture	Yearlong	No limitation
Black Ridge Pasture	Yearlong	River Management/limited water uplands
Lancaster Trap	Yearlong	Small Management/Holding Trap
Mud Springs Pasture	Yearlong	Riparian
West Coldwater Pasture	Yearlong	No limitation
Coldwater Pasture	Yearlong	No limitation
Headquarters Trap	Yearlong	Small Management/Holding Trap
Powerhouse Pasture	Yearlong	River Management/limited water uplands
Hot Springs Pasture	Yearlong	River Management/limited water uplands
Pipeline Trap	Yearlong	Small Management/Holding Trap

The Forest Service through coordination with AZGFD proposes to stock new populations of Gila topminnow, desert pupfish, and northern Mexican garter snake into Mud Spring, Thicket Spring, and White Rock Spring and its tributary (figure 6c, appendix A).

The Cave Creek Complex fire occurred in 2005 and significantly altered vegetation composition on the allotments. The Verde Wild and Scenic River Comprehensive River Management Plan (Verde River Plan) was signed in 2004 and places restrictions on livestock use of the river corridor. Tonto NF proposes to update current allotment management plans from 1982 (Red Creek), 1995 (Six Bar) and 1990 (Skeleton Ridge) through incorporation of adaptive management language and current conservation measures to address these changes.

Conditions are highly variable in the analysis area ecosystems, due to historically dynamic climatic regimes in the desert Southwest and globally changing climate conditions. Production of palatable forage and browse for livestock and wildlife varies greatly both seasonally and annually. Through adaptive management strategies, this proposed action strives to respond to change by using a variety of tactics, including flexible stocking rates and grazing strategies. Data for determining stocking rates would be gathered throughout each grazing season using a variety of monitoring techniques, as described in agency manuals and handbooks as well as through scientific literature produced through other agencies, research stations, and universities.

Rangeland allotment infrastructure includes, but is not limited to, forms of improvements such as fences, water wells, spring developments, storage tanks, dirt tanks, pipelines, and watering troughs. These improvements range in condition from good to poor. Those in poor condition are considered a priority for improvement through this proposed action. Fencing the east and west side of the Verde River is required in order to restrict livestock access through the Wild and Scenic portions of the river. No new range improvements are proposed at this time. Many improvements are reaching the end of their useful life and need to be replaced. If a need for

additional range improvements is identified during the life of this decision, archaeological and biological clearances and required analysis would be completed for individual projects prior to their installation. Permit modifications would be provided and work would be identified through annual operating instructions.

Adaptive Management

Adaptive management uses monitoring results to continually modify management in order to achieve specific objectives. The proposed action would provide sufficient flexibility to adapt management to changing circumstances. If monitoring indicates that desired resource conditions are not being achieved, adaptive management decisions would be used to modify management. Such changes may include annual administrative decisions to adjust the specific number of livestock and/or animal unit months (AUMs), specific dates for grazing, class of animal or pasture rotations. These changes would not exceed limits for timing, intensity, duration, and frequency as defined in the term grazing permit. Adaptive management would be implemented through annual operating instructions, which would adjust livestock numbers and the timing of grazing, so that use is consistent with current productivity and capacity and is meeting management objectives.

Adaptive management also includes monitoring to determine whether identified structural improvements are necessary or need to be modified. In the case that changing circumstances require physical improvements or management actions not disclosed or analyzed herein, further interdisciplinary review would occur. The review would consider any changed circumstances and site-specific environmental effects of improvements in the context of the overall project. Based on the results of the interdisciplinary review, the District Ranger would determine whether correction, supplementation or revision of the EA is necessary in accordance with Forest Service policy or if further analysis under NEPA is required.

Monitoring and Mitigation Common to all Action Alternatives

Upland Utilization Monitoring and Mitigation

Forage utilization would be managed at a level corresponding to light (20 to 30 percent on herbaceous key forage species) to conservative intensity (30 to 40 percent on herbaceous key forage species). Use of browse species and annuals would be limited to not more than 50 percent of current annual growth except in riparian areas, where browse is 40 percent in order to provide for grazed plant recovery, increases in herbage production and retention of herbaceous litter to protect soils (implementation monitoring). Livestock will be moved to the next pasture once utilization is within 10 percent of allowable use commonly referred to as a trigger points.

Only light intensity grazing would be authorized in areas where soil and/or vegetation conditions are impaired or unsatisfactory, until those areas show recovery toward desired conditions. Only light intensity grazing would be authorized in areas where soil and/or vegetation conditions are impaired or unsatisfactory, until those areas show recovery towards desired conditions.

As livestock use each specific unit (pasture), district range personnel would monitor effects of grazing activities in the uplands, such as use on herbaceous and woody vegetation, trailing, and effects on soils and wildlife/fish habitat. This information would be used to help determine when cattle should rotate out of the scheduled unit during the grazing season. If livestock were reaching use limits for current annual production or causing other undesirable effects, they would be

moved from the pasture to the next scheduled unit. Post grazing monitoring would then document effects and, when combined with actual livestock use information over time, would help determine the carrying capacity of each unit for livestock to refine future allotment management. If livestock consistently reach forage use limits before their scheduled move dates, annual authorized numbers and/or animal unit months, would be adjusted in the next year's annual operating instructions. Over time, this information could be used to adjust permitted numbers on the term grazing permit.

If acceptable use levels in all management units are reached before the end of the grazing year or season, livestock may have to be removed from the allotment to avoid exceeding utilization guidelines identified in this decision. Better distribution of livestock avoids concentrating effects and provides the best opportunity for livestock to remain on the allotment for the entire grazing season.

Infrastructure

Fencing around springs and water development offsite may be necessary to reduce or eliminate undesirable effects to associated riparian vegetation and wildlife habitat, if management does not protect or improve those sites.

Existing range improvement infrastructure must be brought up to agency standard prior to installing any new developments. Improvements west of Verde River are a priority for maintenance, before working on existing improvements east of Verde River.

Riparian Utilization Monitoring

Riparian components in key reaches would be monitored using riparian utilization measurements (implementation monitoring) following methods in "Sampling Vegetation Attributes and Utilization Studies and Residual Measurements" (ITT 1999) and "Multiple Indicator Monitoring (MIM) of Stream Channels and Streamside Vegetation" (Burton et al. 2011) or the most current acceptable method. It has been determined that in a reach of approximately 1,000 feet, sampling of 30 to 50 plants within that reach is necessary for statistically valid monitoring.

Use guidelines for riparian components are as follows: obligate riparian tree species – limit use to < 50 percent of terminal leaders (top one third of plant) on palatable riparian tree species accessible to livestock (usually < 6 feet tall); deergrass – limit use to < 40 percent of plant species biomass; emergent species (rushes, sedges, cat-tails, horse-tails) – maintain six to eight inches of stubble height during the grazing period; stream banks - limit use to < 20 percent of alterable banks where stream banks are present or forming. Once riparian utilization guidelines are met, cattle would be moved from the area, or to the next scheduled pasture regardless of available forage in the uplands. It may become necessary to minimize or remove access to riparian habitat, if grazing pressure becomes a limiting factor in the use of pastures.

Changes in riparian vegetation and stream channel geomorphology condition and trend would be measured at five to ten year intervals (effectiveness monitoring) using methods described in Burton et al. (2011), Harrelson et al. (1994), photo point monitoring, or the most current acceptable method.

Livestock trailing would not occur in riparian corridors. Cattle would be driven along roads or upland trails.

Water Quality

Best management practices (BMPs) will be used to maintain and protect water quality. The BMPs are taken from FSH 2509.22 and will be used to protect soil and water resources. They are listed on page 88.

Recreation

The permittee would continue to access the allotments on existing roads and trails as designated by Tonto NF maps to avoid the creation of illegal ATV trails. Access by permittees to roads closed on the Forest Service system may be authorized by the agency in writing.

Wilderness

Compliance with the *Wilderness Act* (1964) and *Arizona Wilderness Act* (1984) in the Mazatzal Wilderness and Pine Creek Wilderness is important and expected of all users on the allotments. Permittees should strive to maintain the untrammeled, natural conditions within wilderness areas. No motorized equipment should be used in wilderness areas, without obtaining authorization from the Regional Forester. Management emphasis for wilderness is on wilderness values. It provides for livestock grazing and recreation opportunities that are compatible with maintaining wilderness values and protecting resources. Section 4(c) of the *Wilderness Act of 1964* defines minimum requirements for administrative actions in wilderness areas, which includes grazing. Wilderness resources must be considered when preparing range improvement construction standards and techniques (2323.26a).

Section 4(d)(4)(2) in FSM 2320.5 states that "...wilderness designation should not prevent the maintenance of existing fences or other livestock management improvements, nor the construction and maintenance of new fences or improvements which are consistent with allotment management plans and/or which are necessary for the protection of the range."

Livestock access to the Verde Wild and Scenic River corridor is not permitted under the Verde Wild and Scenic River Plan. Any Verde River crossings for livestock would occur outside the VWSR corridor.

Wildlife

Surveys may be conducted for aquatic and terrestrial species and associated habitats by the Tonto NF, AZGFD, USFWS, Bureau of Reclamation, Christmas Bird Count participants, and others.

- Ocular estimates may be utilized to determine need for additional measurements
- Photo points may be utilized to establish baseline information and determine trend
- Stream channel cross sections and riparian vegetation monitoring may be used to document and track changes and determine trends

A biological assessment and evaluation will be completed and consultation will occur with USFWS to determine effects to threatened and endangered species on the allotments. All resulting mitigation measures would be incorporated into any action decision made for the allotments. Any applicable recovery plans would also be incorporated where necessary. Candidate species will be treated as proposed for the purposes of the consultation. Doing so will provide concurrence or biological opinion, if species are listed in the future.

Grazing would not be authorized in designated restorable or regenerating (potential) flycatcher habitat in Red Creek, Tangle Creek, and along the Verde River.

Grazing would not be authorized in designated critical habitat for flycatcher or razorback sucker on the Verde River.

Livestock trailing would not be permitted in riparian corridors to mitigate undesirable effects to riparian habitat, streams, fish, and wildlife species.

Heritage

FSM 2364.02 lists as the first three objectives for the protection and stewardship of heritage resources:

- Protect cultural resources in a manner consistent with their National Register qualities and management allocations.
- Avoid or minimize the effects of Forest Service (FS) or FS-authorized land use decisions and management activities on cultural resources.
- Safeguard cultural resources on National Forest System lands from unauthorized or improper uses and environmental degradation.

Mitigation of impacts to heritage resources for all action alternatives is best accomplished by avoidance of these properties through placement and construction of all range improvements, particularly those that may be associated with concentrated use and intense trampling, such as corrals, traps, or water sources. It can also be achieved by minimizing opportunities for localized concentration of animals, improving distribution across the allotment and across each pasture, and by reducing the intensity of grazing for allotments as a whole. In instances where a proposed improvement will involve any potential for direct impact through ground disturbance, such as stock tanks and other water developments, 100 percent archaeological survey will be conducted. Other, more specific mitigation requirements may be identified as each of these improvements is developed and a heritage inventory is made of their areas of potential effect. Such protective measures are developed in accordance with the goals of the project, taking into account site vulnerability as well as the methods of project implementation. All inventoried heritage sites are treated as eligible for the National Register of Historic Places with the exception of those that have been formally determined to be not eligible in consultation with the State Historic Preservation Officer (SHPO). Archaeological clearance must be approved - with all necessary consultation with SHPO and the potentially interested Tribes completed - prior to issuing any decision regarding the construction, modification, or removal of all improvements. In addition, should any of these allotments propose high intensity management strategies for specific areas, such as paddock-based increased stocking, short duration systems, the entire area to be grazed under the intensified system, not just the associated constructed facilities required to implement such strategies, will require archaeological inventory. Should this inventory identify heritage resources within the intensified management area, a specific mitigation plan must be developed to identify the appropriate protective measures necessary to reduce or, preferably, eliminate the effects of intensified livestock trampling and high levels of vegetation utilization with its resulting loss of ground cover.

Protection measures identified under the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities*, Appendix H (Protocol) for archaeological and historic sites include:

- Archaeological survey will be conducted for areas proposed for surface disturbance which have no previous survey coverage, or have outdated surveys which do not conform to current standards.
- Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties.
- Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing.
- Fencing or enclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing.
- Periodic monitoring to assess site condition and to ensure that protection measures are effective.
- Other mitigation measures involving data recovery, for example, may be developed and implemented in consultation with SHPO, as the need arises. The appropriate Tribes will be consulted if the mitigation is invasive or it affects a TCP or other property of concern for them.

Protection measures identified in the Protocol that are applicable to significant tribal places as well as archaeological and historic sites are as follows:

- Use of temporary closures to public access, if needed, to protect traditional activities from disruption. Authority to issue such closures to protect the privacy of tribal activities for traditional, religious, and cultural purposes also derives from the *American Indian Religious Freedom Act* (42 USC 1996), *Executive Order 13007, Accommodation of Sacred Sites*, and the *Food, Conservation and Energy Act of 2008 P.L. 110-246, Title VIII, Section 8104*.
- Revision of designations, if determined necessary to protect sacred and traditional places from adverse effects.
- Monitoring to ensure that impacts to sacred or traditional places are not occurring or that protection measures are working.

In accordance with the Protocol, monitoring will be conducted as part of the day-to-day activities of the professional cultural resource specialists and certified para-archaeologists working in the area. Grazing allotments cover most of any given forest, and when archaeologists are in the field conducting surveys they are most likely surveying within a grazing allotment. Archaeologists will use these opportunities to observe and report on grazing activities, effectiveness of the grazing strategy, and potential impacts to heritage resources. Any incidents of damage to historic properties from grazing will be reported, and the archaeologists will draw upon the protection measures outlined in the Protocol to ensure that the effects are avoided or minimized.

Alternatives Considered But Eliminated From Detailed Study

The interdisciplinary team determined the three alternatives initially proposed (No Action, Current Management, Proposed Action) would adequately address issues raised through scoping. There were no alternatives considered and eliminated from further analysis.

Comparison of Alternatives

Table 3 compares effects of alternatives as relating to major issues. Table 4 compares the effects of the alternatives on resources as they relate to existing condition and by desired condition.

Table 3: Comparison of Alternatives by Issue

Issue		Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Verde River		No grazing would eliminate potential cattle impacts	Grazing is excluded along Wild and Scenic River corridor and excluded on remainder through nonuse	Grazing excluded along Wild and Scenic River Corridor Physical trailing across river would not occur due to potential impacts to TES fisheries Water would need to be pumped from river to supply pastures east of river when cattle were using them
Wildlife/ TES species		Wildlife habitat conditions would improve for all species Improvements in aquatic and riparian habitat would likely be quicker than other alternatives Small game and nongame species could generally increase over time Alternative would result in a no effect determination for TES and candidate species and critical habitat Other impacts would still occur	Upland habitat capability for game and other species would remain unchanged Riparian and aquatic habitat would remain unchanged or degrade west of river and improve east of river Wildlife species and habitats in uplands and riparian areas would remain unchanged in grazed areas with exception of drought cycles No effect determination for bald eagle.	Grazing east of river would slow development of riparian areas and recovery of soil and watershed conditions Upland habitats would not improve east of river as fast as alternative 2 Aquatic and riparian habitats east of river would not be expected to improve as fast as alternative 1 or 2 Upland habitat capability for

Issue		Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Wildlife/ TES species		from cumulative effects (recreation, roads, wildfire, mining, etc.)		game and other species would improve slower east and west of river Wildlife species, herbaceous cover, riparian/ aquatic habitat conditions would likely degrade as compared to alternatives 1 or 2 due to higher stocking rates and grazing on both sides of river No effect determination for bald eagle.
Wildlife /TES Species	Birds	*Bald eagle	No Effect	No Effect
		Cuckoo, yellow-billed	No Effect	May Affect Not Likely to Adversely Affect
		Flycatcher, southwestern willow	No Effect	May Affect Not Likely to Adversely Affect
		Flycatcher, southwestern willow critical habitat	No Effect	May Affect Not Likely to Adversely Affect
		Flycatcher, southwestern willow potential habitat	No Effect	May Affect Not Likely to Adversely Affect
		Owl, Mexican	No Effect	May Affect Not Likely to Adversely

Issue			Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Wildlife /TES Species	Birds	spotted		Affect	Adversely Affect
		Rail, Yuma clapper	No Effect	May Affect Not Likely to Adversely Affect	Likely to Adversely Affect
	Fish	Pikeminnow, Colorado (nonessential experimental)	No Effect	Not Likely to Jeopardize	Not Likely to Jeopardize
		Sucker, razorback	No Effect	May Affect Not Likely to Adversely Affect	Likely to Adversely Affect
		Sucker, razorback, critical habitat	No Effect	May Affect Not Likely to Adversely Affect	Likely to Adversely Affect
		Chub, headwater	No Effect	May Affect Not Likely to Adversely Affect	Likely to Adversely Affect
		Chub, roundtail	No Effect	Likely to Adversely Affect determination for Roundtree Canyon May Affect Not Likely to Adversely Affect determination for Verde River population	Likely to Adversely Affect
		Topminnow, Gila	No Effect	No Effect	May Affect Not Likely to Adversely Affect at Dutchman Grave Spring
	Reptiles	Snake, northern Mexican garter	No Effect	May Affect Not Likely to Adversely Affect	Likely to Adversely Affect
		Snake, northern Mexican garter	No Effect	May Affect Not Likely to Adversely	Likely to Adversely Affect

Issue			Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Wildlife /TES Species	Reptiles	critical habitat		Affect	
		Snake, narrow-headed garter	No Effect	May Affect Not Likely to Adversely Affect	Likely to Adversely Affect
		Snake, narrow-headed garter critical habitat	No Effect	May Affect Not Likely to Adversely Affect	Likely to Adversely Affect
Archeology			No direct effects to resources or sacred sites and traditional uses Cumulative effects would continue	Concentrated livestock use and construction of range improvements creates threat to resources All surface disturbing activities are required to undergo evaluation and determination of effect- goal is to reduce or eliminate any potential for activities to directly or indirectly affect archaeological, historical, or traditional use properties Grazing management will likely result in most heritage resources moving increasingly away from what are considered desired conditions	Same as alternative 2 or slightly less based on grazing intensity
Soils			Infiltration rates, total basal perennial grass and shrub cover were higher on ungrazed soils Absence of grazing on sites with soils highly susceptible to compaction and/ or erosion may benefit	Hoof action can compact soils, risk is greatest when soils are wet Trailing can physically displace soils Trampling can temporally increase water infiltration rates but tends to decrease long-term rates	Effects of improvement construction would be minor, localized, short-term disturbances This alternative is most likely to impede growth or decrease cover of biological crusts

Issue	Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Soils	Would provide the fastest increase for vegetative cover, species diversity, and improvement in soil condition Most likely to increase cover of biological crusts	Removal of vegetation through grazing can reduce protective soil cover, including litter If allowable use guidelines are not exceeded, areas of unsatisfactory or impaired soil condition should begin to improve though not as fast as alternative 1 Grazing may slow or prevent recovery of biological crusts Ungrazed pastures would improve the fastest but controlling grazing and limiting utilization would allow soils to begin to recover	Overall improvement of soils is likely to be slower than alternative 1 and in some places alternative 2 since pastures east of Verde River could be grazed
Vegetation	Historic conditions may not be reached with removal of grazing due to other limitations Infiltration rates, total basal perennial grass and shrub cover were higher on ungrazed soils Absence of grazing on sites with soils highly susceptible to compaction and/ or erosion may be beneficial Long-term changes could include increases in species richness and canopy cover for grasses, shrubs, and forbs	Has the capability of satisfying resource concerns when grazing management is prompt in addressing resource issues Grazing could cause shifts in vegetation state but is not always a leading cause Grazing affects grasslands through removal of biomass and stressing of plants Livestock influence the cover and density of woody and herbaceous species Monitoring has identified areas of	Has the capability of satisfying resource concerns when grazing management is prompt in addressing resource issues Resource impact is accelerated when resource concerns are not addressed promptly Balancing utilization levels with soil conditions has potential to move resource conditions toward desired conditions but at a slower rate

Issue	Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Vegetation	May allow localized increases in non-native herbaceous plants that would otherwise be reduced through grazing (red brome, etc.)	concern because of overutilization Grazing in ponderosa pine alters forest dynamics by reducing biomass and density of understory vegetation which otherwise outcompetes conifer seedings Livestock grazing has played a role in promoting woody expansion	
Climate	Amount of rainfall and degree of intensity of rainfall has the potential to limit or slow recovery The Federal Advisory Committee Draft Climate Assessment Report is projecting higher temperatures and lower precipitation for the Southwestern U.S.	Anecdotal accounts indicate cattle have had greater impact during drought than under average conditions Changes in soil and vegetation due to livestock grazing are occurring in arid lands throughout the world The Federal Advisory Committee Draft Climate Assessment Report is projecting higher temperatures and lower precipitation for the Southwestern U.S.	Anecdotal accounts indicate cattle have had greater impact during drought than under average conditions Changes in soil and vegetation due to livestock grazing are occurring in arid lands throughout the world The Federal Advisory Committee Draft Climate Assessment Report is projecting higher temperatures and lower precipitation for the Southwestern U.S.
Riparian	Amount of time required for recovery can vary from several years to decades Would allow recovery or maintain or improve existing condition of riparian areas and stream channels	Not grazing several key reaches under this alternative has contributed to improved conditions especially in lower Red Creek and Verde River If riparian area utilization guidelines	Effects are similar to alternative 2 Trailing to cross Verde River could impact springs and riparian areas along FR 269 and Trail 11 or FR 18, if FR

Issue	Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Riparian	Implementation should maintain or improve existing condition of upper watersheds Meets the intent of the Forest Plan to protect, manage and restore riparian areas	are followed, undesirable effects of grazing would be minimized Where key reaches do not have enough riparian vegetation to monitor Red Creek in Soda Springs Pasture and Holmes Canyon in Middle Fork Pasture, use should be deferred until vegetation reestablishes and ecological status improves Use levels may be reached quickly in some key reaches Should meet the intent of the Forest Plan if mitigation measures are successful	18 is used to trail cattle Red Creek would not meet intent of Forest Plan It is likely use guidelines would be met quickly in Tangle Creek in the Peso Pasture If riparian area utilization guidelines are followed, undesirable effects of grazing would be minimized. Where key reaches do not have enough riparian vegetation to monitor Red Creek in Soda Springs Pasture and Holmes Canyon in Middle Fork Pasture, use should be deferred until vegetation reestablishes and ecological status improves. Should meet the intent of the Forest Plan, if mitigation measures are successful
Stocking rates / grazing strategy	Livestock would not be stocked	Ecosystem processes are affected by grazing- impacts can be positive or negative depending on number of animals and length of time they are present	Limited water in pastures east of Verde River would make cattle distribution difficult. If stocking rates are promptly adjusted to vegetation and

Issue	Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Stocking rates / grazing strategy		Slope gradient and water distribution affects grazing use Using Skeleton Ridge and Six Bar for winter use successfully addressed concerns with available water Implementing recommendations would improve stocking rates and grazing strategy If stocking rates are promptly adjusted to vegetation and ecosystem needs, proposed grazing with recommendations has potential to move resource conditions toward desired conditions at a potentially faster rate than alternative 3 but slower rate than alternative 1	ecosystem needs, proposed grazing with recommendations has potential to move resource conditions toward desired conditions at a potentially slower rate than alternative 1 or 2. Significant fencing and water development would be needed to make pastures east of Verde River feasible for grazing.
Water quality/ water use	There are two water rights filings on Verde River in the name of Houston Creek Ranch and Red Creek Ranch	Use best management practices to maintain and protect water quality	Use best management practices to maintain and protect water quality Water would have to be pumped from Verde River to supply cattle using pastures on east side If trailing occurs on FR 18 there may be impacts to water quality There are two water rights

Issue	Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Water quality/water use			filings on Verde River in the name of Houston Creek Ranch and Red Creek Ranch
Fire	Fuel loading of fine fuels would increase and allow natural fire the necessary fuel continuity and loading to have a beneficial effect and increase chances of restoring a natural fire return interval Fire behavior and intensity would increase	Livestock grazing reduces abundance of fine fuels which formerly carried low intensity fires through forests Where abundant fuel is available fires should burn in a nonmosaic pattern and at high intensity Where fuel loads are significantly reduced burn patterns would be mosaic and fire intensity would be low Cattle tend to congregate on recent burns because of tender, succulent new growth and temporary forbs Fire behavior, intensity, and resistance to control would be typical of recent past behavior Any wildfire in Sonoran Desert would be immediately suppressed	Similar to alternative 2 Increasing amount of cattle grazing on a larger portion of the landscape may alter amount of perennial and annual grasses that might readily be available to burn Any wildfire in Sonoran Desert would be immediately suppressed
Wilderness	Recreationists may or may not notice the area is no longer used to graze cattle Visitors may observe deteriorating range fences and water developments	Cattle may be seen and/or encountered Visitors may or may not notice cattle	Effects would be similar to alternative 2 New fences may be observed when floating river or participating in recreational activities within wilderness

Issue	Alternative 1 – No Action	Alternative 2 - Current Management	Alternative 3 - Proposed Action
Wilderness	Would not affect recreation opportunities		

***The bald eagle is currently a Forest Service Sensitive species. It is afforded more protection through the application of the Bald and Golden Eagle Protection Act (BGEPA). We elected to evaluate effects to the bald eagle and habitat as if it were federally listed in order to disclose effects in the Wildlife and Aquatics Environmental Consequences, and in the Environmental Assessment. The bald eagle will be addressed as a Forest Service Sensitive species in the Biological Evaluation.**

Table 4: Comparison of Existing Condition to Desired Condition by Resource

Resource	Existing Condition	Desired Condition
Upland Vegetation /Noxious Weeds	For every site that shows improvement or upward trend, there is generally a site showing downward vegetative trend. Perennial grasses in desert scrub are limited and have in large part been replaced by annual grasses and forbs. Lack of fire and grazing pressure has altered juniper grasslands however increase in abundance and diversity of perennial grasses has occurred in the last 15 years. Seed dispersal of Malta star thistle by livestock is common where populations occur	Manage vegetation to achieve satisfactory or better watershed condition Maintain or achieve a minimum of 30 percent effective ground cover Increase cover of native herbaceous species Increase plant basal area and litter Allow for increased reproduction of jojoba in Sonoran Desert communities In grasslands, increase foliar canopy cover and vigor of palatable shrubs Improve livestock distribution to avoid areas of high impact and concentrated use Contain and eventually eliminate any infestations of buffelgrass, fountain grass, Malta star thistle, and Saharan mustard
Soils	4,312 acres of soil are in satisfactory condition 7,531 acres of soil are in a combination of	Minimize impacts on soil and water resources from all ground disturbing activities Mitigate adverse effects through use of Best

Resource	Existing Condition	Desired Condition
Soils	satisfactory and impaired condition 1,073 acres of soil are in a combination of satisfactory and unsatisfactory condition 12,840 acres of soil are in impaired condition 13,797 acres of soil are in a combination of impaired and unsatisfactory condition 24,220 acres of soil are in unsatisfactory condition 86,074 acres are not suitable for grazing due to slope but are in satisfactory condition Impaired and unsatisfactory soils are generally on gentler slopes	Management Practices Emphasize improvement of soil productivity Maintain or improve soils currently in satisfactory condition Improve soils in impaired or unsatisfactory condition Sustain soil productivity and function Improve soil nutrient cycling
Hydrology, Riparian Vegetation	Watershed condition assessment-Bishop Creek watershed is impaired, Sycamore Creek and Canyon Creek/ Verde River watershed is functioning, nine watersheds in project area are functioning at risk 124 miles of perennial and intermittent streams channels that support obligate riparian vegetation <i>Verde River</i>- riverside vegetation has increased significantly in 10 years <i>Holmes Canyon/ Willow Spring</i>- lacking seedling/ sapling woody plants, deergrass heavily used in past <i>Little Hutch Spring</i>- only deergrass present, past use was low <i>Caveness Hole</i>- high cover of deergrass and some woody plants, channel appeared stable	Maintain residual herbaceous vegetation along the greenline or stream bank whenever precipitation is expected Reintroduce riparian vegetation if native riparian species are absent Minimize annual impacts to seedling and sapling riparian woody species Limit physical impacts to alterable stream banks and greenlines Optimize riparian tree and shrub establishment Increase density, vertical, and horizontal canopy cover of woody riparian tree species Increase proportion of obligate and facultative riparian species Maintain or increase canopy cover of herbaceous

Resource	Existing Condition	Desired Condition
Hydrology, Riparian Vegetation	Middle Fork Squaw Creek- supports thick deergrass, channel appeared stable from photos <i>Squaw Creek</i>- large cottonwoods, willows, and patchy deergrass <i>Mud Spring Creek</i>- CCC Fire caused dramatic changes to channel and loss of vegetation. Supports cottonwood, willow, velvet ash, deergrass <i>South Fork Mud Spring Creek</i>- unstable condition after fire but recovering deergrass and tree seedlings <i>Hutch Spring</i>- supports numerous large deergrass plants <i>Red Creek</i>- repeated overuse has resulted in a lack of riparian vegetation to monitor in Soda Springs pasture. Recovering channel with banks forming and vegetation establishing in Red Creek pasture. Increasing size and density of riparian vegetation and narrowing banks, channel is recovering in Red Hills pasture where vehicle traffic is not impacting the creek <i>Soda Spring Creek</i>- cattle concentrate here for shade and water, degraded through repeated overuse in Red Creek pasture but inaccessible in Mustang pasture <i>Middle Red Creek</i>- increasing size and density of vegetation near the mouth <i>Horse Camp Canyon</i>- abundant deergrass cover and establishing seedlings and saplings indicate a	species Decrease greenline to greenline width Optimize establishment of floodplains and stream banks Improve stream channel function and stability Coordinate with range to achieve utilization in riparian areas that will not exceed 20 percent of current annual growth by volume of woody species Coordinate with range to achieve at least 80 percent of potential riparian overstory crown coverage Rehabilitate at least 80 percent of potential shrub cover in riparian areas through use of appropriate grazing systems and methods Rehabilitate and maintain mixed broadleaf riparian to achieve 80 percent of potential overstory crown coverage Reestablish riparian vegetation in severely degraded but potentially productive riparian areas Rehabilitate cottonwood willow Type 2 to achieve conversion to Type 1 Protect, manage, and improve riparian areas while implementing land and resource management activities. Manage riparian areas under the principles of multiple uses and sustained yield while emphasizing protection and improvement of water

Resource	Existing Condition	Desired Condition
Hydrology, Riparian Vegetation	change in management that is allowing trees to establish <i>Roundtree Canyon</i>- impaired condition due to lack of vegetation and a high width/depth ratio in the channel <i>White Rock Spring</i>- affected by CCC fire but recovering with establishment of herbaceous species <i>Tangle Creek</i>- portion of creek used for livestock trailing has caused damage to channel, stream banks, floodplains, and vegetation. Bank alteration is generally high throughout reach with varying amounts of use on vegetation. An exclosure demonstrates that channel features have not changed significantly without grazing however density and diversity of vegetation has increased in Tangle Mountain pasture. Use of riparian vegetation is generally within guidelines, herbaceous vegetation has increased since 1993 in Peso Pasture <i>Frog Spring</i>- most vegetation is herbaceous and holding a deep layer of fine sediment <i>Wet Bottom Creek</i>- riparian vegetation is thick <i>Dutchman Grave Spring</i>- good mix of age classes of riparian trees, use noted on deergrass with some use on woody species. Very little of the stream banks are alterable <i>Houston Creek</i>- variety of riparian vegetation occurs, use on vegetation was generally light but trailing impacts have caused fine sediments to	Give attention to land along all stream channels capable of supporting riparian vegetation Give special attention to land and vegetation approximately 100 feet from edges of perennial streams Give special attention to adjacent terrestrial areas to ensure adequate protection for riparian-dependent resources Follow best management practices Emphasize improvement of water quality

Resource	Existing Condition	Desired Condition
Hydrology, Riparian Vegetation	deposit in the channel in Mud Springs pasture. Also used for trailing in Black Ridge pasture in previous years. More recent monitoring indicated variety of riparian vegetation and age/ size class for trees <i>Squaw Creek</i>- wide variety of riparian trees and diverse herbaceous component with bank features <i>Pigeon Spring Creek</i>- lower end was degraded with large eroding banks and low species diversity. Diversity improved upstream with a variety of riparian vegetation <i>Trap Canyon</i>- ash, red willow, deergrass with moderate to high use on woody plants and low use on deergrass <i>Horse Camp Canyon</i>- similar to Trap Canyon	
Wild and Scenic River	Verde River from Beasley Flat to Red Creek is designated as National Wild and Scenic River. Two additional reaches within the project area are potentially eligible	Manage potential wild and scenic rivers to protect their indicated outstandingly remarkable values Maintain and enhance visual resource values by emphasizing recreation resource management Verde WSR corridor will be administered in such a manner as to protect and enhance its designated outstandingly remarkable scenic, fish and wildlife, and historical/ cultural values while protecting the river's free flowing character and water quality
Water Quality	Red Creek is rated <i>inconclusive</i> due to insufficient data Roundtree Canyon is rated <i>attaining</i> some uses but needs analysis for dissolved copper and selenium	Follow best management practices Emphasize maintenance/improvement of water quality

Resource	Existing Condition	Desired Condition
Water Quality	Sycamore Creek is rated <i>attaining</i> some uses but needs analysis of arsenic, dissolved oxygen, selenium, and mercury Verde River from Wet Bottom Mesa to Tangle Creek is rated <i>attaining</i> some uses and needs analysis of selenium and mercury	
Fire and Fuels	Semidesert scrub is classified as having a moderate departure from a natural fire regime Chaparral is classified as having a low departure from a natural fire regime Grassland type is classified as having a high departure from a natural fire regime CCC Fire caused sudden changes in fuel loading, fire return intervals, and burn severity	Manage fire consistent with resource objectives Provide a mosaic of age classes within total type which will provide for mix of successional stages Allow fire to resume its natural ecological role within ecosystems Suppress wildfires when they adversely affect forest resources, endanger public safety, or have potential to damage significant capital investments
Wildlife and Fisheries	Game species that occur include desert mule deer, Coue's whitetail deer, mountain lion, black bear, javelin, coyote, gray fox, bobcat, raccoon, Gambel quail, dove, rock squirrels, desert cottontail, jackrabbit, and a variety of birds, rodents, reptiles, and amphibians, resident and migratory waterfowl, non-native river otter, numerous Forest sensitive species, yellow-billed cuckoo, southwestern willow flycatcher, Mexican spotted owl, Yuma clapper rail, garter snakes, headwater chub, razorback sucker, Colorado River pike minnow, and Gila topminnow Designated, suitable and potential habitat for TES	Manage desert scrub type to emphasize production of javelin, Gambel quail, and mule deer Manage pinyon-juniper type to emphasize production of mule deer Manage chaparral type to emphasize production of whitetail deer Maintain a minimum of 30 percent effective ground cover Stock populations of Gila topminnow, desert pupfish, and northern Mexican garter snake

Resource	Existing Condition	Desired Condition
Wildlife and Fisheries	species occurs Non-native fishes occur in Verde River CCC Fire affected wildlife habitat to varying degrees in project area Project area contains high number of riparian and water resources for wildlife	Follow guidance criteria for TES species Fence around springs, seeps, and other riparian areas to reduce or eliminate undesirable effect to riparian vegetation and wildlife habitat if management alone does not protect or improve sites
Recreation, Wilderness, and Visual Quality	Verde River Wild and Scenic River provides river running opportunities at least eight months of the year Eight designated hiking trails are within the project area Cow paths and user created trails cause confusion for trail users Four Recreation Opportunity Spectrum (ROS) categories- primitive, semiprimitive nonmotorized; semiprimitive motorized; roaded natural Four Inventoried Roadless Areas (IRA) Pine Mountain and Mazatzal Wilderness Scenic driving opportunities occur Hunting, fishing, picnicking occur	Manage for wilderness values while providing livestock grazing and recreation opportunities that are compatible with maintaining wilderness values and protecting resources Provide a quality mix of year-round outdoor recreation experience opportunities River floaters and trail users will have a sense of remoteness and other wilderness experiences when traveling through Mazatzal wilderness Dispersed outdoor recreation will continue to provide opportunities such as open space and natural settings in wilderness and roadless areas Recreational Opportunity Spectrum categories will not be changed by continuing to allow livestock grazing Administer livestock grazing in accordance with the <i>Wilderness Act</i>, <i>Arizona Wilderness Act</i>, <i>Multiple Use Sustained Yield Act</i>, <i>CFR 294</i>, <i>FSM 2300</i>
Archeology	Incurring no more impact from livestock than has been the case historically Project area is known to contain hundreds of	Archaeological survey will be conducted for areas proposed for surface disturbance which have no previous survey coverage, or have outdated surveys which do not conform to current

Resource	Existing Condition	Desired Condition
Archeology	prehistoric archaeological sites (Hohokam) and many historic sites used by Apache, Yavapai, Anglo ranchers, stockmen, miners, prospectors Project area contains many plant and animal species, water sources, mineral, and geographic landforms and places that have significance to contemporary Indian tribes	standards. Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties. Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing. Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing. Periodic monitoring to assess site condition and to ensure that protection measures are effective. Other mitigation measures involving data recovery, for example, may be developed and implemented in consultation with SHPO, as the need arises. The appropriate Tribes will be consulted if the mitigation is invasive or it affects a TCP or other property of concern for them. Use of temporary closures to public access, if needed, to protect traditional activities from disruption. Revision of designations, if determined necessary to protect sacred and traditional places from adverse effects. Monitoring to ensure that impacts to sacred or traditional places are not occurring or that

Resource	Existing Condition	Desired Condition
Archaeology		protection measures are working.
Air Quality	Not in a nonattainment area	Emphasize improvement of air quality
Climate	Project area remains in long-term drought Precipitation has been below average for six of last ten years	Ensure national forests are conserved, restored, and made more resilient to climate change while enhancing water resources

Chapter 3: Affected Environment and Environmental Consequences

This chapter summarizes physical, biological, social, and economic environments of the project area and effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for comparison of alternatives presented in chapter 2.

Upland Vegetation/ Noxious Weeds

Desired Condition

Management Direction

The *Multiple Use Sustained Yield Act* states that management of national forests must provide “sustained yields in perpetuity without impairment of the productivity of the land” (FSM 2550.1 Authority 1).

FSM 2550.3 policy states the U.S. Forest Service is to “manage forest and rangelands in a manner that will improve soil productivity.”

FSM 2521.03 objectives state the U.S. Forest Service is to “manage terrestrial ecosystems and National Forest System watersheds to protect soil productivity and hydrologic function. Implement soil and water conservation measures with management activities to maintain satisfactory or optimum watershed conditions.”

FSM 2520.02 objective states the U.S. Forest Service is to “protect National Forest System watersheds by implementing practices designed to maintain or improve watershed condition, which is the foundation for sustaining ecosystems and the production of renewable natural resources, values, and benefits.”

The *Wilderness Act of 1964*, as enacted September 3, 1964, and amended October 21, 1978 (16 U.S.C. 1131-1136), specifies congressional policy to secure for the American people an enduring resource of wilderness for the enjoyment of present and future generations. It defines wildernesses as areas untrammeled by people that offer outstanding opportunities for solitude and directs agencies to manage wilderness to preserve natural ecological conditions (section 2320.6). With certain exceptions, the Act prohibits motorized equipment, structures, installations, roads, commercial enterprises, aircraft landings, and mechanical transport. The Act permits mining on valid claims, access to private lands, fire control, insect and disease control, grazing, water resource structures (upon the approval of the President), and visitor use.

Vegetation and Watershed

The Forest Plan recognizes that grazing by domestic livestock can impact vegetation by changing: the mix of species in the plant community (species composition), the density and frequency of perennial herbaceous plants (plant frequency), and the vigor of grazed plants. The combined effects of composition, density, and plant vigor can be used to measure the condition and trend of rangeland plant communities.

Desired conditions for vegetation communities are to:

- Maintain a minimum of 30 percent effective ground cover for watershed protection and forage production. Where less than 30 percent exists, it will be the management goal to obtain a minimum of 30 percent effective ground cover (pg. 40).
- Increase cover of native herbaceous species with an ultimate goal of achieving ecosystem potential.
- Increase plant basal area and litter.
- Allow for increased reproduction of jojoba in Sonoran Desert communities.
- In grasslands, increase the foliar canopy coverage, basal cover, and vigor of grass species that decrease under grazing pressure.
- In chaparral, increase the foliar canopy cover and vigor of shrub species preferred by grazing animals. They are referred to as “A” species in Forest Service Handbooks (*FSH 2209.21 R-3*) and include, but are not limited to desert ceanothus, mountain mahogany, and Wright’s silktassel.
- Improve livestock distribution in pastures to avoid areas of high impact and concentrated use and to allow for uniform light to moderate utilization (30 to 40 percent).
- Contain and eventually eliminate infestations of buffelgrass, fountain grass, Malta star thistle, and Saharan mustard. Reduce salt cedar where feasible and where no conflict exists with endangered species habitat.

Management Prescriptions - All Management Areas

- Maintain a minimum of 30 percent effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas. Where less than 30 percent exists, it will be the management goal to obtain a minimum of 30 percent effective ground cover
- Coordinate with range to achieve utilization in the riparian areas that will not exceed 20 percent of the current annual growth by volume of woody species.
- Coordinate with range to achieve at least 80 percent of the potential riparian overstory crown coverage.
- Coordinate with range to achieve at least 50 percent of the cottonwood-willow and mixed broadleaf acres in structural type 1 by 2030.
- Rehabilitate at least 80 percent of the potential shrub cover in riparian areas through the use of appropriate grazing systems and methods.
- Rehabilitate and maintain, through improved management practices, mixed broadleaf riparian to achieve 80 percent of the potential overstory crown coverage. Natural regeneration is anticipated to achieve most of this goal. Artificial regeneration may be necessary in some areas.
- Re-establish riparian vegetation in severely degraded, but potentially productive, riparian areas. Natural regeneration is anticipated to achieve this goal, but artificial regeneration may be necessary in some area.

Existing Condition

Summaries of Parker Three-Step transects that were visited in each allotment are listed in tables 5, 6, and 7 below. Due to the size of the allotments, it is debatable if the number and location of established transects is sufficient to draw large scale conclusions. However, it does indicate that for every location that shows an improvement or upward trend, there are other areas that indicate a downward trend. Range conditions are evaluated over time by monitoring several related vegetation, soil, and watershed resource values. These may be improved by changing cattle

distribution, fencing waters, and creating new stock tanks/water sources. Range analysis indicates that other factors affecting vegetative and soil condition are drought conditions, fire effects, overstocking/over utilization, and concentrated use on perennial grasses where they are available. Areas that have improved or deteriorated are thus usually linked to changes in one or more of these factors.

Vegetation condition ratings by the Parker Three-Step method are based on scores for three elements: composition, forage plant frequency, and vigor. Plant species are classified according to the manner in which they respond to grazing or disturbance as decreasers, increasers, or invaders. This is not a rating system that considers similarity with site potential based on soils or climate, nor does it rate overall ecological status.

The Forest Plan states that “range condition is a subjective expression of the status or health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community”. Condition classes may be classified as excellent, good, fair, poor, and very poor for both vegetation condition and soil/watershed condition with its associated trend (up, down, or stable). Fair or above condition classes with an upward or stable trend are equivalent to satisfactory range and watershed condition.

Red Creek Allotment Vegetation

Topography on Red Creek Allotment west of the Verde River is a gently rolling basin surrounded by fairly steep mountains on the west, south, and east. Topography rises sharply to the northwest, providing fairly effective natural boundaries at the Verde Rim and Skeleton Ridge. To the northeast lies the broad flat expanse of Long Mesa. A rim at the northern edge of Long Mesa forms another natural boundary. Several steep-walled drainages bisect the allotment. Elevations range from 6,600 feet at the Verde Rim to 2,000 feet at the river, and 5,500 feet atop Cypress Butte. Elevation in Bloody Basin, where a large part of the allotment is situated, averages 3,000 feet.

The Verde River runs through the eastern, central part of the allotment. A large portion of the eastern half of the allotment lies within the Mazatzal Wilderness Area, while a smaller portion on the northern boundary lies within the Pine Mountain Wilderness Area. The Red Hills increase rapidly in elevation east of the Verde River, with a steep rim west of Cypress Butte. Wet Bottom Creek Canyon forms a natural barrier to livestock movement to the north, except for a short stretch near the river.

Vegetation on the allotment is classified as the following types: desert scrub, juniper/associated grasslands mixed with desert scrub, juniper/associated grasslands, pinyon/juniper/oak woodlands, riparian areas, and barren/rock/no vegetation. The summary of Parker Three-Step range condition on Red Creek Allotment is shown in table 5 below.

Desert scrub includes Sonoran Desert scrub. Key indicator species are palo verde (*Parkinsonia microphyllum*) and giant saguaro (*Carnegiea gigantea*). Other species present include velvet mesquite (*Prosopis velutina*), jojoba (*Simmondsia chinensis*), prickly pear cactus (*Opuntia phaeacantha*), catclaw acacia (*Acacia greggii*), and desert broom (*Baccharis sarathroides*).

This type occupies the lowest elevations on the allotment. Perennial grass production is limited and, over time, has in large part been replaced by annual grasses and forbs in areas easily accessible to livestock. Most of this vegetation type occurs on slopes less than 40 percent.

Juniper/associated grasslands mixed with desert scrub occur below pinyon - juniper woodlands and are within semidesert grasslands bordering the upper Sonoran Desert ecotone. Vegetation is similar to the juniper/associated grasslands type, but includes scrub species listed in the desert scrub type as well.

These areas have been altered over time due to past and continued grazing pressure, as well as a lack of natural fire disturbance. Some of the perennial grass species that should occur throughout the landscape have been reduced to areas well-protected from livestock use, such as under the shrub canopy. However, both frequency plots and Parker Three-Step transects have demonstrated increases in abundance and diversity of perennial graminoids over the last 15 years.

Juniper/associated grasslands occur between semidesert grasslands and pinyon - juniper woodlands and are the dominant vegetation type. Red-berry juniper (*Juniperous erythrocarpa*) or Utah juniper (*Juniperous osteosperma*) average 5 to 10 percent canopy cover with small amounts of pinyon pine (*Pinus monophylla*) in the Pine Mountain Wilderness Area. The grass community is dominated by curly mesquite (*Hilaria belangeri*). Other common perennial grasses include hairy grama (*Bouteloua hirsuta*), side oats grama (*Bouteloua curtipendula*), and three awn species (*Aristida*).

Pinyon/juniper/oak woodlands occur above juniper woodlands. The overstory generally contains about 25 percent canopy cover of pinyon and Utah juniper. There is generally about 20 percent canopy cover of shrubs dominated by turbinella oak (*Quercus turbinella*) and manzanita (*Arctostaphylos pungens*). Canopy coverage of grasses is about 5 to 10 percent and is dominated by curly mesquite, side oats grama, or hairy grama.

Riparian areas are described in greater detail later in this chapter. Plant species in riparian areas include, but are not limited to: Fremont's cottonwood (*Populus fremontii*), velvet ash (*Fraxinus velutina*), red willow (*Salix laevigata*), Goodding's willow (*Salix gooddingii*), coyote willow (*Salix exigua*), deergrass (*Muhlenbergia rigens*), Arizona sycamore (*Platanus wrightii*), and velvet mesquite.

Barren/rock/no vegetation comprises approximately 583 acres in this category, which consist of areas of rock outcrop or other areas void of vegetation.

Table 5: Summary of Parker Three-Step Range Condition on Red Creek Allotment

Pasture	Vegetative Type	Vegetation Condition	Vegetation Trend	Soil/Watershed Stability	Soil/Watershed Trend
Mustang	Semidesert Grassland	12, Very Poor	Down	32, Poor	Up
Red Creek	Semidesert Grassland	23, Poor	Down	40, Poor	Down
Cedar Holding	Semidesert Grassland	38, Poor	Up	57, Fair	Up
Tangle	Woodland-Assoc. Grassland	43, Fair	Down	44, Fair	Down
Peso	Woodland	9, Very Poor	Down	74, Good	Up
Rugged Mesa	Woodland	24, Poor	Up	51, Fair	Up

Skeleton Ridge Allotment Vegetation

Topography ranges from rough, steep country to broad, gentle basins. Houston Creek is the only major drainage running through the allotment. Elevations on Skeleton Ridge Allotment range from 6,814 feet atop Pine Mountain to 2,800 feet in Cedar Basin. The Verde River runs along the northeast boundary of Skeleton Ridge and also flows through the middle of the Mazatzal Wilderness portion. To the south, in addition to the headwaters of Red Creek itself, are the headwaters of several creeks that flow off Long Mesa/Soda Springs Rim and become tributaries to Red Creek. These are: Soda Springs, Yellow Jacket, Horse Camp, and Trap Canyon. A large part of Pine Mountain Wilderness and a portion of Mazatzal Wilderness lie within the allotment. These areas are steep, thickly vegetated, and access through much is difficult even on horseback.

Vegetation on the allotment is classified as the following types: pinyon-juniper, pinyon-juniper/semidesert transition, mountain browse, and riparian.

Pinyon-juniper is the major vegetative type on this allotment. Overstory is almost exclusively juniper; subtypes are created by variations in understory. Major understory species are curly mesquite, snakeweed, hairy and side oats grama, three awns, shrubby buckwheat, and false mesquite (*Calliandra*).

North of Marble Mine in the Soda Springs Pasture, juniper shares the overstory with turbinella oak. Half shrubs such as false mesquite and broom snakeweed make up a large percentage of the understory.

The **pinyon-juniper/semidesert transition** type is limited to approximately 238 acres in Black Mountain Pasture on the east-facing slope west of the Verde River. Although juniper is an obvious component of the vegetation, characteristic semidesert plants, such as mesquite, palo verde, ocotillo, crucifixion thorn, and ratany are also common.

Most of the area typed as **mountain browse** is on the rugged slopes of the Pine Mountain Wilderness. It also occurs in small patches on north-facing slopes in every pasture on the allotment.

Riparian vegetation occurs and is described in detail further into chapter 3. Species include Fremont's cottonwood, red willow, Goodding's willow, coyote willow, velvet ash, deergrass, *Baccharis* species, Arizona sycamore, horsetail (*Equisetum spp*), common reed (*Phragmites spp*), cattails (*Typha spp*), Arizona alder (*Alnus oblongifolia*), Cyprus (*Lathyrus ochrus*), and rush (*Scirpus/ Isolepis spp*).

Winter floods have recurrently removed stands of riparian vegetation along the Verde River. Salt cedar (*Tamarix*) saplings have taken advantage of these newly cleared, river bottoms and have become well established. Skeleton Ridge has extensive riparian areas occurring along portions of Houston Creek and the Verde River, plus springs in portions of the allotment. The summary of Parker Three-Step range condition on Skeleton Ridge Allotment is shown in table 6.

Table 6: Summary of Parker Three-Step Range Condition on Skeleton Ridge Allotment

Pasture	Vegetative Type	Vegetation Condition	Vegetation Trend	Soil/Watershed Stability	Soil/Watershed Trend
Pete's Cabin	Semidesert Grassland	21, Poor	Up	40, Poor	Up

Pasture	Vegetative Type	Vegetation Condition	Vegetation Trend	Soil/Watershed Stability	Soil/Watershed Trend
Mud Springs	Semidesert Grassland	24, Poor	Up	40, Poor	Down
Long Mesa	Woodland – Assoc. Grassland	44, Fair	Up	47, Fair	Up

Six Bar Allotment Vegetation

Topography is steep with rocky mesas cut by deep drainages. The allotment ranges in elevation from approximately 2,000 to 5,742 feet.

Vegetation is predominantly **juniper-associated grassland**. Steep slopes are covered by chaparral and major drainages are composed of an ash/sycamore riparian vegetation type. Species diversity on the uplands is high. Shrub and half-shrub species in the chaparral community include the following: silk tassel (*Garrya spp.*), sugar sumac (*Rhus ovata*), skunkbush sumac (*Rhus trilobata*), turbinella oak, cliff rose (*Purshia spp.*), beargrass (*Nolina spp.*), buckthorn (*Rhamnus spp.*), mountain mahogany (*Cercocarpus spp.*), *Ceanothus*, Wright's buckwheat (*Eriogonum wrightii*), catclaw acacia (*Acacia greggii*), wait-a-bit (*Mimosa spp.*), prickly pear, agave, and broom snakeweed. The juniper-grassland community is composed of red-berry juniper, Utah juniper, and alligator juniper (*J. deppeana*), along with shrub species of the chaparral community, hedgehog cactus (*Echinocereus spp.*), agave, deergrass, green sprangletop (*Leptochloa dubia*), side oats grama, black and hairy grama (*B. eriopoda*, *B. hirsuta*), tanglehead (*Heteropogon contortus*), sand dropseed (*Sporobolus cryptandrus*), vine mesquite (*Panicum obtusum*), Plains lovegrass (*Eragrostis intermedia*), and Junegrass (*Koeleria macrantha*).

The **riparian community** is described in greater detail further in chapter 3. Plant species include, but are not limited to: Fremont's cottonwood, velvet ash, red willow, Goodding's willow, coyote willow, deergrass, Arizona sycamore, velvet mesquite, salt cedar (*Tamarix ramosissima*), cattail, burrobrush (*Hymenoclea salsola*), nut-leaf hackberry (*Celtis spp.*), yellow monkey flower (*Mimulus brevipes*), beardless rabbit's foot grass (*Polypogon viridis*), alder, walnut (*Juglans spp.*), alligator juniper, Bermuda grass (*Cynodon dactylon*), and *Baccharis spp.*

Arizona agave (*Agave arizonica*) was the only threatened, endangered, or sensitive species verified on Six Bar Allotment, until it was delisted.

Overgrazing, both historic and current, has occurred in many of the riparian areas on the allotment, resulting in an increase of catclaw acacia, mimosa, and other undesirable species along riparian drainages. Over most of the allotment, areas readily accessible to cattle, such as mesas and riparian bottoms, show heavy use, with invader species being predominant. Areas that are slightly less accessible, such as side slopes and areas away from roads and trails are in better condition with an improved groundcover and a diversity of perennial grasses. The summary of Parker Three-Step range condition on Six Bar Allotment is shown in table 7 below.

Table 7: Summary of Parker Three-Step Range Condition on Six Bar Allotment

Unit	Vegetative Type	Vegetation Condition	Vegetation Trend	Soil/Watershed Stability	Soil/Watershed Trend
Middle Fork/Hogan Cabin	Semidesert Grassland	57, Fair	Stable	51, Fair	Down
Mud Springs	Semidesert Grassland	24, Poor	Down	38, Poor	Down
Middle Fork/ N. of Six Bar Spring	Semidesert Grassland	53, Fair	Up	42, Fair	Up
Middle Fork/Squaw Creek	Semidesert Grassland	27, Poor	Down	46, Fair	Up
Middle Fork/Willow Spring	Woodland- Assoc. Grassland	43, Fair	Up	47, Fair	Down
Middle Fork/Hutch Mesa	Semidesert Grassland	50, Fair	Up	57, Fair	Up

Effects Analysis

General Effects of Grazing (All Vegetation Types on the Three Allotments)

Ecosystem processes (energy, nutrients, and water) in arid and semiarid plant communities are affected by grazing herbivores. The removal of herbaceous vegetation, trampling and hoof action, and fecal and urine deposits by domestic and wild ungulates could positively or negatively impact plant communities depending on the number of animals and length of time they are present on a site. Domestic livestock, mainly cattle and sheep, were introduced on western rangeland in the late 1800s and early 1900s (Manier and Hobbs 2007). Grazing effects of wild and domestic ungulates differ because cattle and sheep diets mainly consist of herbaceous plant components rather than shrubs and other woody species that wild ungulates tend to consume. If domestic livestock stocking rates are higher than that of wild ungulates, then more herbaceous material than woody material may be removed over time, creating the possibility of a shift in vegetative state (Manier and Hobbs 2007).

Shifts in plant community composition are caused by a range of natural disturbances. While grazing could cause shifts in vegetation state, it is not always the leading cause. Often grazing pressures are removed with the idea that its absence would allow the vegetative community of a specific site to return to historical conditions (Ruyle and Dyess 2010). Historical conditions of the site may not be reached even with the removal of grazing, due to other limitations of the site such as water infiltration rate (Castellano and Valone 2007), seed source deficiencies, the presence of exotic or invasive plant species and altered characteristics of soil (Ruyle and Dyess 2010). Global climate change also poses important implications on state changes in vegetation caused by climate or other disturbances, further decreasing the chances that disturbed sites would return to historical conditions without intensive human management (Ruyle and Dyess 2010).

According to a study by Gillen, Krueger, and Miller (1984) slope gradient was the only physical factor consistently associated with cattle grazing distribution. Cattle appeared to avoid slope gradients in excess of 20 percent during all grazing periods. Cattle preferred areas within 200 meters of water and avoid areas greater than 600 meters from water in continuously grazed

pastures (Gillen, Krueger, and Miller 1984). Correlation analysis pointed out slope gradient as the physical factor most consistently associated with cattle use of the landscape. This effect of slope gradient on cattle distribution is well known on mountain rangelands (Mueggler 1965, Cook 1966).

Averaged across years and pastures, cattle preferred slopes less than 4 percent, but were observed on slopes ranging from 0 to 40 percent (Pinchak, Smith, Hart, and Waggoner 2013). Cattle make little use of slopes with more than a 10 percent gradient (Holechek et al. 2004). The avoidance cattle have for conservative to severe slopes (Gillen et al. 1984) was reflected in the spatial distribution of use on the foothill range. Sensitivity of cattle to slope is most pronounced in foothill and mountain regions (Mueggler 1965, Roath and Krueger 1983, and Gillen et al. 1984) though patterns of utilization by cattle on any landscape having significant topographic diversity would be influenced by slope (Martin and Ward 1970).

Slopes of 25 to 40 percent markedly reduce utilization (Martin and Ward 1970). On mountainous rangeland, overgrazing and deterioration often occur on the flatter, more convenient sites even though the total forage supply is adequate. In rough, rugged terrain, cattle congregate on the more convenient flat areas, such as valley bottoms, riparian zones, and ridge tops. Forage on the steeper slopes (over 60 percent) receives little or no use by cattle (Mueggler 1965 and Cook 1966) and, per Holechek (1988), these lands should be deleted from the grazable land area.

Range Vegetation Types with Grazing on Red Creek, Skeleton Ridge, Six Bar Allotments

Riparian areas: see the riparian and hydrology section of this chapter for detailed information on riparian areas.

Sonoran and other desert types: vegetation of the hot desert types did not evolve with grazing by large herbivores (Holechek et al. 2004). However, this area was one of the first types in the United States to be grazed by domestic livestock. Both severe overuse and lack of adaptation to grazing may explain the large-scale decline of black grama and other climax grasses in the past 100 years. Because of low forage production and grazing resistance, livestock grazing is not practical in much of the Mojave and Sonoran deserts (Holechek et al. 2004). Management of livestock focuses on water development to improve livestock distribution and carefully adjusting stocking rates to forage availability (Holechek 1991, 1992). Because of the low precipitation, recovery from heavy grazing is often very slow to nonexistent (little recovery after 30 years). Therefore, consequences of historic overgrazing are much more severe than in most of the other range types (Holechek et al. 2004).

Semidesert grasslands: grazing affects grasslands directly through the removal of biomass, stressing of plants and altering of soil properties. In addition, plant community composition could be strongly influenced by intensity, duration, and frequency of livestock grazing (Geiger and McPherson 2005). In arid systems and under drought conditions, effects of grazing are intensified, because of the additional stress caused by lack of moisture. After defoliation, relatively less carbon is translocated to the root system and during drought periods the root extension rate may not be sufficient to maintain access to soil moisture. Damage to grasslands by livestock in the late 1800s, followed by severe drought in the early 1900s may have caused so much damage to soils and vegetation that when livestock were removed vegetation response was “not continuous, not reversible, or not consistent” and had entered a new “state.” Livestock influence the cover and density of woody and herbaceous species in the American Southwest

(McPherson & Weltzin, 2000). Anecdotal accounts of the Buenos Aires Natural Wildlife Refuge indicate that cattle have had greater impact during drought than under average conditions (Geiger and McPherson 2005).

Ponderosa Pine: livestock grazing alters forest dynamics by (1) reducing the biomass and density of understory grasses and sedges, which otherwise outcompete conifer seedlings and prevent dense tree recruitment, and (2) reducing the abundance of fine fuels, which formerly carried low-intensity fires through forests. Grazing by domestic livestock has thereby contributed to increasingly dense western forests and to changes in tree species composition. In addition, exclosure studies have shown that livestock alter ecosystem processes by reducing the cover of herbaceous plants and litter, disturbing and compacting soils, reducing water infiltration rates, and increasing soil erosion (Belsky and Blumenthal 1997). In the Southwest, historic livestock grazing and fire suppression have promoted the development of unnaturally dense stands of suppressed young trees. This condition now threatens the remaining large trees through competition and by fueling increasingly extensive crown fires as in ponderosa pine forests of other regions (Allen et al. 2002). Within the three allotments for this NEPA document, only 120 acres is typed as ponderosa pine.

Pinyon/juniper/oak: pinyon-juniper range is commonly referred to as woodland rather than forest, since the trees are small and below saw timber size. The climate of this type is relatively harsh for tree growth. It is characterized by low precipitation, hot summer, high wind, low relative humidity, high evaporation rates, and much clear weather and intense sunlight. The understory herbaceous vegetation varies with grazing history, physical features of the site, and density of the trees (Holechek et al. 2004). Livestock grazing has clearly played a role in promoting woody expansion and infilling across a range of ecosystems globally. Declines in grass and herbaceous understory under intensive livestock grazing, which may influence tree-grass competition and increase fire return intervals, have been hypothesized as important mechanisms by which trees out compete grasses and herbaceous species (Barger et al. 2009).

In Utah, Arizona, Colorado, and New Mexico, this type supports a mixture of warm- and cool-season grasses. Spring grazing has been detrimental to many of the cool-season grasses. As the tree overstory increases, perennial grasses and forbs decrease, because of shading and increased competition from the trees. Pinyon-juniper woodland is one of the most depleted range types occurring in the United States, especially in northern areas. Very few areas presently support a good grass understory. Recovery from overgrazing is considered to be slow to nonexistent in most areas without control of the trees (Holechek et al. 2004).

Criteria used to Evaluate Alternatives and Determine Consistency with Management Direction

The criteria used to evaluate alternatives was based on the likelihood of moving toward or attaining desired conditions described in the affected environment, in the Forest Plan, as amended (USDA 1985), for grazing management; and in accordance with the U.S.D.A. National Best Management Practices (BMP) for Water Quality Management on National Forest System Lands (USDA 2012).

Range management affects uplands, riparian areas, and all resources within the three allotments. Recovery and attainment of desired conditions depend primarily on the effectiveness of the recommendations and mitigation measures, along with considering topography and resulting success of movement of the livestock.

Permitted cattle numbers under alternative 2 are analyzed by pasture and allotment. Utilization rates for uplands are analyzed for either (1) light or (2) conservative rates based on soil and vegetative conditions respectively of (1) unsatisfactory/impaired/ (2) satisfactory/impaired. This is mitigation for alternative 3 and a recommendation for alternative 2 where upland areas currently have a conservative utilization rate regardless of soil condition.

Proposed livestock numbers in alternative 3 do not take slope into consideration. Slopes of 60 percent or greater are recognized in alternative 2 and numbers are adjusted for slope in the recommendations section.

Alternative 2- the design concept for Terrestrial Ecosystem Unit Inventory (TEUI) ecological units uses slope classes that are derived from literature for landscape stability, geomorphic process and soil productivity; and limitations of mechanized equipment and other disturbance processes, i.e., herbivory (personal communication with Wayne Robbie, Regional Office (RO) Supervisory Soil Scientist). Slope classes for the ecological units coincide with known geomorphic process in the Southwest (wind, water, and gravity) that are associated with landform and slope stability. Typically, slopes of less than 15 percent are considered stable; slopes that range from 15 to 40 percent are considered metastable; whereas slopes over 40 percent are considered unstable (active), especially where the ground cover is lacking. Also, slopes over 40 percent are generally shallow (<50 cm) and cannot withstand accelerated soil erosion processes without jeopardizing long-term site productivity. All soil loss models clearly show that above 40 percent slope the rates of erosion significantly increases and exceeds the thresholds for sustaining soil productivity (personal communication with Wayne Robbie, RO Supervisory Soil Scientist with supporting scientific documents).

All recent Forest Plans in Region 3 have incorporated 40 percent slope limitations for watershed, rangeland, and forestry practices. In the Rangeland Analysis and Management Training Guide (1997), topographic indicators show that with slopes from 40 to 80 percent, soil loss exceeds deposition and the net balance is not maintained. These slopes are considered active and are usually classified as potential capability or for the most part no capability. The Forest Service has consistently found during the allotment analysis process that the amount of grazable land between 40 and 60 percent slope is limited and capacity in this range is small, when compared to the lesser sloped more manageable areas. Typically slopes over 40 percent become allocated for wildlife forage and browse. Although most rangeland analysis does not assign capacity to slope greater than 40 percent, it is generally recognized that incidental grazing would take place (personal communication with Wayne Robbie, RO Supervisory Soil Scientist).

TEUI divided many of its soil classifications at the 40 percent slope designation. Therefore, a GIS process was used to determine acres in each pasture with slopes less than 60 percent. Forage on the steeper slopes (over 60 percent) receives little or no use by cattle (Mueggler 1965; Cook 1966), and per Holechek (1988) these areas should be deleted from the grazable land area.

Number of cattle permitted for each allotment was established in the 1970s based on acres. These numbers were adjusted when number of acres associated with an allotment changed. Grazing permit numbers were not adjusted when Pete's Cabin and Red Hills Pasture were removed from grazing, but it was documented that this needed to be completed in the VWSR Environmental Assessment (USDA 2004). These adjustments are recommended under alternative 2.

Environmental Consequences by Alternative

Environmental Consequences - Alternative 1 (No Action)

Direct and Indirect Effects

A study conducted at the Appleton-Whittell Research Ranch compared seasonal differences in water infiltration rates on grazed and ungrazed soil on semiarid grasslands in southeastern Arizona. Infiltration rates, total basal perennial grass and shrub cover were higher in ungrazed soils (Allington and Valone 2011). Shrub cover results were consistent with previous studies, but herbaceous cover was significantly lower on grazed versus ungrazed sites (Allington and Valone 2011) contrasting with results reported in Manier and Hobbs (2007). It appears that knowledge of soil type and the management of grazed areas may be important in determining if the removal of grazing would move a vegetative community to a state where energy, water, and nutrient processes are functional. Based on the soil condition of the three allotments in this document, the absence of grazing from sites with soils highly susceptible to compaction and/or erosion may benefit from the no grazing alternative, if those areas are currently being accessed by cattle under current management.

Restoration: Serious soil erosion could hinder improvements in vegetative composition by as many as 20 years in desert systems (Holechek et al. 2004). Vegetative sites that have crossed an ecological threshold to a state where a return to a perennial grass dominated site is unlikely, removal of grazing may not achieve desired resource conditions without additional restorative efforts (West et al. 1984). The same prediction holds for this analysis area. The action of removal of grazing from a site may not achieve desired conditions by itself.

Changes in soil and vegetation due to livestock grazing are occurring in arid lands throughout the world. The most extreme cases result in desertification, which is seen as largely irreversible, because of altered soil properties (Allington and Valone 2011). Desertification often involves a change in vegetation from dominance of perennial grasses to dominance by shrubs and bare ground. This shift has been attributed to climate change, altered fire regimes, and overgrazing; livestock herbivory has been suggested to be the most important factor in this change. In the absence of livestock and with the cessation of trampling, soil compaction may decrease slowly over time, resulting in increased water infiltration into the soil. Because water strongly limits plant growth in arid systems, an increase in soil water availability via this mechanism is presumed to eventually create an environment conducive to perennial grass recover. The removal of livestock would help improve the soil compaction over these three allotments, but the amount of rainfall and the degree of intensity of rainfall has the potential to limit or slow this recovery (Allington and Valone 2011).

Grazing was eliminated from an area in south-central Arizona in 1968. Long-term changes included both increases in species richness (diversity) and significant increases in canopy cover for midgrass, shortgrass, shrub, and forb species groups (Brady et al. 1989). The removal of grazing from these three allotments could achieve the same increases in vegetative cover and species diversity over the long term.

Invasive plants: Seed dispersal of species such as *Prosopis* spp. (mesquite), *Acacia* spp., and *Centaurea solstitialis* (Malta star thistle) by livestock is common (Browning and Archer 2011). Spread of these seeds would be reduced, if livestock were removed. However the spread of invasive species is still likely in both uplands and riparian areas through a number of vectors like

wind, water, and wildlife. The recreating public would also be a vector for the introduction and spread of invasive species.

Cumulative Effects

The implications of historic unregulated livestock grazing and fire suppression on North American southwestern rangelands in the late 1800s and early 1900s (Moore et al. 2010, Reynolds et al. 2012) must be considered as a lasting effect across the project area. Ecological processes may benefit from livestock removal on some semidesert grassland, pinyon/ juniper grassland and pinyon/juniper oak woodland vegetation types, if climatic variables remain more or less constant. If, however, more frequent and longer droughts persist as predicted (Izaurrealde 2011), then plant communities may not necessarily benefit from the absence of grazing.

Ceased maintenance of water and fence improvements may have undesirable implications for wildlife within the area. Wildlife ungulates such as mule deer, white tail deer, and other species depend on many livestock watering facilities.

The largest wildfire to impact the project area was the 2005 Cave Creek Complex (CCC) Fire. It covered almost all of Six Bar Allotment and the southwest portion of the Red Creek Allotment. The 2004 Willow Fire started on Cave Creek RD and burned into the southeast corner of the Red Hills Pasture on the Red Creek Allotment. Floods after the fires washed out vegetation and filled channels with sediment. This alternative has the potential to allow faster recovery on the stream channels and woodies in the streambank; however, herbaceous vegetation has already returned on many of the streams.

Other activities taking place on National Forest land such as recreation, logging, and mining would continue to persist in the absence of grazing. OHV use would persist on and off authorized roads, waterways would still receive recreational impacts, and fire would still have an effect on species composition and distribution.

Environmental Consequences - Alternative 2 (Current Management)

Direct and Indirect Effects

Adaptive management has been used on the allotments since 2001 in cooperation with permittee needs. Over the past twelve years, grazing management has consisted of rotating livestock through the three allotments based on a pasture schedule proposed by the permittees considering available water and forage and ease of movement. The combined rotation incorporated use of Six Bar during winter months. Skeleton Ridge also has larger pastures that were grazed successfully for longer periods of time in the winter. Using Skeleton Ridge and/or Six Bar for winter use successfully addressed concerns with available waters and management of larger pastures. Distribution of livestock in larger pastures requires increased management (herding, salting, and available water) to use more of the pasture. Due to cooler weather in the winter and increased water (depending on rain), livestock are easier to move and distribute over a greater portion of a large pasture in the winter. Also, livestock generally tend to hang in riparian areas for shorter periods of time in the winter, assisting with management of a large area.

The original numbers on the allotments were established in approximately the 1970s with numbers adjusted as additional land was acquired or pastures changed between Red Creek and Skeleton Ridge allotments. Under current management (past decade), the highest authorized

numbers on the allotments (grazed with one combined herd) have been 393 adults yearlong and 170 yearlings from January 1 through May 31 (2210 range files). The current utilization guidelines for alternative 2 are shown in table 8.

Vegetative composition: The effect of current management on vegetation units has not been adequately compiled, but monitoring has identified areas of concern because of overutilization. Areas where cattle management has contributed to overutilization are generally in riparian areas, flatter mesas, or areas of gentler slopes. The difficulties for management on these three allotments are well-documented. Direct and indirect effects of current livestock grazing management on existing vegetative conditions are interpreted relative to historic or reference conditions (site potential) provided by TEUI data collected from 1979 through 1981 and 1993 through 2009. Using adaptive management as identified in annual operating instructions (AOIs), yearly allowable livestock numbers are adjusted based on data from several past years' grazing effects and knowledge of potential concerns and opportunities or any changes on-the-ground (i.e., water developments maintained and building required fences to keep livestock off the Verde River).

Red Hills/North Red Hills pastures in Red Creek Allotment and Pete's Cabin Pasture/Skeleton Ridge Allotment are not grazed for a number of reasons: Portions of the Verde River that run through these pastures were identified as wild and scenic (VWSR 1984), and the Verde was designated critical habitat for razorback sucker and southwestern willow flycatcher. Years of monitoring indicated that cattle could not be grazed here without exceeding Tonto NF riparian standards. The VWSR decision requires the Verde River be fenced, before cattle could graze in the area again. Currently the only location identified for the livestock to cross the Verde River to access Red Hills/North Red Hills and Pete's Cabin pastures is in the Red Creek Allotment approximately nine miles south of Pete's Cabin. Pete's Cabin pasture and the majority of Red Hills Pasture are in the Mazatzal Wilderness. Over thirty miles of fence would need to be built to fence off the Verde River, if Pete's Cabin and Red Hills were grazed (see alternative 3). Other considerations: difficulties in accessing the area, the cost to build over thirty miles of new fence, mechanized restrictions in building in wilderness, and the lack of available water for livestock other than the Verde River. Both Pete's Cabin and Red Hills pasture have limited water in the uplands and depended on the Verde River to water the livestock. Water would need to be pumped from the Verde uphill to provide water for the cattle when they are grazing the pastures and also to provide water to the cattle when they are being moved through Red Hills pasture to access the south end of Pete's Cabin Pasture. Limited water would also make cattle distribution difficult.

Cedar Basin (103 acres) and Pipeline (330 acres) pastures were excluded from grazing through the VWSR 2004 Decision based on the amount of fence required to be built for the small amount of acreage in the pastures.

Table 8: Current utilization guidelines for Alternative 2

Vegetation	Use Threshold
Upland herbaceous species	Limited to 35 percent of the plant biomass on key perennial species (current year's growth)
Riparian emergent species (ex. rushes, sedges, cattails, horsetails, etc.)	Maintain 6 to 8 inches of stubble height during the grazing season
Riparian herbaceous species (ex. deergrass)	Limited to less than 40 percent of plant species biomass

Vegetation	Use Threshold
Obligate Riparian woody species	Limited to less than 40 percent of terminal leaders (top 1/3 of plant) on palatable riparian tree species accessible to livestock (approximately 6 feet tall)
Streambanks	Limited to less than 20 percent alteration of alterable streambanks

Recommendations for Alternative 2

Based on literature cited earlier, forage on the steeper slopes (over 60 percent) receive little or no use by cattle. TEUI studies break out soil conditions above and below 40 percent slope (figure 10, appendix A). The Forest Plan is scheduled for revision but currently considers slopes up to 60 percent as grazable by livestock. Under this recommendations section, alternative 2 adjusts numbers based on cattle grazing slopes less than 60 percent and it also adjusts livestock numbers based on number of acres removed from grazing due to nonuse of Pete's Cabin and Red Hills pastures and private land/exclosures/administrative areas.

Table 9: Total grazable acres under Alternative 2 – Current Management with slopes less than 60 percent and removing pastures east of the Verde River

Allotment Name	Allotment Acres	Allotment Acres minus Exclosures /Admin Sites/ Private	Pasture Acres With Access to Verde River	Non-Verde Acre 60 percent Slopes or Greater	Total Recommended Acres Removed From Grazing	Total Recommended Grazable Acres
Red Creek	78,356	883	31,126	7,196	39,437	38,919
Skeleton Ridge	43,098	71	17,219	8,108	25,397	17,701
Six Bar	28,446	20	-0-	5,789	5,809	22,637

Table 10: Recommended numbers for alternative 2 following adjustments to herd numbers based on slope and removal of pastures east of the Verde*

Allotment Names	Original Permitted Herd Numbers Adults/Yearlings	Percent Reduced Acres	Recommended Permitted Numbers
Red Creek	519 adults 339 yearlings 1/1 to 5/31	50 percent	260 adults 170 yearlings 1/1 to 5/31
Skeleton Ridge	260 adults 170 yearlings 1/1 to 5/31	59 percent	107 adults 70 yearlings 1/1 to 5/31
Six Bar	700 calves 11/15 to 6/15 or 539 adults from 11/1 to 4/1	20 percent	431 adults from 11/1 to 4/1 (5 months)

*Total herd to rotate through 3 allotments = 583 adults plus 240 yearlings (does not take into consideration the need to convert yearlings [not permitted on Six Bar] to adults).

Past permitted numbers on Six Bar Allotment were for either calves or adults with season of use and number of livestock adjusted, so allowable animal unit months were the same. The animal unit months takes into consideration the size/type of animal grazing and how much forage that animal would consume. Using one herd, if yearlings are allowed to graze with the adult livestock

on Six Bar, the number of adult livestock would be less than the permitted adult numbers to adjust for the amount of yearlings (based on 0.7 - forage use versus an adult) that were also grazed at that time. Since the 1950s, past permits connected to Six Bar Allotment were not yearlong due to the lack of fences and water developments. Even with winter/spring months of grazing in Six Bar Allotment, the water would often dry up in the dirt tanks. The 1995 Environmental Analysis (EA) identified a number of new fences and water developments that needed to be constructed, before livestock grazing could occur on Six Bar allotment yearlong. Based on that decision, these range improvements still need to be built before yearlong grazing could occur in Six Bar.

The majority of pastures in Red Creek Allotment west of the Verde River have been grazed every year for the past ten years. It is recommended that a rest-rotation plan would be implemented as designated in the prior allotment management plan, so that each pasture in all three allotments would have a year of rest every third or fourth year.

Pastures identified as winter-use only pastures: In Skeleton Ridge Allotment, the following pastures are recommended as winter use only: Black Ridge, Houston Basin, and Mud Springs. Mud Springs pasture has traditionally been utilized as a winter only pasture.

In Red Creek Allotment recommended winter-only pastures would be: Tangle Creek, Red Creek, and Peso. Both Red Creek and Tangle Creek pastures would have light utilization recommended for uplands based on the vegetative and/or soil condition. Peso would have light to conservative utilization. This would provide a better opportunity to manage for light use in the winter grazing season.

Six Bar Allotment would have a recommended winter/spring only allowable grazing season for the entire allotment. This would allow adult livestock to graze from November 1 through April 1 each year. Currently calves are permitted November 15 through June 15 and adults are permitted November 1 through April 1. Since the 1950s, this allotment has not been permitted for yearlong grazing.

Small pastures are generally used as holding pastures to work livestock, to separate out bulls, heifers or to medicate sick cattle. Small pastures in Red Creek Allotment that are roughly 100 to 600 grazable acres or less are: Horse pasture (contains the base property), West Soda, East Soda (sometimes identified as Lower Soda), Monroe, Palo Verde Holding, Horse Camp, and Cedar Holding pastures.

Rugged Mesa and Cedar Push are about 1,000 grazable acres each. These smaller pastures are recommended to be used for shorter periods of time, but could potentially be grazed by the entire herd. Dugan Holding Pasture is included with Cedar Mountain Pasture.

Small pastures in Skeleton Ridge Allotment used as holding pastures are: Headquarters, Hot Springs, Long Mesa Holding, Long Mesa Tank, and Powerhouse pastures. Lancaster Pasture contains roughly 428 grazable acres and suggested use would only be scheduled for working cattle once every three years due to the condition of the vegetation, soils, and riparian area after past heavy over-utilization. The resource conditions would need to be reevaluated to determine when Lancaster Pasture could sustain more frequent grazing.

Six Bar Allotment has one small pasture: Six Bar pasture.

Recommended use for all pastures would be a maximum of one time per year. Small pastures are not recommended to be used multiple times in one year to work livestock. Small pastures often have poorer soil conditions and a larger number of annuals versus perennial herbaceous plants. Since the smaller pastures would only be used for shorter periods of time and once a year, this should enable the vegetation to recover and ultimately the soil conditions.

With the recommendations under alternative 2 and mitigations under alternative 3, driving cattle along or through riparian areas would not be recommended in any pasture. Moving cattle perpendicularly across riparian areas would be recommended.

Actual recommended numbers would require an adjustment for not grazing east of the Verde River and then adjust numbers based on acres of grazable land less than 60 percent slope. This allows the possibility of an increase from the current 393 adult livestock up to 583 adult livestock after the required fences have been built and range improvement water sources that are currently not functioning have been repaired. Improving water developments, plus the additional pastures acquired once the fences are built, would add additional acres for livestock to graze in the future and address current resource concerns.

Recommended Allowable utilization levels for Alternative 2

Allowable utilization based on pasture and soil condition

Upland herbaceous forage utilization is recommended to be managed at a level corresponding to conservative use (30 to 40 percent) on areas with satisfactory soil conditions or satisfactory-impaired soils. Light intensity grazing (20 to 30 percent) on herbaceous key forage species is recommended in areas where soil conditions are impaired or unsatisfactory, and/or vegetation in poor condition, until those areas show recovery toward desired conditions. The following list identifies each pasture and what the recommended utilization levels would be, based on the soil condition surveys from the TEUI soils report.

Recommended upland utilization levels by pasture for Alternative 2 and mitigation for Alternative 3

Red Creek Allotment:

Cedar Mountain Pasture (includes Dugan Holding Pasture): light to conservative use (25 to 35 percent); not quite half of the pasture is over 60 percent slope, remaining acres: 1,208 acres impaired soil condition; 375 acres satisfactory condition.

Cedar Push Pasture: light use (20 to 30 percent); entire pasture has unsatisfactory soil condition.

Cedar Holding Pasture: light use: entire pasture has unsatisfactory soil condition and poor vegetation condition.

Horse Camp Pasture: light use: slopes 40 to 80 percent have severe erosion hazard and satisfactory-unsuited soil condition. Remaining acres have unsatisfactory soil condition.

Horse Pasture (contains base property): light use: 69 percent of pasture in unsatisfactory soil condition; remaining acres riparian or with slopes over 40 percent.

Lower Soda Pasture: light use: acres are in impaired soil condition or slopes over 40 percent.

Mustang Pasture: light use: has impaired, satisfactory and unsatisfactory soil condition acres. Major riparian area has been fenced in an enclosure. Cluster in semidesert grassland vegetative type indicates vegetation in poor condition.

North Red Hills/Red Hills Pasture: under alternative 2, this pasture is in nonuse.

Palo Verde Holding Pasture: light use: Entire pasture is in unsatisfactory or impaired-unsatisfactory soil condition.

Peso Pasture: light to conservative use, winter use only. Pasture contains satisfactory, impaired and unsatisfactory soil conditions. Cluster indicates poor vegetative condition. Winter use only should help with obtaining light to conservative use.

Red Creek Pasture: light use. Pasture contains 63 percent of pasture with slopes 40 percent or greater; contains acres in satisfactory, unsatisfactory and impaired condition. The pasture contains the Red Creek riparian area. Cluster in this pasture indicates poor vegetation condition.

Roundtree Pasture: light use: Majority of pasture has impaired or unsatisfactory soil condition. Also seven percent of pasture is riparian area.

Rugged Mesa Pasture: light use: Majority of pasture has impaired or unsatisfactory soil conditions. Cluster indicates vegetation in poor condition.

Soda Springs Pasture: light use: Contains almost equal acres in satisfactory or impaired/unsatisfactory condition. Also contains Red Creek Springs and Soda Springs, areas with poor condition riparian vegetation. Cluster indicates poor vegetative condition.

Tangle Mountain Pasture: light use: Contains a majority of impaired/unsatisfactory soil condition acres. However, would be winter use, so could consider 25 to 35 percent forage utilization.

Yellow Jacket Pasture: light use: The majority of the pasture has soils in unsatisfactory condition.

Skeleton Ridge Allotment

Black Ridge Pasture: light use: The majority of the pasture is in unsatisfactory or impaired soil condition.

Cedar Basin Holding Pasture: Pasture is removed from grazing through VWSR plan.

Coldwater Pasture/West Cold Water: conservative use (30 to 40 percent): The majority of the pasture has satisfactory soil condition.

Headquarters Pasture: conservative use: The majority of the small pasture has satisfactory soil condition except for the unsatisfactory 12 acres of riparian.

Hot Springs Pasture: conservative use: The majority of the small pasture is in satisfactory soil condition except for the 21 acres of riparian.

Houston Basin Pasture: light use: The majority of the pasture is in unsatisfactory or impaired condition.

Lancaster Pasture: light use: Entire pasture under 40 percent slopes has impaired soil condition and severe erosion hazard. With identified resource issues, pasture use is limited to once every three years until recovery apparent.

Long Mesa Holding Pasture: light use: Entire pasture has unsatisfactory soils or slopes over 40 percent with severe erosion hazard and unsuitable soils.

Long Mesa Pasture: light use: Entire pasture with suitable soils has impaired or unsatisfactory soil condition.

Mud Spring Pasture/Skeleton Ridge: light use: The majority of the pasture has impaired or unsatisfactory soil condition. Cluster indicates vegetation in poor condition.

Pete's Cabin Pasture: Under alternative 2, the pasture is in nonuse.

Pipeline Pasture: Pasture is removed from grazing through VWSR plan.

Powerhouse Pasture: light to conservative use: The pasture has almost equal amounts unsatisfactory and satisfactory/impaired soil condition.

Six Bar Allotment

Middle Fork Pasture: light use: The majority of the pasture has impaired and unsatisfactory soil condition. Clusters indicate vegetation in poor to fair condition.

Mud Springs Pasture/Six Bar: light use: The pasture has almost equal portions satisfactory/impaired and unsatisfactory/impaired soil condition. The cluster indicates vegetation in poor condition.

Six Bar Pasture: light use: All acres with 40 percent or less slopes have impaired soil condition.

Cumulative Effects

Under existing current grazing management, resource conditions have not moved towards desired conditions and ecosystem function as identified in the Forest Plan. Historic grazing contributed to the current state of soil and vegetative conditions. Soils in arid and semiarid environments recover slowly from disturbance. Rates of recovery will differ depending on factors such as magnitude of past soil loss, inherent soil properties, current vegetative ground cover, and type of ecosystem. However, the Forest Plan identifies that soils and vegetation should be moving towards satisfactory conditions.

If stocking rates are promptly adjusted to vegetation and ecosystem needs and the direct and indirect effects of this alternative are combined with management, the proposed grazing management strategy with the recommendations for alternative 2 has the potential to move resource conditions towards desired conditions and ecosystem function at a faster rate than alternative 3; but a potentially slower rate than alternative 1. The flexibility of a single herd using all three allotments has the advantage of additional pastures, so a pasture could be skipped when needed to rest a pasture or when a pasture needs to be skipped due to lack of available water, which can be common. Due to the distance between allotments, either Six Bar Allotment or Skeleton Ridge Allotment would be available to graze each winter season. Thus cattle would move from Six Bar for one winter to Skeleton Ridge on the next winter. Cattle would utilize pastures as they travel through Red Creek Allotment with some available pastures in Skeleton Ridge outside of the winter season. This would shorten the travel distance for moving the livestock in any given year.

Alternative 2 recommendations compared to current management:

The recommended winter-use only pastures are similar to the previous scheduled seasons on those pastures under the current management. The virtues of winter-use only for pastures with riparian areas are discussed previously in this document. Required fencing for the Verde River is the same for alternative 2 with or without the recommendations.

The current upland utilization rate is 35 percent for all pastures versus light to conservative utilization based on soil and vegetative condition under the recommendations. By adjusting management prescriptions and utilization rates based on the existing soil and vegetative condition and if use guidelines are adhered to, effects of cattle grazing should be less under the recommendations for alternative 2.

Recommendations for alternative 2 bring permitted livestock numbers more in-line with what the land can support and still allow the potential for a substantial increase in numbers, when additional grazing land is available due to water developments and/or required fences.

This alternative with the recommendations would meet the intent of the Forest Plan direction to protect, manage, and restore riparian areas, when the described mitigation measures are implemented.

Environmental Consequences - Alternative 3 (Proposed Action)

Red Creek, Six Bar, and Skeleton Ridge allotments would be managed under one ranching operation with permitted livestock belonging to one entity administered under one term grazing permit. Total permitted numbers proposed include up to 989 adult cattle (cows, bulls) with up to 705 yearlings yearlong, using deferred, rest rotational grazing systems to move livestock in single or multiple herds through pastures on all three allotments. Annual authorized livestock numbers, stocking rates, and scheduled rotations would be identified through annual operating instructions, taking into consideration monitoring results from previous season's use, production of palatable forage, availability of livestock water, and current resource conditions.

At a minimum, three pasture moves per year should be planned. These moves should occur in the fall, in the spring, and near as possible to the midpoint of the summer growing season. All pastures would be used including those pastures east and/or along the Verde River. However, the 2004 Verde River Decision requires fence be built to keep livestock from accessing the Verde River in this area. The amount of fence required is discussed further in the document.

Table 11 shows the pastures/units, the best time of the year for use (based upon past use records) and characteristics that have limited use of the pasture/unit in the past.

Table 11: Proposed Period of Use

Allotment/Pasture/Unit Name	Most Appropriate Season of Use	Limiting Characteristics
Six Bar Allotment		
Mud Springs Allotment		
Mud Springs Unit	Winter/Spring	Limited Water and Riparian Issues
Middle Fork East Unit	Winter/Spring	Limited Water and Riparian Issues
Middle Fork West Unit	Yearlong	No limitation

Allotment/Pasture/Unit Name	Most Appropriate Season of Use	Limiting Characteristics
Middle Fork South Unit	Yearlong	No limitation
Six Bar Pasture	Yearlong	Small Management/Holding Trap
Red Creek Allotment		
Roundtree Pasture	Yearlong	Riparian
Cedar Push Pasture	Yearlong	Small Management/Holding Trap
Dugan Trap	Yearlong	Small Management/Holding Trap
Peso Pasture	Spring/Summer	Limited Water
Tangle Mountain Pasture	Yearlong	Lack of east boundary fence
Palo Verde Holding Trap	Yearlong	Small Management/Holding Trap
Red Hills Pasture	Winter/Spring	River Management/limited water uplands
North Red Hills Pasture	Winter	River Management/limited water uplands
Red Creek East Pasture	Winter	Riparian
Red Creek West Pasture	Yearlong	Riparian
Horse Pasture	Yearlong	Small Management/Holding Trap
Cedar Mountain Pasture	Yearlong	Limited Water and Riparian Issues
Mustang Pasture	Yearlong	Riparian
West Soda Pasture	Yearlong	Small Management/Holding Trap
East Soda Pasture	Yearlong	Small Management/Holding Trap
Monroe Pasture	Yearlong	Small Management/Holding Trap
Rugged Mesa Pasture	Yearlong	Small Management/Holding Trap
Yellow Jacket Pasture	Yearlong	No limitation
Horse Camp Pasture	Yearlong	Small Management/Holding Trap
Soda Springs Pasture	Yearlong	No limitation
Skeleton Ridge Allotment		
Long Mesa Pasture	Yearlong	No limitation
Long Mesa Tank Trap	Yearlong	Small Management/Holding Trap
Long Mesa Holding Trap	Yearlong	Small Management/Holding Trap
Pete's Cabin Pasture	Winter	River Management/limited water uplands
Cedar Basin Holding Trap	Yearlong	Small Management/Holding Trap
Houston Basin Pasture	Yearlong	No limitation
Black Ridge Pasture	Yearlong	River Management/limited water uplands
Lancaster Trap	Yearlong	Small Management/Holding Trap
Mud Springs Pasture	Yearlong	Riparian
West Coldwater Pasture	Yearlong	No limitation
Coldwater Pasture	Yearlong	No limitation
Headquarters Trap	Yearlong	Small Management/Holding Trap
Powerhouse Pasture	Yearlong	River Management/limited water uplands

Allotment/Pasture/Unit Name	Most Appropriate Season of Use	Limiting Characteristics
Hot Springs Pasture	Yearlong	River Management/limited water uplands
Pipeline Trap	Yearlong	Small Management/Holding Trap

Direct and Indirect Effects

Direct and indirect effects would be similar between alternative 2 and alternative 3, except for the following:

For Six Bar Allotment, table 11 divides Middle Fork pasture into three separate units that are not fenced out and do not have natural boundaries. Past attempts to manage portions of Middle Fork Pasture as separate units were unsuccessful. The 1995 EA and Decision Notice for Six Bar Allotment identified the allotment as winter/spring use only because several miles of fencing would be needed and additional water improvements developed, before it could be used yearlong. The current permit for adult cattle is from November 1 to April 1. Even during this period lack of water has often been a concern. Since the 1950s Six Bar Allotment has only been grazed during the winter/spring season. Yearlong use in Middle Fork, Mud Springs, and Six Bar units would require hauling water and intensive herding to distribute livestock, and building fences and water developments. The allotment depends on dirt tanks for the majority of water until the tanks go dry and then cattle depend on riparian areas.

In Red Creek Allotment the following riparian pastures are not listed: Peso, Tangle Mountain, Red Creek, and Soda Springs. Peso Pasture's main water is the riparian area, so it would be difficult to obtain light to conservative utilization (based on soil conditions) with a herd over 900. Soda Springs Pasture shows no limitations, but has key riparian springs: Red Spring and Soda Springs. Dugan Trap is managed with Cedar Mountain Pasture, as the dividing fence has not been maintained. Yellow Jacket Pasture has limited water and some years the pasture has not been grazed due to the lack of water (2012). East Red Creek and West Red Creek are not divided by a fence. Although required fencing along the Verde River has not been built, in 2011 and 2012 the District Ranger allowed the permittee to graze the western portion of Red Creek Pasture and use herding/riding to keep the cattle in that area. A small section of drift fence was authorized, if cattle started moving east towards the Verde River. This was successful.

Black Ridge and Houston Creek Pastures in Skeleton Ridge Allotment have riparian areas. Lancaster Pasture has a small stretch of riparian area with resource concerns. Long Mesa has two areas where fence needs to be built because the natural boundary is inadequate to contain livestock.

In order to avoid adverse effects to threatened and endangered fish species, cattle cannot cross the Verde River, but would have to cross at Sheep's Bridge. Sheep's Bridge is in the adjoining Sears Chalk Allotment. In order to access Sheep's Bridge, the permittees would need to trail their livestock a number of miles through the adjoining Sears Chalk Allotment, cross Sheep's Bridge, and then trail to the Red Hills and Pete's Cabin pastures requiring several days of trailing outside their allotments. Either Peso or Tangle Creek Pasture in Red Creek Allotment would need to be used to access the road to Sheep's Bridge. Both of these pastures have riparian areas and soil conditions that result in recommendations or mitigation of light utilization on the vegetation. It would be difficult to maintain light use when trailing a large number of livestock through a pasture and still graze that pasture for any period of time. Additionally, livestock would need to

trail back through either Tangle Creek or Peso Pasture to again begin a rotation through other pastures.

The above table also does not list pastures that require fence to be built to keep the cattle from accessing the Verde River. The VWSR plan eliminated Pipeline (330 acres) and Cedar Basin Holding (103 acres) pastures from being grazed, because the pastures are small and the amount of fence required to fence out the Verde River made it uneconomical to build a fence. Actual on-the-ground fence locations for the following fences would need to be identified. Under alternative 3, the following pastures would require fence to be built before the cattle could graze the pasture:

In Skeleton Ridge Allotment:

Pete's Cabin requires approximately 17 miles of fence

Black Ridge Pasture requires fence in two locations approximately one mile each;

Long Mesa Pasture has two locations with short pieces of fence required;

The natural boundary between Houston Basin and Black Ridge pastures require areas of drift fencing, approximately 1.5 miles

Powerhouse Pasture, approximately 1 mile

Headquarters Pasture, approximately 1 mile

Cedar Basin Holding, approximately 2 miles

Pipeline, approximately 1 mile

Hot Springs Pasture, approximately 1.5 mile

In Red Creek Allotment:

Red Hills/North Red Hills Pasture requires a minimum of 13 miles of fence (also water pumped uphill from Verde River to supply water for livestock).

Red Creek Pasture requires approximately three locations of one to two miles each;

Tangle Creek Pasture requires approximately three locations of one to two miles each.

Currently the Forest Service is seeking funding to build two exclosures around White Rock Springs and White Rock Tributary in the Cedar Mountain Pasture of Red Creek. Without the fencing, Cedar Mountain should be a winter-use only pasture.

Past monitoring indicates that Red Hills/North Red Hills has limited water other than the Verde River. By fencing out the Verde River, it would eliminate the water source for the livestock. Thus water would need to be pumped out of the Verde to uphill sites to provide water for livestock, while they are grazing in Red Hills Pasture. Water developments would also be necessary for watering the herd when they are moved through Red Hills Pasture/Red Creek Allotment to access Pete's Cabin Pasture/Skeleton Ridge Allotment that is located approximately nine miles to access the lowest south end of Pete's Cabin Pasture. The entire area east of the Verde River in both Red Hills/North Red Hills and Pete's Cabin is wilderness. A minimum tools analysis would need to be completed to determine the most appropriate means of constructing necessary fencing or other range improvements in the wilderness.

Mitigation

Allowable Utilization Levels based on pasture and soil condition

Herbaceous forage utilization would be managed at a level corresponding to conservative use (30 to 40 percent) on areas with satisfactory soil conditions or satisfactory-impaired soils. Light intensity grazing (20 to 30 percent) on herbaceous key forage species would be authorized in

areas where soil conditions are impaired or unsatisfactory, and/or vegetation in poor condition until those areas show recovery toward desired conditions. The following list identifies each pasture and what utilization level would be allowed based on the soil condition surveys from the TEUI soils report.

Refer to allowable utilization levels section for upland utilization under alternative 2 for majority of pastures as the utilization levels are the same for both alternatives under these recommendations. Allowable upland utilization levels for pastures grazed under alternative 3 but not grazed under alternative 2 are listed below:

Red Creek Allotment

North Red Hills/Red Hills Pastures

The pasture would have light use (20 to 30 percent) based on unsatisfactory or impaired soil conditions on the majority of the pasture. This level of 20 to 30 percent would be difficult to achieve. Red Hills/North Red Hills Pasture is very large and east of the Verde River. Movement of cattle would be limited to two locations across the Verde River. Cattle would then be distributed throughout the large Red Hills Pasture. It would take a considerable amount of time to round up the cattle and remove them from the pasture. Utilization levels could be surpassed during the time it takes to remove the livestock. Under alternative 3, livestock would also need to travel through the Red Hills Pasture to go north (approximately 15 miles) to reach the southernmost boundary of the Pete's Cabin Pasture in the Skeleton Ridge Allotment. It would then be necessary to move the livestock through the Red Hills Pasture again to remove the cattle from Pete's Cabin on the east side of the Verde. The light utilization level may be reached during the time it would take to drive the cattle both ways through Red Hills Pasture for access to and from Pete's Cabin Pasture.

Skeleton Ridge Allotment

Cedar Basin Holding Pasture

Light grazing (20 to 30 percent) would be authorized under alternative 3 because of unsatisfactory soil condition.

Pipeline Pasture

Light use to conservative use (25 to 35 percent): The pasture has almost equal amounts satisfactory and impaired/unsatisfactory soil condition.

Pete's Cabin Pasture

Light use: 20 to 30 percent under alternative 3: The majority of the pasture has soil in unsatisfactory condition and the cluster indicates poor vegetation condition. Light herbaceous use would be difficult to obtain. The south boundary of Pete's Cabin is approximately nine miles from the one site on the Verde River that the livestock would be allowed to cross. Pete's Cabin is a large pasture. After the cattle are distributed throughout the pasture, it would be difficult to round up and remove all the livestock within a short time frame to obtain light utilization levels throughout the pasture.

Grazing strategy: Only a small percentage of the allotments (3 percent) have a satisfactory soil condition. The majority of the allotments (58 percent) have a satisfactory, but inherently unstable

condition, because of slopes over 40 percent. The remaining soil condition is impaired or unsatisfactory (39 percent). Grazing of impaired and unsatisfactory condition uplands may slow the rates of recovery.

Range condition affects how utilization levels correspond to a particular grazing intensity, which would affect the corresponding stocking rate. A stocking rate established to achieve a certain grazing intensity under average meteorological or forage conditions would result in a higher grazing intensity under drought conditions (Hall et al. 2005). If rapid destocking is problematic, overgrazing could easily occur during drought. Grazing east of the Verde River is constrained by a number of factors including moving cattle across the Verde River during high flows (on average once every three years), difficulty in distributing within and then removing livestock from large pastures, lack of water sources in the uplands (developed or natural springs), and stipulations required to address threatened and endangered species habitat, which limits access.

The project area has experienced multiple years of drought in the past decade. Some species of shrubs could offer palatable browse for cattle; however, browsing by ungulates could reduce future forage yield and size of these shrubs (NRCS Plants Database 2008 and Roundy and Ruyle 1989), if use limits are exceeded. The predicted effects of the proposed action may vary depending on the level of on-the-ground management complications and climate. While there are many variables that affect the proposed action, the amount of acres with 60 percent or greater slope, difficulties associated with crossing the Verde River and distributing cattle on the east side of the river, and poor soil conditions may limit ever reaching the higher animal units associated with alternative 3.

The Verde River runs near the middle of the Pete's Cabin Pasture and would require fencing approximately 17 miles of fence (approximately 8.5 miles on each side) to exclude the Verde River in this pasture. Red Hills/North Red Hills Pasture would require approximately 13 miles of fence to exclude the Verde River. Since the majority of the area in Pete's Cabin and Red Hills is wilderness, it may require a helicopter to carry this large amount of fence materials across the Verde River to an area outside the wilderness. Mules could then be used to move the fence material to needed locations along the approximately 30 miles of needed fence. The most recent fence built on Cave Creek RD, outside of wilderness area, requiring mules to pack in fence materials cost roughly \$23,000 per mile and did not include helicopter transportation costs.

The Verde River corridor presents a challenge to monitor and to manage livestock, because of the inaccessibility. This alternative identifies one location in Red Creek Allotment to move cattle across the Verde. Cattle must cross the Verde River within the Red Hills Pasture, which is proposed for winter/spring use. The highest flows occur on the Verde River in January through March, which could make crossing the river during this time difficult or impossible. This has happened in the past when pastures on the east side of the Verde River were grazed. High use on vegetation and bank alteration would be expected at crossings. It is also necessary to travel a minimum of 15 miles north through Red Hills Pasture to access the south boundary of Pete's Cabin Pasture (Skeleton Ridge Allotment), which is also scheduled for grazing. Due to rugged terrain and lack of trails, theoretically it would be considerably greater than 15 miles to access Pete's Cabin. Red Hills Pasture is only allowed light use due to the pasture's soil condition. Light use could potentially be reached just by moving the entire herd north and then south on the return trip from Pete's Cabin through Red Hills Pasture. To improve success in meeting utilization standards a different route would need to be used when driving cattle to and from Pete's Cabin through the rough Red Hills Pasture. Due to rugged topography and difficulty in

moving/removing livestock, and the time it takes to access the pastures, it is doubtful if only light use would occur in these two pastures as scheduled.

Water sources would need to be developed when moving the herd (up to 989 adults) through Red Hills/North Red Hills Pasture to Pete's Cabin and also while cattle are grazing in either pasture. The lack of available water in Red Hills/North Red Hills Pasture has been identified in the past, along with the necessity of fencing off the Verde River. Thus, water would need to be pumped eastward off the Verde to a route for moving livestock. Generators are not allowed in wilderness area, but solar pumping may be an option.

In a wet year, the allotments could produce a maximum amount of palatable forage. In a dry year, forage production would be limited. Even in a wet year, the three allotments may not support 989 adult cattle and 705 yearlings (14,125 animal unit months) for the entire grazing season, because of the large amount of acreage over 60 percent slope. This stocking rate could reduce the frequency of desirable perennial grasses (e.g., sideoats grama) and other desirable vegetative ground cover levels, potentially reducing ecosystem function, and forage productivity. If 989 adult cattle were grazed for a shorter period, grazing may positively impact perennial grass frequency and vegetative ground cover with adequate levels of precipitation and climatic temperatures. Alternately, a lower level of AUMs could remain on the site for a longer period without negatively impacting ecosystem function or vegetative composition. Again, effects of the proposed stocking rates are highly dependent upon climatic conditions, available waters and intensity of management. In the wetter 1980s and 1990s, livestock numbers ranging from 500 to 600 were authorized. For three years in the 1980s grazing numbers of 760 adult cattle were authorized.

Cumulative Effects

Even if stocking rates are promptly adjusted to vegetation and ecosystem needs and the direct and indirect effects of this alternative are combined with management, the proposed grazing management strategy for alternative 3 has less potential to move resource conditions toward desired conditions and ecosystem function than alternative 1. It could also be at a slower rate than alternative 2 due to: use of pastures east of the Verde River (the lack of water within these pastures, obstacles with developing water and fencing the Verde River and difficulties moving livestock within, and to and from, pastures east of the Verde), the time of year listed for grazing pastures, and increased livestock numbers. The flexibility of a single herd using all three allotments has the advantage of additional pastures, so a pasture could be skipped when needed to rest a pasture or when a pasture needs to be skipped due to lack of available water, which can be common. This alternative has additional pastures, so other pastures in the allotments could receive more rest.

By adjusting management prescriptions/utilization rates based on the existing soil and vegetative condition and when use guidelines are adhered to, effects of cattle grazing could be minimized.

Any of the proposed grazing management strategies has the potential to move resource conditions towards desired conditions and ecosystem function, when stocking rates or scheduled grazing time are promptly adjusted to vegetation and ecosystem needs. Scheduled rest periods for each of the pastures are necessary and prompt management adjustments are required to eliminate resource degradation or concerns. Due to the difficulty of the terrain and distance from drivable roads, the ability to move livestock quickly, adjust livestock numbers, or respond to a resource concern

becomes a greater issue for alternative 3 for pastures east of the Verde River. It would be difficult to keep utilization prescriptions, as authorized, in pastures that are not easily accessible.

Effects Common to Alternative 2 and Alternative 3

Both alternatives 2 and 3 have the capability of satisfying resource concerns, when grazing management is prompt in addressing resource issues. Mitigations or recommendations for both alternatives set forage utilization at conservative levels (30 to 40 percent on herbaceous key forage species) except in areas where soil and/or vegetation conditions are impaired or unsatisfactory. Where soil and/or vegetation conditions are impaired or unsatisfactory, forage utilization levels would be set at light intensity grazing (20 to 30 percent on herbaceous key forage species). However, with greater livestock numbers under alternative 3 the resource impact is accelerated when not addressed promptly and economic impact to the rancher with accelerated livestock removal in times of drought (or as other resource issues become apparent) becomes an issue. Due to rugged terrain, lack of available water, and difficulties with accessibility, this becomes a greater issue with alternative 3.

Soils

Desired Condition

Forest Plan Direction

The Tonto NF Plan articulates the following desired conditions:

- Manage vegetation to achieve satisfactory or better watershed conditions
- Minimize impacts on soil and water resources from all ground disturbing activities
- Mitigate adverse effects of planned activities on soil and water resources through the use of Best Management Practices
- Emphasize improvement of soil productivity, air, and water quality
- Management activities within the desert zone must fully recognize the limitations this unique ecosystem has to the impacts of man's uses and activities
- Achieve a management situation that can respond to local or national demands for wood products, livestock production, water yield, and a wide mix of recreation opportunities, including wildlife related uses, which range from the primitive to the urban end of the spectrum. The goal is to produce these outputs and opportunities on a sustained basis while maintaining air, soil, and water resources at or above minimum local, State, or Federal standards. Emphasize improvement of soil productivity, air and water quality.

Forest Service Manual Direction

2550.1 – Authority 1, *The Multiple Use-Sustained Yield-Act* states that management of the national forests must provide “sustained yields in perpetuity without impairment of the productivity of the land.”

2550.2 - Objective “Maintain or restore soil quality on National Forest System lands. Manage resource uses and soil resources on NFS lands to sustain ecological processes and condition so that desired ecosystem services are provided in perpetuity.”

2550.3 – Policy “Manage forest and rangelands in a manner that will improve soil productivity.”

2521.03 - Objective “Manage terrestrial ecosystems and NFS watersheds to protect soil productivity and hydrologic function. Implement soil and water conservation measures with management activities to maintain satisfactory or optimum watershed conditions.”

FSM 2551.1 - Soil assessments are conducted when knowledge of current soil quality conditions is required to advise decision makers whether adjustments in land management practices are needed.

Desired Soil Condition

- Although desired condition is to have all soils in satisfactory soil condition as described in FSH 2509.18-99-1, this is a long-term goal. Characteristics of specific soil types often drive resiliency, productivity, and resistance to erosion. Soils in arid and semiarid environments recover slowly from disturbance. Rates of recovery will differ depending on factors such as: magnitude of past soil loss, inherent soil properties, current vegetative ground cover, and type of ecosystem. However, all soils should be moving towards satisfactory conditions.
- Maintain or improve soils currently in satisfactory condition.
- Improve soils in impaired condition, so they are reaching or moving towards satisfactory condition.
- Improve soils in unsatisfactory soil condition, so they are reaching or moving towards at least impaired condition.
- Soil productivity and function, including ability of soil to resist erosion, infiltrate water and recycle nutrients, should be sustained and functioning properly, so terrestrial and riparian ecosystems are more resilient and better adapted to climate change. Herbaceous vegetation cover should be maintained at levels that contribute to suitable hydrologic function, soil stability, and nutrient cycling. Diversity of grass and forb species and presence of plant litter and grass, forb, shrub, and tree basal area surface cover should help reduce occurrences of compaction and erosion.
- Impaired and unsatisfactory soils should be improving and moving towards satisfactory conditions, sustaining vital soil functions and soil productivity. Soils in satisfactory condition should maintain vital soil functions and soil productivity.
- Through improved soil and vegetation conditions, soil nutrient cycling should be improving, resulting in improved soil productivity. Surface hydrologic soil condition should be at or moving toward satisfactory condition. Surface soil structure should be angular or subangular blocky parting towards granular, have common or many tubular pores, and loose to slightly hard rupture resistance.

Soil Condition Evaluation (FSM 2500)

Soil condition is primarily determined by evaluating surface soil properties. This is the critical area where plant and animal organic matter accumulate, begin to decompose and eventually become incorporated into soil. It is also the zone of maximum biological activity and nutrient release. The physical condition of this zone plays a significant role in soil stability, nutrient cycling, water infiltration, and energy flows. Presence and distribution of surface soil is critically important to productivity. While soil condition is an important element in determining general watershed condition, it is not intended to be a stand-alone process for evaluation of site specific conditions such as soil mass movement, stream channel health or sediment yield.

Soil Condition Categories (FSM 2500)

Ecological land units are assigned a soil condition category, which is an indication of the status of soil functions. Soil condition categories reflect soil disturbances resulting from both planned and

unplanned events. Current management activities provide opportunities to maintain or improve soil functions which are critical in sustaining soil productivity.

Following is a brief description of each soil condition category:

Satisfactory - Indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of soil to maintain resource values and sustain outputs is high. Satisfactory soils have properties that allow the infiltration of water and the ability to resist erosion (stable) (U.S.F.S. 2001). Properties such as granular surface soil structure, soft consistency, low bulk density, and large pores allow rapid and deep entry of water (U.S.F.S. 2001). Healthy soils also have appropriate amounts of litter and plant cover to help rebuild or maintain soil organic matter, maintain nutrient levels, and resist erosion (U.S.F.S. 2001).

Impaired - Indicators signify a reduction of soil function. The ability of soil to function properly has been reduced and/or there exists an increased vulnerability to degradation. An impaired category should signal land managers that there is a need to further investigate the ecosystem to determine causes and degrees of decline in soil functions. Changes in management practices or other preventative actions may be appropriate.

Unsatisfactory - Indicators signify that loss of soil function has occurred. Degradation of vital soil functions result in the inability of soil to maintain resource values, sustain outputs, and recover from impacts. Soils rated in the unsatisfactory category are candidates for improved management practices or restoration designed to recover soil functions.

Transitional (U.S.F.S. 2001) – If soils do not have the properties of a stable soil, they should at least be showing signs of improvement. Signs of improvement include: the development of a softer and looser surface horizon; minimal conspicuous rills, gullies, pedestaled plants, and exposed roots; soil deposited on the uphill sides of logs, rocks, and larger plants; or other signs of accelerated erosion. If erosion is evident, there should be signs that they are stabilizing. Positive signs are gullies starting to heal over and plants recolonizing eroded areas.

Grasslands and ecosystems with grassy understories should have well-distributed grasses at an appropriate density for the climate. Grass roots not only resist erosion, but help supply organic matter and nutrients to the soil. Ecosystems, such as chaparral and conifer forests, rely on needle cast and leaf litter to protect soil from erosion and add organic matter to the soil surface horizons. These ecosystems should have well-distributed litter that are not only associated with prominent plants. Conifer forests should also have 5 to 14 tons of coarse woody material that help retain moisture and nutrients. Sonoran Desert soils should have a cover of cryptogamic soil crusts to reduce soil erosion, increase infiltration, and limit the spread of exotic annuals.

Existing Condition

The analysis area is located within the Central Highlands or Transition Zone Physiographic Province (Chronic 1983). Vegetation is extremely variable ranging from Sonoran Desert at lower elevations to pine forest at the highest elevations. Riparian vegetation occurs in drainages. Topographical features range from nearly level basins and mesa tops to rugged steep slopes and deep canyons. Mean annual precipitation ranges from 11 inches at lower elevations to 22 inches at the higher elevations. Mean annual soil temperature ranges from about 68° F at lower elevations to about 55° F at higher elevations (U.S.D.A. 1985). Geology is dominated by granite (Xg), basalt (Tb), and conglomerate sandstone (Tsy). Smaller areas of metamorphosed volcanic

rocks (Xmv), sandstone, and shale (MC), and metasedimentary rocks of sandstone, shale, and schist (Xms) occur along with small areas of younger alluvial deposits, which occur along drainages (AZGS web site map, 2000).

Terrestrial Ecosystem Survey (TES)/Terrestrial Ecological Unit Inventory (TEUI)

A TES, including Red Creek, Skeleton Ridge, and part of Six Bar allotments, was conducted by the Tonto NF in the late 1970s and early 1980s (U.S. Forest Service, 1980). Information from that survey was used as part of this analysis. The portion of Six Bar Allotment not covered by TES has been mapped as part of an ongoing TEUI survey currently being conducted. Working draft maps and a map unit legend exist in internal GIS files (Figure 8: Vegetation Map, appendix E). All this information is preliminary and frequently updated.

Soil Condition

Soil condition was evaluated using a combination of TES, TEUI, topographic maps, and the field work of a former Tonto NF soil scientist (Figure 9: Soils Map, appendix E).

Soil condition represents an approximation. It is not possible to visit all areas. Interpretations were based on historical livestock use patterns and slope characteristics. Flatter and more open areas tend to experience greater impacts than steeper slopes or areas with dense vegetation. Areas with less than satisfactory soil condition are a result of past and current management practices. Most soils of these allotments are in unsatisfactory condition or are not suitable for grazing due to slope. Many of the lower elevation areas below 3,200 feet on slopes less than 15 percent are in unsatisfactory condition. Other areas are in impaired soil conditions. These are mostly flats above 3,200 feet and 15 to 40 percent slopes at lower elevations. A summary of data shows 4,312 acres (3 percent) in satisfactory condition, 7,531 acres (5 percent) a combination of satisfactory and impaired conditions, 1,073 acres (0.7 percent) a combination of satisfactory and unsatisfactory conditions, 12,840 acres (9 percent) in impaired condition, 13,797 acres (9 percent) a combination of impaired and unsatisfactory conditions, 24,220 acres (16 percent) in unsatisfactory condition, and 86,074 acres (58 percent) not suitable for grazing (no capability) but are in satisfactory condition. The soils rated impaired and unsatisfactory are normally on gentler slopes. Soils with no capability occur on slopes greater than 40 percent. Appendix B, table B1 lists soils sorted by erosion hazard. Appendix B, table B2 lists a summary of soil condition by map unit. Appendix B, table B3 lists a summary of soil condition by pasture.

Soils in unsatisfactory condition show signs of compaction, have a low diversity and density of perennial grasses, and have little litter cover. Compaction and sparse ground cover have caused reduced infiltration rates leading to excessive runoff and poor watershed conditions. Soils have lost organic matter through both erosion and oxidation of the organic matter. A lack of perennial grasses and litter cover is limiting the ability of soils to rebuild their supply of organic matter. For these soils to recover, compact layers must be allowed to achieve normal compaction (i.e., bulk density within 15 percent of normal) by limiting hoof action, especially when soils are wet.

Appendix B (mapping unit legend) lists each map unit, taxonomy including soil depth, soil particle size class (texture), surface soil texture and rock fragments, climatic class, and soil temperature regime.

Red Creek Allotment

Red Creek Allotment contains 18 pastures as described below.

Cedar Pasture contains 12 acres (0.4 percent) of riparian area (map unit 15) that has portions of satisfactory and unsatisfactory soil condition. Not quite half of the pasture (42.5 percent) is in map units 3339, 373, 451, and 9239. These are part of the pinyon/juniper/oak and the semidesert grasslands community types. They are in the 40 to 80 percent or 40 to 120 percent slope class. Due to the steepness of slopes, they have a severe erosion hazard and are considered not suitable for grazing. Map unit 3050 is 362 acres (13 percent) of this pasture and is semidesert grassland. It is on 0 to 15 percent slopes that are in satisfactory condition, but do have severe erosion hazard. Map unit 416 is 13 acres (0.5 percent) of this pasture and is in the pinyon/juniper/oak community type. It is on 15 to 40 percent slopes, has satisfactory soil condition and a moderate erosion hazard. Map unit 3521 is 43 percent (1,208 acres) of this pasture and is in the pinyon/juniper/oak community. It is on 15 to 40 percent slopes, has an impaired soil condition and a severe erosion hazard.

Cedar Push Pasture: map units 15 (riparian), 3124 and 7606 (semidesert grasslands) make up this pasture. Map unit 7606 is on 0 to 15 percent slopes and 3124 is located on 15 to 40 percent slopes. The whole pasture has an unsatisfactory soil condition and map units 3124 and 7606 have a severe erosion hazard.

Dugan Holding Pasture has map units 15, 3050, 3124, 3306, 3339, and 9239. Map unit 15 is 50 acres (12 percent) of this pasture and has a satisfactory-unsatisfactory soil condition rating. Map unit 3339 makes up about 10 acres (2 percent) of this pasture and is in the pinyon/juniper/oak community type. It is a steep unit (40 to 80 percent), and therefore, is considered in satisfactory condition, but not suitable for grazing and has a severe erosion hazard. The rest of this pasture is in the semidesert grasslands community type. Map unit 9239 is 163 acres (40 percent) and on 40 to 120 percent slopes, has a severe erosion hazard and is unsuitable for grazing. Map unit 3050 (169 acres or 41 percent) is on 0 to 15 percent slopes, considered in satisfactory soil condition, but has a severe erosion hazard. Map unit 3306 (12 acres or 3 percent) is also located on 0 to 15 percent slopes, but has an unsatisfactory soil condition and a slight erosion hazard. Map unit 3124 makes up only 3 acres (0.7 percent), is found on 15 to 40 percent slopes, has an unsatisfactory soil condition and a severe erosion hazard.

Horse Camp Pasture only has two map units (3339 and 3520). It has 362 acres of which map unit 3339 is 290 acres (80 percent) and map unit 3520 is 72 acres (20 percent). Map unit 3339 has a pinyon/juniper/oak community type and a 40 to 80 percent slope range. It has a severe erosion hazard and a satisfactory-unsuited soil condition due to the steep slopes. Map unit 3520 is also in the pinyon/juniper/oak plant community and is found on 0 to 15 percent slopes. It has unsatisfactory soil condition and a slight erosion hazard.

Horse Pasture: Map units 15, 3124, 3339, and 9239 make up this pasture. Map unit 15 is 25 acres (12 percent) of this pasture. It has riparian vegetation, has a 0 to 10 percent slope and has a satisfactory-unsatisfactory soil condition. Map unit 3124 (148 acres or 69 percent) is in the semidesert grasslands, located on 15 to 40 percent slopes and is in the semidesert grasslands community. It has an unsatisfactory soil condition and a severe erosion hazard. Map unit 9239 covers 38 acres (18 percent) of this pasture and is also in the semidesert grasslands. It has a 40 to 120 percent slope range, and therefore, the soil condition is considered satisfactory, but unsuitable, for grazing. It has a severe erosion hazard. Map unit 3339 only has 1 acre (0.5

percent) of this pasture. It is in the pinyon/juniper/oak community type. It is in the 40 to 80 percent slope range, has a severe erosion hazard, and is considered in satisfactory soil condition, but unsuitable for grazing.

Lower Soda Pasture is made up of map units 3124, 3231, 3339, 3521, and 9239. This pasture has both semidesert grasslands (3124 and 9239) and pinyon/juniper/oak (3231, 3339, and 3521) plant communities. Map unit 3339 is found on about 53 acres (4 percent) of the pasture. It has a 40 to 80 percent slope range, a severe erosion hazard and satisfactory, but unsuitable, soil condition, due to the steepness of the slope. Map unit 9239 (111 acres or 8.5 percent) also has a severe erosion hazard and a satisfactory, but unsuitable, soil condition (40 to 120 percent slopes).

Map units 3231 and 3524 are located on 15 to 40 percent slopes. Map unit 3231 (188 acres or 14.5 percent) has a satisfactory-impaired soil condition and a moderate erosion hazard. Map unit 3524 (37 acres or 3 percent) has an impaired soil condition and a severe erosion hazard.

Mustang Pasture is made up of riparian (map unit 15), semidesert grasslands (3050, 3124, 7606, and 9239) and pinyon/juniper/oak (3231, 3339, 3521, 3752, 4170, 430, and 9349) community types. Map unit 15 (122 acres or 1.3 percent) has a 0 to 10 percent slope and a satisfactory-unsatisfactory soil condition. Map unit 3050 is found on 362 acres (3.8 percent) and is on 0 to 15 percent slopes. It has a satisfactory soil condition and severe erosion hazard. Map unit 3124 makes up 26 percent (2,517 acres) of this pasture and is on 15 to 40 percent slopes. It has an unsatisfactory soil condition and severe erosion hazard. Map unit 3231 is on 15 to 40 percent slopes. It has a soil condition rating of satisfactory-impaired and a moderate erosion hazard. Map unit 3521 (29 acres or 0.3 percent) is on 15 to 40 percent slopes, has a severe erosion hazard and an impaired soil condition. Map unit 3752 makes up 31 acres (0.3 percent) of the pasture, is on 15 to 40 percent slopes, and has a moderate erosion hazard and an impaired soil condition. Map unit 4170 is only on 1.4 acres. It is on 0 to 15 percent slope, a slight erosion hazard and an impaired-unsatisfactory soil condition. Map unit 7606 is on 142 acres (1.5 percent) of the pasture, has a 0 to 15 percent slope range, an unsatisfactory soil condition, and a severe erosion hazard. Map units 3339, 430, 9239, and 9349 have a satisfactory, but unsuitable for grazing, soil condition rating and a severe erosion hazard rating due to slope steepness. Map unit 3339 has a 40 to 80 percent slope range and is found on 2,216 acres (23 percent) of the pasture. Map unit 430 is only on 1.5 acres of the pasture and also has a 40 to 80 percent slope range. Map units 9239 (2,019 acres or 21 percent) and 9349 (1,309 acres or 13.6 percent) have 40 to 120 percent slopes.

North Red Hills Pasture has 2,509 acres of which map unit 9 is 89 acres (3.5 percent), map unit 1120 is 63 acres (2.5 percent), map unit 1770 is 443 acres (17.3 percent), map unit 9239 is 1,529 acres (61 percent) and map unit 9349 is 394 acres (16 percent). Map unit 9 is a riparian unit on 0 to 10 percent slopes that has an unsatisfactory soil condition. Map units 1120 and 1770 are part of the Sonoran Desert plant community type. Map unit 1120 is found on 0 to 15 percent slopes and has an unsatisfactory soil condition and moderate erosion hazard. Map unit 1770 is on 0 to 40 percent slopes and has an impaired-unsatisfactory soil condition and a slight erosion hazard. Map units 9239 and 9349 are on 40 to 120 percent slopes and have a satisfactory, but unsuitable, soil condition and a severe erosion hazard. Map unit 9239 is part of the semidesert grassland community type and map unit 9349 is part of the pinyon/juniper/oak community type.

Palo Verde Holding Pasture has riparian and Sonoran Desert plant communities. Map unit 9 (riparian) makes up 8 acres (3 percent) of the pasture. It has a 0 to 10 percent slope and is in unsatisfactory soil condition. Map units 1120 (78 acres or 34 percent) and 1770 (147 acres or 63

percent) are part of the Sonoran Desert community. Map unit 1120 is on 0 to 15 percent slope, has an unsatisfactory soil condition and a moderate soil erosion hazard. Map unit 1770 has an impaired-unsatisfactory soil condition and a slight erosion hazard.

Peso Pasture has riparian, Sonoran Desert, semidesert grasslands and pinyon/juniper/oak community types. Map unit 15 (21 acres or 0.7 percent) is the riparian unit. It has a satisfactory-unsatisfactory soil condition rating. Map unit 1770 (1 acre) is part of the Sonoran Desert vegetation community, has an impaired-unsatisfactory soil condition and a slight erosion hazard. Map unit 3050 (275 acres or 9 percent), 3124 (651 acres or 22 percent), and 9239 (1,233 acres or 42 percent) are in the semidesert grasslands community. Map unit 3050 is on 0 to 15 percent slopes and has a satisfactory soil condition rating and a severe erosion hazard. Map unit 3124 is on 15 to 40 percent slopes and has an unsatisfactory soil condition and a severe erosion hazard. Map unit 9239 is on 40 to 120 percent slopes and has a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map units 3339 (764 acres or 26 percent) and 451 (1.5 acres) are in the pinyon/juniper/oak community. Map unit 3339 (40 to 80 percent slopes) and map unit 451 (40 to 120 percent slopes) have a severe erosion hazard rating and a satisfactory, but unsuitable, soil condition.

Red Creek Pasture: riparian, semidesert grasslands and pinyon/juniper/oak community types can be found in this pasture. There are two riparian map units in this pasture. Map unit 9 (48 acres or 0.7 percent) is on 0 to 10 percent slopes and has an unsatisfactory soil condition. Map unit 15 (43 acres or 0.6 percent) is on 0 to 10 percent slopes and has a satisfactory to unsatisfactory soil condition.

Map units 3050 (47 acres or 0.7 percent), 3124 (1,963 acres or 29 percent), 7606 (261 acres or 4 percent) and 9239 (3,970 acres or 58 percent) are in the semidesert grasslands. Map unit 3050 is found on 0 to 15 percent slopes and has a satisfactory soil condition and a severe soil erosion rating. Map units 3124 and 7606 are on 0 to 15 percent slopes, have an unsatisfactory soil condition and a severe erosion hazard. Map unit 9239 is on 40 to 120 percent slopes, has a severe erosion hazard and a satisfactory, but unsuitable, soil condition rating. Map units 3231 (1.5 acres), 3333 (99 acres or 1.5 percent), 3339 (277 acres or 4 percent), and 3521 (85 acres or 1.3 percent) are part of the pinyon/juniper/oak community. Map unit 3231 is on 15 to 40 percent slopes, has a satisfactory-impaired soil condition and a moderate erosion hazard. Map unit 3333 is on 0 to 15 percent slopes, has an unsatisfactory soil condition and a slight erosion hazard. Map unit 3339 is on 40 to 80 percent slopes, has a severe erosion hazard and a satisfactory, but unsuited, soil condition. Map unit 3521 is on 15 to 40 percent slopes, has an unsatisfactory soil condition and severe soil erosion hazard rating.

Red Hills Pasture contains five vegetation communities. Map units 9 (1,247 acres or 4 percent) and 15 (202 acres or 0.7 percent) are riparian units. Map units 1120 (901 acres or 3.1 percent) and 1770 (8,094 acres or 28.3 percent) are in the Sonoran Desert. Map units 3050 (810 acres or 2.8 percent), 3124 (1,465 acres or 5.1 percent), 3187 (458 acres or 1.6 percent), and 9239 (7,070 acres or 25 percent) are part of the semidesert grasslands. Map unit 3710 (369 acres or 1.3 percent) is a juniper savanna vegetation community. Map units 3231 (336 acres or 1.2 percent), 3339 (2,142 acres or 7.5 percent), 3371 (125 acres or 0.4 percent), 3730 (38 acres or 0.1 percent), 3752 (1,299 acres or 4.5 percent), 3821 (552 acres or 1.9 percent), and 9349 (3,507 acres or 12 percent) are part of the pinyon/juniper/oak community. Map unit 9 is on 0 to 10 percent slope and an unsatisfactory soil condition. Map unit 15 is also on 0 to 10 percent slopes and has a satisfactory-unsatisfactory soil condition. Map unit 1120 is on 0 to 15 percent slopes, has an

unsatisfactory soil condition and a moderate erosion hazard. Map unit 1770 is on 0 to 40 percent slopes, has an impaired-unsatisfactory soil condition and a slight erosion hazard. Map unit 3050 is on 0 to 15 percent slopes, has a satisfactory soil condition and a severe erosion hazard. Map unit 3124 is found on 15 to 40 percent slopes, has an unsatisfactory soil condition and severe erosion hazard. Map unit 3187 is on 0 to 15 percent slopes, has an unsatisfactory soil condition and moderate erosion hazard. Map unit 9239 is on 40 to 120 percent slopes with a severe erosion hazard and a satisfactory, but unsuited, soil condition. Map unit 3710 is on 0 to 15 percent slopes and has an impaired-unsatisfactory soil condition and slight erosion hazard. Map unit 3231 is on 15 to 40 percent slopes, has a moderate erosion hazard and a satisfactory-impaired soil condition. Map unit 3339 is on 40 to 80 percent slopes, has a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3371 is on 0 to 40 percent slopes, has an impaired soil condition and severe erosion hazard. Map unit 3730 is on 0 to 15 percent slopes, has an impaired-unsatisfactory soil condition and moderate erosion hazard. Map unit 3752 is on 15 to 40 percent slopes, has an impaired soil condition and moderate soil erosion hazard. Map unit 3821 is on 15 to 40 percent slopes, has a satisfactory-impaired soil condition and severe soil erosion hazard. Map unit 9349 is on 40 to 120 percent slopes, has a severe erosion hazard and a satisfactory, but unsuitable, soil condition.

Roundtree Pasture: riparian, semidesert grasslands and pinyon/juniper/oak communities can be found in this pasture. Map unit 15 (riparian) is 197 acres (6.5 percent) of this pasture. It has a satisfactory-unsatisfactory soil condition and has a 0 to 10 percent slope range. Map units 3050 (232 acres or 7.7 percent), 3124 (890 acres or 29.5 percent), 3230 (265 acres or 8.8 percent), and 9239 (331 acres or 11 percent) make up the semidesert grasslands. Map unit 3050 is on 0 to 15 percent slopes, has a satisfactory soil condition and a severe erosion hazard. Map unit 3124 can be found on 15 to 40 percent slopes, has an unsatisfactory soil condition and severe erosion hazard. Map unit 3230 is on 0 to 15 percent slopes, with an unsatisfactory soil condition and a slight erosion hazard. Map unit 9239 is on 40 to 120 percent slopes with a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map units 3231 (77 acres or 2.5 percent), 3339 (542 acres or 18 percent), 3521 (458 acres or 15 percent), 407 (12 acres or 0.4 percent), and 416 (15 acres or 0.5 percent) are in the pinyon/juniper/oak communities. Map unit 3231 is on 15 to 40 percent slopes, has a satisfactory-impaired soil condition and a moderate soil erosion hazard. Map unit 3339 is found on 40 to 80 percent slopes, has a satisfactory, but unsuitable, soil condition and a severe erosion hazard. Map unit 3521 is on 15 to 40 percent slopes with an impaired soil condition and a severe erosion hazard. Map unit 407 is on 15 to 40 percent slopes with an impaired-unsatisfactory soil condition and a severe erosion hazard. Map unit 416 is on 15 to 40 percent slopes with a satisfactory soil condition and a moderate erosion hazard.

Rugged Mesa Pasture has semidesert grasslands and pinyon/juniper/oak communities. Map units 3306 (290 acres or 29 percent) and 9239 (69 acres or 7 percent) make up the semidesert grasslands in this pasture. Map unit 3306 is a 0 to 15 percent unit with unsatisfactory soil condition and slight erosion hazard. Map unit 9239 is on 40 to 120 percent slope with a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map units 3231 (69 acres or 7 percent), 3339 (258 acres or 26 percent), and 3520 (306 acres or 31 percent) make up the pinyon/juniper/oak community in this pasture. Map unit 3231 is on 15 to 40 percent slopes, a satisfactory-impaired soil condition rating and moderate erosion hazard. Map unit 3339 is on 40 to 80 percent slopes with a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3520 is found on 0 to 15 percent slopes and it has an unsatisfactory soil condition and slight erosion hazard.

Soda Springs Pasture covers semidesert grasslands and the pinyon/juniper/oak communities. Two map units (3124 and 9239) occur in the semidesert grasslands. Map unit 3124 (122 acres or 2 percent) is on 15 to 40 percent slopes, has unsatisfactory soil condition and severe erosion hazard. Map unit 9239 (63 acres or 1 percent) is on 40 to 120 percent slopes, has a severe erosion hazard and a satisfactory, but unsuitable, soil condition. The pinyon/juniper/oak area of this pasture contains map units 3231, 3339, 3521, and 9349. Map unit 3231 (776 acres or 12 percent) is on 15 to 40 percent slopes, has a satisfactory-impaired soil condition and a moderate erosion hazard. Map unit 3339 (3496 acres or 54 percent) is on 40 to 120 percent slopes with a severe erosion hazard and satisfactory, but unsuitable, soil erosion hazard. Map unit 3521 (209 acres or 3 percent) is on 15 to 40 percent slopes with impaired soil condition and severe erosion hazard rating. Map unit 9349 (1692 acres or 26 percent) is on 40 to 120 percent slopes with a severe erosion hazard rating and a satisfactory, but unsuitable, soil condition.

Tangle Mountain Pasture: map unit 15 (115 acres or 1.8 percent) is the riparian unit in this pasture. It has a 0 to 10 percent slope range and a satisfactory-unsatisfactory soil condition. Map unit 1770 (269 acres or 4.3 percent) has a Sonoran Desert vegetation community, 0 to 40 percent slopes, an impaired-unsatisfactory soil condition and slight erosion hazard. The semidesert grasslands occur in map units 3124 (2,609 acres or 42 percent), 3306 (142 acres or 2 percent), 7606 (569 acres or 9 percent) and 9239 (157 acres or 2.5 percent). Map unit 3124 is on 15 to 40 percent slopes with an unsatisfactory soil condition and severe erosion hazard. Map unit 3306 is on 0 to 15 percent slopes and has an unsatisfactory soil condition with a slight erosion hazard. Map unit 7606 is on 0 to 15 percent slopes and has an unsatisfactory soil condition and severe erosion hazard. Map unit 9239 is on 40 to 120 percent slopes and has a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map units 3521 (241 acres or 4 percent) and 9349 (157 acres or 2.5 percent) are part of the pinyon/juniper/oak community. Map unit 3521 is on 15 to 40 percent slopes and has impaired soil condition and severe erosion hazard. Map unit 9349 is on 40 to 120 percent slopes with a severe erosion hazard and satisfactory, but unsuitable, soil condition.

Trap contains only 4.8 acres. Map unit 15 (0.1 acre or 2 percent) is a riparian unit on 0 to 10 percent slopes and a satisfactory-unsatisfactory soil condition. Map unit 3124 (1.3 acres or 27 percent) has semidesert grassland vegetation on 15 to 40 percent slopes and has a severe erosion hazard and an unsatisfactory soil condition. Map unit 7606 (3.4 acres or 71 percent) is also part of the semidesert grasslands. It is on 0 to 15 percent slopes, has an unsatisfactory soil condition and severe erosion hazard.

Yellowjacket Pasture is predominately in the pinyon/juniper/oak community type. Map unit 3231 (1,536 acres or 42 percent) is on 15 to 40 percent slopes and has a satisfactory-impaired soil condition and a moderate erosion hazard. Map unit 3339 (1,182 acres or 32.5 percent) is on 40 to 80 percent slopes with a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3520 (28 acres or 0.8 percent) is on 0 to 15 percent slopes, has an unsatisfactory soil condition and a slight erosion hazard. Map unit 9349 (685 acres or 19 percent) is on 40 to 120 percent slopes and has a severe erosion hazard and satisfactory, but unsuitable, soil condition. There is a small area of semidesert grasslands that is identified as map unit 3306 (116 acres or 3.2 percent). It has a slope range of 0 to 15 percent, a soil condition of unsatisfactory and a slight erosion hazard. There is also a small area of ponderosa pine identified as map unit 5352 (88 acres or 2.4 percent). It is on 40 to 80 percent slopes, has a severe erosion hazard rating and a satisfactory, but unsuitable, soil condition.

Skeleton Ridge Allotment

Black Ridge Pasture has riparian and pinyon/juniper/oak vegetative communities. Riparian map unit 9 (97 acres or 4 percent) has a 0 to 10 percent slope range and unsatisfactory soil condition. Map unit 3231 (10 acres or 0.4 percent) has a slope range of 15 to 40, a satisfactory-impaired soil condition, and a moderate erosion hazard. Map unit 3339 (2,056 acres or 76 percent) has a 40 to 80 percent slope range, a severe erosion hazard, and a satisfactory, but unsuitable, soil condition. Map unit 3521 is on 15 to 40 percent slopes with an impaired soil condition and severe erosion hazard.

Cedar Basin Holding Pasture: map unit 9 is a 6 acre (6 percent) riparian unit in this pasture. It has a 0 to 10 percent slope range and an unsatisfactory soil condition. Map unit 9239 (32 acres or 31 percent) is part of the semidesert grassland community. It has a 40 to 120 percent slope range with a severe erosion hazard and satisfactory, but unsuitable, soil condition. Map unit 3231 (44 acres or 43 percent) is part of the pinyon/juniper/oak community. It is on 15 to 40 percent slopes with a satisfactory-impaired soil condition and a moderate soil erosion hazard. Map unit 3339 (20 acres or 19 percent) is also part of the pinyon/juniper/oak community. It has a 40 to 80 percent slope range and has a severe erosion hazard and a satisfactory, but unsuitable, soil condition.

Coldwater Pasture has riparian and pinyon/juniper/oak vegetative communities. Riparian map unit 9 (41 acres or 1.2 percent) has a 0 to 10 percent slope range and an unsatisfactory soil condition. Map unit 3339 (2,777 acres or 84.4 percent) is on 40 to 80 percent slopes, has a severe erosion hazard, and a satisfactory, but unsuitable, soil condition. Map unit 3520 (40 acres or 1.2 percent) is on 0 to 15 percent slopes with an unsatisfactory soil condition and a slight soil erosion hazard. Map unit 3521 (373 acres or 11.3 percent) has 15 to 40 percent slopes, an impaired soil condition, and severe erosion hazard rating. Map unit 9349 (59 acres or 1.8 percent) is on 40 to 120 percent slopes and has a severe erosion hazard and a satisfactory, but unsuitable, soil condition.

Headquarters Pasture contains 3 mapping units. Map unit 9 (11.7 acres or 4 percent) is a riparian unit with a 0 to 10 percent slope range and an unsatisfactory soil condition. Map unit 3050 (73 acres or 28 percent) is part of the semidesert grassland community, has a satisfactory soil condition, and a severe erosion hazard. Map unit 3339 (177 acres or 68 percent) is in the pinyon/juniper/oak community. It is on 40 to 80 percent slopes and has severe erosion hazard and a satisfactory, but unsuitable, soil condition.

Hot Springs Pasture has 4 mapping units. Map unit 9 (21 acres or 3 percent) is a riparian unit with a 0 to 10 percent slope range and an unsatisfactory soil condition. Map unit 3050 (130 acres or 18 percent) is part of the semidesert grassland community, has a satisfactory soil condition, and a severe erosion hazard. Map unit 3339 (126 acres or 17 percent) is in the pinyon/juniper/oak community. It is on 40 to 80 percent slopes and has severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3231 (453 acres or 62 percent) is in the pinyon/juniper/oak and has a satisfactory-impaired soil condition and a moderate soil erosion hazard.

Houston Basin Pasture has one small delineation of semidesert grassland and the rest of the pasture is in the pinyon/juniper/oak community. Map unit 9239 (26 acres or 0.8 percent) is in the semidesert grasslands. It has a slope range of 40 to 120 percent with a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3231 (223 acres or 7 percent) is on 15 to 40 percent slopes, has a satisfactory-impaired soil condition and a moderate erosion hazard. Map unit 3339 (2,079 acres or 66 percent) is on 40 to 80 percent slopes with a severe erosion hazard

and satisfactory, but unsuitable, soil condition. Map unit 3520 (5 acres or 0.2 percent) is on 0 to 15 percent slopes with an unsatisfactory soil condition and a slight erosion hazard. Map unit 3521 (823 acres or 26 percent) is on 15 to 40 percent slopes with an impaired soil condition and a severe soil erosion hazard.

Lancaster Pasture only has two mapping units. Both are in the pinyon/juniper/oak community. Map unit 3339 (241 acres or 57 percent) is on 40 to 80 percent slopes, has a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3521 (187 acres or 43 percent) is on 15 to 40 percent slopes and have an impaired soil condition and severe erosion hazard.

Long Mesa Holding Pasture: there are only two mapping units in this pasture. Map unit 9239 (7 acres or 4 percent) is in the semidesert grasslands. It is on 40 to 120 percent slopes, has a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3520 (185 acres or 96 percent) is part of the pinyon/juniper/oak community. It has a 0 to 15 percent slope range, an unsatisfactory soil condition, and slight erosion hazard.

Long Mesa Pasture: this pasture has one map unit of semidesert grasslands and one map unit of ponderosa pine. The rest of the pasture is in the pinyon/juniper/oak vegetation community. Map unit 9239 (1,108 acres or 21 percent) is semidesert grasslands on 40 to 120 percent slopes with severe erosion hazard rating and a satisfactory, but unsuitable, soil condition rating. Map unit 5452 (82 acres or 1.6 percent) is in the ponderosa pine and has a 40 to 80 percent slope, a severe erosion hazard, and a satisfactory, but unsuitable, soil condition. Map unit 3231 (10 acres or 0.2 percent) is on 15 to 40 percent slopes with a satisfactory-impaired soil condition and a moderate soil erosion hazard. Map unit 3339 (2,182 acres or 42 percent) is on 40 to 80 percent slopes with a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3520 (998 acres or 19 percent) is on 0 to 15 percent slopes an unsatisfactory soil condition and a slight erosion hazard. Map unit 3521 (474 acres or 9 percent) is on 15 to 40 percent slopes with an impaired soil condition and a severe erosion hazard. Map unit 9349 (362 acres or 7 percent) is on 40 to 120 percent slopes with a severe erosion hazard and a satisfactory, but unsuitable, soil condition.

Long Mesa Tank is only in the pinyon/juniper/oak vegetation community. Map unit 3339 (14 acres or 16 percent) is on 40 to 80 percent slopes with a severe erosion hazard and satisfactory, but unsuitable, soil condition. Map unit 3520 (39 acres or 46 percent) is on 0 to 15 percent slopes with an unsatisfactory soil condition and slight erosion hazard. Map unit 3521 (32 acres or 38 percent) is on 15 to 40 percent slopes, has an impaired soil condition and a severe erosion hazard.

Mud Springs Pasture: most of this pasture is the pinyon/juniper/oak vegetative type with one delineation of semidesert grassland and one delineation that is part of the Arizona cypress community type. Map unit 3050 (2.5 acres or 0.1 percent) is part of the semidesert grasslands. It is on 0 to 15 percent slopes with a satisfactory soil condition and a severe soil hazard. Map unit 4468 (104 acres or 4.5 percent) is in the Arizona vegetative type on 15 to 40 percent slopes with a satisfactory soil condition and a severe erosion hazard. Map unit 3231 (71 acres or 3 percent) is on 15 to 40 percent slopes with satisfactory-impaired soil condition and moderate erosion hazard. Map unit 3339 (1974 acres or 85 percent) is on 40 to 80 percent slopes with a severe erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3521 (122 acres or 5 percent) is on 15 to 40 percent slopes with an impaired soil condition and severe erosion hazard. Map unit

9349 (36 acres or 1.6 percent) is on 40 to 120 percent slopes, has a severe erosion hazard and a satisfactory, but unsuitable, soil condition.

Pete's Cabin Pasture ranges from the Sonoran Desert to the pinyon/juniper/oak vegetative type. There are two riparian delineations in this pasture. Map unit 9 (884 acres or 5 percent) has a 0 to 10 percent slope range and an unsatisfactory soil condition. Map unit 15 (76 acres or 0.4 percent) has a 0 to 10 percent slope range with a satisfactory-unsatisfactory soil condition. Map units 1120 (594 acres or 3.4 percent) and 1770 (3439 acres or 20 percent) are in the Sonoran Desert vegetative type. Map unit 1120 has a 0 to 15 percent slope range with an unsatisfactory soil condition, and a moderate soil erosion hazard. Map unit 1770 has a slope range of 0 to 40 percent, an impaired-unsatisfactory soil condition, and a slight erosion hazard. Map units 3050 (499 acres or 3 percent), 3124 (322 acres or 2 percent), 3187 (161 acres or 1 percent), 3760 (53 acres or 0.3 percent), and 9239 (7,264 acres or 42 percent) are part of the semidesert grasslands vegetation type. Map unit 3050 has a slope range of 0 to 15 percent, a satisfactory soil condition, and a severe erosion hazard. Map unit 3124 has a slope range of 15 to 40 percent with an unsatisfactory soil condition and severe erosion hazard. Map unit 3187 has a slope range of 0 to 15 percent with an unsatisfactory soil condition and moderate erosion hazard. Map unit 3760 has a 0 to 15 percent slope range with an unsatisfactory soil condition and a slight erosion hazard. Map unit 9239 is on 40 to 120 percent slopes with a severe soil erosion hazard and a satisfactory, but unsuitable, soil condition. The rest of the map units in this pasture are in the pinyon/juniper/oak vegetative type. Map unit 3339 (998 acres or 6 percent) is on 40 to 80 percent slopes with a severe erosion hazard and satisfactory, but unsuitable, soil condition. Map unit 3351 (96 acres or 0.6 percent) has a slope range of 15 to 40 percent with an impaired soil condition and a severe erosion hazard. Map unit 3371 (931 acres or 5 percent) has a slope range of 15 to 40 percent with an impaired soil condition and severe erosion hazard. Map unit 3520 (90 acres or 0.5 percent) is on 0 to 15 percent slopes, has an unsatisfactory soil condition and a slight erosion hazard. Map unit 3521 is on 15 to 40 percent slopes with an impaired soil condition and severe erosion hazard. Map unit 3730 (10 acres or 0.1 percent) is on 0 to 15 percent slopes, has an impaired-unsatisfactory soil condition and moderate erosion hazard. Map unit 3752 (12 acres or 0.1 percent) is on 15 to 40 percent slopes, has an impaired soil condition and a moderate soil erosion hazard. Map unit 3753 (69 acres or 0.4 percent) has a slope range of 40 to 80 percent slopes, a severe soil erosion hazard, and a satisfactory, but unsuitable, soil condition. Map unit 3770 (266 acres or 1.5 percent) is on 15 to 40 percent slopes with an impaired soil condition and moderate erosion hazard. Map unit 3821 (131 acres or 0.8 percent) is on 15 to 40 percent slopes with a satisfactory-impaired soil condition and severe erosion hazard. Map units 9349 (350 acres or 2 percent) and 9459 (140 acres or 0.8 percent) are on 40 to 120 percent slopes with severe erosion hazard and satisfactory, but unsuitable, soil condition.

Pipeline Pasture has one riparian unit, one semidesert grassland unit and three pinyon/juniper/oak units. Map unit 9 (4 acres or 1 percent) is a riparian unit with 0 to 10 slopes and an unsatisfactory soil condition. Map unit 3050 (82 acres or 25 percent) is in the semidesert grasslands. It has 0 to 15 percent slope range, a satisfactory soil condition, and severe erosion hazard rating. Map unit 3231 (76 acres or 23 percent) has a slope range of 15 to 40 percent with a soil condition of satisfactory-impaired and a moderate soil erosion hazard. Map unit 3521 (136 acres or 41 percent) has a slope range of 15 to 40 percent, an impaired soil condition, and severe erosion hazard. Map unit 3339 (32 acres or 10 percent) has a slope range of 40 to 80 percent, an erosion hazard of severe, and a satisfactory, but unsuitable, soil condition.

Powerhouse Pasture has one riparian unit, one semidesert grassland unit and two pinyon/juniper/oak units. Map unit 9 (21 acres or 2.3 percent) is a riparian unit with 0 to 10 slopes and an unsatisfactory soil condition. Map unit 3050 (2 acres or 0.2 percent) is in the semidesert grasslands. It has 0 to 15 percent slope range, a satisfactory soil condition, and severe erosion hazard rating. Map unit 3231 (23 acres or 2.5 percent) has a slope range of 15 to 40 percent with a soil condition of satisfactory-impaired and a moderate soil erosion hazard. Map unit 3339 (865 acres or 96 percent) has a slope range of 40 to 80 percent, an erosion hazard of severe, and a satisfactory, but unsuitable, soil condition.

West Coldwater Pasture contains the Arizona cypress, pinyon/juniper/oak and ponderosa pine vegetative types. Map unit 4468 (606 acres or 10 percent) is an Arizona cypress vegetative type with a slope range of 15 to 40 percent, a satisfactory soil condition and severe erosion hazard. Map units 3339 (1127 acres or 19 percent), 3520 (25 acres or 0.4 percent), 3521 (316 acres or 5 percent), 5075 (504 acres or 8 percent), and 9349 (2645 acres or 44 percent) are part of the pinyon/juniper/oak vegetative type. Map unit 3339 is on 40 to 80 percent slopes with a severe soil erosion hazard and a satisfactory, but unsuitable, soil condition. Map unit 3520 is on 0 to 15 percent slopes with an unsatisfactory soil condition and slight erosion hazard. Map unit 3521 has a 15 to 40 percent slope range, an impaired soil condition, and severe erosion hazard. Map unit 5075 is on 15 to 80 percent slopes, has a satisfactory-unsuitable soil condition and severe erosion hazard. Map unit 9349 has a slope range of 40 to 120 percent, a severe erosion hazard, and a satisfactory-unsuitable soil condition. Map units 5252 (124 acres or 2 percent), 5452 (562 acres or 9 percent), and 5550 (120 acres or 2 percent) are in the ponderosa pine vegetative type. Map units 5252 and 5452 have a slope range of 40 to 80 percent, a satisfactory-unsuitable soil condition, and a severe erosion hazard. Map unit 5550 is on 0 to 15 percent slopes with a satisfactory soil condition and a slight erosion hazard.

Six Bar Allotment

Middle Fork Pasture contains riparian, Sonoran Desert, semidesert grasslands, woodland/shrubland, juniper savanna, pinyon/juniper/grasslands, and pinyon/juniper/oak vegetation types. Map unit 20 (90 acres or 0.4 percent) is a riparian unit with slopes of 0 to 5 percent, and a satisfactory soil condition. Map unit 252 (1,469 acres or 6.5 percent) is a Sonoran Desert vegetation type with a 40 to 80 percent slope range, a severe erosion hazard, and a satisfactory-unsuitable soil condition. Map units 3124 (38 acres or 0.2 percent), 342 (875 acres or 4 percent), 353 (35 acres or 0.2 percent), 380 (12 acres or 0.1 percent), 382 (2.3 acres), and 9239 (88 acres or 0.4 percent) are in the semidesert grasslands. Map units 342 (40 to 80 percent slopes) and 9239 (40 to 120 percent slopes) have a severe erosion hazard and a satisfactory-unsuitable soil condition. Map unit 3124 is on 15 to 40 percent slopes and has an unsatisfactory soil conditions and severe erosion hazard. Map unit 353 is on 0 to 40 percent slopes with an impaired soil condition and a severe soil erosion hazard. Map unit 380 is on 0 to 15 percent slopes and has an unsatisfactory soil condition and slight soil erosion hazard. Map unit 382 is on 0 to 15 percent slopes with an impaired soil condition and slight soil erosion hazard. Map units 435 (665 acres or 3 percent), 436 (5,131 acres or 23 percent), and 450 (940 acres or 4 percent) are in the woodland/shrubland vegetation type. Map unit 435 is on 15 to 40 percent slopes and has an impaired soil condition and severe erosion hazard. Map units 436 (40 to 120 percent slopes) and 450 (40 to 80 percent slopes) have a severe erosion hazard and satisfactory-unsuitable soil condition. Map unit 431(643 acres or 3 percent) is in the juniper savanna vegetation type. It has a 0 to 15 percent slope range, an unsatisfactory soil condition, and moderate soil erosion hazard. Map units 485 (383 acres or 2 percent) and 489 (139 acres or 0.6 percent) are in the

pinyon/juniper/grassland vegetation types. Both map units have a 0 to 15 percent slope range and unsatisfactory soil condition. Map unit 485 has a slight erosion hazard, while map unit 489 has a moderate erosion hazard. Map units 3231 (249 acres or 1.1 percent), 3339 (709 acres or 3.1 percent), 373 (43 acres or 0.2 percent), 407 (616 acres or 3 percent), 430 (7671 acres or 34 percent), 432 (2,316 acres or 10 percent), and 9349 (84 acres or 0.4 percent) are in the pinyon/juniper/oak vegetation type. Map units 3339 (40 to 80 percent slopes), 373 (40 to 120 percent slopes), 430 (40 to 80 percent slopes), and 9349 (40 to 120 percent slopes) have a severe erosion hazard rating and a satisfactory-unsuitable soil condition. Map units 3231, 407, and 432 have a 15 to 40 percent slope range. Map units 3231 and 407 have a satisfactory-impaired soil condition and 432 has an impaired soil condition. Map 3231 has a moderate soil erosion hazard and map units 407 and 432 have a severe erosion hazard.

Mud Springs Pasture: map units 3306 (881 acres or 18 percent) and 9239 (7 acres or 0.1 percent) are in the semidesert grassland vegetation type. Map unit 3306 is on 0 to 15 percent slopes with an unsatisfactory soil condition and slight erosion hazard. Map unit 9239 is on 40 to 120 percent slopes with a severe soil erosion hazard and satisfactory-unsuitable soil condition. Map unit 424 (12 acres or 0.2 percent) has a woodland/shrubland vegetation type. It is on 0 to 15 percent slopes and has an impaired soil condition and slight erosion hazard. Map unit 489 (157 acres or 3 percent) is in the pinyon/juniper/grassland vegetation type on 0 to 15 percent slopes and has an unsatisfactory soil condition and moderate soil erosion hazard. Map units 3231 (1,822 acres or 37 percent), 3339 (417 acres or 8 percent), 430 (258 acres or 5 percent), 432 (416 acres or 8 percent), and 9349 (1,001 acres or 20 percent) are in the pinyon/juniper/oak vegetation type. Map units 3339 and 430 (40 to 80 percent slopes) and 9349 (40 to 120 percent slopes) have a severe soil erosion hazard and satisfactory-unsuitable soil erosion hazard. Map unit 3231 has a 15 to 40 percent slope range, a satisfactory-impaired soil condition, and a moderate erosion hazard. Map unit 432 is on 15 to 40 percent slopes with an impaired soil condition and severe erosion hazard.

Six Bar Pasture is in the pinyon/juniper/oak vegetation type. Map unit 432 (400 acres or 45 percent) is on 15 to 40 percent slopes with impaired soil condition and severe soil erosion hazard. Map unit 430 (487 acres or 55 percent) is on 40 to 80 percent slopes with a severe soil erosion hazard and satisfactory-unsuitable soil condition.

Effects Analysis

Direct Effects

Grazing and Grazing Related Activities: Livestock grazing can affect soil quality in several ways. Hoof action of cattle can directly impact soils by compacting soils. The risk for compaction is greatest when soils are wet (NRCS 1996). Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (NRCS 1996, 1998, 2001). Trailing by cattle on steeper slopes can physically displace soils, leading to erosion. Trampling by cattle in certain circumstances can temporally increase water infiltration rates, but tend to decrease long-term rates (Roundy et al. 1992). Grazing can, under certain conditions, increase planting of grass seeds and seedling emergence (Winkle 1991). Cattle tend to concentrate on flatter areas especially if they are fairly open. Holechek reports that cattle tend to use 10 to 30 percent slopes thirty percent less often than 0 to 10 percent slopes and 30 to 60 percent slopes sixty percent less often than flats. Slopes over 60 percent are seldom used (Holechek, 1992). Because of the tendency of cattle to use flatter slopes, areas of impacted soils are more likely to be found on gentler slopes.

Range improvements (e.g., fencing, water developments, etc.) can have slight, localized, short-term impacts to soils during construction. Building new fences and developing waters, as mentioned in the proposed action, would have extremely small, localized direct impacts to soils

Noxious Weed Activities: Treatments used to remove noxious weeds can lead to localized, short-term disturbance to soils. Effects of noxious weed control are detailed in the Tonto Weeds EA (An Environmental Assessment for Integrated Treatment of Noxious or Invasive Plants on the Tonto National Forest). Noxious weed control will take place whether or not any of the alternatives are selected.

Indirect Effects

Grazing and Grazing Related Activities: Cattle indirectly impact soils by removing vegetation resulting in a loss of protective cover including litter. Loss of vegetation and litter reduces infiltration and exposes the soils to raindrop impact and overland flow thus leading to soil crusting and increased erosion. Reduced cover can also result in a loss of soil organic matter and a reduction in soil microbes which play a significant role in nutrient cycling. Soils that are lower in organic matter have poorer structure, which also affects infiltration and root growth. Building fences and developing waters would indirectly affect soils by improving distribution of cattle resulting in a net positive effect. Other management actions, such as salting and water development, that affect livestock use patterns can improve cattle distributions and lessen impacts to heavily used areas, but could lead to increased use of other areas that had been previously unused or lightly used.

Noxious Weed Activities: Treatments used to remove noxious weeds can lead to localized, short-term disturbance to soils. Effects of noxious weed control are detailed in the Tonto Weeds EA. Noxious weed control will take place whether or not any of the alternatives are selected.

Cumulative Effects

Cumulative effects include the direct and indirect effects of the proposed action and alternatives when added to all past, present, and reasonably foreseeable future actions.

Past grazing actions have resulted in soil erosion and compaction while current management has, in some cases, prevented or slowed recovery. The Forest Service Range Management files (File Code 2210) document the overgrazed condition of the uplands, springs, and riparian areas.

A long history of fire suppression has altered the characteristics of many ecosystems. Conifer forests generally have a greater fuel load and a greater density of trees. Other ecosystems (woodlands, juniper savannas, and semi-desert grasslands) have had an increase in woody plants.

The Cave Creek Complex (2005) is the largest fire to impact the analysis area. It burned through all of the Six Bar Allotment, the southwest portion of the Red Creek Allotment and associated watersheds. Floods after this fire caused a lot of erosion. The Willow Fire (2004) burned into the southwest corner of the Red Hills Pasture of the Red Creek Allotment.

Improperly maintained roads can cause soil erosion where runoff from roads is allowed to concentrate. Roads can be a source of concentrated runoff which can lead to localized soil erosion downslope from roads. Unauthorized cross-country vehicle travel can negatively impact soils and

vegetation through direct impacts on soils and removal or degradation of herbaceous or woody vegetation.

Other activities and management actions that have occurred in the past or are presently occurring in the analysis area are:

- juniper treatments (including juniper chaining and pushes)
- mining
- prescribed and managed fires
- introduction of non-native invasive plants that lead to an increased risk of erosion and wildfire
- management and maintenance of the 345 kV power line operated by the Western Area Power Administration (Red Creek and Skeleton Ridge allotments)
- recreational camping
- introduction and spread of noxious weeds by hikers, vehicles, domestic animals, etc.
- unauthorized livestock from adjacent allotments and other lands

Recent and on-going drought and possible future climate change can also impact conditions. Higher temperatures and lower precipitation are predicted for the southwestern United States (Garfin et al. 2013)

Consistency with the Forest Plan

The Forest Plan recognizes the need for watershed improvement. The intent of the plan is to have over 90 percent of the Tonto NF in satisfactory watershed condition by the end of the fifth planning period. Management direction is to: “Manage vegetation to achieve satisfactory or better watershed conditions.”

Criteria Used to Evaluate Alternatives and Determine Consistency with Management Direction

The criteria used to evaluate alternatives are based on the likelihood of moving toward or attaining desired conditions described in the affected environment and in the Forest Plan. The alternatives are contrasted based on the likelihood of upland vegetation and soils attaining the short and long-term desired conditions described above.

Soils in less than satisfactory condition are generally on gentler slopes. Even with good management, flatter areas will still have a tendency to receive heavy use since these areas are favored by livestock. Key areas, established to monitor cattle use, are normally on flatter, more open areas. If monitoring of grazing intensity of these areas shows acceptable use, other parts of a pasture can be expected to have acceptable levels of impacts.

Environmental Consequences - Alternative 1 (No Action)

Direct and Indirect Effects:

The majority of the allotments (about 58 percent) are in a satisfactory, but inherently unstable, soil condition (greater than 40 percent slope). Only about 3 percent of the allotment is in satisfactory soil condition. The remaining approximately 39 percent of the allotments is in impaired or unsatisfactory soil condition. The No Grazing alternative would provide the fastest increase to vegetative cover, species diversity, and improvement to soil condition.

Hoof action of cattle can cause direct impacts by compacting soils. Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (NRCS 1996, 1998, 2001). Therefore, the quickest and most likely recovery from soil compaction due to past grazing activities would normally occur with complete protection from grazing. The amount of time required for complete recovery after degradation can vary from several years to decades depending on the severity of the impacts and the nature of the ecosystem. Although soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, continued grazing could slow or prevent recovery in some areas. This alternative is likely to lead to the fastest overall improvement, but even with complete rest it may take more than ten years for some areas with impaired and unsatisfactory soil condition to improve to a better condition class.

Biological crusts play an important role in some ecosystems especially the Sonoran Desert and, to a somewhat lesser extent, the other ecosystems in the analysis area. Biological crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on soil crusts. Grazing can have detrimental effects on the amount of biological crusts (Beymer 1992). This alternative is most likely to increase the cover of biological crusts and their ecological benefits.

The effects of removing improvements would be a minor, localized, short-term disturbance to soils.

Effects of not grazing or browsing may allow localized increases in non-native herbaceous plants (mostly red brome in the desert) that would have otherwise been reduced by heavy grazing in certain areas.

Cumulative Effects:

Direct and indirect effects of this alternative, when combined with other past, present, or reasonably foreseeable actions (cumulative effects) as listed above, will be generally beneficial to soils and vegetation. Removing grazing would allow impaired and unsatisfactory soils, often affected by compaction, to recover. Periodic vegetation maintenance, trimming plants to maintain a safe distance beneath a 345 kV power line would have only minor effects on soils, since the plants are not removed. Climate change presents additional considerations. Warming and drying of the climate could increase the risk of wildfire especially in fire-dependent ecosystems.

Environmental Consequences - Alternative 2 (Current Management)

Direct and Indirect Effects:

Hoof action of cattle can cause direct impacts by compacting soils. Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (NRCS 1996, 1998, 2001). Therefore, the quickest and most likely recovery from soil compaction due to past grazing activities would normally occur with complete protection from grazing. Soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing and current management. Soils most likely to have impaired or unsatisfactory soils occur on flatter areas, areas most likely to be used by livestock. These areas are likely to continue to receive a substantial amount of use however, if allowable use guidelines are not exceeded (light grazing on soils in impaired or unsatisfactory soil condition), these areas should begin to improve.

The improvement is not likely to be as fast as would occur under the No Action/No Grazing Alternative.

Cooler season grazing normally leads to better distribution of cattle. Cattle spend less time in draws and lowlands and more time on ridge tops (Senft 1985). This would allow more of the traditionally heavily-used areas, areas that tend to have more impaired and unsatisfactory soils, to recover. Cool season grazing may also benefit warm season grasses. A negative aspect is that soils are normally wetter in cool seasons and are more subject to compaction. Although cool seasons grazing leads to better cattle distribution, grazing intensity is much more critical than grazing timing in affecting perennial grass cover (Galt 1999).

Biological crusts play an important role in some ecosystems, especially Sonoran deserts and to a somewhat lesser extent, other ecosystems in the analysis area. Crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on soil crusts. Grazing can have detrimental effects on the amount of biological crusts (Beymer 1992). Biological crusts on sandy soils are less susceptible to disturbance when moist or wet; on clay soils, when crusts are dry. In general, light to moderate stocking in early- to mid-wet season is recommended (USDI 2001). Grazing may slow or prevent the recovery of biological crusts.

Developing new or improved water sources will have an overall positive indirect effect by improving cattle distribution, but could negatively affect some areas by drawing cattle into places that previously received no or only light use. Developing waters will have a very minor direct effect on soils.

The effects of improvements (fence construction, tank construction or improvement, etc.) would be a minor, localized, short-term disturbance to soils.

Cumulative Effects:

Direct and indirect effects of this alternative, when combined with other past, present, or reasonably foreseeable actions (cumulative effects as listed above), are likely to result in attainment of desired conditions for soils and vegetation at a slower rate than alternative 1. Except for those pastures currently excluded under current management from grazing, grazing would occur throughout the analysis area. The less than satisfactory soils that are not grazed would improve the most quickly, but controlling grazing and limiting utilization would allow impaired and unsatisfactory soils, often affected by compaction, to begin to recover. However, recovery from the effects of grazing is likely to be slower than under the No Action/No Grazing Alternative. Periodic vegetation maintenance, trimming plants to maintain a safe distance beneath a 345 kV power line would have only minor effects on soils since the plants are not removed. Climate change presents additional considerations. Warming and drying of the climate could increase the risk of wildfire especially in fire-dependent ecosystems. Climate change presents additional considerations for grazing. While the changes that may occur are difficult to predict, adaptive management should allow grazing management to respond to climate variations by adjusting cattle numbers and duration of grazing.

Environmental Consequences - Alternative 3 (Proposed Action)

Direct and Indirect Effects:

The majority of the allotments (about 58 percent) are in a satisfactory, but inherently unstable, soil condition (greater than 40 percent slope). Only about 3 percent of the allotment is in satisfactory soil condition. The remaining approximately 39 percent of the allotments is in impaired or unsatisfactory soil condition. Forage production on these areas is normally low. Nearly all of these occur on slopes of less than forty percent. There is a tendency for flatter areas (including areas in unsatisfactory condition) to be overused. The success of meeting the short and long-term desired conditions will depend on timely monitoring and cattle management. However, if these areas are closely monitored and utilization standards are met (light grazing) the use of adaptive management techniques should, over time, allow these areas to improve, though it may take more than ten years for some areas with impaired and unsatisfactory soil condition to improve to a better condition class. If guidelines are not met, these areas may not improve. Overall improvement is likely to be slower than under alternative 1 and in some areas slower than alternative 2 since areas east of the Verde River (Pete's Cabin and Red Hills pastures) could be grazed. If utilization guidelines are met, soils in satisfactory condition are likely to remain so. Since grazing intensity in pastures west of the Verde River is not increased, the potential effects are similar to alternative 2.

Cooler season grazing normally leads to better distribution of cattle. Cattle spend less time in draws and lowlands and more time on ridge tops (Senft 1985). This would allow more of the traditionally heavily-used areas, areas that tend to have more impaired and unsatisfactory soils, to recover. Cool season grazing may also benefit warm season grasses. A negative aspect is that soils are normally wetter in cool seasons and are more subject to compaction. Although cool seasons grazing leads to better cattle distribution, grazing intensity is much more critical than grazing timing in affecting perennial grass cover (Galt 1999).

Developing new or improved water sources would have an overall positive indirect effect by improving cattle distribution, but could negatively affect some areas by drawing cattle into places that previously received no use or only light use. Developing waters would have a very minor direct effect on soils.

Fencing would have an overall positive indirect effect by improving cattle distribution but could negatively affect some areas by drawing cattle into places that previously received no or only light use. Building new fences would have a very minor direct effect on soils.

Biological crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on areas having biological soil crusts. Biological crust could play an important role in preventing fire in the Sonoran Desert. Grazing can have detrimental effects on the amount of biological crusts. According to studies, grazing reduced visible crust cover almost 80 percent on grazed compared to ungrazed sites (Beymer 1992). Biological crusts on sandy soils are less susceptible to disturbance when moist or wet; on clay soils, when crusts are dry. In general, light to moderate stocking in early- to mid-wet season is recommended (USDI 2001). This alternative is most likely to impede the growth or decrease the cover of biological crusts and their ecological benefits. Since the Skeleton Ridge Allotment east of the Verde River could be grazed, this alternative would have a greater undesirable effect on biological crust development than alternatives 1 and 2.

Cumulative Effects:

Direct and indirect effects of grazing management, when combined with other past, present or reasonably foreseeable actions (cumulative effects as listed above), should result in most areas moving toward desired conditions although at a slower rate than under alternative 1. Past grazing activities on these soils combined with proposed future grazing may cause further degradation of these sites. Controlling grazing and limiting utilization would allow impaired and unsatisfactory soils, often affected by compaction, to begin to recover. In general, under alternative 3, effects on soils and vegetation from grazing are somewhat less beneficial than alternative 2 and much less beneficial than alternative 1, if the pastures on the east side of the Verde River are used. If the pastures on the east side are not used, then effects are similar to alternative 2. Periodic vegetation maintenance, trimming plants to maintain a safe distance beneath a 345 kV power line will have only minor effects on soils, since the plants are not removed. Climate change presents additional considerations. While the changes that may occur are difficult to predict, adaptive management should allow grazing management to respond to climate variations by adjusting cattle numbers and duration of grazing.

Hydrology/Riparian Vegetation/ Water Quality

Desired Condition

The most common conditions limiting proper functioning condition of stream channels in the project area are high width-depth ratios, excessive erosion or deposition, and lack of riparian vegetation (elements of Mason and Johnson 1999). Restoration and recovery of stream channel stability and proper functioning condition is dependent upon restoration and recovery of riparian vegetation.

Based on direction from *FSH 2209.13, Chapter 90* (2007), specific statements of desired condition should be developed for each allotment within the context of the Forest Plan. The following project-specific desired condition statements have been developed for the riparian areas and stream channels in the analysis area with the intent of achieving stream channel proper functioning condition (Barrett et al. 1993).

Desired conditions for key reaches include both short-term and long-term timeframes. Short-term desired conditions are to:

- Maintain residual herbaceous vegetation along the greenline or stream bank, whenever precipitation is expected;
- Reintroduce riparian vegetation, if native riparian species are absent;
- Minimize the annual impacts to seedling and sapling riparian woody species; and
- Limit physical impacts to alterable stream banks and greenlines.

Long-term desired conditions are to:

- Optimize riparian tree and shrub establishment, especially following episodic, regional winter storms;
- Increase density, vertical, and horizontal canopy cover of woody riparian tree species;
- Increase the proportion of obligate and facultative riparian species;
- Maintain or increase canopy cover of herbaceous species to at least 50 percent (or 5 percent to 25 percent for reaches now at trace to 1 percent);
- Decrease greenline to greenline width;

- Optimize the establishment of floodplains and stream banks; and
- Improve stream channel function and stability.
- Reaching desired conditions for riparian areas and stream channels will depend not only on management activities, but on climatic events. Both drought and floods have potential to affect riparian areas and stream channels. High flows (greater than ten-year recurrence interval) are likely to scour impaired or unstable channels. Even moderate flows (about two-year recurrence interval) could cause unstable channels to widen or incise.

Assumptions and Methodologies

Forest Plan Direction

Analysis of environmental consequences is based primarily on data collected during past and present field visits conducted for the purposes of monitoring riparian use, stream channel classification, condition assessment, and inspections. Direction for managing riparian areas on the Tonto NF is found in the Forest Plan. Intent of the Forest Plan is to manage riparian areas for protection of soil, water, vegetation, wildlife, and fish populations. The Forest Plan defined the following long-term management direction for water, riparian areas, wildlife, and fish:

- Emphasize improvement of soil productivity, air and water quality;
- Enhance riparian ecosystems by improved management; and
- Ensure coordination that provides for species diversity and greater wildlife and fish populations through improvement of habitat.

In addition, key standards and guidelines/desired conditions from the Forest Plan include:

- Coordinate with range to achieve utilization in the riparian areas that will not exceed 20 percent of the current annual growth by volume of woody species;
- Coordinate with range to achieve at least 80 percent of the potential riparian overstory crown coverage;
- Coordinate with range to achieve at least 50 percent of the cottonwood-willow and mixed broadleaf acres in structural Type I (tall trees with well-developed understory) by 2030;
- Rehabilitate at least 80 percent of the potential shrub cover in riparian areas through the use of appropriate grazing systems and methods;
- Rehabilitate and maintain, through improved management practices, mixed broadleaf riparian to achieve 80 percent of the potential overstory crown coverage (natural regeneration is anticipated to achieve most of this goal though artificial regeneration may be necessary in some areas);
- Re-establish riparian vegetation in severely degraded, but potentially productive, riparian areas (natural regeneration is anticipated to achieve this goal, but artificial regeneration may be necessary in some areas); and
- Rehabilitate cottonwood willow Type II (tall trees with little or no understory) to achieve conversion to Type I (tall trees with well-developed understory) by the year 2030 (natural regeneration is anticipated to achieve most of this goal, but artificial regeneration may be necessary in some areas).

Forest Service Manual Direction

Forest Service Manual 2500 provides direction for managing all National Forest lands. Objectives and policy for riparian areas (*FSM 2526.02 and 2526.03*) include:

To protect, manage, and improve riparian areas, while implementing land and resource management activities;

To manage riparian areas in the context of the environment in which they are located, recognizing their unique values;

Manage riparian areas under the principles of multiple use and sustained yield, while emphasizing protection and improvement of soil, water, and vegetation; particularly because of their effects upon aquatic and wildlife resources (giving preferential consideration to riparian-dependent resources, when conflicts among land use activities occur);

Give attention to land along all stream channels capable of supporting riparian vegetation (36 *CFR* 219.27e);

Give special attention to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water (this distance shall correspond to at least the recognizable area dominated by the riparian vegetation (36 *CFR* 219.27e)); and

Give special attention to adjacent terrestrial areas to ensure adequate protection for the riparian-dependent resources.

Best Management Practices

Arizona Department of Environmental Quality (ADEQ) has jurisdiction from the Environmental Protection Agency (EPA) to implement the *Clean Water Act* in Arizona. The Southwestern Region has a Memorandum of Understanding with ADEQ (2008) in which the Forest Service agrees to use best management practices (BMPs) for on the ground projects.

BMPs that follow are taken from *FSH* 2509.22 and will be used to protect soil and water resources. The handbook contains an explanation and implementation section for each BMP.

22.11 - Controlling Livestock Numbers and Season of Use: Safeguard water and soil resources under sustained forage production. Managed forage utilization by livestock to maintain healthy ecosystems for all resource objectives.

22.12 - Controlling Livestock Distribution: To manage sustained forage production and forage utilization by livestock while protecting soil and water resources. Maintaining healthy ecosystems for wildlife and other resources.

22.13 - Rangeland Improvements: To improve, maintain or restore range resources, including soil and water through the use of rangeland improvements.

22.14 - Determining Grazing Capability of Lands: To maintain or improve soil stability, soil productivity and water quality by grazing the land within its capability.

22.15 - Revegetation of Areas Disturbed by Grazing Activities: To establish a vegetative cover on disturbed sites to prevent accelerated erosion and sedimentation.

22.16 - Erosion Control Structure Maintenance: To ensure that constructed erosion control structures are stabilized and working.

Data Collection

Multiple sources of field methods and protocols are used to determine stream type, stream condition, and annual use including:

GIS layers and feature classes used to provide allotment-wide information include National Wetland Inventory (NWI) (USDI 1991 to 1995), riparian vegetation, perennial streams, photo points, stream route, water points, and constructed features;

Photo points are repeat photography taken at the same location, year after year (a total of 51 photo points have been established in the project area, GIS points show the approximate locations); and

Documented riparian use monitoring and field trips, including stream channel classification using stream channel type description (Rosgen 1996), condition assessment, and water source inventory.

Watershed Condition Assessment

In 2010, a national effort was launched to assess the condition of all sixth code watersheds (figure 11, appendix A) on National Forest land, which are typically 10,000 to 40,000 acres in size. Twelve indicators were assessed including: water quality, water quantity, aquatic habitat, aquatic biota, riparian vegetation, road and trail network, soil, fire effects and regime, rangeland, terrestrial invasive species, forest cover, and forest health. Each indicator has its own definition of functioning, functioning at risk, and impaired, and was assessed a point value based on its condition. Each 6th code watershed was given an overall rating of functioning, functioning at risk, or impaired based on the indicator scores (table 12). The results of the assessment for the 6th code watersheds in the project area are listed below (USDA 2010).

Table 12: Watershed condition for Sixth Code Watersheds in the Project Area

6th Code Watershed	Condition
Bishop Creek	Impaired
Squaw Creek	Functioning at risk
Tangle Creek	Functioning at risk
Red Creek	Functioning at risk
Middle Red Creek	Functioning at risk
Canyon Creek-Verde River	Functioning (rating is incorrect in USDA 2010)
Wet Bottom Creek	Functioning at risk
Dry Wash-Verde River	Functioning at risk
Sycamore Creek	Functioning
Houston Creek	Functioning at risk
Lower Fossil Creek	Functioning at risk
Gap Creek-Verde River	Functioning at risk

Existing Condition

Red Creek, Skeleton Ridge, and the eastern quarter of Six Bar lie within the Verde River Watershed. The western three-quarters of Six Bar lie within the Agua Fria River Watershed. There are approximately 218 miles of named streams on the U.S.G.S. 1:24,000 topographic quadrangles within the project area. In addition, there are nearly as many miles of unnamed streams (delineated as blue lines) on the U.S.G.S. topographic quadrangles. These unnamed streams are the ephemeral and intermittent tributaries to the named streams and are primarily headwater streams dominated by upland vegetation and ephemeral channels dominated by upland and xeric riparian vegetation. They provide the function relating to water quantity, water quality, flood regime, hydrological connectivity, riparian vegetation, and wildlife habitat (Meyer et al.

2003, Levick et al. 2007) within the watershed. U.S. Army Corp of Engineers (2013) defines ephemeral, intermittent, and perennial streams as follows:

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Historic Conditions

Existing condition of watersheds, stream channels and riparian areas has been affected by many factors, both natural disturbances, including drought, fire, and floods, and human activities, including fire suppression and grazing.

Cattle were introduced to Arizona in the late 1870s following the Civil War and subjugation of the Apaches. During this time period, there was no regulation of grazing. By the early 1890s, one and a half million cattle had been brought to Arizona (Allen 1989). There are many accounts of overgrazing and subsequent drought and flood events that occurred throughout central and southeastern Arizona, which resulted in arroyo cutting and washed out stream channels (Wagoner 1952, Dobyns 1981). In 1905, the Tonto NF was designated to protect watersheds that provide water to the Phoenix area.

Range inspection reports for this project area date back to the 1950s; the following information is taken from those reports and inspections. Cattle were brought into the analysis area in the early 1880s. After about fifty years of being grazed by cattle with a resultant seriously overgrazed condition, a decision was made to use the area as winter range for sheep. The LX Bar portion of the project area was converted from a sheep allotment to a cattle allotment in 1958. Because of continued poor conditions, the Red Hills portion was put in nonuse from 1957 to 1962, resulting in no measurable recovery. Range inspection reports throughout the 1960s and into the 1970s describe the severe overuse occurring up to that time and indicate management practices that were used to try to alleviate the problems. There were few developed waters until the 1960s, causing overuse in riparian areas.

Recent Flood Events

Stream channels are dynamic systems that are constantly being changed by water and sediment flowing through the system. These changes obey the natural forces of gravity, friction, and fluid cohesion (Janicke 2000). A stable or properly functioning stream channel is dependent on its ability to resist forces of erosion and will maintain its dimensions (width/depth ratio, gradient, and sinuosity) over time without excessive erosion or deposition (Barrett 1993, Rosgen 1996, Mason and Johnson 1999, and Janicke 2000). A healthy riparian ecosystem contributes to channel stability by increasing resistance; thereby reducing flood peaks, trapping sediment, and increasing

groundwater recharge (Briggs 1996). Modifications that cause removal of vegetation will lower a channel's resistance to erosion and lead to an increased frequency and magnitude of flood impacts (Trimble and Mendel 1995, Rosgen 1996, and Janicke 2000).

Over half of the stream channels assessed in the analysis area are in impaired or unstable condition (Mason and Johnson 1999) in large part due to lack of riparian vegetation. These streams are less able to resist erosive forces of flood waters, even during smaller events of lower water velocities (Janicke 2000). When large flood events with high water velocities occur, the channels experience severe erosion and/or aggradation causing heavy loss of riparian vegetation. Channels in stable condition, or impaired, but with sufficient riparian vegetation to resist erosive forces of flood waters, experience little erosion or aggradation and retain riparian woody and herbaceous species.

In mid-January 2010, three low-pressure systems passed through Arizona within a week causing intense rainfall and record flooding south and west of the Mogollon Rim (NOAA 2010). In January 2010, the U.S.G.S. gage Verde River below Tangle Creek (09508500) recorded the 11th highest flow of record at 72,300 cubic feet per second (cfs) (USGS 2012). The period of record for this gage has been continuous since 1925, with four historic peak flows recorded back to 1891 (USGS 2012). Effects of this flow on stream channels in the analysis area are discussed below.

Current Condition

Presently, of 218 miles of stream channels, there are approximately 124 miles of perennial and intermittent stream channels that support obligate riparian vegetation. Obligate riparian vegetation needs a steady supply of surface or subsurface water. Based on Forest Service reports and historic conditions, overall extent of riparian vegetation has been reduced (Croxen 1926, Haskett 1935, and Heffernan 2008).

On these allotments, many of the stream channels evaluated in the field remain in unstable or impaired condition (appendix C, table C1). Riparian areas and springs have been relied upon as the primary source of livestock water for many years causing stream channels and adjacent riparian areas to receive concentrated grazing pressure.

Key Reaches

A stream reach is defined as any length of stream between two points. Key reaches, similar to upland key areas (Interagency Technical Team 1996), are stream channels/ springs/ riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key species. Key reaches are synonymous with designated monitoring areas (DMAs) defined by Burton, et al., as the location where monitoring occurs (2011). Table 13 displays key reaches for these allotments by pasture. The 31 riparian areas identified have the potential to improve within a relatively short time period (10 years), or have already reached desired condition, and have been identified as key reaches for this analysis (figure 12, appendix A).

Table 13: Key Reaches within Each Allotment and Pasture

Allotment	Pasture	Stream
Six Bar	Middle Fork	Holmes Canyon
Six Bar	Middle Fork	Willow Spring

Allotment	Pasture	Stream
	Middle Fork	Little Hutch Spring
	Middle Fork	Caveness Hole
	Middle Fork	Middle Fork Squaw Creek
	Middle Fork	Squaw Creek
	Mud Springs	Mud Spring Creek
	Mud Springs	South Fork Mud Spring Creek
	Mud Springs	Hutch Spring
Red Creek	Soda Springs	Red Creek
	Soda Springs	Soda Springs Creek
	Lower Soda	Soda Springs Creek
	Mustang	Soda Springs Creek
	Red Creek	Red Creek
	Red Creek	Middle Red Creek
	Horse Camp	Horse Camp Canyon
	Roundtree	Roundtree Canyon
	Cedar	White Rock Spring
	Tangle Mountain	Tangle Creek
	Tangle Mountain	Frog Spring
	Red Hills	Verde River
	Red Hills	Red Creek
	Red Hills	Wet Bottom Creek
	Red Hills	Dutchman Grave Spring
	Peso	Tangle Creek
Skeleton Ridge	Mud Springs	Houston Creek
	Black Ridge	Houston Creek
	Houston Basin	Squaw Creek
	Houston Basin	Pigeon Spring Creek
	Long Mesa	Trap Canyon
	Long Mesa	Horse Camp Canyon

Existing and desired conditions of these key reaches are discussed below, by allotment and pasture. Key reaches displayed on figure 12, appendix A, are approximated locations for monitoring. The Verde River is the largest stream and crosses multiple allotments. Existing conditions for each stream reach include condition assessment (Mason and Johnson 1999), stream type (Rosgen 1996), and/or monitoring data. In addition, the water sources for each pasture that contains a key reach are described. Availability of alternative, developed water sources within a pasture can lessen the amount of time cattle may spend in riparian areas. Many of the water developments have been inventoried and data is available in appendix C (tables C2 through C4).

Verde River

The Verde River originates at Sullivan Lake and flows through several different land ownerships before reaching the Tonto NF. It flows north to south for approximately 30 miles through the Skeleton Ridge and Red Creek allotments. On Skeleton Ridge it forms the eastern boundary of the Coldwater, Headquarters, Power House, Hot Springs, Pipeline and Black Ridge pastures and flows through the middle of Pete's Cabin Pasture. It flows through the western side of Red Hills Pasture on Red Creek Allotment.

The river on Skeleton Ridge Allotment flows through steep rock cliffs, as well as wider areas that contain cobble bars and soil banks that support riparian vegetation. On Red Creek Allotment, the river flows through rugged terrain, with steep mesas frequently forming the boundaries of the valley bottoms. However, the valley bottom in Red Hills Pasture is wider than it is upstream. Topography of the adjacent uplands becomes gentler; and riverine terraces and floodplains become wider.

Extensive monitoring was done on the Verde River through the analysis area from 1999 to 2002 (Fenner 2003). This timeframe was an extended period of low flows, with no large flood events, contributing to the establishment of riparian vegetation (table 15). Response of the herbaceous and young woody vegetation component during this favorable climatic and flow period has likely increased the ability of the channel to withstand increasingly greater magnitude flood events. Several photo points were established on the Verde River within the project area; report conclusions are discussed below (Fenner 2003).

Low use in riparian areas resulted during winter/spring, if there was sufficient precipitation to produce annual production to draw cattle into the uplands.

Grazing when there was little annual production in the uplands resulted in high use on riparian herbaceous and woody vegetation.

Summer grazing in Black Ridge Pasture resulted in low use of riparian vegetation, because cattle were kept away from the river.

The Verde River has not been grazed on these allotments for over 10 years. From recent river trips, U.S.F.S. River Ranger Don Sullivan (2012) reports that riverside vegetation has increased tremendously, including tree species, herbaceous species, and especially giant reed (*Arundo*). This vegetation has narrowed the channel significantly. Vegetation includes Goodding's willow, Fremont cottonwood, bulrush, horsetail, sedges, rushes, spike rushes, giant reed, and seep willow.

Old terraces support scattered mesquite bosque and a few mature Fremont cottonwood, Goodding's willow, Arizona sycamore, and velvet ash stands. Floodplains support younger stands of these species, often in linear, single-age stands. Salt cedar is present, and burro brush and *Baccharis* species are found on both terraces and the floodplain. There are small patches of Bermuda grass within the active channel above the greenline.

Stream flow in the Verde River has been gauged by the U.S. Geological Survey (U.S.G.S.) at various sites by historic and currently operating gauges. The "Verde River below Tangle Creek, above Horseshoe Dam, Az" (09508500) gage is the closest gage to the analysis area, located about two miles south of the allotment. The period of record for the gage is 1945 to present, and the drainage area is 5,858 square miles (USGS 2012). The annual hydrograph is characterized by a peak in the mean monthly flows in February in response to snowmelt followed by a steady

decline through June with another smaller peak in August in response to monsoon moisture. Mean monthly flows for the period of record are shown in table 14.

Table 14: Monthly mean data for water years 1985 to 2011 at "Verde River below Tangle Creek, above Horseshoe Dam, Az" in cubic feet per second (cfs) (U.S.G.S. 2012).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,320	1,410	1,380	598	175	119	153	259	249	223	345	513

Arizona has been in a period of extended drought since about 1996 (ADWR 2007), with fewer large flood events during the winter. Table 15 shows peak flows for the last 15 years at the "Verde River below Tangle Creek, above Horseshoe Dam, Az" gauge. Peak flows have occurred about equally between the monsoon season and winter rains. The wet period from 1965 to 1995 saw more than twice as many peaks during the winter rains as during the monsoons (U.S.G.S. 2012).

Table 15: Peak flows at "Verde River below Tangle Creek, above Horseshoe Dam, Az" (USGS 2012).

Water Year	Date	Flow (cfs)
1997	Jan. 27, 1997	5,690
1998	Mar. 28, 1998	25,800
1999	Sep. 24, 1999	12,400
2000	Jun. 20, 2000	1,180
2001	Oct. 29, 2000	3,630
2002	Sep. 11, 2002	2,850
2003	Mar. 17, 2003	11,000
2004	Sep. 21, 2004	10,200
2005	Dec. 30, 2004	66,500
2006	Aug. 01, 2006	2,630
2007	Aug. 07, 2007	6,360
2008	Jan. 28, 2008	46,200
2009	Dec. 26, 2008	15,900
2010	Jan. 22, 2010	72,300
2011	Dec. 24, 2010	5,220

Six Bar Allotment

Squaw Creek and its tributary Middle Fork Squaw Creek are the main streams on this allotment. The main fork originates on Six Bar Ridge and flows west to its confluence with the Agua Fria River off forest. The Middle Fork and East Branch of Squaw Creek originate below Hutch Mesa and flow south to their confluences. All are intermittent. The valley bottom of Squaw Creek is wide in its headwaters and narrows downstream. The Cave Creek Complex Fire of 2005 and subsequent flooding impacted all streams on this allotment. Water source inventory data on this allotment is from 2002 to 2009.

Middle Fork Pasture

The narrow west side of the pasture is watered by two springs, a well, and Squaw Creek. The larger east side of the pasture is well watered with 20 stock tanks and 16 springs, many of which support riparian areas.

Holmes Canyon and Willow Spring: Willow Spring and the headwaters of Holmes Canyon are located on the east side of the pasture. Holmes Canyon is an intermittent stream that flows east and then south off the allotment to its confluence with Roundtree Canyon. This area of the pasture was visited in 2002. According to existing data, upland utilization was very high.

Holmes Canyon is a Rosgen “F5” type stream. There was not a sufficient amount of seedling/sapling woody riparian plants to measure for utilization, nor was there a well-defined streambank. Use on deergrass was very high in 2002, leaving average stubble of just over two inches. Holmes Canyon does not contain enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool.

Herbaceous vegetation at Willow Spring had been both heavily grazed and trampled in 2002. One Goodding's willow remained at the spring, but no recruitment was observed. The pipeline and trough were in good condition. Ranger district personnel reported Willow Spring received high use by unauthorized cattle in 2012.

Little Hutch Spring: Little Hutch Spring is located in the very north tip of the pasture. The site was visited in 2003. The drainage contained deergrass as the only obligate species. Use on deergrass was low, but other perennial grasses in the area showed high use.

Caveness Hole: Caveness Hole is a small tributary to Squaw Creek in the south portion of the pasture that supported a high cover of deergrass and a few ash, red willow, and sycamore in early 2002. It appeared that the area had not been grazed in some time. The channel alternates between a Rosgen “B1” and “B3” type in stable condition. Photos from 2012 show a channel that supports thick, tall deergrass. Much of the banks consist of bedrock, though there are areas of soil banks. The channel appears to be in stable condition.

Middle Fork Squaw Creek: this tributary to Squaw Creek originates on the eastern side of the pasture. In 1993, the reach near Hogan Spring supported sycamore and deergrass and low cover of willow and ash. The channel was scoured and braided. Photos from 2003 and 2012 show a more stable channel that supports thick deergrass.

Squaw Creek: photo points on Squaw Creek in 2006 show impacts from the Cave Creek Complex Fire such as burned vegetation, bare ground, and wide cobbly channels. By 2010, the vegetation had recovered. There are large cottonwoods and willows and patchy deergrass lining the channel.

Mud Springs Pasture

This pasture is watered by eight springs, three of which support riparian areas, and one stock tank, which was functioning when last observed.

Mud Spring Creek: Mud Spring Creek originates on the west side of the pasture, east of Hutch Mesa. It is an intermittent stream with reaches of near perennial flow supplied by springs.

The reach of Mud Spring Creek from Mud Spring to the South Fork Mud Spring confluence has been monitored several times. In 2000 and 2005 vegetation use was within guidelines. In 2007, postfire flooding, from the Cave Creek Complex Fire had caused dramatic changes in the channel and loss of vegetation. In 2009, the channel upstream of FR 3170 was a Rosgen “F4” with no greenline or bank features. Woody riparian species included sycamore, salt cedar, seep willow, burro brush, net-leaf hackberry, and velvet mesquite. Where deergrass persisted following the 2005 floods, it was vigorous and ungrazed. Only a few scattered plants remained in other sections of the reach. The channel downstream of FR 3170 was a Rosgen “B” type. The reach supports seedlings and saplings of cottonwood and Goodding’s willow, with velvet ash and red willow. Use on the woody vegetation was low. The floodplain was covered with deergrass.

South Fork Mud Spring Creek: the reach above the confluence was monitored several times. In 2008, the channel was a Rosgen “F4” in unstable condition due to lack of vegetation and excessive sediment in the channel, effects from flooding after the Cave Creek Complex Fire.

In 2002, there was high use on deergrass and the channel had been used to trail cattle. In 2004 and 2005, use on vegetation was light. Postfire floods altered the channel from a Rosgen “B” type to a Rosgen “F,” scouring the channel and removing vegetation. In 2009, the channel and vegetation were still in the very early stages of recovery. There were a few deergrass and tree seedlings that established near the perennial stream channel and a number of plants that established along the greenline.

Hutch Spring: the spring, which is tributary to Hutch Gulch, is located just above FR 269 and supplies water to concrete sheep troughs downstream. It supports numerous large deergrass plants. The spring channel is fenced from road access, but the fence was down in 2009.

Red Creek Allotment

The northern portions of this allotment were visited in 2004 and 2009 to observe cattle use and identify sources of water. Recent cattle sign (manure and tracks) was observed in Lower Soda, Soda Springs, and Mustang pastures; and cattle were in Red Creek Pasture. Constrictive bedrock in Soda Spring Creek between Lower Soda and Soda Springs Pasture limits passage, but not totally. The fence separating Lower Soda and Mustang Pasture was down in Soda Spring Creek in 2004. Cattle were moving between four pastures, Soda Springs, Lower Soda, Mustang, and Red Creek.

In 1998 Red Creek/FR 18 was walked from where FR 18 enters Red Creek to the Verde River, to determine how the road was impacting the creek. FR 18 follows lower Red Creek for approximately four miles. Of the four miles, 1.57 miles are within the active channel. Other parts of the road are on terraces or upper banks and include numerous stream crossings. This was introducing an excessive amount of sediment into the creek and inhibiting growth of riparian vegetation. Also, the entire cattle herd had been trailed through Red Creek twice a year to and from Red Hills Pasture.

The Verde River on this allotment has not been grazed since 1998, though there have been reports of unauthorized cattle. Water source inventory data on this allotment is from 2006 to 2011.

Soda Springs Pasture

Water in this pasture is supplied by springs, most of which occur in drainages. There is also one stock tank that was not functional when inventoried.

Red Creek: originates on the Verde Rim and flows southeast for approximately 14 miles to its confluence with the Verde River. It is intermittent in this pasture. Red Creek Spring provides water to two troughs.

This reach was visited in 2004, 2010, and 2012. Much of Red Creek above FR 1997 is a Rosgen “F” type - wide, cobbly, and dry. However, approaching Red Creek Spring the valley narrows to less than 30 feet and there is a floodplain covered with thick Bermuda grass, a patch of seep willow, and a few sapling sycamores. Deergrass was monitored for use in 2004 and 2010. In 2012, deergrass had been extirpated from the channel, though large deergrass is growing where inaccessible, on the canyon wall. Bare ground is prevalent and the area shows signs of repeated overuse. This spot has high potential to support deergrass and woody species. Above the spring area, the valley narrows further to a slot canyon. Desert baccharis and other herbaceous vegetation are present. This reach of Red Creek does not contain enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool.

Soda Spring Creek: originates on the Verde Rim and flows southeast for approximately 5.3 miles to its confluence with Red Creek. It is intermittent with short reaches of perennial flow supplied by springs. This area was visited several times and has shown no recovery, as cattle concentrate in this area for water and shade. The reach below Soda Spring #2 was degraded in 2010, partly due to large flows that occurred in January 2010 and partly due to repeated overuse. There is no defined channel. Cottonwood seedlings, seep willow, and deergrass are growing in small patches along the water’s edge. Photos from 2012 show no change in channel condition or vegetation. Deergrass had high use and the channel was trampled.

Lower Soda Pasture

Beside three springs in drainages, this pasture is watered by a stock tank and a well, both of which were functioning when inventoried. Water is also piped from some springs in Soda Springs Pasture.

Soda Spring Creek: the natural barrier that restricts cattle movement between this pasture and Soda Springs Pasture to the north is not always effective. The channel becomes dryer in this pasture, though the deergrass continues downstream. Use is spotty and occurs where there is water. In the dryer reaches, the deergrass is large and supports stream banks, with cottonwoods and willows.

Mustang Pasture

This pasture is watered by 18 springs and five stock tanks, of which two were functioning and one was not functioning when inventoried. There is also a stock tank in a trap at the southern end of the pasture, which is functioning. The northern half of the pasture contains only springs.

Soda Spring Creek: this reach of Soda Spring Creek is similar to that in the Lower Soda Pasture, described above.

Red Creek Pasture

Waters in this pasture consist of one spring and two stock tanks, leaving lower Red Creek and Middle Red Creek to provide most of the water. This pasture has had only limited grazing on the east side since 2002.

Red Creek: perennial in the lower part of this pasture. In 1998, the reach that contained the road was a Rosgen “F” type with few channel features and little vegetation, mostly Bermuda grass. Photo points from 2000 to 2011 show an increase in the size and density of riparian vegetation. Photos from 2009 and 2012 show a recovering channel. In places, banks have formed and are armored with vegetation. Long reaches of the banks and floodplain are covered with thick deergrass, sedges, and equisetum. Medium and large trees occur further back on the floodplains. Tire tracks were visible in the channel and there were impacts to banks and vegetation at entry and exit points.

Middle Red Creek: Tonto NF riparian mapping layers identify all of Middle Red Creek and North Red Creek in this pasture as supporting riparian vegetation, either Fremont cottonwood-shrub community or sycamore-Fremont cottonwood. Limited access is likely in the upper reaches of Middle Red Creek. Photo points taken at the mouth of Middle Red Creek show an increase in size and density of riparian vegetation from 2000 to 2011. Species include cottonwood, willow, seep willow, and deergrass. There are no other field data for these reaches.

Horse Camp Pasture

This small pasture is watered by two springs, one in Horse Camp Canyon and one in a tributary, and one stock tank, which was functioning when inventoried. On a visit in 2009, the allotment told us cattle have used this pasture for a short period every other year.

Horse Camp Canyon: originates on the Verde Rim and flows southeast for approximately four miles to its confluence with Trap Canyon. Most of the creek in this pasture is ephemeral. The spring provides perennial flow for a short reach. The stream is used by cattle to water immediately below the road for less than 50 feet. It then becomes inaccessible from the upper end. Deergrass cover in 2009 was between 75 to 100 percent in the channel. Cattails were also present. Trees were mostly seedlings and saplings, indicating a change in management that is allowing trees to establish.

Roundtree Pasture

There are four stock tanks and one spring in this pasture. Of the four stock tanks, two were functioning; one was not functioning; and one could not be located when inventoried. Roundtree Canyon is the primary water source for this pasture.

Roundtree Canyon: originates southeast of Six Bar Ridge and flows northeast approximately seven miles to its confluence with Tangle Creek. It is mostly an intermittent stream that includes a road for approximately 2.5 miles. The road confines the stream in places and contributes sediment at crossings.

Approximately two miles of Roundtree Canyon flow through Roundtree Pasture. The upper mile, which is perennial, flows through a narrow canyon, widening into a braided wash one half mile above its confluence with Tangle Creek.

The reach upstream from a camping area has been monitored several times between 2000 and 2007. In 2001 and 2004 use was very high on willow and ash. In 2000 and 2007 use was within guidelines. Photo points from 1993 and 1997 to 2007 show no apparent change in trend.

A cross section done in 2004 indicated a Rosgen “B3” type stream in impaired condition due to lack of vegetation and a high width/depth ratio. Vegetation consists of willow, cottonwood, ash, and deergrass.

Cedar Pasture

Except for one tank, this pasture is watered by six springs in drainages.

White Rock Spring: located in a mostly ephemeral drainage tributary to Tangle Creek. Just downstream is the confluence of another such unnamed drainage that also contains a spring, which provides flow to support a short riparian reach. The Cave Creek Complex fire of 2005 killed many overstory trees, mostly velvet ash. White Rock Spring was fenced, but falling trees compromised it in 2008. There were a few deergrass and *Juncus* species plants on the unnamed drainage above its confluence with White Rock Spring. In 2012, there were thick patches of deergrass, *Juncus*, and other herbaceous and aquatic species in the channels created by the springs.

Tangle Mountain Pasture

Water in this pasture is provided by eleven stock tanks and two springs. Nine of the stock tanks were functioning when inventoried. Tangle Creek is the boundary between this pasture and the Peso Pasture. Location of the fence on current maps is partially incorrect.

Tangle Creek: begins at the confluence of Brushy Creek and Mud Spring Creek and flows southeast approximately nine miles to its confluence with the Verde River. It is an intermittent stream with some reaches of perennial flow.

Most of the lower half of Tangle Creek in this pasture is difficult to access. The upper half of Tangle Creek supports riparian vegetation and several reaches have been extensively monitored. The creek in this pasture is used as a travel way for moving cattle between pastures. This practice causes damage to the channel, stream banks, floodplains, and vegetation.

The upper-most reach is just below a Tonto NF administrative site. Use on vegetation was within guidelines in 2000. Use was high on deergrass in 2001 and on woody riparian vegetation in 2003. Bank alteration was high in 2000 and 2003.

The next downstream reach is below an enclosure and below the FR 269 crossing. This reach was monitored in 2000 during a cattle drive in the creek. Bank alteration and use on deergrass was high, though use on woody vegetation was low. In 2002 and 2003 vegetation use was within guidelines and bank alteration was high in 2003.

The next reach is downstream from the next FR 269 crossing and had similar results as the previous reach. In 2002 and 2003 vegetation use was within guidelines, while bank alteration was high in both years.

There are several photo points in this pasture. Some are located in exclosures. Most in the main pasture show moderate improvement in size and density of riparian vegetation.

There is a small exclosure (one-quarter mile long) located on Tangle Creek about one-half mile below the administrative site (just above the middle reach). Constructed in the 1980s, cattle were not effectively excluded until the late 1990s, because the stream would regularly wash out wire fences located across the creek. A permanent stream channel cross section was established within the exclosure in 1992 and reread in 1997 and 2002. Channel features have not changed significantly; however, the density and diversity of vegetation has increased and there is typically a fence line contrast between inside the exclosure outside the exclosure.

Frog Spring: lies above FR 269 and flows south to its confluence with Tangle Creek. About one-quarter mile lies above FR 269 and one-quarter mile lies below the road. This small channel lies in a narrow valley bottom less than 20 feet wide. It is a unique and uncommon riparian area on the Tonto NF, verging on being a wetland. There are only a few small riparian trees, including willow. Most of the vegetation is herbaceous and includes a blanket of Bermuda grass, deergrass, and small patches of American bulrush. These species are holding a deep layer of fine sediments, mostly sand and small gravel. Deergrass plants are very large and continue downstream of the spring area.

Red Hills Pasture

Except for one tank in the very northwest of the pasture, which was functioning when inventoried, water is provided by springs and streams. This pasture has not been grazed since 2002.

Verde River: most of the photos from Fenner (2003) show an increase in density, size, and diversity of riparian vegetation, though a couple sites show little change. Some sites also show herbaceous vegetation expanding into the stream, narrowing the channel.

Red Creek: the reach below the confluence with Middle Red Creek to three quarters of a mile from the confluence with the Verde River is a Rosgen "C4" stream type. In 1998 it was in impaired condition due to lack of vegetation and high amount of sediment. Photo points from 1996 to 2011 show an increase in the size and density of riparian vegetation and a narrowing of the stream banks. Photos taken in 2009 and 2012 show a recovering channel. Banks are formed by thick deergrass, sedges, and *Equisetum*. Cottonwoods and willows line the channel or occur further back on the floodplain. As upstream, tire tracks were visible in the channel and there were impacts to vegetation and banks at entry and exit points.

Wet Bottom Creek: a stream channel cross section completed in 2001 upstream of the confluence indicates a Rosgen "F" type stream. Photo points taken in the same reach from 1990 to 2001 show no change, but riparian vegetation was thick and included deergrass, cottonwood, sycamore, willow, cattails, and sedges. Tonto NF riparian mapping indicates Fremont cottonwood-shrub and Fremont cottonwood-conifer community types that extend from the confluence approximately 3.8 miles upstream. Above that, the valley bottom narrows and appears to be inaccessible.

Dutchman Grave Spring: there are actually two springs, Upper and Lower Dutchman Grave Springs, tributary to Sycamore Creek. The upper spring was originally on the Sears Club/Chalk Mountain Allotment; however, the fence has been moved to include both springs on Red Creek Allotment. Three monitoring trips were made to the springs in 1998. There was a good mix of age

classes of willow, cottonwood, and sycamore. The majority of use was noted on deergrass, with some use on willow and cottonwood. Very little of the stream banks are alterable, mainly consisting of cobble, boulder, and bedrock. This site is very remote to monitor and there is no recent field data.

Peso Pasture

Tangle Creek is the primary source of water for this pasture. There is one other spring.

Tangle Creek: use on this reach of Tangle Creek was within guidelines in 2007. Vegetation consisted of deergrass, seep willow, bulrush, willow, ash, and cottonwood. The majority of woody plants were mature and out of reach of livestock; though, there were several cottonwood seedlings. The photo point shows a dramatic increase in herbaceous vegetation from 1993 to 2008.

Skeleton Ridge Allotment

The river pastures on this allotment has not been grazed since 2001, though there have been reports of unauthorized cattle. Water source inventory data on this allotment is from 2007 to 2011.

Mud Springs Pasture

This pasture has not been grazed for two years, though there have been reports of unauthorized use. Except for one stock tank, which could not be located, this pasture is watered by springs in drainages and streams.

Houston Creek: a mostly perennial stream that originates below Tule Mesa and flows southeast to its confluence with the Verde River. The reach in this pasture lies in a narrow valley bottom (30 to 50 feet wide). Tree species consisted of sycamore, ash, cottonwood, and alder. Pole-sized trees were dominant, with seedlings and saplings, but few larger sized trees. The understory included seep willow, Bermuda grass, and traces of deergrass, horsetail, sedges, and rush species. It was monitored in 2002, 2006, and 2008. In all three years, use on woody vegetation was light and the trace of herbaceous vegetation showed light use. However, much of the valley bottom (between 30 to 50 percent) had been impacted by trailing. The terraces were largely bare; with trails on both sides of the stream exposing fine sediments and sediment was being deposited into the channel.

Black Ridge Pasture

In addition to two stock tanks, which were functioning when inventoried, this pasture contains three upland springs and two springs along Houston Creek.

Houston Creek: the reach in this pasture has been used as a travel way to move cattle from Cedar Basin Holding Pasture to Lancaster Pasture. It forms the boundary between Black Ridge Pasture and adjacent pastures of Cedar Basin Holding, Houston Basin, and Lancaster. In 2002, a permanent stream cross section was installed below Pigeon Spring Creek. It was identified as a Rosgen “B6” type stream in unstable condition due to a high width/depth ratio, lack of vegetation and recent downcutting. There was little regeneration of woody species throughout the reach, use

was high on those present, including unpalatable species. Trailing was evident on all fluvial surfaces.

In 2006, use was not scheduled in this pasture, but was monitored to assess use from the adjacent pasture. Evidence of livestock use included consistent use on velvet ash along the trail. Light use occurred on deergrass, and some trampling and trailing occurred overall. Impacts were minimal and no recent cow pies were observed. The dominant greenline vegetation was Bermuda grass, with deergrass, both of which were vigorous. The woody vegetation was a mix of ash, cottonwood, Goodding's willow, seep willow, red willow, tamarisk, and sycamore. Age and size class structure of the trees ranged from seedling to large.

Houston Basin Pasture

This pasture contains three tanks, only one of which was functioning when inventoried, and five springs in drainages.

Squaw Creek: an intermittent stream that originates in the south portion of this pasture, just east of Long Mesa and flows northeast to its confluence with Houston Creek. The reach below the north fork was visited in 2008. No grazing was observed. Velvet ash, cottonwood, Goodding's willow, and sycamore were present. Seedlings and saplings were common, especially ash. There was a diverse herbaceous component and bank features. The upper reaches of Squaw Creek are mostly inaccessible.

Pigeon Spring Creek: an intermittent stream that originates just north of Skeleton Ridge and flows east to its confluence with Houston Creek. It forms the boundary between this pasture and the Lancaster Pasture, from which cattle can access the lower end of Pigeon Spring Creek. The creek was visited in 2002 and 2008. A short reach just below the north fork is used as a water gap. In 2002, the lower end near the confluence was observed during a visit to Houston Creek. It was degraded with large eroding banks. Species diversity was low, but increased upstream. In 2008, the upper end was observed, below the water gap. The valley bottom is very narrow, less than 50 feet wide. Most of channel is bedrock with gravel. It was a stable Rosgen "B" type stream. Vegetation included horsetail, monkey flower, cardinal flower, sedges, rushes, cattail, deergrass, columbine, Arizona grape, seep willow, California buckthorn, and desert baccharis. There were seedlings and saplings of ash, red and Goodding's willow, and cottonwood.

Long Mesa Pasture

Besides the streams, this pasture is watered by one spring and eight stock tanks. Five tanks were not functioning; and the other three needed repairs when inventoried.

Trap Canyon: an intermittent stream originating just below Skeleton Ridge and flowing south to its confluence with Middle Red Creek. Trap Canyon was monitored in 2001 and 2009. Above the confluence of Horse Camp Canyon, Trap Canyon is a Rosgen "F" type stream, where cumulative impacts appear higher, and a Rosgen "B" type stream below. In 2009, ash and red willow were the dominant woody species within the reach, and there were fewer trees and a more open mature canopy downstream of Horse Camp Canyon. There were a large number of deergrass present within the channel and along the banks. Use was moderate to high on the woody species and low on deergrass.

Horse Camp Canyon: parallels upper Trap Canyon and is tributary to it. The reach of Horse Camp Canyon in this pasture is similar to Trap Canyon (described above) and receives similar use.

Wild and Scenic Rivers

The Verde River, from near Beasley Flat to Red Creek confluence, was designated as a National Wild and Scenic River Area by the *Arizona Wilderness Act of 1984* (USDA 2004). The Comprehensive River Management Plan excludes grazing from the riparian habitat along the Verde River. It also states that livestock water would be developed outside the river corridor.

Two additional reaches of the Verde River within the project area have been classified as potentially eligible for inclusion into the National Wild and Scenic Rivers System (USDA 1993). The outstandingly remarkable values (ORVs) are listed in table 16 and there are criteria established to describe these ORVs (see appendix C). Forest Handbook direction is to manage potential wild and scenic rivers to protect their indicated ORVs (FSH 1909.12).

Table 16: National Wild and Scenic Rivers System designated and potentially eligible streams

Stream Name	Location	Classification	ORVs	Designation
Verde River	Beasley Flat to north boundary of Mazatzal Wilderness	Scenic	Scenic, fish and wildlife, historic and cultural	designated
Verde River	North boundary of Mazatzal Wilderness to Red Creek	Wild	Scenic, fish and wildlife, historic and cultural	designated
Verde River #2a	Red Creek to south boundary of Mazatzal Wilderness	Wild	Recreational, riparian, ecological	eligible
Verde River #2b	South boundary of Mazatzal Wilderness to Sheep Bridge	Wild	Recreational, riparian, ecological	eligible

Water Quality

Arizona Department of Environmental Quality (ADEQ) evaluates water quality status of waters within the state in a Nonpoint Source Assessment Report (2012). Four streams within the project area have been monitored by ADEQ (table 17). For descriptions of abbreviations of designated uses, see note (*) below table 17.

Red Creek is *inconclusive* due to insufficient data. Roundtree Canyon is *attaining* some uses but needs additional analysis of dissolved copper and selenium for A&Ww. Sycamore Creek is *attaining* some uses but needs additional analysis of arsenic, dissolved oxygen, selenium, and mercury.

Verde River from Wet Bottom Mesa to Tangle Creek is *attaining* some uses due to the need to collect more seasonally distributed core parameters and additional analysis of selenium and mercury.

Table 17: List of water bodies monitored by ADEQ and their designated uses (ADEQ 2011a)

Stream Name	Designated Uses*	Overall Assessment
Red Creek	A&Ww, AgL, FBC, FC	Inconclusive
Roundtree Canyon	A&Ww, AgL, FBC, FC	Attaining some uses
Sycamore Creek	A&Ww, AgL, FBC, FC	Attaining some uses
Verde River – West Clear Creek to Fossil Creek	A&Ww, AgI, AgL, FBC, FC	Attaining all uses
Verde River – Wet Bottom Mesa to Tangle Creek	A&Ww, AgI, AgL, FBC, FC	Attaining some uses

*Descriptions of abbreviations

A&Ww - aquatic and wildlife-warm water fisheries

A&Wc - aquatic and wildlife-cold water fisheries

FBC - full body contact recreation

FC - fish consumption

DWS – domestic water source

AGI – agricultural irrigation

AGL - agricultural livestock watering

A&We - aquatic and wildlife-ephemeral water fisheries

PBC - partial body contact recreation

Designated uses for non-ephemeral, unlisted tributaries above 5,000 feet are A&Wc, FBC and FC.

Designated uses for non-ephemeral, unlisted tributaries below 5,000 feet are A&Ww, FBC and FC.

Designated uses for ephemeral, unlisted tributaries are A&We and PBC (A.A.C. R18-11-105).

Effects Analysis

Riparian areas have ecological importance beyond their small percentage of land area. This percentage is even smaller in the arid southwestern United States, and inversely, their importance more critical. Although volumes of literature have been written on riparian systems in the southwest, little actual research has been accomplished (Milchunas 2006). The limited research available shows that grazing has greater effects on southwestern riparian understory plant communities than adjacent upland plant communities. Southwestern riparian plant communities are more sensitive to livestock grazing and more likely to experience reductions in plant species diversity, than plant communities that evolved with ungulate grazing (Milchunas 2006). Clary and Kruse (2003) concur that southwestern riparian systems have not had the intensive study that other regional riparian ecosystems have had. In their review of environmental impacts, management practices and management implications for southwestern riparian areas, they state the necessity to rely on proven principles and practices from other similar riparian areas to fill the gaps in management applications in the Southwest.

Direct Effects: riparian areas, with their high species diversity and structural complexity, provide critical terrestrial and aquatic habitat to wildlife species from adjacent upland and riparian area environments. Cattle tend to congregate in many riparian areas. They favor riparian forage and water availability, shade in warm months, and gentle topography. Excessive grazing, trampling and trailing impacts can destabilize and break down stream banks, cause mechanical damage to shrubs and small trees, reduce or eliminate woody seedlings and saplings, expose soils, eliminate or shift native herbaceous species to weedy or exotic species with reduced root systems, and cause widening or incision of stream channels (Trimble and Mendel 1995, Clary and Kruse 2003). These changes may lead to loss of stream stability and function (Rosgen 1996). Stream

channel profile, stream bank stability, streamside vegetation, channel bottom embeddedness, stream sediments, and stream temperature are all aquatic species habitat features that can be directly or indirectly affected by livestock grazing practices. Maintaining native obligate riparian plants is extremely important to many streams because of their resistance to the erosive energy of flowing water (Clary and Kruse 2003). Herbaceous riparian vegetation is especially important to stabilizing stream bank, point bar, and floodplain deposits. Development of these features is critical to the channel restoration process (Clary and Kruse 2003). One of the most important factors influencing riparian conditions is utilization (Mosley et al. 1999, Clary and Kruse 2003).

Indirect effects: stream channels and riparian areas can also be affected indirectly by watershed condition and/or stream channel conditions above and below the stream reach of interest. Soil compaction, decreased infiltration, and loss or alteration of upland vegetation can cause increased runoff and higher peak flows, leading to channel adjustments and decrease in stream function (Gori and Backer 2005).

Cumulative Effects Common to All Alternatives

Existing condition of streams and riparian areas on these allotments is the result of cumulative effects of historic and recent management, natural disturbances, and the interaction between these two agents of change. This discussion includes the 6th code watersheds listed in table 12, the Verde River watershed for effects to the Verde River, and begins with settlement of lands in the 1880s.

Historic overgrazing has had the most extensive effect on watersheds, stream channels and riparian areas. The range was considered overstocked with cattle by 1891 (Allen 1989). There have been many accounts of overgrazing and subsequent drought and flood events that occurred throughout central and southeastern Arizona (Wagoner 1952). Forest Service Range Management files (File Code 2210) document overgrazed condition of uplands as well as springs and riparian areas.

The largest wildfire to impact the project area was the 2005 Cave Creek Complex Fire. It covered the Six Bar Allotment and the southwest portion of Red Creek Allotment. Floods after the fire washed out vegetation and filled the channels with sediment. While riparian vegetation has returned on many of the streams, the stream channels are still full of sediment from floods. The Willow Fire of 2004 burned into the southeast corner of Red Hills Pasture on Red Creek Allotment.

The largest threat to the Verde River is groundwater depletion. Other effects include previous and ongoing mining, sand and gravel extraction, agricultural diversions, livestock grazing, urban development, and recreation (Sullivan and Richardson 1993). Most of these activities have occurred or are occurring in the upper reaches of the river, off the Tonto NF, but have cumulative effects downstream, such as reduced base flow and increased peak flows.

Unauthorized cross country travel can impact streams and riparian areas through removal, destruction, or degradation of herbaceous and woody vegetation, aquatic emergent vegetation, and stream banks. Travel Management is intended to analyze alternate motorized routes in order to provide access and a recreation experience sufficient so vehicle operators no longer feel compelled to travel off established roads or trails. Once routes are established, maps will be

available to the public. Enforcement of the Travel Management decision is imperative to ensure compliance.

Other activities and management actions that have occurred within the watersheds include road development, lack of road maintenance, fire suppression, juniper treatments, and prescribed fire. These activities can cause short and/or long-term sedimentation into stream channels.

Climate change presents additional considerations. According to the Arizona Drought Monitor Report for January 2013 (ADWR 2013), the long-term drought status for the Verde and Salt River watersheds is “moderate drought,” and for the Agua Fria River is “severe drought,” which has had an effect on these allotments. According to NOAA National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein 2006). The Federal Advisory Committee Draft Climate Assessment Report is projecting higher temperatures and lower precipitation for the southwestern United States (Garfin et al. 2013). New modeling efforts for North American monsoons indicate the amount of monsoon moisture will change little; however, the monsoons will be delayed and most of the precipitation will come late in the season (September to October) (Cook and Seager 2013).

Environmental Consequences by Alternative

Environmental Consequences - Alternative 1 (No Action)

Direct Effects: Riparian areas are generally regarded as having high inherent potential for recovery from disturbance (Milchunas 2006). Stream channel and riparian area recovery are considered optimal when direct effects of livestock grazing are eliminated (Clary and Kruse 2003). The amount of time required for riparian recovery after severe degradation can vary from several years to decades (Clary and Kruse 2003). Recovery is dependent on size and existing condition of the watershed, stream channel and riparian area (flow regime, channel gradient, dominant channel substrate, watershed area, type and extent of riparian vegetation), future management, climate, and natural disturbances (Kindschy 1987, 1994). Riparian vegetation on many streams on these allotments has made substantial recovery, though channels need more time to be fully functional. Implementation of this alternative would allow recovery or maintain or improve the existing condition of riparian areas and stream channels.

Indirect Effects: Only a small percentage of the allotments (6.2 percent) are in satisfactory soil condition. The majority of the allotments (46.2 percent) are satisfactory, but inherently unstable, being over 40 percent slope. The remaining soil condition is impaired or unsatisfactory. A no grazing alternative usually provides the most rapid increase of upland vegetative cover, species diversity, and improvement of impaired and unsatisfactory condition soils. These changes reduce surface runoff, dampen peak flows, and decrease the probability of channel adjustments, impacts to riparian vegetation and loss of channel function. Implementation of this alternative should maintain or improve existing condition of upper watersheds.

Cumulative Effects: direct and indirect effects of this alternative, when combined with other past, present, or reasonably foreseeable actions (cumulative effects) as listed above, should result in reaching desired conditions most quickly. As stated in direct effects, potential for recovery and rate of recovery will vary by key reach. Where there is potential for recovery of riparian vegetation, eliminating direct and indirect effects of livestock grazing should allow the most rapid rates of recovery. Where riparian vegetation is meeting desired conditions, this alternative would provide the most protection for maintaining those conditions.

A no grazing alternative eliminates direct and indirect effects of cattle grazing to recovering stream channels, riparian areas, and watersheds within the allotments. This alternative meets the intent of Forest Plan direction to protect, manage, and restore riparian areas.

Environmental Consequences - Alternative 2 (Current Management)

Direct Effects: existing condition of riparian areas, riparian vegetation utilization, residual vegetation heights and availability of off-channel water developments are the elements most likely to affect riparian area and stream channel condition and recovery. Many stream channels are in impaired or unstable condition (Mason and Johnson 1999). In some pastures, most of the water available to livestock is located in springs and riparian areas; though the largest pastures that lack water (Red Hills and Pete's Cabin) are not being grazed in this alternative.

Under current management the following pastures with key reaches are not being grazed: Red Creek Allotment – Red Hills and Red Creek pastures (Verde River, Red Creek, Wet Bottom Creek, Dutchman Grave Spring, and Middle Red Creek); Skeleton Ridge Allotment - Hot Springs, Pete's Cabin, Powerhouse, Pipeline, and Headquarters pastures (Verde River). This management has contributed to improved conditions, especially in lower Red Creek and the Verde River in those pastures.

Riparian utilization guidelines are intended to maintain or increase existing riparian vegetation. Annual operating instructions for grazing recommend mitigating direct effects of livestock grazing in key reaches by using riparian utilization measurements (ITT 1999, Burton et al. 2011). If riparian area utilization guidelines are followed and cattle are moved when use guidelines are met, undesirable, direct effects of grazing would be minimized and riparian area and stream channel condition should be maintained or improved. This mitigation measure should be effective for all key reaches except Red Creek in Soda Springs Pasture and Holmes Canyon in Middle Fork Pasture, which do not have enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool. Utilization guidelines were not intended for riparian areas that have potential to support riparian vegetation but do not, or support very low cover or density of riparian vegetation. Clary and Webster (1989) recommend that grazing riparian areas in early seral condition be deferred until riparian vegetation re-establishes and ecological status improves. Because the riparian vegetation on Red Creek in Soda Springs Pasture and Holmes Canyon in Middle Fork Pasture is low in density or in early seral condition, riparian utilization measurements may not effectively identify thresholds of unacceptable impact that would trigger moving cattle from the riparian area or pasture, or use levels may be reached quickly. These channels have the potential to support riparian tree seedlings and an herbaceous understory based on photo points and comparison areas and should be rested until riparian vegetation has become re-established. At that time they could be managed using riparian utilization measurements.

Indirect Effects of Grazing: Only a small percentage of the allotments (2.7 percent) are in satisfactory soil condition. The majority of the allotments (57.6 percent) are satisfactory, but inherently unstable, condition being over 40 percent slope. Remaining soil condition is impaired or unsatisfactory. Grazing of impaired and unsatisfactory condition uplands may slow rates of upland recovery, indirectly slowing the rate of riparian area and stream channel recovery from scouring effects of increased runoff and higher peak flows. If management prescriptions are followed and cattle are moved when use guidelines are met, undesirable, indirect effects of grazing would be minimized.

Cumulative Effects: direct and indirect effects of this alternative, when combined with other past, present, or reasonably foreseeable actions (cumulative effects discussed above), are likely to result in attainment of desired conditions for riparian areas that are grazed, but at a slower rate than for alternative 1. Key reaches listed above, in pastures not being grazed, would maintain desired conditions or move toward them at the same rate as alternative 1. In this alternative 26 key reaches may be grazed by livestock. BMPs would be implemented to protect water quality. When monsoon rains come later in the season than is typical (Cook and Seager 2013), pastures may run out of water in summer months.

Consistency with Riparian Area Management Direction: This alternative should meet the intent of Forest Plan direction to protect, manage, and restore riparian areas, if described mitigation measures are successful. Mitigation measures have a high probability of success for all key reaches with the exception of Red Creek in Soda Springs Pasture and Holmes Canyon in the Middle Fork Pasture. If they are rested until riparian vegetation has become re-established, they would also have a high probability of success.

Environmental Consequences - Alternative 3 (Proposed Action)

Direct Effects: Existing condition of riparian areas, riparian vegetation utilization, residual vegetation heights, and availability of off-channel water developments are elements most likely to affect riparian area and stream channel condition and recovery. Many stream channels are in impaired or unstable condition (Mason and Johnson 1999). In some pastures, most water available to livestock is located in springs and riparian areas.

Riparian utilization guidelines are intended to maintain or increase existing riparian vegetation as described under direct effects for alternative 2. Mitigation measures should be effective for all key reaches except Red Creek in Soda Springs Pasture and Holmes Canyon in Middle Fork Pasture, which do not have enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool. Because the riparian vegetation on Red Creek in Soda Springs Pasture and Holmes Canyon in Middle Fork Pasture is low in density or in early seral condition, riparian utilization measurements may not effectively identify thresholds of unacceptable impact that would trigger moving cattle from the riparian area or pasture or use levels may be reached quickly. These channels have the potential to support riparian tree seedlings and an herbaceous understory based on photo points and comparison areas and should be rested until riparian vegetation has become re-established. At that time they could then be managed using riparian utilization measurements.

The Comprehensive River Management Plan decision excludes grazing from the riparian habitat along the Verde River (USDA 2004). The Verde River must be fenced before the pastures containing the wild and scenic reaches can be grazed, therefore the Verde River is not considered a key reach in those pastures (all pastures north of Red Creek that contain the Verde River). To utilize Red Hills or Pete's Cabin pastures cattle must cross the river within the Red Hills Pasture. The Red Hills Pasture is proposed for winter/spring use (table 2). The highest flows occur on the Verde River in January through March, which could make crossing the river during this time difficult.

Crossing on Sheep's Bridge would entail trailing cattle on FR 269 to the bridge. Depending on where the cattle enter the road, there are springs along the road which could be impacted, including Frog Spring and Peso Spring. Effects may include trampling and high use on the

vegetation. After crossing the bridge, cattle would then travel on Trail 11 through the Sears Club/Chalk Mountain Allotment. The trail crosses Horse Creek and Sycamore Creek. Horse Creek supports mainly seep willow. Sycamore Creek supports an extensive riparian area of cottonwoods, willows, and seep willow. Again, impacts may include trampling and high use on the vegetation at the crossing, though the banks contain a large amount of cobble which should afford some protection. It is about 1.5 miles from the bridge to the Red Creek Allotment, Red Hills Pasture.

To get to Pete's Cabin Pasture, cattle must travel through approximately nine miles of the Red Hills Pasture on the trail system. There are no water sources on the west side of the Red Hills Pasture east of the river (where the cattle would travel). Water would have to be pumped out of the Verde River to supply water for cattle away from the riparian area. There are two water rights filings (Statements of Claim) for the Verde River in the name of Houston Creek Ranch, LLC, and Red Creek Ranch, LLC.

The alternative to trailing cattle on FR 269 is to trail the cattle on FR 18. FR 18 is in Red Hills Pasture and lies in the lower four miles of Red Creek. Trailing the entire herd through FR18/Red Creek twice a year to and from the Red Hills Pasture has been done in the past. Effects included excessive amounts of sediment in the creek, a wide shallow channel with no bank features, and little recruitment or growth of riparian vegetation. There may also be impacts to water quality. This route would not be possible during high flows.

It is proposed to graze some pastures seasonally. Table 18 displays the pasture and key reach by proposed season of use.

Table 18: Pasture and key reach by proposed season of use

Winter/Spring Use	
Mud Springs Pasture	Mud Spring Creek, South Fork Mud Spring Creek, Hutch Spring
Middle Fork East Unit	Holmes Canyon, Willow Spring
Red Hills Pasture	Verde River, Red Creek, Wet Bottom Creek, Dutchman Grave Spring
Winter Use	
Red Creek East Pasture	Red Creek, Middle Red Creek
Spring/Summer Use	
Peso Pasture	Tangle Creek

Generally, livestock will not browse riparian trees or shrubs once leaves have dropped during the winter and before they break bud in the spring. Elevations for the Verde River winter and winter/spring use pastures range from about 2,500 feet to about 2,100 feet, therefore a period of dormancy could be very brief. Cooler winter temperatures, which encourage cattle to stay out of colder drainages and up on warmer ridges, may allow for longer periods of use before annual use guidelines in riparian areas are met. Cattle browse riparian trees and shrubs if other more palatable forage is not easily available. Herbaceous plants may remain palatable at low elevations and would likely be grazed.

Except for one spring, Tangle Creek is the only source of water in the Peso Pasture. With spring/summer use, it is likely use guidelines would be met quickly in Tangle Creek.

Indirect Effects of Grazing: As described for alternative 2, only a small percentage of suitable soils are in satisfactory condition. Grazing on impaired and unsatisfactory condition uplands may slow rates of upland recovery, indirectly slowing the rate of riparian area and stream channel recovery from scouring effects of increased runoff and higher peak flows. If management prescriptions are followed and cattle are moved when use guidelines are met, undesirable, indirect effects of grazing would be minimized.

Cumulative Effects: Direct and indirect effects of this alternative, when combined with other past, present, or reasonably foreseeable actions (cumulative effects discussed above), are likely to result in attainment of desired conditions for the riparian areas that are grazed, but at a slower rate than for alternative 1. In this alternative 31 key reaches may be grazed by livestock. If FR 18 is used to trail cattle, Red Creek would not attain or maintain desired conditions. BMPs would be implemented to protect water quality. When monsoon rains come later in the season than is typical (Cook and Seager 2013), pastures may run out of water in summer months.

Consistency with Riparian Area Management Direction: This alternative should meet the intent of Forest Plan direction to protect, manage, and restore riparian areas, if described mitigation measures are successful. Mitigation measures have a high probability of success for all key reaches with the exception of Red Creek in Soda Springs Pasture and Holmes Canyon in the Middle Fork Pasture. If they are rested until riparian vegetation has become re-established, they would also have a high probability of success.

Effects of Alternatives on Watershed Condition Assessment Ratings

Under each of the twelve indicators used to assess watershed condition, there are several attributes. Three attributes were considered for these environmental consequences: large woody debris, channel shape and function, and riparian vegetation condition.

The following watersheds have too small an area within the analysis area to affect the watershed rating: Bishop Creek, Sycamore Creek, and Lower Fossil Creek.

Analysis of current riparian vegetation data in the following watersheds would improve the riparian vegetation condition rating by one condition class and move the watershed rating from functioning at risk to functioning: Middle Red Creek, Wet Bottom Creek, and Dry Wash-Verde River (Loomis 2012).

Under alternative 1, or with successful mitigation measures under alternatives 2 or 3, riparian vegetation condition and large woody debris ratings would improve one condition class, but would not improve the overall rating on the following watersheds: Tangle Creek, Red Creek, and Houston Creek (Loomis 2012).

The following watersheds are already rated functioning and should remain so under alternative 1, or with successful mitigation measures under alternatives 2 or 3: Canyon Creek-Verde River and Dry Wash-Verde River (Loomis 2012).

Because of the Cave Creek Complex Fire, it is unlikely that Squaw Creek watershed will improve from functioning at risk to functioning within the timeframe of this project.

Channel shape and function is dependent on establishment of riparian vegetation and would take longer to achieve. The rating for this attribute may not improve within the timeframe of this project.

Fire and Fuels

Desired Condition

Forest Plan Direction:

Management emphasis for wildland fire: wildland fire will be managed consistent with resource objectives. Wildland Fire not meeting management objectives will receive an appropriate suppression response. Fire management objectives for this area include: providing a mosaic of age classes within the total type which will provide for a mix of successional stages, and to allow fire to resume its natural ecological role within ecosystems. Wildland fires or portions of fires will be suppressed when they adversely affect forest resources, i.e., Sonoran Desert ecosystem, or endanger public safety, or have a potential to damage significant capital investments.

National Fire Plan (2001):

Hazardous fuel reduction.

Federal Wildland Fire Management (2001) Policy:

Protection priorities. The protection of human life is the single overriding suppression priority. Suppression: Fires are suppressed at minimum cost, considering firefighter and public safety, and all values to be protected, consistent with resource objectives.

Fire Regime

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention but including the influence of aboriginal burning (Agee 1993; Brown 1995). The five natural fire regimes are classified based on the average number of years between fires (fire frequency or mean fire interval [MFI]) combined with the severity of the fire (the amount of vegetative replacement) and its effects on the dominant overstory vegetation. The five natural fire regimes are as follows:

- I – 0 to 35 year frequency and low severity (most commonly associated with surface fires) to mixed severity (in which less than 75 percent of the dominant overstory vegetation is replaced).
- II – 0 to 35 year frequency and high severity (stand replacement: greater than 75 percent of the overstory vegetation is replaced).
- III – 35 to 100+ year frequency and mixed severity (less than 75 percent of the dominant over story vegetation replaced)
- IV – 35 to 100+ year frequency and high severity (stand replacement) severity (greater than 75 percent of the dominant over story vegetation replaced)
- V – 100 to 200+ year frequency and high severity (stand replacement) severity

Fire Regime Condition Class

Fire regime condition class (FRCC) measures the degree of departure from reference conditions, possibly resulting in changes to key ecosystem components, such as vegetation characteristics

(species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity and pattern; and other associated disturbances, such as insect and disease mortality, grazing and drought. Possible causes of this departure include, but are not limited to: fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, and introduced insects and disease (Schmidt and others 2002).

The three fire regime condition classes are based on no or low (FRCC 1), moderate (FRCC 2) and high (FRCC 3) departure from the central tendency of reference conditions (Hann and Bunnell 2001, Hardy et al. 2001, and Schmidt et al. 2002). The central tendency is a composite estimate of the reference condition vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated natural disturbances.

Characteristic vegetation and fuel conditions are considered to be those that occurred within the natural fire regime, such as those found in FRCC 1 (low departure). Uncharacteristic conditions are considered to be those that did not occur within the natural regime, such as are often found in FRCC 2 and 3 (moderate to high departure). These include, but are not limited to: invasive species (weeds and insects), disease, “high graded” forest composition and structure (i.e., large fire tolerant trees have been removed and small fire-intolerant trees have been left within a frequent surface fire regime), or repeated annual grazing that reduces grassy fuels across relatively large areas to levels that will not carry a surface fire.

Existing Condition

The analysis area is predominately juniper/grassland surrounded by chaparral and semidesert scrub fuel types, which can currently be classified as FRCC 2. The chaparral fuel type is turbinella oak, which has a historic fire return interval of 75 to 100 years and can be classified as FRCC 1. The grass fuel type has a historic fire return interval of 7 to 10 years, and can be classified as FRCC 3. Presence and abundance of annual grasses varies each year and is dependent upon precipitation levels. Abundance of grasses increases the potential for wildland fire to have an effect on the analysis area at any time throughout the year. In 2005 the Cave Creek Complex Fire burned approximately 28,142 acres (98.9 percent) of Six Bar Allotment, and 13,296 acres (16.9 percent) of Red Creek Allotment, thus disrupting the natural fire regime (natural fire return interval) for the analysis area (table 19).

Periodic lightning-caused fires which were once part of the natural ecological processes that helped maintain vegetative communities and habitat diversity have been suppressed to the extent that ecological benefits are not being realized. A lack of natural fire influences over the past century has increased growth of vegetative communities, and the natural role of fire has been virtually eliminated from many vegetative communities within the analysis area. Unnatural accumulation of fuels (both dead and live) has left the area at risk for large scale, intense wildland fires.

Due to the sudden change in fuel loading, fire return intervals and burn severity from the Cave Creek Complex, the district does not plan to use prescribed fire in the analysis area for an undetermined amount of time. However, the ranger district intends to reintroduce prescribed fire into the area when it is deemed appropriate.

In 2007 Tonto NF approved a Wildland Fire Use Program, which includes an amendment to the Forest Plan to allow wildland fire to play its natural ecological role to protect, maintain and enhance resources. The definition of wildland fire for resource benefit is: the application of the appropriate management response to naturally-ignited (lighting) wildland fires to accomplish specific resource management objectives in predefined designated areas outlined in fire management plans. The use of fire will follow specific prescriptions contained in the Fire Management Plan (Tonto NF Fire Management Plan 2010).

Table 19: Analysis Area Wildland Fire History 1975 to 2012 (figure 13, appendix A)*

Year	Number of Fires	Total Acres
1975	1	4
1979	4	1,045
1980	2	2
1988	1	4,500
1994	1	1,850
2004	1	2,560
2005	1	41,438
2011	1	150
2012	1	250

*Years not shown had no fire occurrence

Effects Analysis

Environmental Consequences - Alternative 1 (No Action)

Direct/Indirect Effects

In general, where grazing is not permitted, fuels, including loading of fine fuels, annual and perennial grasses would increase. This would allow natural fire the necessary fuel continuity and loading to have a beneficial effect on the landscape and increasing the chances of restoring a natural fire return interval. A review of the role of fire in desert grasslands reveals that the natural frequency of fire in these systems was probably on the order of every 7 to 10 years. (McPherson 1995). In restoring a natural fire return interval, historically fires in the desert grasslands were sufficient at preventing the establishment of woody plants from encroaching on the grasslands. “The natural frequency and extent of grassland fires in the Southwest are believed to have declined dramatically since Euro-American settlement of the region in the late 1800s” (Bahre 1991 and 1995; Humphrey 1958). Fires occurring on this cycle are believed to be sufficient to prevent the establishment of woody plants by killing seeds on the surface and preventing woody plants from reaching the age where resprouting is possible (McPherson 1995). Although fires eliminate grass cover in the short term, in the long term grasses are rejuvenated by the occurrence of fire and benefit from the elimination of woody plants.

The timing of fires is also important. Fire in the early summer, when the growth of many perennials is just beginning, can negatively impact warm season grasses. These same grasses are tolerant of fire during the dormant season (McPherson 1995).

Cumulative Effects

In the event that grazing is eliminated from the landscape in the analysis area, the amount of fine fuels (grasses) should increase. The effect of this may be that if fire is started in an area where the fine fuel loading is increased, so would the fire behavior and intensity. This would most likely have an effect on not only fire management decisions to be able to effectively suppress undesirable fire in the area, but also on soil, wildlife, and watershed conditions. “Livestock alter forest dynamics by (1) reducing the biomass and density of understory grasses and sedges, which otherwise outcompete conifer seedlings and prevent dense tree recruitment, and (2) reducing the abundance of fine fuels, which formerly carried low-intensity fires through forests” (Belsky, Blumenthal 2002).

Environmental Consequences - Alternative 2 (Current Management)

Direct/Indirect Effects

When abundant fuel is available, fires should burn in a typically nonmosaic pattern and at a high intensity level. Where fuel loads are significantly reduced, it is expected that burn patterns would be very mosaic and fire intensity would be low, limiting the spread of fire to receptive fuel beds. As fire burns throughout the landscape, spread and burn patterns are contingent on factors of wind, slope and available fuel to carry fire.

Naturally ignited wildland fires are random in nature; therefore wildland fires should occur more often on the analysis area during periods of thunderstorm activity. When fire is introduced to the area, burning the vegetation may affect palatability and availability of forage for livestock. Cattle tend to congregate on recent burns because of tender, succulent new growth, and temporary communities of forbs that commonly develop in the early post fire periods. Post-fire foraging could reduce fuel loading to a level that could also reduce fire intensity and spread.

Historically, grazing has had major effects on wildland fire in the Southwest. “Although many factors contribute to fire regimes, perhaps the most important change that has resulted in decreased fire frequency and intensity in the Southwest is the lack of fine fuels to carry the fires” (Humphrey 1958, McPherson 1995).

Cumulative Effects

If current management practices were to remain on the allotments, fire behavior, intensity, and resistance to control would most likely be typical of what we have seen in the past in the analysis area. With cattle foraging on grasses where available, naturally ignited fires would be less likely to burn intensely due to the lessened load of fine fuels in the area. This should increase the probability of being able to manage fire for resource benefit, as well as stimulate growth of annual grasses for future foraging. “Grazing pressures which originally reduced fine fuel loads have decreased significantly during the past 30 years, and fine fuels including cheatgrass (*Bromus spp.*) are again filling the interspaces between the shrubs allowing fires to spread. When ignition occurs in these areas increased fuels result in fires that are very destructive to the existing perennial vegetation and extremely difficult to control” (Davison, 1996).

Environmental Consequences - Alternative 3 (Proposed Action)

Direct/Indirect Effects

The effects of the proposed action under this alternative should be very similar to alternative 2 from a fire standpoint. Increasing the amount of cattle permitted to graze on a larger portion of the landscape may inherently alter the amount of perennial and annual grasses that might readily be available to burn during opportune periods of the fire season, utilizing wildland fire for resource benefit. Any opportunities to reintroduce fire into the landscape to meet objectives set forth in the Tonto NF Fire Management Plan would be assessed and utilized appropriately.

Any wildland fire that takes place in the Sonoran Desert ecosystem would be immediately suppressed, as this ecosystem is nonfire adapted. “In the pre-Colombian southwest, abundant fine fuels were not present in desert environments. Indeed, fire was not an important ecological process in the evolution of desert plants in dry tropical forest and thorn scrub in the Oligocene and Miocene (about 30 to 8 million years ago) or the formation of the Sonoran Desert by the late Miocene” (8 million years ago; Van Devender 1995). Today, high temperatures, low relative humidity, and gusty winds during the dry summer months from late May into July just prior to the monsoon season in the Sonoran Desert, often called the arid foresummer, can create the ideal conditions for the spread of fires (Van Devender 2002).

Cumulative Effects

Similar to the cumulative effects of alternative 2, if the proposed action were to take place in the analysis area the increase in the amount of cattle on the landscape could reduce the intensity and severity of wildfires that would take place within the analysis area.

Wildlife and Fisheries

Desired Conditions

Desired future conditions for wildlife and aquatic species and associated habitats include increased habitat diversity and quality through proper range management, prescribed fire, and wildlife habitat improvement projects. Appropriate use levels of forage utilization within the uplands, and correct timing of grazing permits further recovery of herbaceous and shrub layers, and provides improved habitat conditions for mule deer, white-tail deer, mountain lion, black bear, javelina, coyote, gray fox, bobcat, raccoon, Gambel's quail and dove, rock squirrels, desert cottontail and jackrabbit, a variety of birds, rodents, reptiles, and threatened, endangered, candidate, and sensitive species. Light to conservative use levels of forage within riparian and spring areas, in addition to winter use only, allows further recovery of herbaceous and woody species and promote improved habitat conditions for riparian obligate, aquatic, threatened, endangered, candidate, and sensitive species.

The Forest Plan identifies management prescriptions for wildlife and associated habitat. Prescriptions identify desired future conditions and provide the means to achieve desired conditions. Following are prescriptions specific to wildlife and / or habitat:

- Manage the desert scrub type to emphasize production of javelina, Gambel's quail, and mule deer (USFS, 1985). Desirable plant species include false mesquite, filaree, sugar sumac, ratany, prickly pear cactus, saguaro seeds, spring annuals, *Agave chrysantha*, and

- seeds of palo verde, catclaw, jojoba, and juniper. Increase in such plant species would provide additional forage and hiding / resting cover for wildlife species.
- Manage the pinyon-juniper type to emphasize production of mule deer. Juniper browse and berries are utilized by the species, generally in the fall. Increase in such plant species would provide additional forage and hiding / resting cover for wildlife species.
 - Manage chaparral type to emphasize the production of whitetail deer. Desirable plant species include turbinella oak, skunk bush, mesquite, yellow-leaf silk tassel catclaw acacia, holly-leaf buckthorn, false mesquite, filaree, sugar sumac, buck brush, ratany and juniper. Increase in such plant species would provide additional forage and hiding / resting cover for wildlife species.
 - Maintain a minimum of 30 percent effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas. Where less than 30 percent exists, the management goal would be to obtain a minimum of 30 percent effective ground cover.
 - Coordinate with range to achieve at least 80 percent of the potential riparian overstory crown coverage.
 - Coordinate with range to achieve utilization (rates) in the riparian areas that will not exceed 20 percent of the current year annual growth by volume of woody species. (Limiting use to less than 50 percent of terminal leaders on the top one third of plants that are accessible to livestock. Less than six feet tall is used as a surrogate guideline because use by volume is difficult to measure where use on terminal leaders is quick and repeatable. Use of 50 percent of terminal leaders on the top one third of plants is equivalent to approximately 20 percent of annual growth by volume.)
 - Rehabilitate at least 80 percent of the potential shrub cover in riparian areas through the use of appropriate grazing systems and methods.

The Cave Creek RD, in cooperation with AZGFD, proposes to stock populations of Gila topminnow, desert pupfish and northern Mexican garter snake at White Rock Spring and associated tributary, Thicket Spring (tank), and Mud Spring Tank and Mud Spring Creek within the analysis area. Mud Spring and Thicket Spring have been identified as a reintroduction sites in the Gila topminnow Recovery Plan, and Dutchman Grave Spring has been identified as a site to continue Gila topminnow augmentation, as necessary. Intent is to include introduced species in the Biological Assessment for this analysis to assess effects from livestock operations in the analysis area, in addition to other activities. USFWS may provide a Biological Opinion that includes introductions with current and foreseeable ongoing activities, including livestock activities. Livestock currently have access to White Rock Spring and tributary, Thicket Spring (tank) and Mud Spring Tank and Mud Spring Creek. Dutchman Grave Spring has fencing in place to exclude livestock.

Existing Condition

General Habitat Conditions

Vegetation inventory conducted on a portion of the analysis area within Red Creek Allotment prior to the Cave Creek Complex (CCC) Fire revealed juniper and associated grassland as the dominant vegetation type. Other vegetation types and percent occurrence in the Red Creek Allotment prior to the CCC Fire include: riparian, juniper/associated grassland mixed with desert scrub, desert scrub, and barren/rock/no vegetation. Skeleton Ridge Allotment vegetation is dominated by pinyon-juniper, with pinyon-juniper / semidesert transition and riparian vegetation.

Six Bar Allotment is predominantly juniper and associated grassland with a small riparian component. See the vegetation section earlier in this chapter for a more detailed description of vegetation types.

Wildlife and Aquatics

Game species that occur include desert mule deer, Coue's white-tail deer, mountain lion, black bear, javelina, coyote, gray fox, bobcat, raccoon, Gambel's quail, and dove. Other wildlife species include rock squirrels, desert cottontail and jackrabbit, and a variety of birds, rodents, reptiles, and amphibians. Resident and migratory waterfowl include: green-winged teal, mallard, cinnamon teal, common merganser, wood duck, and northern shoveler to mention a few. The southwestern river otter (*Lontra canadensis sonora*) once occurred in the Verde River, but is no longer known to be present. During 1981 through 1983 a Louisiana subspecies (*Lontra canadensis louisiana*) was introduced. If any native otters occurred during or after the introductions, genetic swapping would be likely (AZGFD 2002). Introduced non-native river otter are common throughout the Verde River and associated reservoirs.

Forest Service sensitive species that may occur on the allotment include: common black hawk, bald eagle, western red bat, pale Townsend's big-eared bat, lowland leopard frog, Arizona toad, desert and Rocky Mountain bighorn sheep to name a few. Rocky Mountain bighorn sheep were seen in May 2012 during an AZGFD Verde River monitoring trip near Table Mountain in the Mazatzal Wilderness, likely the result of transplants in the Clear Creek area on the Coconino National Forest. Table 20 reflects the Forest Service sensitive species known to occur within or near the analysis area.

Federally threatened, endangered and candidate species include yellow-billed cuckoo, southwestern willow fly-catcher, Mexican spotted owl, Yuma clapper rail, headwater chub, roundtail chub, razorback sucker, Colorado River pike minnow (experimental nonessential), and Gila topminnow to name a few (USFS 2011). The Yuma Clapper Rail record upstream on the Verde River upstream of the confluence of Red Creek has been questioned by AZGFD Non-Game Specialist (Berger 2012). Subsequent surveys failed to detect the species in the area, although suitable habitat is present. Table 20 reflects threatened, endangered and candidate species that are known to occur within or near the analysis area.

Suitable occupied habitat for the endangered Gila topminnow occurs at Dutchman Grave Spring in the Mazatzal Wilderness. Various spring sites in the analysis area are considered suitable habitat for the species.

Approximately two and one-quarter miles of Red Creek and two and one-quarter miles of Tangle Creek provides restorable or regenerating (potential) southwestern willow flycatcher (flycatcher) habitat. Potential flycatcher habitat is characterized by existing multilayered riparian vegetation, perennial flows or moist soils, low stream gradient, and available flood plains and suitable substrate for establishment of additional riparian vegetation. Flycatcher critical habitat occurs on the Verde River from the confluence of the East Verde, downstream to the upper end of Horseshoe Reservoir through portions of the Red Creek and Skeleton Ridge allotments. Flycatchers have been documented within suitable habitat at OK Flat and Canoe Mesa (USFS 2007). Potential flycatcher habitat occurs through the majority of other portions of the Verde River, within the critical habitat (figure 6b, appendix A).

Dispersal habitat for the Mexican spotted owl (MSO) exists through the Verde River corridor and other areas that offer steep canyon habitats. No MSO are known to occur within the analysis area. The species has been documented on the Payson RD approximately eight miles from the eastern edge of the analysis area in the Mazatzal Mountains (USFS 2000a). Pine Mountain Wilderness on the western edge of the analysis area has no documented MSO, although suitable habitat exists. Surveys for the species in Pine Mountain Wilderness are not known to have occurred. The Verde River and associated tributaries and canyons provide ample dispersal opportunities between the Mazatzal Mountains, Pine Mountain, and areas to the north adjacent to the Verde River corridor.

Designated razorback sucker critical habitat occurs on the Verde River throughout the analysis area (AZGFD 2002a). AZGFD surveys have documented the presence of the species throughout the Verde River from Childs to Horseshoe Reservoir (AZGFD 2012). An experimental nonessential population of Colorado River pike minnow occurs in the Verde River throughout the analysis area (AGDF 2012). Other native fishes that occur within the analysis area include: longfin dace, roundtail chub, Sonora sucker, desert sucker, and headwater chub (AZGFD 2012). The list of endangered, threatened, sensitive and candidate species is long, largely due to the presence of the Verde River and numerous other stream and spring habitats throughout the analysis area.

The northern Mexican garter snake and narrow-headed garter snake have been proposed for listing with critical habitat. Tonto Forest Supervisor's Office personnel completed a conference call with USFWS and the information was shared with affected ranger districts on the Tonto NF May 1, 2013. There are currently no critical habitat primary constituent elements (PCEs) to evaluate for either garter snake at this time. Neither snake is currently listed, nor is critical habitat officially designated. PCEs will be similar for both snakes according to FWS. The narrow-headed garter snake is currently a Tonto NF sensitive species. FWS asked that the narrow-headed garter snake and designated critical habitat be evaluated throughout the Verde River within the analysis area. The species has been documented in the Verde River north of the analysis area. The northern Mexican garter snake has been a candidate species since 2008 and is expected to be up listed to proposed in the near future. The narrow-headed and northern Mexican garter snake and proposed critical habitat will be included in the biological assessment for consultation with USFWS. Critical habitat for both garter snakes will be proposed for the Verde River from Horseshoe Lake upstream to the forest boundary. The western yellow-billed cuckoo is currently a candidate species and is expected to be considered for listing in the near future and will be evaluated in the biological assessment and treated as proposed for the purposes of consultation. The Colorado River pike minnow (pike minnow) is designated as a nonessential experimental population treated as a proposed species and will be evaluated in the biological evaluation. Additional candidate species will be evaluated in the biological assessment, since they may likely be listed in the near future. Guidance for addressing species was coordinated with the Regional Forest Service office and USFWS Ecological Services offices in Phoenix and Tucson.

The Forest Service Southwestern Regional Office recently updated the Forest Service Sensitive Species list for each forest in the region. The revised updates are currently in draft form and will undergo a final review and response before making the changes official. The tentative deadline for review and comment of the new list is July 1, 2013. Species that will likely be added or removed from the list are noted in table 21. Once additional direction is received, a final sensitive species list will be used for evaluation of this project.

Non-native fishes that occur in the Verde River and its tributaries include fathead minnow, largemouth and smallmouth bass, sunfishes, flathead catfish, channel catfish, common carp, and mosquitofish (AZGFD 2012).

A species map (appendix A, figure 6a) reflects federally listed and Forest Service sensitive species locations identified in the Tonto NF Corporate Data Base, Natural Resource Information System Data Base and Heritage Data Management System (HDMS) shape files administered by AZGFD, and the personal knowledge of the area by the Cave Creek Ranger District biologist, the Tonto NF fisheries biologist, district records, and AZGFD nongame personnel.

Table 20: Endangered, Threatened, Proposed, Candidate Species Known to Occur within the Analysis Area or Habitat Exists for Dispersal or Migration. Sensitive Species Included that are Considered for Listing.

Common Name	Scientific Name	Status	Project Status
Birds			
Cuckoo, yellow-billed	<i>Coccyzus americanus</i>	C	O
Flycatcher, southwestern willow	<i>Empidonax traillii extimus</i>	E	O
Flycatcher, southwestern willow critical habitat	N/A	D	O
Flycatcher, southwestern willow potential habitat	N/A	D	O/PH
Owl, Mexican spotted	<i>Strix occidentalis lucida</i>	T	O/PH
Rail, Yuma clapper	<i>Rallus longirostris yumanensis</i>	E	O
Fish			
Chub, headwater	<i>Gila nigra</i>	C	O
Chub, roundtail	<i>Gila robusta</i>	C	O
Pikeminnow, Colorado (nonessential experimental)	<i>Ptychocheilus lucius</i>	E	O
Sucker, razorback	<i>Xyrauchen texanus</i>	E	O
Sucker, razorback, critical habitat	N/A	D	O
Topminnow, Gila	<i>Poeciliopsis occidentalis occidentalis</i>	E	O
Reptile			
Snake, northern Mexican garter	<i>Thamnophis eques megalops</i>	C	O
Snake, northern Mexican garter critical habitat	N/A	P/D	P/D
Snake, narrow-headed garter	<i>Thamnophis rufipunctatus</i>	*S	O
Snake, narrow-headed garter critical habitat	N/A	P/D	P/D
C = candidate, P = proposed, D = designated, E = endangered, N/A = not applicable, T = threatened O = species known to occur in analysis area, or in general vicinity of the area, PH= (regenerating or restorable) potential habitat identified based upon species occurrence/mobility/dispersal and existing habitat characteristics, P/D = proposed designated critical habitat, *S = sensitive species considered for listing (only applies to narrow-headed garter snake).			

Table 21: Forest Service Sensitive Species Known to Occur within the Analysis Area

Common Name	Scientific Name
Mammals	
Bat, pale Townsend's big-eared	<i>Corynorhinus townsendii pallescens</i>
Bat, western red	<i>Lasiurus blossevillii</i>
Sheep, desert bighorn (- -)	<i>Ovis canadensis mexicana</i>
Sheep, Rocky Mountain bighorn (--)	<i>Ovis canadensis canadensis</i>
Birds	
Blackhawk, common (--)	<i>Buteogallus anthracinus</i>
Cuckoo, yellow-billed*	<i>Coccyzus americanus occidentalis</i>
Eagle, bald (--) (<i>Bald and Golden Eagle Protection Act Applies</i>)	<i>Haliaeetus leucocephalus</i>
Falcon, American peregrine	<i>Falco peregrinus anatum</i>
Hawk, zone-tailed (--)	<i>Buteo albonotatus</i>
Towhee, Abert's (--)	<i>Pipilo aberti</i>
Reptiles	
Monster, reticulate Gila (--)	<i>Heloderma suspectum suspectum</i>
Gartersnake, Narrow-headed	<i>Thamnophis rufipunctatus</i>
Lizard, Bezy's night (++)	<i>Xantusia bezyi</i>
Amphibians	
Frog, lowland leopard	<i>Rana yavapaiensis</i>
Toad, Arizona (--)	<i>Bufo microscaphus</i>
Fish	
Chub, headwater*	<i>Gila nigra</i>
Chub, roundtail*	<i>Gila robusta</i>
Dace, longfin (--)	<i>Agosia chrysogaster</i>
Sucker, desert	<i>Catostomus clarki</i>
Sucker, Sonora	<i>Catostomus insignis</i>
Invertebrates	
Beetle, Parker's cylloepus riffle	<i>Cylloepus parkeri</i>
Plants	
Agave, Tonto Basin	<i>Agave delamateri</i>
Beardroot, Verde (++)	<i>Pedimelum verdiensis</i>
* also a federal candidate species.	
(--) Species expected to be removed from Forest Sensitive Species list, after final review and response. (++) Species expected to be added to Forest Sensitive Species list, after final review and response.	

Table 22 reflects management indicator species habitats that will be evaluated in relation to grazing effects to associated habitats that occur on the allotments. Management indicator species were selected during the Forest Planning process to adequately monitor implementation of project actions on wildlife habitat and species diversity. These indicator species reflect general habitat conditions or significant habitat components which are of value to these and other species with similar habitat needs. Management indicator species for the Tonto NF are listed in appendix G of the Forest Plan.

Table 22: Management Indicator Species Known to Occur on the Allotments

Management Indicator Species	Potential Natural Vegetation Crosswalk w/ Forest Plan Vegetation	Indicator of	Forestwide Habitat Trend	Forestwide Population Trend
Ash-throated flycatcher	PJC, PJG,	Ground cover	Static	Increase
Gray vireo	PJC, PJG	Tree density	Static	Decrease
Townsend's solitaire	PJC, PJG	Juniper berry production	Static	Decrease
Juniper titmouse	PJC, PJG	General woodland conditions	Static	Decrease
Northern flicker	PJC, PJG	Snags	Static	Increase
Spotted towhee	PJC, PJG	Successional stages of pinyon-juniper	Static	Increase
Spotted towhee	IC	Shrub density	Static	Increase
Black-chinned sparrow	IC	Shrub diversity	Static	Increase
Savannah sparrow	CPG, PJG	Grass species diversity	Upward/static	Increase
Horned lark	CPG, PJG	Vegetation aspect	Upward/static	Increase
Black-throated sparrow	DC, SDG	Shrub diversity	Downward/static	Increase
Canyon towhee	DC, SDG	Ground cover	Downward/static	Increase
Bald eagle	CWRF	General riparian	No change	Increase
Bell's vireo	CWRF	Well-developed understory	No change	Increase
Summer tanager	CWRF	Tall, mature trees	No change	Increase
Hooded oriole	CWRF	Medium-sized Trees	No change	Increase
Hairy woodpecker	MBDRF	Snags, cavities	No change	Increase
Arizona gray squirrel	MBDRF	General riparian	No change	Increase
Warbling vireo	MBDRF	Tall overstory	No change	Increase

Management Indicator Species	Potential Natural Vegetation Crosswalk w/ Forest Plan Vegetation	Indicator of	Forestwide Habitat Trend	Forestwide Population Trend
Western wood pewee	MBDRF	Medium overstory	No change	Increase
Common black-hawk	MBDRF	Riparian streamside	No change	Increase
Marcroinvertebrates	Aquatic	Water quality	N/A	N/A
CPG - Colorado plateau grassland, CWRF - cottonwood willow riparian forest, DC - desert communities, IC - interior chaparral, MBDRF - mixed broadleaf deciduous riparian forest, MCA - mixed conifer w/ aspen, MWRF - montane willow riparian forest, PJC - PJ chaparral, PJG - PJ grassland, PPM - ponderosa pine – mild, SDG - semidesert grassland.				

The allotments are extremely diverse and contain numerous vegetation types. Transition zones between various vegetation types provide unique habitat characteristics. For instance it is common to see saguaro cactus on south facing slopes in Bloody Basin and have juniper on the east and north facing slopes of the same ridge complexes. Numerous and varied transition zones provide a unique blend for a variety of wildlife. Vegetation types on the allotments include desert scrub adjacent to the Verde River, juniper/associated grassland mixed with desert scrub, desert grassland, woodland/juniper-associated grassland, grassland, woodland, and riparian.

The CCC Fire greatly reduced juniper and chaparral species in portions of Red Creek Allotment and throughout most of Six Bar Allotment. As a result, herbaceous species have increased and invasive plant species have also increased within the fire area. All but a small portion of Six Bar Allotment burned. The portion of Red Creek Allotment south of Forest Road (FR) 269 and the area west of FR 16 and north of FR 269 to Hutch Mesa burned in the fire. For additional information related to fires with the analysis area refer to the fire and fuels section in this chapter.

The fire had varying degrees of burn intensity, with many areas retaining burned junipers that remain standing and provide habitat for wildlife. With the exception of Squaw Creek and Holmes Canyon in Six Bar Allotment and a small portion of Roundtree Canyon and upper Tangle Creek, most riparian areas were not directly affected by the fire. Indirect effects were seen in most creeks, riparian areas, and washes within the burn or in affected watersheds within the analysis area. Indirect effects were primarily realized through increased siltation and deposition of material.

The importance of prescribed fire is evident, in order to reduce the likelihood of large landscape scale fires such as the CCC fire. The country within the analysis area typically would have wildfires that burn smaller areas, generally driven by terrain and prevailing winds (G. Daniel personal communication). Continued efforts to complete prescribed fires within the natural fire return interval in the analysis area would help improve or maintain watershed health and wildlife habitats once the burned areas have re-established sufficient vegetation.

A key wildlife spring, White Rock, on Red Creek Allotment, north of East Cedar Mountain did burn, although not entirely. The spring exclusion fence, designed to keep livestock out of the spring source, was compromised after trees killed by the fire fell on the fence. The fence was inadequate at White Rock Spring prior to the burn due to the small size and provided no protection to the associated seep and perennial tributary at White Rock Spring.

The fire did not burn the portion of Tangle Creek east of the Tangle Creek Administrative Site or within Red Creek. Both reaches provide restorable or regenerating (potential) flycatcher habitat due to perennial flows or wetted soils, low gradients, riparian over story and potential to develop a multilayered dense understory. Additionally, both systems are tributaries to the Verde River, which provides a migration corridor and suitable habitat for flycatchers (figure 6b, appendix A).

Soil conditions and erosion are key components to consider when assessing aquatic and terrestrial wildlife habitats. Six Bar Allotment is largely steep country with some flat areas interspersed. Since the Six Bar Allotment burned with high fire intensity and as a result of the predominately steep topography in the area, there has been much soil and organic material movement and deposition in the streams and drainages. The upper portion of Holmes Canyon within the Six Bar Allotment did burn, and was negatively impacted by sedimentation from the surrounding uplands. Round Tree Canyon, within Six Bar and Red Creek allotments was partially burned and was impacted by sedimentation from the surrounding burned uplands. Roundtail chub still occupy Roundtree Canyon. Portions of upper Tangle Creek burned in the Cave Creek Complex Fire. Tangle Creek also experienced indirect impacts from increased sedimentation of burned areas within the watershed. Longfin dace continue to occur in Tangle Creek, Red Creek, and Holmes Canyon.

Aquatic and terrestrial species that occurred prior to the fire continue to occur. Dutchman Grave Spring, within Red Creek Allotment, Red Hills Pasture, was negatively affected by the 2004 Willow Fire. The upper portion of Dutchman Grave Spring burned during that fire and upper and lower portions of the spring/stream system were affected by increased sedimentation and deposition of organic material. A wildfire in 2011, within the Dutchman Grave watershed, slowed recovery within approximately twenty-five acres of the surrounding uplands. Dutchman Grave Spring is suitable occupied Gila topminnow habitat (USFS 2011).

The Verde River had few direct effects from the Cave Creek Complex Fire within the analysis area. The Verde River provides suitable occupied habitat and potential habitat for the following federally listed species: southwestern willow flycatcher, razorback sucker, Colorado River pike minnow (experimental nonessential population), and Yuma clapper rail (USFS 2011).

Riparian and Water Resources

The analysis area has a high number of streams, springs, and seeps. Significant streams include: Red Creek, Tangle Creek, Wet Bottom Creek, Round Tree Canyon, Holmes Canyon, Houston Creek, Squaw Creek, and the Verde River. For a complete description of stream channels, riparian areas and watershed conditions within the analysis area refer to the riparian section in this chapter.

Aquatic and riparian systems provide habitats for many endangered, threatened, candidate, and numerous sensitive species (table 19). The analysis area is very important in terms of threatened, endangered, candidate and sensitive species and associated habitats, largely due to the presence of aquatic and riparian habitats. The analysis area has a high occurrence of aquatic and riparian resources, especially when compared to other Tonto NF allotments at similar elevations. Although other habitats are utilized by some species during portions of their life cycle, riparian, stream and spring habitats provide key habitat for wildlife and aquatic species, especially in the arid Southwest.

Drought conditions continue, and have been experienced during the past ten years. As a result, riparian systems and associated streams have increased importance to wildlife to that of predrought conditions. Past and present management of livestock in the analysis area has been problematic, usually within aquatic and riparian habitats. Livestock utilization limits have often been exceeded resulting in habitat degradation within affected stream and riparian systems. Trailing/herding of livestock by the current permittee has occurred through portions of Tangle Creek that are restorable or regenerating (potential) flycatcher habitat.

Effects Analysis

Assumptions and Methodology

The purpose of developing the proposed action is to develop and implement a grazing strategy on the allotments, which is consistent with the Forest Plan, as amended.

Alternatives will be evaluated to address the following management concerns, as they relate to compliance with the Forest Plan:

- Impacts of grazing activities and infrastructure as they relate to threatened, endangered, or sensitive (TES) species and designated critical habitats and regenerating or restorable habitats, management indicator species and general wildlife, and associated habitats.
- Riparian and aquatic conditions of the Verde River and tributaries, springs, seeps, and other stream systems.
- Watershed and soils conditions within the analysis area.

Methods used to gather current wildlife data within and adjacent to the analysis area included federally listed and Forest Service sensitive species locations identified on the Tonto NF Corporate Data Base, Natural Resource Information System Data Base, Heritage Data Management System (HDMS) shape files administered by the AZGFD, personal knowledge of the area by the Cave Creek RD biologist and Tonto NF fish biologist, district records, and AZGFD game and nongame specialist personnel.

Alternative evaluation was based upon scientific literature, knowledge of species and habitat / life cycle requirements. Specialist reports effects analysis for each alternative were reviewed in order to make determinations of effect to species and associated habitats. The riparian / watershed, soils and range alternative effects analysis were of key importance to make scientifically sound effects analysis for wildlife, habitats, and designated critical habitats. USFWS literature was utilized to disclose primary constituent elements for critical habitats and considerations that may affect the constituent elements.

The Southwestern Willow Flycatcher Recovery Plan was used to assist in effects analysis for the endangered southwestern willow flycatcher (flycatcher), designated critical habitat, and regenerating or restorable (potential) habitats for the species.

For assistance in determining the effects of livestock grazing on threatened and endangered species, and to streamline consultation under section 7(a)(2) of the *Endangered Species Act of 1973*, the Southwestern Region developed the Framework for Streamlining Informal Consultation for Livestock Activities (framework) (USFS, 2005). The framework has received concurrence from the U.S. Fish and Wildlife Service and the Southwestern Regional Forest Service Office. The Region has directed each Forest to use the framework for 'not effect' and 'not likely to

adversely affect' determinations. The framework was developed to facilitate improved habitat conditions for threatened, endangered and proposed species in the presence of livestock grazing.

Environmental Effects of Livestock Grazing on Terrestrial and Aquatic Wildlife and/or Habitat

Livestock grazing can affect wildlife species or habitats in several ways. Presence of cattle in the uplands and riparian zones may cause compaction of soils, which may result in increased runoff and reduced rainfall infiltration and reduced vegetation and litter cover (Belsky et al. 1999). Resource recovery following periods of drought, appear to be promoted by the presence of litter that may have trapped seeds and lowered evaporative losses (Milchunas 2006). It is important for managers and livestock permittees to recognize the importance of responding through reduced stocking or de-stocking during drought, whereby organic litter would be left on the soil surface for subsequent recovery of the plant community (Milchunas 2006).

Precipitation patterns are an important consideration for both long and short-term goals. Because rainfall varies on the allotments and may be highly erratic both within and between years, the maintenance of residual biomass to ensure plant vigor and ground cover on all grazed rangelands is critical for wildlife habitat and watershed protection. The Tonto NF Drought Policy should assist resource managers in minimizing impacts to resources from livestock grazing during drought.

Grazing may also affect vegetation communities by impacting plant species that are more palatable to livestock or those species that are less able to withstand grazing. Riparian and wetland communities represent a very small percentage of the land area in the Southwest, but are areas of high plant and animal diversity and productivity (Milchunas 2006). Riparian areas and wetlands provide water and cover to animals that may be more associated with adjacent upland communities, including livestock, as well as many species that are riparian obligate species for all or part of their life cycles. These areas may be more important to animals more associated with uplands in arid and semiarid regions, because they provide refuge from the surrounding harsh environment. Unlike shrub invasion problems in upland communities, riparian zone overstories are often reduced by livestock grazing (Kauffman and Krueger, 1984). This stratum provides cover for nesting for many land vertebrates and affects water temperatures for aquatic organisms. Streamside vegetation exerts a large influence on bank and channel morphology through effects on flow velocities, cutting during flood conditions, and erosional inputs from uplands. There is potential for these productive areas to be impacted by livestock to a relatively greater degree than adjacent less-productive communities, but there is also the potential for more rapid recovery from disturbance because of faster growth rates of the vegetation (Milchunas 2006).

Direct / Indirect Effects

Riparian and upland areas provide important terrestrial and aquatic habitat for wildlife species. Congregation of livestock (herding, stock tank areas, trailing, loading/unloading, maintenance of livestock facilities, and branding) may have direct effects to wildlife or associated habitat when considering grazing alternatives. Effects may include removal of vegetation, dust accumulation, noise, avoidance of areas by wildlife, and soil compaction (Fleischner 1994).

Excessive grazing and trampling impacts destabilize and break down stream banks, which results in negative effects to aquatic wildlife and proper stream function. These effects may be realized

through modification of stream morphology and function, increased siltation, and reduction of woody and herbaceous vegetation. During scouring floods, fish populations are more vulnerable to removal without stable banks and associated vegetation in place (Belsky et al. 1999).

Upland areas and associated habitats may be directly affected by grazing and associated activities through livestock consumption of plants, bedding, congregating at water developments, herding, off-loading livestock, and branding activities. Upland vegetation density and composition may be reduced, when livestock grazing and associated activities are not managed to reduce or minimize such effects (Fleischner 1994).

Livestock grazing can directly affect fisheries and wildlife by altering riparian and upland soils and vegetation composition, density and structure, water quality, quantity, temperature and flow patterns, shape and form of the stream channel, and aquatic and terrestrial faunal assemblage composition (Kauffman and Krueger 1984; Trimble and Mendel 1995; Belsky et al. 1999). One of the most important factors influencing riparian conditions is utilization (Mosley et al. 1999, Clary and Kruse 2003).

Hoof action by livestock can impact soils by compacting soils, especially when soils are wet. Compacted soils in the uplands have lower rates of water infiltration and may result in increased runoff and soil loss resulting in indirect negative effects to riparian, aquatic and terrestrial species (Belsky et al. 1999). As a result, wildlife habitat components may be affected by increased runoff and soil loss, especially if riparian and upland conditions are not properly functioning (Belsky et al. 1995). Utilization of woody and herbaceous vegetation by livestock may result in increased stream temperatures, reduced ground cover, and organic litter, which may indirectly affect aquatic and terrestrial wildlife through increased surface runoff and potentially reducing the establishment of additional vegetative cover in the uplands and riparian areas (Kauffman and Krueger 1984). In addition, habitat available to prey species in the uplands and riparian area may be reduced by livestock grazing, resulting in reduced numbers of prey species and / or increased predation upon those species. Water quality may also be indirectly affected by livestock use in the uplands as a result of decreased infiltration of surface water and livestock fecal accumulation (Belsky et al. 1999).

Cumulative Effects Common to All Grazing Alternatives

Cumulative effects include the direct and indirect effects of the proposed action and alternatives when added to all past, present, and reasonably foreseeable future actions.

Congregation of livestock (herding, stock tank areas, trailing, loading/unloading, maintenance of livestock facilities, branding) may contribute to cumulative effects to wildlife or associated habitat, when considering grazing alternatives. Effects may include removal of vegetation, dust accumulation, noise, avoidance of areas by wildlife, soil compaction, and watershed effects. Impacts may vary depending upon circumstances associated with the cumulative effects.

Motorized/nonmotorized recreation and illegal cross country travel negatively impact wildlife resources and or habitat through removal, destruction or degradation of herbaceous/woody vegetation and aquatic emergent vegetation and associated stream habitats. Traffic patterns may result in a persistent dust cloud, vehicle noise, and physical presence, especially on weekends and holidays, along Forest Road (FR) 24 and FR 269. Traffic impacts to wildlife may be realized by avoidance of the area by some wildlife due to dust and or presence of vehicles and people,

wildlife vehicle collisions, and poaching from vehicles. Secondary roads may have similar impacts to wildlife, although traffic volume and speed would generally be lower, and impacts to wildlife would exist but at reduced levels due to lower traffic volume.

Illegal cross country travel also has negative effects to wildlife and habitat through proliferation of wildcat trails, use of motor vehicles through washes, riparian corridors and uplands. Wildlife habitat becomes fragmented and often damaged for the long term as a result of illegal cross country motorized travel. The Travel Management Environmental Impact Statement, which is in the process of being analyzed, will designate alternate motorized routes in order to provide access and a recreation experience sufficient, so vehicle operators no longer feel compelled to travel off established roads or trails. Once routes are established, maps will be available to the public and modified as needed to reflect any changes. Enforcement of the Travel Management decision is imperative to ensure compliance. Funding and personnel dedicated to enforcement of travel management would be required. The addition of a second law enforcement officer on the Cave Creek Ranger District would assist with the enforcement.

The presence of crayfish and non-native fish species in the Verde River and associated tributaries would continue to negatively impact macro invertebrate and native fish populations through consumption, competition, and alteration of the aquatic environment (water quality, macroinvertebrate diversity / abundance, and aquatic vegetation).

Presence of people and associated noise/ disturbance of habitat in dispersed areas, on nonmotorized trails would have negative effects on wildlife. Impacts to wildlife include total avoidance of areas that regularly receive high recreational use, habitat destruction or modification, and avoidance of critical riparian areas where recreation is common.

Maintenance of roads and trails may also negatively affect wildlife by the mere presence of equipment or people conducting the work and associated noise, which may lead to wildlife avoiding those areas when maintenance is underway. Road maintenance effects to wildlife are minimal, due to the infrequent maintenance cycle of FR 24 and FR 269, roughly two or three weeks per year. Other roads such as FR 58 and FR 602 have recently been maintained, but would not likely be maintained for several years due to maintenance needs elsewhere on the district.

Wildfire and suppression activities may also negatively affect wildlife and associated habitat by direct loss of habitat to fire or suppression activities (brush removal, line construction, black-line construction, aerial application of retardant, drafting from streams) and indirect effects such as fire support aircraft noise, sedimentation in aquatic systems and avoidance of areas with fire suppression activities. The Cave Creek Complex (Complex) Fire affected portions of the analysis area and associated watersheds. The Complex greatly reduced shrub and woody vegetation, particularly in the Six Bar Allotment. Wildlife and wildlife habitat will continue to be affected by the Complex Fire effects for several decades.

Recreational shooting and hunting may negatively impact wildlife as a result of noise created by shooting, habitat alteration, littering, illegal off road travel, poaching, or presence of people. For the most part recreational shooting occurs in the FR 24 and FR 269 corridor. Hunting may have negative impacts on wildlife in that high concentrations of hunters use the allotment due to proximity to Phoenix. Recent Arizona hunting regulation changes added additional deer seasons in the area, which will further contribute to hunter related issues associated with wildlife.

Watershed and vegetation conditions of lands outside of the analysis area, but within the watersheds that flow into the analysis area will continue to influence overland flow of run-off, top soil loss or retention, and to some extent ability of riparian and wetland areas to retain surface water throughout the year.

Consistency with the Forest Plan

Direction for managing wildlife resources and habitats on the Tonto NF is found in the Forest Plan.

The Forest Plan recognizes the need for wildlife/fish habitat improvement. Management direction is to: “recognize wildlife and fish habitat elements in all resource planning and management activities to assure coordination that provides for species diversity and greater wildlife and fish populations through improvement of habitat. Ensure that fish and wildlife habitats are managed to maintain viable populations of native vertebrate species. Improve habitat for selected species.”

The management prescription for Management Area 1F states “Manage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, livestock forage production, and dispersed recreation. Watersheds will be managed so as to improve them to a satisfactory or better condition. Improve and manage the included riparian areas to benefit riparian dependent resources.

Key standards and guidelines from the Forest Plan include:

- Maintain a minimum of 30 percent effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas.
- Coordinate with range to achieve at least 80 percent of the potential riparian overstory crown coverage.
- Rehabilitate at least 80 percent of the potential shrub cover in riparian areas through the use of appropriate grazing systems and methods.

Environmental Consequences by Alternative

Criteria used to evaluate alternatives

The alternatives are contrasted based on the likelihood of riparian vegetation and stream channels in the critical reaches attaining short and long-term desired conditions as described in the existing conditions section. Threatened, endangered, sensitive, proposed, candidate and management indicator species, which require riparian and aquatic environments, will respond to changes in riparian and aquatic habitats. Upland vegetation and soil condition, short and long-term goals, described in the existing conditions would be employed to measure effects to species that require upland and riparian habitats. Watershed effects from upland and riparian areas will have either beneficial or undesirable impacts to aquatic and terrestrial wildlife species and associated habitats. Short-term desired conditions limit annual impacts of livestock grazing. Long-term desired condition is measured through effectiveness monitoring. Although upland livestock use levels, and associated wildlife habitat are important to wildlife, riparian and aquatic habitat condition is of higher value due to limited habitat availability, and high use of riparian and aquatic habitats by endangered, threatened, proposed, candidate, sensitive, wildlife and management indicator species.

For assistance in determining the effects of livestock grazing on threatened and endangered species, and to streamline consultation under section 7(a)(2) of the *Endangered Species Act of 1973*, the Southwestern Region Office developed the Framework for Streamlining Informal Consultation for Livestock Activities (framework) (USFS, 2005). The framework identified in the document received concurrence from USFWS. The framework was developed to facilitate improved habitat conditions for threatened, endangered, proposed and candidate species in the presence of livestock grazing. The Southwestern Region Office and USFWS recommended the framework be used to assist in determinations.

Alternative 1 (No Action) Direct and Indirect Effects

General Wildlife

With discontinuation of grazing wildlife habitat conditions would improve. Riparian areas would continue to recover from past grazing and fire effects. Recruitment of woody and herbaceous riparian species, including deer grass, could increase, because they would no longer be utilized by livestock. It is expected that, over time, structural and age class diversity in riparian areas would improve and result in increased potential for riparian dependent wildlife species to occur on the allotment.

Improvements in the aquatic and riparian habitat would likely be quicker, as compared to the other alternatives due to recovery of soils, watershed conditions and removal of livestock direct impacts. Soil compaction problems and herbaceous plant vigor in key areas would improve without livestock grazing. It is expected that, over time, watershed and soil conditions across the allotment would continue to improve.

Game management unit (GMU) 21 data provided by AZGFD provides general indications of mule deer, whitetail, quail and javelina population trends (Darveau 2013). The AZGFD Game Specialist assisted in interpreting trends. Although GMU 21 contains areas outside of the analysis area, and the area east of the Verde River is within GMU 22 the data still provides relevant trend data for the analysis area. According to the data mule deer have had a general decline within the GMU likely the result of whitetail encroachment/competition, drought and off highway vehicle use. Whitetail deer had a general decline from 2002 through 2006 primarily due to drought. From 2008 through 2011 whitetail populations have trended up. Quail data was more difficult to interpret, since much data was collected outside of GMU 21 at Punkin Center check station. Gamble's quail data from 2006 to 2010 showed a decline from 2006 to 2007 and a stable trend from 2007 to 2010. Javelina populations in GMU 21 have remained relatively stable from 2002 through 2011 with exception of declines from 2005 to 2007 as a result of drought. Generally speaking, javelina do not respond as quickly to drought as other species; there usually is a two-year delay. Drought may take a couple years to affect prickly pear, which is a staple food for javelina. Livestock may directly compete with javelina since, both may utilize prickly pear cactus. Javelina have the most capacity to be affected by livestock due to possible utilization of prickly pear, although it was agreed that climactic factors appear to have a greater impact upon game species considered.

Upland habitat capability for game species could generally increase in herbaceous vigor and density in the openings, and an improvement in riparian habitat could be realized under this alternative. Small game and nongame species could generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity. Improvements in these resource conditions would be expected to occur more quickly than they would under

implementation of any of the other alternatives due to removal of livestock direct and indirect effects.

Management Indicator Species

Habitat conditions for these species are expected to improve with cessation of livestock grazing on the allotment. Elimination of grazing would result in improved soil and vegetation conditions. Improved wildlife habitat would be expected to occur over time. Improvements to terrestrial habitat are as described under the general wildlife discussion above. Elimination of livestock from stream courses should result in overall improvements in water quality and may result in some increases in macroinvertebrate populations, although the presence of crayfish in some of the stream system and Verde River would still negatively affect macroinvertebrate populations. Elimination of bank trampling and trailing from livestock would have an overall benefit to water quality and improve aquatic conditions for aquatic species to that of the other alternatives. Recreational impacts present in many riparian areas and the existing road network would continue to have site-specific detrimental impacts to water quality.

TES Species

The no grazing alternative would be expected to increase habitat potential for threatened and endangered species associated with upland and riparian areas. Unsatisfactory and impaired soil conditions would improve over time which would lead to greater water infiltration, reduced runoff and erosion and a reduction in flooding. In stream trampling, disturbance from eroded banks, sediment trapping by stream banks and stream side, and in stream vegetation would be expected to improve.

Habitat for species identified in table 19 would be expected to improve due to items described above. Riparian, aquatic, and upland conditions would likely improve over time due to elimination of direct and indirect livestock impacts. Critical habitats would improve primarily due to upland soil condition improvements. Increased infiltration would reduce flooding, increase water table available to riparian and stream systems and reduce soil erosion. Riparian and aquatic critical habitats would also improve without grazing, since neither TES habitats nor species would be exposed to direct or indirect effects from livestock. The effect would promote improved riparian habitat, water quality, aquatic habitat, and upland conditions. Although factors other than livestock grazing play a role in the quality of the habitat for species on the allotment (such as flooding regime, recreational use, etc.), it is anticipated that removal of all grazing from these areas would result in greater improvement of riparian areas to that of the other alternatives. All wildlife populations in the area, including threatened and endangered species dependent on riparian habitat would benefit from improved habitat conditions. Potential habitat for threatened or endangered species should improve, which may lead to suitable habitat for species. General habitat conditions for sensitive species would improve with discontinuation of livestock grazing. Habitat for fish and wildlife would improve more quickly than that of alternative 2 or 3 since livestock impacts would no longer occur in the analysis area.

This alternative would result in **No Effect determinations for threatened or endangered species or critical habitats with cessation of grazing. Candidate species** that would be treated as **proposed species during consultation** with USFWS would result in **No Effect determinations.**

Cumulative Effects

Implementation of this alternative would begin to reverse some of the undesirable impacts resulting from historic livestock grazing such as soil, watershed, and vegetative conditions. Watersheds outside of the allotment contribute to the present condition of some creeks and riparian areas on the allotment. Other actions occurring in the project area that may continue to impact wildlife resources or habitats via recreational and commercial river running, motorized and nonmotorized recreation, illegal cross country motorized travel, high traffic areas, equestrian use, road maintenance, wildfire and suppression activities, mining, recreational shooting, hunting, presence of people and associated noise and disturbance, past grazing and yearlong use of FR 24 and 269 in addition to other less frequently traveled roads.

Alternative 2 (Current Management) Direct and Indirect Effects

General Wildlife

Game management unit (GMU) 21 data provided by AZGFD provides general indications of mule deer, whitetail, quail, and javelina population trends (Darveau 2013). The AZGFD Game Specialist assisted in interpreting trends. Analysis of the data under this alternative better reflects game trends in the portion of the analysis area that are grazed (GMU 21) because the portion east of the river (GMU 22) will not be included in the data set, with exception of quail data. The data still provides relevant trend data for the portion of the analysis area to be grazed. According to the data mule deer have had a general decline within GMU 21 likely the result of whitetail encroachment/competition, drought and off highway vehicle use. Whitetail deer had a general decline from 2002 through 2006 primarily due to drought. From 2008 through 2011 whitetail populations have trended up. Quail data was more difficult to interpret since much data was collected outside of GMU 21 at Punkin Center check station. Gamble's quail data from 2006 to 2010 showed a decline from 2006 to 2007 and a stable trend from 2007 to 2010. Javelina populations in GMU 21 have remained relatively stable from 2002 through 2011 with exception of declines from 2005 to 2007 as a result of drought. Generally speaking, javelina do not respond as quickly to drought as other species; there is usually a two year delay. Drought may take a couple years to affect prickly pear cactus, which is a staple food for javelina. Livestock may directly compete with javelina, since both utilize prickly pear cactus. Javelina have more capacity to be affected by livestock due to possible utilization of prickly pear, although it was agreed that climactic factors appear to have a greater impact upon game species considered.

Upland habitat capability for game and other species in grazed areas would remain unchanged under this alternative. Uplands east of the river would improve over time. Riparian and aquatic habitats would also remain unchanged or degrade west of the river and improve over time east of the river. Direct and indirect effects to wildlife and associated habitats in the uplands and riparian areas would remain unchanged in grazed areas. Wildlife species and associated habitats would generally remain unchanged in grazed areas, with exception of drought cycles. The area east of the river would continue to improve over time. Resource conditions under this alternative, east of the river would be expected to improve in the absence of grazing and conditions west of the river would remain unchanged.

Management Indicator Species

Habitat conditions for these species would be expected to improve east of the river and remain unchanged or west of the river. Continued nonuse of pastures east of the river would continue to

improve watershed conditions and result in benefits to riparian and aquatic habitats in addition to removal of direct effects.

No change in stocking rates or authorized utilization would result in essentially no change in wildlife habitat. The pastures east of the river would continue to improve wildlife habitat over time with no grazing. Description of terrestrial habitat under this alternative is described under the general wildlife discussion above. Continued nonuse of pastures east of the river would result in overall improvements in water quality and may result in some increases in macro invertebrate populations, although the presence of crayfish in some of the stream system and Verde River would still negatively affect macro invertebrate populations. Bank trampling from livestock would likely continue to have negative effects to riparian and aquatic habitats in areas west of the river. The pastures east of the river do not have such effects, since they are not be stocked.

TES Species

This alternative would essentially maintain the majority of TES habitats that currently exist. Southwestern willow flycatcher (flycatcher) potential habitat through approximately 4.5 miles of Tangle and Red Creek would continue to be excluded from livestock.

The river and associated riparian habitats east of the river would continue to improve due to continued absence of direct and indirect livestock effects. No grazing in pastures on the east side of the river would lead to improved watershed and soil conditions and resulting riparian, aquatic and water quality improvements as previously described in this report.

Dispersal habitat for Mexican spotted owls (MSO) would remain unchanged from current condition, because canyons, steep cliffs and drainages provide the species dispersal habitat within the analysis area.

Roundtail chub (chub) in Roundtree Canyon is the only TES aquatic species known to occur outside the river corridor with exception of Gila topminnow (topminnow) at Dutchman Grave Spring and headwater chub in Wet Bottom Creek. Neither Dutchman Grave nor Wet Bottom is currently grazed, since they occur east of the river. Chub were stocked in Roundtree Canyon in 2008 by AZGFD and were augmented in 2012. The current range permittee agreed to the stocking, the only stocking of sensitive species in the analysis area. All other threatened and endangered species known to occur within the analysis area, do so in areas that are not currently grazed (Verde River, Wet Bottom Creek, Dutchman Grave Spring) under current management.

Analysis utilizing the framework follows for TES species, for the purposes of consultation with USFWS federal candidate species would be treated as federally proposed. Either a conference opinion, for a likely to adversely affect determination, or a conference report would be issued for a not likely to adversely affect determination, if the species are listed in the future. The conference opinion would be converted to a biological opinion if the species are listed in the future.

It was assumed that fish species not identified in the framework, due to recent status changes and consideration of candidate species to be evaluated as proposed species, would be evaluated using the same aquatic species factors that has been the method employed during past informal consultations utilizing the framework. The framework criteria for aquatic species are as follows:

The following criteria are to be used by a fisheries biologist to determine the effects that the proposed livestock grazing and management activities would have on the previously described fish species.

No Effect (must meet one of the criteria)

1. The species or critical habitat is not present in the action area.
2. Livestock grazing in the action area will be excluded so that there is no species exposure and thus no response. Furthermore, there will be no indirect effects such as:
 - a. Sedimentation (sediment traps occur between the allotment and threatened, endangered, proposed (TEP) species habitat),
 - b. Evidence of active erosion caused by livestock or livestock management activities.

Criteria one would not met for any of the candidate, threatened or endangered aquatic species because the aquatic species shown in table 19 occur in the action area and critical habitat is designated for razorback sucker throughout the Verde River, within the analysis area.

The second criteria would be met in the case of Gila topminnow (topminnow) in Dutchman Grave Spring and headwater chub in Wet Bottom Creek. There would be no authorized grazing under this alternative east of the river, thus no species exposure or indirect effects to topminnow at Dutchman Grave Spring or headwater chub in Wet Bottom Creek.

Thus, Gila topminnow (topminnow) in Dutchman Grave Spring and headwater chub in Wet Bottom Creek meet the criteria for a No Effect determination.

All other candidate, proposed, threatened, and endangered aquatic species, with exception of roundtail chub in Round Tree Canyon, would not have species exposure or direct effects, because livestock would not have access to occupied habitats. The species would be exposed to indirect effects from livestock (sedimentation) in the river and roundtail chub in Roundtree Canyon. Additionally, roundtail chub in Roundtree Canyon would be exposed to direct effects from livestock.

Thus, all other candidate, threatened and endangered aquatic species in the analysis area must be evaluated under the “May Affect, Not Likely to Adversely Affect” criteria.

May Affect, Not Likely to Adversely Affect (must meet all of the criteria)

1. Evidence suggests that there is reason to believe listed aquatic species are reasonably certain to occur in the action area,
2. Direct effects to listed fish will be avoided by yearlong exclusion of livestock from occupied TEP species habitats in the action area,
3. Indirect effects to listed fish occurring within the action area which result from upland livestock grazing are determined to be insignificant or discountable.

Criteria one would be met because all the aquatic species in table 19 occur in the action area.

Criteria two would be met for all aquatic species in table 19 *with exception of roundtail chub in Roundtree Canyon*. Criteria two would also be met due to exclusion of livestock from razorback sucker critical habitat throughout the length of Verde River within the analysis area.

Criteria three would be met for all aquatic species in table 19, because upland livestock utilization is conservative west of the river, and pastures east of the river are not be grazed thus removing potential livestock direct and indirect effects at Wet Bottom Creek, Dutchman Grave Spring, and the Verde River from the area east of the river.

Thus, the May Affect, Not Likely to Adversely Affect determination is met for razorback sucker and critical habitat (Verde River).

Roundtail chub (Verde River) meet the criteria for the Not Likely to Adversely Affect determination.

Colorado pike minnow (experimental nonessential designation, Verde River) would Not Likely be Jeopardized.

The roundtail chub population in Roundtree Canyon are exposed to direct effects from livestock grazing, therefore does not meet the criteria for the may affect, not likely to adversely affect determination. Therefore, the framework indicates that **livestock grazing in Roundtree Canyon results in a Likely to Adversely Affect determination for roundtail chub.**

Roundtail chub are currently a federal candidate species and would be treated as proposed for the purposes of this consultation. A conference opinion would be requested for this species in Roundtree Canyon. If the species is listed in the future the conference opinion would be converted to a biological opinion.

No criteria exist for the northern Mexican garter snake or the narrow-headed garter snake.

Discussions with Forest Service Regional Office personnel and USFWS Phoenix and Tucson personnel led to the decision to utilize criteria for aquatic species for this report. Both garter snakes depend upon fish for feeding, thus healthy native populations of fish would help both snakes survive and expand their range. According to USFWS there would be a 600-foot buffer on each side of designated critical habitat (Verde River). It is expected that exclusion of the Verde River would satisfy the 600-foot buffer for both snakes. Fences and excluded areas along the Verde provide sufficient buffer, exceeding 600 feet on the west side of the river. Livestock do not have access to the east side of the river under current management. Both snakes are expected to have critical habitat designated throughout the Verde River north of Horseshoe Lake. Based upon the criteria for fish both snakes and designated critical habitat would result in **May Affect, Not Likely to Adversely Affect determinations for the northern Mexican and narrow-headed garter snake.** Discussion and rational are provided in the fisheries analysis and application of the framework.

It was assumed that riparian bird species not identified in the framework, due to recent status changes and consideration of candidate species to be evaluated as proposed species, would be evaluated using the same criteria in the framework set for the flycatcher, which has been the method employed during past informal consultations utilizing the framework. The criteria for flycatcher (riparian bird species - Yuma clapper rail, yellow-billed cuckoo) are as follows:

Determinations for the southwestern willow flycatcher, Yuma clapper rail, and yellow-billed cuckoo

No Effect (Must meet one of the criteria)

1. Southwestern willow flycatchers (Yuma clapper rails, yellow-billed cuckoos) are not present within the action area during any time of the year.

Criteria one is not met since flycatchers, Yuma clapper rails (rails) and yellow-billed cuckoos (cuckoos) have been documented in the action area.

May Affect, Not Likely to Adversely Affect (must meet all of the criteria)

1. Grazing activities in the action area, do not measurably or detectably reduce the suitability or regeneration of southwestern willow flycatcher (rail, cuckoo) habitat,
2. Indirect effects occurring within the action area resulting from livestock grazing on the allotment are determined to be insignificant or discountable,
3. Livestock grazing should comport with or be more conservative than the descriptions provided in table 2, appendix G of the 2002 USFWS Southwestern Willow Flycatcher Final Recovery Plan (appendix D, table D1).

Criteria one is met because livestock grazing would not occur on the Verde River which is designated flycatcher critical habitat and provides flycatcher suitable and potential habitat. The river also provides rail and cuckoo habitat and both species have been documented on the river. A portion of Red Creek and Tangle Creek would continue to be excluded from grazing where potential flycatcher habitat has been identified. Additionally, the portion of Red Creek potential flycatcher habitat contains the location the author documented yellow-billed cuckoos.

Criteria two is met because grazing in the uplands would be authorized for conservative use and would not be expected to change watershed and soil conditions in those areas. Grazing east of the Verde River is not authorized thus removing indirect impacts (from area east of the river) to the Verde River which provides habitat for flycatchers, rails and cuckoos.

Criteria three is met because potential flycatcher habitat would not be grazed through portions of Red Creek, Tangle Creek or the river. Suitable and potential flycatcher habitat on the river would not be grazed nor would flycatcher critical habitat throughout the entire section of river within the analysis area.

The May Affect, Not Likely to Adversely Affect determination is met for the flycatcher, flycatcher critical habitat, flycatcher potential or suitable habitat and Yuma clapper rail and yellow-billed cuckoo.

Determinations for the Mexican spotted owl

No Effect

1. Mexican spotted owls are not present within the action area.
2. In the action area, no livestock grazing or livestock management activities will occur within protected and restricted habitats, as defined by the species' recovery plan.

Criteria one is met because no Mexican spotted owls (owls) are known to occur within the analysis area. The nearest known owls occur approximately eight miles east of the eastern edge of the Red Hills Pasture (Red Creek Allotment) in the Mazatzal Wilderness. It is unknown if owls continue to occur in that area since it burned in 2004.

Criteria two is not be met because livestock grazing would occur in some riparian zones (Houston Creek, lower Tangle Creek, upper portions of Red Creek, and Roundtree Canyon) in the analysis area. Riparian areas are considered restricted in the recovery plan.

May Affect, Not Likely to Adversely Affect (must meet all criteria 1 through 3)

1. In the action area, livestock grazing or livestock management activities will occur within PACs, but no human disturbance or construction actions associated with the livestock grazing will occur in PACs during the breeding season,
2. Livestock grazing and livestock management activities within PACs, in the action area, will be managed for levels that provide the woody and herbaceous vegetation necessary for cover for rodent prey species, the residual biomass that will support prescribed natural and ignited fires that would reduce the risk of catastrophic wildfire in the Forest and regeneration of riparian trees,
3. In owl foraging areas, forage utilization will be maintained at conservative levels (see definitions).

Criteria one is met because neither the species nor PACs are known to occur within the analysis area.

Criteria two is met because PACs are not known to occur within the analysis area. Utilization levels are limited to conservative use. No grazing would occur east of the river. As a result, woody and herbaceous vegetation for cover of rodent prey species and residual biomass that support prescribed fire would be expected to improve east of the river. Woody and herbaceous vegetation for cover of rodent prey species and residual biomass that support prescribed fire would be expected to remain unchanged west of the river. Regeneration of riparian trees throughout the river, protected portions of Tangle and Red Creek, and east of the river would occur in the absence of grazing. Riparian areas that are currently grazed are not expected to change from current condition.

Criteria three is met, because utilization by livestock is limited to conservative use.

The May Affect, Not Likely to Adversely Affect determination is met for the Mexican spotted owl.

The bald eagle is currently a sensitive species. It is afforded more protection through the application of the *Bald and Golden Eagle Protection Act* (BGEPA). We are electing to treat the bald eagle as if it were federally listed to meet the intent of the BGEPA.

Determinations for the Bald Eagle

1. **No Effect** (must meet one of the criteria)
2. Bald eagles are not present within the action area.
3. Livestock grazing will not occur, in areas that drain into identified bald eagle nesting habitat (upper Verde and Salt rivers and Tonto Creek in Arizona) or roost sites.
4. Livestock management activities (beyond presence of livestock) in the action area will not occur within 0.25 miles of a bald eagle roost or nest site during any time of occupation by bald eagles.

Criteria one would not be met because bald eagles occur within the action area

Criteria two would not be met because grazing occurs within watersheds that drain into bald eagle nesting habitat (Verde River, lower Tangle Creek) or roost sites.

Criteria three would be met because no livestock management activities in the action area would occur within 0.25 miles of a bald eagle nest or roost site during any time of occupation by the species. The two bald eagle nests in the analysis area occur on the Verde River, which are not grazed under this alternative.

The framework indicates that a No Effect determination is appropriate for the bald eagle.

If the decision were made to implement the following recommendations, affect determinations would remain unchanged. Improvements to watershed conditions, soils, upland and riparian habitats are expected to be achieved at a slower rate than that of alternative 1, but at a faster rate than alternative 3.

The number of cattle that might be authorized on an annual basis would be fewer under alternative 2 than alternative 3. This would result in reduced direct and indirect effects and improved habitats more under alternative 2 than alternative 3.

Continued nonuse of pastures east of the Verde River would result in no direct or indirect livestock effects and reduced effects to the Verde River. This would result in improved habitats east of the river and reduce negative indirect effects to the Verde River more under alternative 2 than alternative 3, but not to the extent of alternative 1.

Range Recommendations:

- Reduced numbers based on slope and pastures available and VWSR Plan direction to reduce livestock numbers.
- Light utilization in areas with unsatisfactory or impaired soils.

Reduced stocking rates would reduce direct and indirect effects through reduced soil compaction, increased infiltration, increased residual herbaceous, increased woody and shrub layers and reduced direct and indirect impacts to riparian and stream systems.

Light utilization would result in additional residual plant material, which would help improve watershed, soil conditions, riparian and stream systems. For a detailed description see direct/indirect effects section of this report.

Determinations of effects would remain unchanged, if the decision were made to implement these range recommendations, although wildlife and habitats would benefit for the reasons described. Light utilization and reduced stocking would minimize direct and indirect effects to roundtail chub in Roundtree Canyon and fish species in the Verde River.

Wildlife/Fish Recommendation:

- Yearlong exclusion of livestock through 2.5 mile portion of Tangle and 2.5 mile portion of Red Creek flycatcher potential habitat.
- Fencing around springs, seeps, and other riparian areas may be necessary to reduce or eliminate undesirable effects to associated riparian vegetation and wildlife habitat, if management alone does not protect or improve those sites.

- The Forest Service through coordination with AZGFD propose to stock new populations of Gila topminnow, desert pupfish, and northern Mexican garter snake into Mud Spring, Mud Spring Creek, Thicket Spring, and White Rock Spring and its tributary and augmentation of Gila topminnow at Dutchman Grave Spring.

Continued nonuse of potential flycatcher habitat through 2.5 miles of Tangle Creek and 2.5 miles of Red Creek would continue to improve aquatic and riparian habitats. Fencing may be utilized if livestock cannot be kept out of potential flycatcher habitat with salting and herding. Fencing would be left in place until habitat moves from potential to suitable habitat, as defined in the Southwestern Willow Flycatcher Recovery Plan.

If necessary, additional fencing of springs, seeps and other riparian areas would be completed. If the decision were made to do so, the sites would no longer be exposed to direct livestock impacts and habitats would begin to improve at a faster rate than unfenced, grazed sites.

Stocking of listed species in portions of the analysis area would aid in recovery of the species. Recovery of listed species is identified in the Forest Plan. Utilization limits would apply to the areas stocked. If livestock impacts were not kept within allowable use levels the area(s) may need to be excluded from livestock.

Cumulative Effects

Current management has begun to reverse some of the undesirable impacts resulting from historic livestock grazing. Upstream activities outside of the allotment contribute to the present condition of some of the creeks and watersheds on the allotment as described in direct/indirect effects section of this report. Other actions occurring in the project area that may continue to impact wildlife resources or habitats via recreational and commercial river running (presence of people, potential habitat alteration), motorized and nonmotorized recreation (presence of people, potential habitat alteration), illegal cross country motorized travel, high traffic areas (presence of vehicles, dust, noise), equestrian use (presence of people, potential habitat alteration), road maintenance (noise, dust, sedimentation), wildfire and suppression activities (presence of people/equipment, noise, dust, suppression activities), mining, recreational shooting (presence of people, potential habitat alteration), hunting, presence of people and associated noise and disturbance, past grazing, and yearlong use of FR 24 and 269 in addition to other less frequently traveled roads.

Alternative 3 (Proposed Action) Direct and Indirect Effects

Evaluation of alternative 3 includes livestock crossing the Verde River near the Red Creek confluence outside of the Wild portion of the river. Crossing of the river would be required in order to graze pastures east of the Verde River. Due to periodic high flows of the river during the winter / early spring, it is expected that river flows would not be low enough for livestock to cross every year. The permittee proposed crossing Sheep's Bridge, outside of the three allotments covered under this analysis when flows are too high for livestock to cross the river.

General Wildlife

It is expected that, over time, structural and age class diversity in riparian areas would remain unchanged or degrade west of the river, due to higher stocking rates. Upland habitats west of the river would also remain unchanged or degrade west of the river. Grazing pastures east of the river would slow the development of riparian areas and recovery of soil and watershed conditions

compared to the current condition (no grazing). Upland habitats would not improve east of the river as fast as alternative 2, because grazing would be authorized where it currently does not occur, thus impacts to soil and watersheds would occur that currently do not.

Aquatic and riparian habitats east of the river would not be expected to improve as fast as alternative 1 or 2, because the area east of the river would be grazed. Soil compaction problems and herbaceous plant vigor in key areas would not be expected to improve as quickly due to grazing the east side of the river. Watershed and soil conditions across the allotment would not be expected to improve as quickly with grazing the east side of the river and direct and indirect effects described in direct and indirect effects section of this report.

Game management unit (GMU) 21 data provided by AZGFD provides general indications of mule deer, whitetail, quail, and javelina population trends (Darveau 2013). The AZGFD Game Specialist assisted in interpreting trends. The data does not include findings for wildlife east of the river with exception of quail. The data still provides relevant trend data for the analysis area, considering it was the most applicable and current data AZGFD could provide. According to the data, mule deer had a general decline within GMU 21, likely the result of whitetail encroachment/competition, drought, and off highway vehicle use. Whitetail deer had a general decline from 2002 through 2006 primarily due to drought. From 2008 through 2011 whitetail populations have trended up. Quail data was more difficult to interpret since much data was collected outside of GMU 21 at Punkin Center check station. Gamble's quail data from 2006 to 2010 showed a decline from 2006 to 2007 and a stable trend from 2007 to 2010. Javelina populations in GMU 21 remained relatively stable from 2002 through 2011 with exception of declines from 2005 to 2007 as a result of drought. Generally speaking, javelina do not respond as quickly to drought as other species; there is usually a two-year delay. Drought may take a couple years to affect prickly pear cactus, which is a staple food for javelina. Livestock may directly compete with javelina, since both may utilize prickly pear cactus, although it was agreed that climactic factors appear to have a greater impact upon game species considered.

Upland habitat capability for game and other species would improve slower east of the river, compared to alternatives 1 and 2. Uplands west of the river may improve, but at a slower rate than alternative 1 or alternative 2. Wildlife species would not be expected to increase over time east of the river compared to alternatives 1 and 2, because of a decrease in herbaceous cover, grass species diversity, riparian/aquatic habitat quality east of the river as compared to alternatives 1 and 2. Wildlife species, herbaceous cover, riparian/aquatic habitat conditions would likely degrade as compared to alternatives 1 and 2 due to higher stocking rates and grazing both sides of the river. This alternative offers the least potential for improvement in upland, riparian/aquatic conditions for the reasons identified in this discussion.

Management Indicator Species

Habitat conditions for these species are not expected to improve east of the river because the area is not currently grazed and grazing would result in undesirable direct and indirect impacts to species and habitats. Species and associated habitats would not be expected to improve west of the river due to higher stocking rates. Grazing areas east of the river would not lead to improved watershed conditions due to soil compaction and utilization of herbaceous and woody species as compared to alternatives 1 and 2. Rationale for impacts to watershed conditions is described in direct and indirect effects in this report. Based on this discussion, it is expected that this

alternative would not improve wildlife or fish habitat, and would provide the least potential for wildlife or fish habitat improvements when compared to alternatives 1 and 2.

Grazing east of the river would result in greater impacts to water quality and macro invertebrate populations than alternatives 1 and 2. The presence of crayfish in some of the stream systems and Verde River would continue to negatively affect macro invertebrate populations. Bank trampling from livestock would continue to have undesirable effects to riparian and aquatic habitats, and such effects would be realized more quickly with higher stocking rates. Grazing east of the river would have additional undesirable effects on water quality and aquatic conditions and would not provide the opportunity for improvement that alternatives 1 and 2 offer, for the reasons outlined in this discussion.

TES Species

This alternative would provide the least potential for TES habitats to be maintained or improve when compared to alternative 1 (provides opportunity for most improvement) or alternative 2. Southwestern willow flycatcher (flycatcher) potential habitat through approximately 4.5 miles of Tangle and Red Creek would be excluded from livestock. Fencing may be required, if herding and/or salting do not keep livestock out of flycatcher potential habitat. Higher stocking rates under this alternative would likely reduce the opportunity for the potential habitat to develop over time due to soil compaction and watershed effects from the surrounding uplands. Those effects are described in the direct and indirect effects section of this report.

The river and associated riparian habitat would be exposed to additional soils and watershed effects; because grazing would be authorized east of the river and stocking rates would be higher under this alternative. The river corridor would have less potential for improvement as compared to alternative 1 or 2 because the pastures east of the river would be grazed and higher stocking rate would be authorized.

Dispersal habitat for Mexican spotted owls would be impacted to a greater degree than alternative 1 or 2, because the pastures east of the river would be grazed. Canyons, steep cliffs, and drainages provide the species dispersal habitat within the analysis area.

Roundtail chub in Roundtree Canyon, topminnow at Dutchman Grave Spring and headwater chub in Wet Bottom Creek occur outside of the Verde River and would be exposed to direct and indirect effects under this alternative. Chub were stocked in Roundtree Canyon in 2008 by AZGFD and were augmented in 2012. The current range permittee agreed to the stocking, the only stocking of sensitive species in the analysis area. All other threatened and endangered species known to occur within the analysis area, do so in areas that are not grazed (Verde River and Red Creek) under this alternative.

Analysis utilizing the framework follows for threatened, endangered, and candidate species. For the purposes of consultation with USFWS federal candidate species will be treated as federally proposed. Either a conference opinion, for a likely to adversely affect determination, or a conference report would be issued for a not likely to adversely affect determination, if the species are listed in the future. The conference opinion would be converted to a biological opinion if the species are listed in the future.

It was assumed that fish species not identified in the framework, due to recent status changes and consideration of candidate species to be evaluated as proposed species, would be evaluated using the same aquatic species factors. The criteria for aquatic species are as follows:

The following criteria are to be used by a fisheries biologist to determine the effects that the proposed livestock grazing and management activities would have on the previously described fish species.

No Effect (must meet one of the criteria)

1. The species or critical habitat is not present in the action area.
2. Livestock grazing in the action area will be excluded so that there is no species exposure and thus no response. Furthermore, there will be no indirect effects such as:
 - a. Sedimentation (sediment traps occur between the allotment and TEP species habitat),
 - b. Evidence of active erosion caused by livestock or livestock management activities.

The no effect determination would not be met for any of the proposed, candidate, threatened, or endangered aquatic species because the aquatic species shown in table 19 occur in the action area. Critical habitat is designated for razorback sucker in the Verde. Critical habitat is expected to be designated in the near future for the northern Mexican and narrow-headed garter snakes from Horseshoe Lake upstream to the forest boundary.

The second criteria would not be met because livestock grazing would be authorized east of the river and headwater chub in Wet Bottom Creek and roundtail chub in Roundtree Canyon, razorback sucker and critical habitat, Colorado pike minnow and habitat would be exposed to grazing direct effects. Gila topminnow (topminnow) in Dutchman Grave Spring, which is fenced to exclude livestock would be exposed to indirect effects because grazing would be authorized east and west of the river and stocking rates would be higher, thus increasing the likelihood of higher rates of sedimentation when compared to alternatives 1 and 2.

Thus, all candidate, threatened and endangered aquatic species in the analysis area must be evaluated under the “May Affect, Not Likely to Adversely Affect” criteria.

May Affect, Not Likely to Adversely Affect (must meet all of the criteria)

1. Evidence suggests that there is reason to believe listed aquatic species are reasonably certain to occur in the action area,
2. Direct effects to listed fish will be avoided by yearlong exclusion of livestock from occupied TEP species habitats in the action area,
3. Indirect effects to listed fish occurring within the action area which result from upland livestock grazing are determined to be insignificant or discountable.

Criteria one would be met because all the aquatic species in table 19 occur in the action area.

Criteria two would not be met for razorback sucker and critical habitat, Colorado pike minnow, headwater chub in Wet Bottom Creek or roundtail chub in the river or Roundtree Canyon because livestock would have access to those habitats resulting in direct impacts.

Criteria two would be met for topminnow at Dutchman Grave Spring because livestock would not have access to the site, thus no direct effects.

Criteria three would be met for topminnow at Dutchman Grave Spring.

Thus, the May Affect, Not Likely to Adversely Affect determination is met for topminnow at Dutchman Grave Spring.

Razorback sucker and critical habitat, Colorado pike minnow and roundtail chub in the Verde River do not meet criteria three, because grazing would occur on both sides of the river. Grazing both sides of the river would result in an increased area (east and west) being grazed that drains into the river. Cattle would cross through the river (at least two times) to and from pastures on the east side of the river each winter and spring. A higher stocking rate would result in additional soil compaction and other watershed effects due to the additional grazed area, thus impacting the river. Rational is explained for upland effects to streams and riparian areas in the direct/indirect effects section of this report. Headwater chub in Wet Bottom Creek would be exposed to direct and indirect effects from grazing the east side of the river.

Thus, the framework indicate that grazing both sides of the river, and river crossings by livestock would result in a **Likely to Adversely Affect determination for razorback sucker and critical habitat, headwater chub, and roundtail chub.**

Colorado pike minnow (experimental nonessential designation, Verde River) would Not Likely be Jeopardized.

Roundtail and headwater chub are currently a federal candidate species and would be treated as proposed for the purposes of this consultation. A conference opinion would be requested for both species. If the species are listed in the future the conference opinion would be converted to a biological opinion.

No criteria exist for the northern Mexican garter snake or the narrow-headed garter snake at this time.

Both garter snakes depend upon fish for feeding, thus healthy native populations of fish would help both snakes survive and expand their range. According to FWS there would be a 600-foot buffer on each side of designated critical habitat (Verde River). This proposal includes crossing the Verde River in the vicinity of Red Creek, when river flows permit. It would be expected that crossing the Verde River with up to 1,794 livestock would not satisfy the 600-foot buffer for both snakes. Fences (yet to be constructed) and excluded areas along the Verde would provide sufficient buffer on the west side of the river. Fencing would be required on the east side of the river to exclude livestock from the wild portion of the river. Both snakes are expected to have critical habitat designated throughout the Verde River north of Horseshoe Lake. Based upon the criteria for fish, both snakes and designated critical habitat would result in **Likely to Adversely Affect determinations for the northern Mexican and narrow-headed garter snake and critical habitats.** Discussion and rational are provided in the fisheries analysis and application of the framework for this alternative.

It was assumed that riparian bird species not identified in the framework, due to recent status changes and consideration of candidate species to be evaluated as proposed species, would be evaluated using the same criteria in the framework set for the flycatcher, which has been the method employed during past informal consultations utilizing the framework. The criteria for flycatcher (riparian bird species - Yuma clapper rail and yellow-billed cuckoo) are as follows:

Determinations for the southwestern willow flycatcher, Yuma clapper rail, and yellow-billed cuckoo No Effect (must meet one of the criteria).

1. Southwestern willow flycatchers (Yuma clapper rails and western yellow-billed cuckoos) are not present within the action area during anytime of the year.

Criteria would not be met because flycatchers, Yuma clapper rail (rails) and yellow-billed cuckoos (cuckoos) have been documented in the action area.

May Affect, Not Likely to Adversely Affect (must meet all of the criteria)

2. Grazing activities in the action area, do not measurably or detectably reduce the suitability or regeneration of southwestern willow flycatcher (rail, cuckoo) habitat,
3. Indirect effects occurring within the action area resulting from livestock grazing on the allotment are determined to be insignificant or discountable,
4. Livestock grazing should comport with or be more conservative than the descriptions provided in the 2002 USFWS Southwestern Willow Flycatcher Final Recovery Plan (appendix D, table d1).

Criteria one would not be met, because livestock would be permitted to cross the river, through flycatcher critical habitat. Crossing the river with up to 1,694 livestock at least two times a year, when river flows permit, would have negative direct and indirect effects to flycatcher critical habitat constituent elements. See direct and indirect effects section of this report for detailed discussion of effects. Crossing the river via Sheep Bridge would occur when river flows are too high for livestock to cross the river channel. There are no fences or other means to keep livestock out of the river or associated riparian areas, and the proposal becomes more challenging with up to 1,694 head of livestock. Livestock would have direct and indirect effects when crossing the river or crossing Sheep's Bridge, then driving livestock upstream to the allotment. Criteria one would not be met for flycatchers or cuckoos, because 1,694 livestock would have negative direct and indirect effects on both species habitat at river crossings or when using Sheep Bridge and driving upstream 0.5 air miles to the southernmost portion of the allotment.

Criteria one would be met for the rail, because the crossings would be south of rail habitat where the species was documented, so long as the designated livestock crossing was not within rail habitat.

Criteria two would not be met, because grazing would be authorized in the uplands on both sides of the river. Grazing the east side of the river would increase the effects to the river because additional area would be subjected to soil compaction, erosion and reduced ground cover. Higher stocking rates under this alternative would also increase direct and indirect effects through increased soil compaction and decreased residual herbaceous cover. Higher stocking rates would also increase direct and indirect effects to woody and shrub layers and riparian/stream systems.

Rationale is further described in direct and indirect effects in this report.

Criteria three would not be met, because potential flycatcher habitat and critical habitat would be exposed to up to 1,694 livestock crossing the river, or crossing Sheep Bridge and moving 0.5 air miles upstream to the southernmost portion of the allotment. Suitable flycatcher habitat on the river could also be impacted by either crossing scenario. Red Creek and Tangle Creek potential flycatcher habitat would be excluded from livestock direct effects year long.

Thus, the framework indicate that grazing both sides of the river, and river crossings by livestock would result in a **Likely to Adversely Affect determination for southwestern willow flycatcher and critical habitat, Yuma clapper rail, and yellow-billed cuckoo.**

Determinations for the Mexican spotted owl.

No Effect

1. Mexican spotted owls are not present within the action area.
2. In the action area, no livestock grazing or livestock management activities will occur within protected and restricted habitats, as defined by the species' recovery plan.

Criteria one would be met because no Mexican spotted owls (owls) are known to occur within the analysis area. The nearest known owls occur approximately eight miles east of the eastern edge of the Red Hills Pasture (Red Creek Allotment) in the Mazatzal Wilderness. It is unknown if owls continue to occur in that area since it burned in 2004.

Criteria two would not be met, because livestock grazing would occur in some riparian zones (Houston Creek, lower Tangle Creek, upper portions of Red Creek, Roundtree Canyon, and Wet Bottom Creek) in the analysis area. Riparian areas are considered restricted in the recovery plan.

May Affect, Not Likely to Adversely Affect (must meet all criteria 1 through 3)

1. In the action area, livestock grazing or livestock management activities will occur within PACs, but no human disturbance or construction actions associated with the livestock grazing will occur in PACs during the breeding season,
2. Livestock grazing and livestock management activities within PACs, in the action area, will be managed for levels that provide the woody and herbaceous vegetation necessary for cover for rodent prey species, the residual biomass that will support prescribed natural and ignited fires that would reduce the risk of catastrophic wildfire in the Forest, and regeneration of riparian trees,
3. In owl foraging areas, forage utilization will be maintained at conservative levels (see definitions).

Criteria one would be met, because neither the species nor PACs are known to occur within the analysis area.

Criteria two would be met, because PACs are not known to occur within the analysis area. Utilization levels would be limited to conservative use. Grazing would occur east of the river at conservative intensity. As a result, woody and herbaceous vegetation for cover of rodent prey species and residual biomass that would support prescribed fire are expected to be maintained. Regeneration of riparian trees throughout the river, protected portions of Tangle and Red Creek would occur in the absence of grazing. Timing of grazing in riparian areas would generally be during the winter months when livestock have reduced impacts as compared to growing season use.

Criteria three would be met because utilization by livestock utilization rates would be conservative.

The May Affect, Not Likely to Adversely Affect determination is met for the Mexican spotted owl.

The bald eagle is currently a sensitive species. It is afforded more protection through the application of the *Bald and Golden Eagle Protection Act* (BGEPA). We are treating the bald eagle as if it were federally listed to meet the intent of the BGEPA.

Determinations for the bald eagle

No Effect (must meet one of the criteria)

1. Bald eagles are not present within the action area.
2. Livestock grazing will not occur, in areas that drain into identified bald eagle nesting habitat (upper Verde and Salt rivers and Tonto Creek in Arizona) or roost sites.
3. Livestock management activities (beyond presence of livestock) in the action area will not occur within 0.25 miles of a bald eagle roost or nest site during any time of occupation by bald eagles.

Criteria one would not be met, because bald eagles occur within the action area

Criteria two would not be met, because grazing would occur within watersheds that drain into bald eagle nesting habitat (Verde River and lower Tangle Creek) or roost sites.

Criteria three would be met, because no livestock management activities in the action area would occur within 0.25 miles of a bald eagle nest or roost site during any time of occupation by the species. The two bald eagle nests in the analysis area occur on the Verde River, which would not be grazed under this alternative.

The framework indicates that a No Effect determination is appropriate for the bald eagle.

Range Recommendations:

- Reduced numbers based on slope and pastures available and VWSR Plan direction to reduce livestock numbers.
- Light utilization in areas with unsatisfactory or impaired soils.

Reduced stocking rates would reduce direct and indirect effects through reduced soil compaction, increased infiltration, increased residual herbaceous, increased woody and shrub layers, and reduced direct and indirect impacts to riparian and stream systems.

Light utilization would result in additional residual plant material, which would help improve watershed, soil conditions, riparian and stream systems. For a detailed description see direct/indirect effects section of this report.

Determinations of effects would remain unchanged, if the decision were made to implement range recommendations, although wildlife and habitats would benefit for the reasons described. Light utilization and reduced stocking would minimize direct and indirect effects to roundtail chub in Roundtree Canyon and fish species in the Verde River.

Wildlife/Fish Recommendations:

- Yearlong exclusion of livestock through 2.5 mile portion of Tangle and 2.5 mile portion of Red Creek flycatcher potential habitat.
- Fencing around springs, seeps, and other riparian areas may be necessary to reduce or eliminate undesirable effects to associated riparian vegetation and wildlife habitat, if management alone does not protect or improve those sites.

- The Forest Service through coordination with Arizona Game and Fish Department, Region 6, proposes to stock new populations of Gila topminnow, desert pupfish, and northern Mexican garter snake into Mud Spring, Mud Spring Creek, Thicket Spring, and White Rock Spring and its tributary and augmentation of Gila topminnow at Dutchman Grave Spring.

Continued nonuse of potential flycatcher habitat through 2.5 miles of Tangle Creek and 2.5 miles of Red Creek would continue to improve aquatic and riparian habitats. Fencing may be utilized if livestock cannot be kept out of potential flycatcher habitat with salting and herding. Fencing would be left in place until habitat moves from potential to suitable habitat as defined in the Southwestern Willow Flycatcher Recovery Plan.

If necessary, additional fencing of springs, seeps and other riparian areas would be completed. If the decision were made to do so, the sites would no longer be exposed to direct livestock impacts and habitats would begin to improve at a faster rate than unfenced, grazed areas.

Stocking of listed species in portions of the analysis area would aid in recovery of the species. Recovery of listed species is identified in the Forest Plan. Utilization limits would apply to the areas stocked. If livestock impacts were not kept within allowable use levels the area(s) may be excluded from livestock.

Cumulative Effects

Since alternative 3 would propose to run greater numbers of livestock on more acres, the direct and indirect effects and cumulative effects would be higher under this alternative than under alternatives 1 and 2.

This alternative provides the least potential for improvement of upland, aquatic, and riparian habitats when compared to alternative 1 or 2.

Implementation of this alternative would result in livestock utilizing areas east and west of the Verde River and with stocking rates higher than those under alternatives 1 and 2. Although conservative grazing utilization would be authorized, watershed effects to the Verde River would be greater than for alternatives 1 and 2 where grazing is not authorized east of the river. Other actions occurring in the project area that may continue to impact wildlife resources or habitats via recreational and commercial river running (presence of people and potential habitat alteration), motorized and nonmotorized recreation (presence of people, potential habitat alteration), illegal cross country motorized travel, high traffic areas (presence of vehicles, dust, and noise), equestrian use (presence of people, potential habitat alteration), road maintenance (noise, dust, sedimentation), wildfire and suppression activities (presence of people/equipment, noise, dust, suppression activities), mining, recreational shooting (presence of people, potential habitat alteration), hunting, presence of people and associated noise and disturbance, past grazing and yearlong use of FR 24 and 269 in addition to other less frequently traveled roads.

Mitigation Measures Common to Grazing Alternatives:

- Time grazing to promote perennial grass recovery and provide cover for wildlife species. Improve riparian and spring conditions to benefit riparian dependent resources through management of grazing and other activities.

- Reduce livestock use in riparian and spring areas, during the growing season, to minimize impacts to woody and herbaceous plants and alterable banks.
- Make appropriate adjustments to the annual operating instructions, when necessary, to accelerate resource recovery from drought, fire or disease.
- Manage for sufficient litter cover to minimize exposed soil, thus improving soil conditions over time.
- Watersheds shall be managed to improve them to satisfactory or better condition.
- Provide wildlife access and escape on all livestock and wildlife water developments (USDA, 1985).
- Build range fences according to standards that provide for wildlife passage/crossing.
- The Tonto NF Drought Policy will be used to provide protection to range resources during time of drought.

Monitoring

- In order to determine if existing conditions on the allotment are moving toward desired conditions range, riparian, soils, species and habitat, and terrestrial ecosystem surveys will be utilized.
- Surveys may be conducted for aquatic and terrestrial species and associated habitats by Forest Service, Arizona Game and Fish, U.S. Fish and Wildlife Service, Bureau of Reclamation, Christmas Bird Count participants, and others.
- Ocular estimates may be utilized to determine need for additional measurements.
- Photo points may be utilized to establish baseline information and determine trend.
- Stream channel cross sections will be utilized to determine change(s) in stream morphology and composition.
- Vegetation will be monitored in critical riparian areas and key areas to document and track changes, and determine trend.

Recreation, Wilderness, Visual Quality

Desired Condition

Forest Plan

- Manage for wilderness values while providing livestock grazing and recreation opportunities that are compatible with maintaining wilderness values and protecting resources.”
- Maintain and enhance visual resource values by emphasizing recreation resource management which will increase opportunities for a variety of developed and dispersed experiences.
- The Verde Wild and Scenic River corridor will be administered in such a manner as to protect and enhance its designated outstandingly remarkable scenic, fish and wildlife, and historical/cultural values, while protecting the river’s free flowing character and water quality.

One desired condition for the area is that a quality mix of year-round outdoor recreation experience opportunities for personal enjoyment ranging from develop recreation sites to wilderness experiences will be provided.

Also, river floaters and trail users will have a sense of remoteness and other wilderness experiences when traveling through the Mazatzal wilderness and trail users will have the same experience when recreating within these three allotments and when floating in the WSR portion of the Verde River.

Within the Mazatzal Wilderness, Pine Mountain Contiguous, Lime Creek and Arnold Mesa IRAs, dispersed outdoor recreation will continue to provide opportunities such as open space and natural settings.

Recreational Opportunity Spectrum categories will not be changed by continuing to allow livestock to graze on these allotments.

The following laws also apply:

- The *Code of Federal Regulations* at 36 CFR Part 294 - *Special Areas*
- Forest Service Manual 2300-Recreation, Wilderness, and Related Resource Management
- *Wilderness Act* (1964)
- Special Provision – Section 4 (d)(4)(2): “...the grazing of livestock, where established prior to September 3, 1964, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture.”
- *Arizona Wilderness Act of 1984*
- (f)(1) Grazing of livestock in wilderness areas established 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 section 108 of Public Law 96-560.
- Congressional Grazing Guidelines have become part of FS Wilderness Management Policy and can be found at: FSM 2323.22. Pertinent sections of the guidelines are excerpted here:
- “As stated in the Forest Service regulations (36 CFR 293.7), grazing in wilderness areas ordinarily will be controlled under the general regulations governing grazing of livestock on National Forests* * *. This includes the establishment of normal range allotments and allotment management plans. Furthermore, wilderness designation should not prevent the maintenance of existing fences or other livestock management improvements, nor the construction and maintenance of new fences or improvements which are consistent with allotment management plans and/or which are necessary for the protection of the range.”
- *Multiple Uses - Sustained Yield Act* 1960
- *The Wild and Scenic River Act* (Public Law 90-542).
- Verde Wild and Scenic River Comprehensive River Management Plan

Existing Condition

Recreation opportunities exist within the allotments because they provide access, via trails, roads, and waterways, to remote areas such as the Mazatzal Wilderness and Verde Wild and Scenic River. People recreate in the southern part of Red Creek Allotment because of the proximity to three trails which can be accessed from the popular Sheep Bridge historical site. Recreation users can hike or ride horses on eight trails within these allotments. People also float on the Verde River through Skeleton Ridge and Red Creek allotments.

Verde Wild and Scenic River

No developed recreation areas are within allotments; however the Verde River and some trails receive consistent use by river runners and trail users throughout most of the year (USFS 2013).

The Verde River runs north – south through Skeleton Ridge and Red Creek allotments. In 1984, parts of the Verde River were designated by Congress as a Wild and Scenic River (WSR). WSR designation is intended to protect the free flowing character of the river, water quality, and outstandingly remarkable features for the benefit of present and future generations. Approximately 19 miles of Verde WSR are in the Skeleton Ridge Allotment and about six miles of the WSR are in the Red Creek Allotment (figure 3, appendix A).

Eight Forest Service designated trails are within the project area (figure 7, appendix A). There are also many “paths” made by humans, wild animals and/or cows that are sometimes mistaken for designated trails, causing confusion to trail users. Trail lengths noted in table 23 are lengths of designated trails within each allotment. For example, the Verde River Trail # 11 is about 27 miles in length with about 10 miles of the trail within the Red Creek Allotment and 7 miles within the Skeleton Ridge Allotment. The rest of the trail is outside these allotments.

Table 23: Designated trails and lengths in approximate miles

Red Creek Allotment Trails	Length	Six Bar Allotment Trails	Length	Skeleton Ridge Allotment Trails	Length
Verde River #11	10.0	Hogan #8	7.0	Verde River #11	7.0
Red Hills #262	6.0	#257	6.0	Deadman #17	0.5
Wet Bottom #269	6.0			Highwater #20	3.0
Dutchman Grave #22	2.5				
Highwater #20	1.5				

A special use permit is not required to float the Verde River and there is no written record of how many people float the river. The river is very popular for river floating for at least eight months per year according to Forest Service recreation employees, who are often in the area.

The volume of trail use is uncertain because there is no system that keeps records about trail users. Due to the high summer temperatures in the area trail use is also assumed to be about eight months per year. The Verde River Trail is probably the most popular trail within these allotments. This trail mostly runs parallel to the Verde River and requires crossing the river a few times.

Information about most of the above mentioned trails is available at:

<http://www.fs.usda.gov/activity/tonto/recreation/hiking>. Several of the above mentioned trails are described in many commercial Arizona hiking books.

Recreation Opportunity Spectrum

Within the boundaries of the allotments there are four Recreation Opportunity Spectrum (ROS) categories. The ROS is a land classification system that categorizes National Forest System (NFS) lands into six classes, each class being defined by its setting and by the probable recreation experiences and activities it offers. The six classes in the spectrum are primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban. The ROS divides areas by determining the recreational experience that is likely to occur, or does occur, within designated boundaries. Allotment acreages by ROS classification are shown below (table 24).

Table 24: ROS classifications and approximate acreage of the classifications within the allotments

Allotment	Primitive acres	Semiprimitive Nonmotorized acres	Semiprimitive Motorized acres	Roaded Natural acres
Red Creek	17,429	41,910	7,660	11,358
Six Bar	0	16,582	8,961	2,903
Skeleton Ridge	14,241	19,054	6,701	6,335
Total	31,670	77,546	23,322	20,596

The Recreation Opportunity Spectrum identifies “primitive” as an area where the visitor has a very high probability of solitude and little evidence of other visitors in the area. “Semiprimitive nonmotorized” category means that there is a high probability for solitude and experiencing closeness to nature and there may be some evidence of other visitors. “Semiprimitive motorized” means that a moderate probability for experiencing solitude, closeness to nature and tranquility in a predominately natural appearing environment is likely to occur for visitors recreating in this category of area. “Roaded natural” category means a visitor may have an opportunity to affiliate with other users in developed sites though there is some chance for privacy.

Inventoried Roadless Areas

There are portions of four inventoried roadless areas (IRAs) within the allotments (figure 7, appendix A). These IRAs are Arnold Mesa, Pine Mountain Wilderness Contiguous, Lime Creek, and Mazatzal Wilderness. Approximate acreages of these areas are shown by allotment in table 25.

Table 25: Inventoried Roadless Areas by approximate acres on each allotment

IRA	Acres	Allotment
Arnold Mesa	248	Skeleton Ridge
Pine Mountain	1,779	Skeleton Ridge
Pine Mountain	3,819	Red Creek
Lime Creek	3,850	Red Creek
Mazatzal	5,147	Skeleton Ridge
Mazatzal	42,841	Red Creek

Inventoried roadless areas are areas within the U.S. Forest Service system that were identified in 1978 during the Roadless Area Review and Evaluation (RARE II). During RARE II, undeveloped areas, typically exceeding 5,000 acres, that met the minimum criteria for wilderness consideration under the 1964 *Wilderness Act* were documented and mapped. In January of 2001, the Roadless Rule established all the IRAs that were inventoried during the Forest Service’s 1978 RARE II process.

The Department of Agriculture adopted the Roadless Rule to establish prohibitions on road construction, road reconstruction, and timber harvesting in IRAs on National Forest System (NFS) lands. The intent of this final rule is to provide lasting protection for IRAs within the NFS in the context of multiple-use management (36 *CFR Part 294* 2001).

Wilderness

Pine Mountain Wilderness was designated in 1972 and is roughly 20,061 acres. Approximately 4,917 acres are in Skeleton Ridge Allotment and about 6,263 acres are in Red Creek Allotment on the Tonto NF. The rest of Pine Mountain Wilderness is on the Prescott NF, which has primary responsibility for management of this wilderness. Pine Mountain Wilderness on Tonto NF is classified as semiprimitive nonmotorized, because of the proximity of roads.

The website, www.wilderness.net, developed by the University of Montana in cooperation with the federal agencies that manage wilderness is dedicated to providing the public with general and specific designated wilderness information. Among other things, this website lists the regulations for every wilderness in the country. On this website the following regulations are listed for Pine Mountain Wilderness as of January 2013:

- Group size is limited to no more than 15 persons.
- No more than 15 head of pack and saddle animals per group or party.
- Grazing livestock on native grass or herbage as the main food source or maintaining livestock in the same location for more than 12 hours is prohibited. Weed free supplemental feed is required.
- Camping for more than 14 days is prohibited.

Mazatzal Wilderness was designated in 1964 and is comprised of approximately 252,390 acres. Approximately 18,943 acres are in Skeleton Ridge Allotment and about 29,873 acres are in Red Creek Allotment. The rest of the Mazatzal Wilderness lies to the east and south of the allotments. On www.wilderness.net the following regulations are listed for Mazatzal Wilderness as of January 2013:

- Group size is limited to no more than 15 persons.
- No more than 15 head of pack and saddle animals per group or party.
- Grazing livestock on native grass or herbage as the main food source or maintaining livestock in the same location for more than 12 hours is prohibited. Weed free supplemental feed is required.
- Camping for more than 14 days is prohibited.

Within the allotments Mazatzal Wilderness has been classified as both primitive and semiprimitive nonmotorized in ROS (figure 7, appendix A). Parts of this wilderness were categorized as semiprimitive nonmotorized because of the proximity of roads.

Wilderness is commonly classified as primitive in the ROS spectrum, but as towns and cities expand toward designated wildernesses, some wildernesses have become “urban wilderness” and, like Pine Mountain and Mazatzal on the Tonto NF, recategorized as semiprimitive nonmotorized.

Scenic Driving/Vehicle Use

Vehicles used for scenic driving varies with the terrain and range from passenger cars and 4x4s to OHVs, dirt bikes, and mountain bikes. Many roads on the allotments (e.g., Forest Roads 16, 269, 1363, and 18) are popular to access the Verde River; and for fishing, hunting, and picnicking.

Hunting

The project area is located within the Arizona Game and Fish Management Units 21 and 22. These game units provide small and big game hunting opportunities such as elk, deer, bear, javelina, etc., that is very popular with in and out-of-state hunters as well as permitted outfitting and guiding companies. Although a year round activity across the ranger district, hunting is heaviest during the fall.

Effects Analysis

Environmental Consequences - Alternative 1 (No Action)

Direct Effects

Most recreationists may or may not notice that the area was no longer used to graze cattle. Visitors could view deteriorating range fences and livestock waters that become nonfunctional while recreating within the allotment boundaries or when floating the Verde River. No cattle would be seen or encountered and no signs of grazing (i.e., cow droppings, reduced height of vegetation) would be noticed when floating the river and/or hiking, fishing, bicycling, horseback riding, camping, or participating in motorized recreation.

Indirect Effects

The ROS would not change current classifications, if there were no cattle within the project area. This would not impact recreationalists' use of the area. Within the Pine Mountain Wilderness Contiguous, Mazatzal Wilderness, Lime Creek, and Arnold Mesa Inventoried Roadless Areas, dispersed outdoor recreation would continue to provide open space and natural settings opportunities.

Cumulative Effects

Because the population in the area is increasing, it is likely that recreation in the project area may increase. If visitor use increases due to population, motorized and nonmotorized "cross country" travel may increase.

Environmental Consequences - Alternative 2 (Current Management)

Direct Effects

Livestock grazing has been a public use of the project area since the first settlers arrived to the area in the late 1800s. Presence of livestock grazing does not preclude or prevent other recreational opportunities within the project area. Public perceptions of cattle grazing may affect an individual's recreational experience within the project area, but this is difficult to assess due to the wide range of public opinion on grazing on public lands. Continuation of livestock grazing within the project area will have minimal effect on the recreational experience of Forest users (Chelsea L. Muise, District Recreation Officer, Payson Ranger District, Tonto NF).

Cattle may be seen and/or encountered when recreationists float the river and/or hike, fish, bicycle, horseback ride, camp, or participate in motorized recreation. Visitors may or may not notice the cattle when they are involved in recreational activities in the project area. New fences may be seen while floating the Verde WSR. When participating in recreational activities within Mazatzal Wilderness, fences may be encountered and/or seen.

Indirect Effects

Cow droppings may be noticed when hiking, fishing, bicycling, horseback riding, camping, or participating in motorized recreation. Uneven and low height vegetation from grazing may or may not be noticed by recreationists. Trails established by wild animals, cattle, or humans may be mistaken for designated trails. Within the Pine Mountain Wilderness Contiguous, Mazatzal Wilderness, Lime Creek, and Arnold Mesa Inventoried Roadless Areas, the area would not be affected by implementing this alternative, because there would be no road building or tree cutting in the IRAs and would not affect recreation activities. Dispersed outdoor recreation would continue to provide opportunities for open space and natural settings. The ROS would not change the current classifications. This would not impact the areas' recreation use.

Cumulative Effects

Because the population in the area is increasing, recreation in the project area may increase. If more recreationists are in the project area, more cattle/human encounters may occur. These encounters could result in positive or negative experiences depending on the individual recreational user's attitude toward livestock, the *Multiple Use – Sustained Yield Act*, and the recreationist's desired recreational experience. When fences are built to exclude livestock out of certain areas (e.g., the Verde WSR, some springs, Sheep's Crossing area), river access and general access in the project area may be difficult for recreationists. The effects of all past, present, and reasonably foreseeable actions that have or will take place in these allotments would not change ROS settings, thus would not affect visitors' experiences when recreating in this area.

Environmental Consequences - Alternative 3 (Proposed Action)

Direct Effects

Having one grazing permit for Red Creek, Six Bar, and Skeleton Ridge allotments would not affect recreation in the project area in any way differently than alternative 2. Visitors would not notice pasture rotations. Visitors may or may not notice cattle, when they are involved in recreational activities in the project area. Cattle may be seen and/or encountered, when floating the river and/or hiking, fishing, bicycling, horseback riding, camping, or participating in motorized recreation.

Indirect Effects

Having one grazing permit for the three allotments would have essentially the same indirect effects as alternative 2.

Cumulative Effects

Implementing Alternative 3, the Proposed Action, would have essentially the same cumulative effects as alternative 2.

Heritage Resources

Desired Condition

Heritage resources are protected from mechanical disturbance and incur no more impact from livestock than has been the case historically. The environmental context of the heritage sites on

these allotments, especially as regards vegetation and the intrusion of modern constructed facilities, resembles its historical environmental context to the extent feasible, and/or is at least free of non-native species.

Tonto NF Land Management Plan

Forest Plan Amendment No. 21 does not specify desired future conditions for heritage resources on the Forest; however, it does specify that "...the preferred management of sites listed in, nominated to, eligible for, or potentially eligible for the National Register [of Historic Places] is avoidance and protection." It further states that "Preservation of Heritage resources in place will become increasingly important under the following conditions [including] where the cultural values derive primarily from the qualities other than research potential, and where those values are fully realized only when the cultural remains exist undisturbed in their original context(s)...."

Forest Service Manual Direction

- Owing to the complexity and diversity of heritage or cultural resources on the national forests, the Forest Service Manual does not specify one overarching desired future condition. However, FSM 2364.02 lists as the first three objectives for the protection and stewardship of heritage resources:
- Protect cultural resources in a manner consistent with their National Register qualities and management allocations.
- Avoid or minimize the effects of FS or FS-authorized land use decisions and management activities on cultural resources.
- Safeguard cultural resources on National Forest System lands from unauthorized or improper uses and environmental degradation.

Existing Condition

Heritage resources are a combination of archaeological, historic, and traditional cultural resources, including contemporary Tribal uses of natural, archaeological, and historic resources.

Red Creek, Six Bar, and Skeleton Ridge allotments are all known to contain hundreds of prehistoric archaeological sites representing the occupation and agricultural modification and use of this area by people related to the Hohokam archaeological tradition over a period of 8,000 to 10,000 years. They also contain many historic sites reflecting use and occupation by Apache and Yavapai hunters, gatherers, and farmers, Anglo ranchers, stockmen, miners and prospectors, and the Forest Service.

Very few archaeological surveys have been conducted within these allotments, except along the Verde River corridor running through Red Creek and Skeleton Ridge allotments. Even so, hundreds of sites have been formally inventoried, the bulk of them along the River, but also scattered across the entire landscape. However most of this area remains unsurveyed. Many more sites are known or have been reported and informal reconnaissance has revealed that some areas within the allotments have very high site densities. Known heritage properties include a wide variety of features, ranging from massive multiroom masonry prehistoric residential sites to simple artifact scatters, though a number of those artifact scatters represent buried pit house villages with no surface structures visible other than trash mounds. Most features are prehistoric and consist of collapsed stone masonry structures ranging from single room field houses to large

compound and room block sites, various water control devices such as check dams and terraces, and roasting pits for the processing of agave. There are also a large number of features associated with a long history of cattle ranching and a few reflecting prospecting, mining, quarrying, and ore processing. Many other prehistoric and historic archaeological sites are represented by nothing more than a scatter of artifacts on the ground surface.

Between the prehistoric occupation and arrival of Anglo miners and ranchers, this area was also extensively occupied by the Apache and Yavapai, who left their own nearly ephemeral archaeological signature and who still maintain connection to the area through traditional use areas and sacred places, though no specific traditional cultural properties, native plant gathering areas, or tribal sacred sites have been identified on the ground. No specific efforts to identify and inventory such areas have been made.

From the 1870s to the early 1920s, grazing of what would become these three allotments was heavy and unregulated. This resulted in an initial reduction of vegetative cover which would have affected heritage resources due to soil loss, erosion, and trampling. Since the establishment of allotments and implementation of grazing management, impacts to known and inventoried heritage resources have lessened and, in many cases, these properties may have improved in condition as vegetative cover has returned.

Existing Condition: Contemporary Tribal Uses

Red Creek, Six Bar, and Skeleton Ridge allotments contain many plant and animal species, water sources, minerals, and geographic landforms and places that have significance to contemporary Indian Tribes for their use in traditional economies, religious practices, or in Tribal and clan histories. Most recently, this area was occupied by Apache and Yavapai peoples and it still retains significance through affiliation into either the recent past or prehistory for the O'odham, Hopi, and Zuni peoples.

An important consideration in the fulfillment of the Forest Service mission is the trust relationship the Forest Service has with these Tribes and the potential impact Forest Service policy, program, and project decisions may have on them. Tonto NF recognizes that several area Tribes have cultural ties to and knowledge about lands now managed by the Forest Service. Many tribal members regularly visit the Forest to harvest traditional plant resources such as acorns, piñon nuts, arrowweed, agave, willow, cattails, and beargrass, to collect medicinal plants and mineral resources for personal and ceremonial uses, to collect firewood, and to visit sacred sites traditional cultural properties (TCPs) and, activities that require motorized access, particularly for Tribal elders, who make up the majority of traditional practitioners. The Tribes, therefore, share an interest in protecting important natural and cultural resources from damage, including that caused by grazing and the construction of new livestock improvement facilities.

Some general locations used by Tribal members to conduct traditional activities such as plant collection and religious rites on the Forest are known, but no specific locations were identified during scoping that are within the *area of potential effect* (APE) for this analysis, though it is known that Tribal members utilize areas adjacent to these allotments, such as Fossil Creek, as traditional resource gathering areas and may have sacred sites located there as well.

Tribal consultation is necessary to identify and protect these areas of traditional cultural and religious use. This process for the Forest is guided through a variety of laws, Executive Orders,

Memorandums, and case law. Some of those laws include: *National Historic Preservation Act* (NHPA) and subsequent amendments, *Archaeological Resources Protection Act*, *American Indian Religious Freedom Act*, *National Environmental Policy Act*, and *National Forest Management Act*. Executive Orders and Memorandum include *1994 Government-to-Government Relations with Native American Tribal Governments*, *E.O. 13007 Accommodations of Sacred Sites*, and *E.O. 12898 Environmental Justice*. Depending on the specific location of an undertaking, the Forest routinely consults between nine and thirteen Tribes regarding proposed projects and management policies. These are: Apache (San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, and Yavapai-Apache Nation), Four Southern Tribes (Salt River Pima-Maricopa Indian Community, Gila River Indian Community, Ak Chin Indian Community, and the Tohono O'odham Nation), Hopi Tribe, Pueblo of Zuni, and Yavapai (Yavapai-Prescott Tribe, Fort McDowell Yavapai Nation, and Yavapai-Apache Nation).

Effects Analysis

Impacts to heritage resources, especially archaeological sites, can be generally defined as anything that results in the removal of, displacement of, or damage to artifacts, features, and/or stratigraphic deposits of cultural material. In the case of heritage resources, which are considered eligible for inclusion in the National Register of Historic Places, this can also include alterations of a property's setting or context. In the case of traditional cultural properties and sacred places, additional considerations may include alterations in the presence or availability of particular plant species. Heritage resources, depending on their nature and composition, are subject to several different types of impact from activities associated with grazing. Direct impacts from grazing are generally considered to be those resulting from concentrated livestock trampling or construction. Indirect impacts can include erosion and changes in vegetative composition and density, which alter the setting and geographic context of sites.

Since site condition assessments for heritage resources are not available for any time prior to the introduction of European livestock species to the Southwest, some level of effect is assumed to have contributed to the current condition of all sites on the allotments. Given the nonrenewable nature of heritage resources; prehistoric as well as historic archaeological sites; any portion of a given site either damaged or removed diminishes its cultural and scientific value permanently. Therefore, all effects to heritage resources are considered cumulative.

Environmental Consequence: Traditional Cultural and Religious Sites - significant Tribal places, whether sacred sites or resource collecting areas, or places associated with clan or Tribal histories, are located throughout the Forest, though their specific locations often remain known only to Tribal members. They can be archaeological or historic sites, landmarks, or simply places on the landscape used for traditional activities. Like other heritage resources, they are subject to several different types of impact from activities associated with recreation and Forest management that can degrade their physical characteristics and disrupt the traditional or religious activities associated with them. Like archaeological and historic sites, they are irreplaceable and individually unique and their integrity is wholly dependent on the contextual relationship with the environment in which they are found, something that cannot be recreated or restored once disturbed. They are also, by their very nature, previously affected, reduced by any activities taking place there since the land passed out of their control. Any effect to such sites, therefore, is cumulative.

Direct effects to sacred sites and traditional use areas can be generally defined as anything that results in removal of, displacement of, or damage to the physical features of the landscape associated with the traditional use or alteration of the vegetative composition of the area in the case of collecting sites.

Grazing has the potential to create those kinds of impacts. Direct effects can include alterations of a sacred site's setting or context, sometimes to the extent that they are no longer recognizable and the various landscape features associated with their past use cannot be relocated. Grazing practices that result in erosion and changes in vegetative composition and density or alterations in the presence or availability of particular plant species can be especially damaging to traditional collecting areas.

Indirect impacts can include the presence of non-native species and any other activities that may be seen as degrading to either the sacred nature of a place or to the experience of conducting traditional activities there. They can also take the form of conflicts with other recreational or economic uses that affect the ability of traditional practitioners to access these areas.

Effects Common To All Alternatives - based on a history of observation and consultation with the SHPO, managed grazing is not considered in and of itself to constitute an effect on heritage resources when the grazing strategy is designed to match herd size with capacity and distribute livestock as evenly as possible across the allotment in order to avoid localized concentrations of animals and the resultant impacts to soils and vegetation associated with intense trampling. Changes in grazing strategy are likewise not considered to have an effect provided that whatever new strategy is implemented does not alter these conditions. Adverse effects can be foreseen if a proposed grazing strategy were to introduce livestock into an area not known to have been grazed historically. They may also be expected when a grazing strategy proposes shifting to a more intensive system where higher permitted numbers or high intensity/short duration schedules would concentrate livestock into confined areas where either the absolute or relative stock density would cause a significant increase in surface disturbances due to trampling that would be above previous or existing levels. This could result in either direct or indirect adverse effects depending on the degree of trampling resulting from localized concentration and on the presence or absence of heritage resources in the concentration area, the nature of the resource and its resistance to such impacts, and the distance to other heritage sites. For the most part, these conditions tend to be associated with the construction of range improvements designed to provide water or to concentrate and hold stock for roundup or shipping. Thus, the greatest potential for direct adverse effects to heritage resources is associated with the construction of range improvements, primarily stock tanks and other livestock watering features, corrals, and the access roads needed to build and maintain them.

Environmental Consequences - Alternative 1 (No Action)

Direct Effects

Without grazing, there would be no direct effects to archaeological and historic resources or to sacred sites and traditional use areas from livestock under this alternative.

Indirect Effects

Without grazing, there would be no indirect effects to archaeological and historic resources or to sacred sites and traditional use areas from livestock under this alternative.

Cumulative Effects

Cumulative effects include the direct and indirect effects of the proposed action and alternatives when added to all past, present, and reasonably foreseeable future actions. Since site condition assessments for heritage resources are not available for any time prior to the introduction of European livestock species to the Southwest, some level of effect is assumed to have contributed to the current condition of all sites on the allotment. Given the nonrenewable nature of heritage resources; prehistoric as well as historic archaeological sites; any portion of a given site either damaged or removed diminishes its cultural and scientific value permanently. Therefore, all effects to heritage resources are considered cumulative.

Some of the actions that have affected the condition of heritage resources include:

- Past and current grazing: Past grazing actions have resulted in soil erosion and compaction while current management has, in some cases, prevented or slowed recovery.
- Natural and prescribed fire suppression: A long history of fire has altered the characteristics of many ecosystems from what they were in the archaeological and historical past. Fire suppression has likewise damaged archaeological sites and modified historic landscapes.

Activities with a potential to affect heritage resources foreseeable in the future for the Red Creek, Six Bar, and Skeleton Ridge allotments include:

- Management and maintenance of the 345kV power line operated by the Western Area Power Administration (Red Creek and Skeleton Ridge allotments)
- Recreation camping (all allotments)
- Off-road travel for game retrieval during hunting seasons (all allotments)
- Prescribed fire and managed fire activities (all allotments)
- Unauthorized off-road ATV and UTV travel by recreationists
- Introduction and spread of noxious weeds by hikers, vehicles, domestic animals, etc.
- Unauthorized livestock from adjacent allotments and other lands (all allotments)

The cumulative effects listed above, have generally resulted in most heritage resources moving increasingly away from what are considered desired conditions. With no direct or indirect effects resulting from this alternative, no additional contribution to the cumulative effect will be incurred from the alternative, but most heritage resources will continue to move increasingly away from what are considered desired conditions.

Environmental Consequences - Alternative 2 (Current Management)

Direct Effects

Direct effects to archaeological and historical resources, especially archaeological sites, can be generally defined as anything that results in the removal of, displacement of, or damage to artifacts, features, and/or stratigraphic deposits of cultural material. In the case of heritage resources which are considered eligible for inclusion in the National Register of Historic Places, this can also include alterations of a property's setting or context. In the case of traditional cultural properties and sacred places, additional considerations may include alterations in the presence or availability of particular plant species. Archaeological and historical, depending on their nature and composition, are subject to several different types of impact from activities associated with grazing. Direct impacts from grazing are generally considered to be those resulting from

concentrated livestock trampling or construction. For the most part, these conditions tend to be associated with the construction of range improvements designed to provide water or to concentrate and hold stock for roundup or shipping. Thus, the greatest potential for direct adverse effects to heritage resources is associated with the construction of range improvements, primarily stock tanks and other livestock watering features, corrals, and the access roads needed to build and maintain them.

Direct effects to sacred sites and traditional use areas can be generally defined as anything that results in removal of, displacement of, or damage to the physical features of the landscape associated with the traditional use or alteration of the vegetative composition of the area in the case of collecting sites. Grazing has the potential to create those kinds of impacts. Direct effects can include alterations of a sacred site's setting or context, sometimes to the extent that they are no longer recognizable and the various landscape features associated with their past use cannot be relocated. Grazing practices that result in erosion and changes in vegetative composition and density or alterations in the presence or availability of particular plant species can be especially damaging to traditional collecting areas.

Indirect Effects

Indirect effects on archaeological and historic sites can include erosion and changes in vegetative composition and density that alter the setting and geographic context of sites.

Indirect effects on sacred sites and traditional use areas can include the presence of non-native species and any other activities that may be seen as degrading to either the sacred nature of a place or to the experience of conducting traditional activities there. They can also take the form of conflicts with other recreational or economic uses that affect the ability of traditional practitioners to access these areas.

Cumulative Effects

Since site condition assessments for heritage resources are not available for any time prior to the introduction of European livestock species to the Southwest, some level of effect is assumed to have contributed to the current condition of all sites on the allotment. Given the nonrenewable nature of heritage resources – prehistoric as well as historic archaeological sites - any portion of a given site either damaged or removed diminishes its cultural and scientific value permanently. Therefore, all effects to heritage resources are considered cumulative.

Nevertheless, based on a history of observation and consultation with the SHPO, managed grazing is not considered in and of itself to constitute an effect on heritage resources when the grazing strategy is designed to match herd size with capacity and distribute livestock as evenly as possible across the allotment in order to avoid localized concentrations of animals and the resultant impacts to soils and vegetation associated with intense trampling. Changes in grazing strategy that do not increase grazing intensity or increase stocking rates are likewise not considered to have an effect provided that whatever new strategy is implemented does not alter these conditions. Since grazing intensity under this alternative would remain the same, it would be considered to have no effect on heritage resources.

All surface disturbing activities related to grazing management are required to undergo an evaluation and determination of effect under *Section 106 of the National Historic Preservation Act*, as regulated under the *First Amended Programmatic Agreement Regarding Historic Property*

Protection and Responsibilities between the U.S.D.A. Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation, signed December 24, 2003, specifically Appendix H, the *Standard Consultation Protocol for Rangeland Management*. The goal of this process is to reduce or eliminate any potential for these activities to directly or indirectly affect archaeological, historical, or traditional use properties and to help to attain the desired future condition for these resources. Despite this fact, the direct and indirect effects of grazing management under this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects discussed above), will likely result in most heritage resources moving increasingly away from what are considered desired conditions.

Environmental Consequences - Alternative 3 (Proposed Action)

Direct Effects

See effects for alternative 2. Since grazing intensity is not increased beyond current management in this alternative, its effects on heritage resources will be approximately the same or slightly less owing to a minor reduction in use for the Six Bar Allotment.

Indirect Effects

See effects for alternative 2. Since grazing intensity is not increased beyond current management in this alternative, its effects on heritage resources will be approximately the same or slightly less owing to a minor reduction in use for the Six Bar Allotment.

Cumulative Effects

See effects for alternative 2. Since grazing intensity is not increased beyond current management in this alternative, its effects on heritage resources will be approximately the same, continuing to contribute to the cumulative effects and likely resulting in most heritage resources moving increasingly away from what are considered desired conditions. In general, under alternative 3, effects on heritage resources are the same as those under alternative 2 and more pronounced than alternative 1.

Air Quality

Existing Condition

Air quality for the analysis area is monitored by Arizona Department of Environmental Quality under direction from the *Clean Air Act* and Environmental Protection Agency, who provide National Ambient Air Quality Standards (NAAQS). The analysis area is not in a nonattainment area or maintenance area for regulated air pollution. Action alternatives are expected to have a minimal effect on air quality.

Desired Condition

Projects related to action alternatives are subject to NAAQS and should strive to keep particulate matter within those standards during normal operations or special projects.

Effects

Particulate matter (10 microns and smaller) dispersed during activities associated with livestock grazing management can penetrate human and animal lungs. Inhaling particulate matter 2.5 microns and smaller has been linked to increases in death rates, heart attacks, plaque and clotting, respiratory infections, asthma attacks, and cardiopulmonary obstructive disease (ADEQ 2011). Effects can be mitigated through proper site preparation and construction techniques and through site restoration following ground-disturbing activities. These effects could occur during livestock gathering (heavy trailing, increased vehicle movement) and during construction of range improvements. Effects would be minimized under a no grazing alternative without livestock gathering and trailing; however, use of roads in the area would still occur and construction of improvements for wildlife or recreational benefit could still occur on the allotment. Air quality would still be affected by activities on other active grazing allotments in the analysis area and by continued recreational activities in the project area and just outside the project area.

Climate

Existing Condition

Climate on these allotments is characterized by a bimodal precipitation pattern with about sixty percent occurring as frontal systems in winter from December to March and about forty percent occurring as monsoons in summer from July to September. Summer storms can be more intense than winter storms, but are generally of shorter duration and smaller aerial extent.

According to Arizona Drought Monitor Report (ADWR 2010), Arizona remains in a long-term drought, which has likely had an effect on the allotments. According to NOAA National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein 2006). Models used by Seager, et al., to predict how climate change will affect the southwestern United States indicate this region has begun the transition to a dryer climate, which will continue into the 21st century (2007). However, the models are too broad scale to predict how climate change might affect monsoons, which contribute 40 percent of the total annual precipitation received on the Tonto NF (Lenart 2005).

The nearest climate gage to the project area is Horseshoe Dam. The period of record is 1948 to present and the average annual precipitation is 14.61 inches (WRCC 2012). Of the last ten years (2002 to 2011) the data indicate six years had below average precipitation, two years were above average and two years had missing data (WRCC 2012).

Desired Condition

U.S.D.A. Strategic Plan for 2010 to 2015 sets a departmental goal to “ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources.” As a measure of this goal, all national forests are to come into compliance with a climate change adaptation and mitigation strategy. The Plan and A Roadmap for Responding to Climate Change has been developed and is available on the agency’s website at <http://www.fs.fed.us/climatechange/>.

The Roadmap integrates land management, outreach, and sustainable operations accounting. It focuses on three kinds of activities: assessing current risks, vulnerabilities, policies, and gaps in knowledge; engaging partners in seeking solutions and learning from, as well as educating, the

public and employees on climate change issues; and managing for resilience, in ecosystems as well as in human communities, through adaptation, mitigation, and sustainable consumption strategies. To measure agency progress in moving toward this goal, a *performance scorecard* has been implemented.

Effects

Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill, Smith, and Wilkinson 2010). This effect is anticipated to be minor in the analysis area as cumulative livestock numbers are low and distributed broadly across the landscape for all grazing allotments in the project area. It would be difficult to separate effects of livestock emissions from those produced by other human activities, such as passenger vehicles and off-road vehicles traveling on roads in the analysis area, industrial activities such as mining, and outflow from major metropolitan areas such as Phoenix, Arizona, which lies approximately 30 miles south of the analysis area.

Livestock grazing may or may not affect climate by altering the abundance or type of carbon-sequestering vegetation available on the landscape (Brown, Valone, Curtin 1997; Asner et al. 2004; and SRM 2008). Implementation of best management practices and utilization guidelines is anticipated to mitigate this effect across the analysis area.

Climatic fluctuations, on the other hand, can have a profound effect on livestock grazing. Implementing an adaptive management strategy will be critical for responding to these fluctuations by adjusting stocking rates as needed in periods of below average or above average precipitation to meet desired conditions for all resources.

Removal of livestock from the allotments through selection of a no grazing alternative would reduce emissions slightly; however, it would be difficult to measure this change. Emissions would continue to be generated from neighboring allotments in the analysis area. Eliminating grazing pressure on vegetation may also have a slight benefit for carbon sequestration; again, this would be difficult to measure on such a small scale.

Engineering

Sheep's Bridge has been proposed for moving cattle across the Verde River to access pastures east of the river. If planks are plastic, engineers do not recommend livestock traffic. Livestock could damage plastic planks.

If planks are timber, cattle could cross the bridge a limited number of times. Long-term crossings should not be established. Horses should be led across the bridge rather than ridden. Design calculations indicate the one-quarter-inch steel plate would be acceptable for an 800 pound livestock point load, similar to a 750 pound point load for a horse. The steel plate would keep cattle and horses from punching through timbers.

There is a concern that long-term multiple crossings could impact the life of the bridge, which could lead to higher maintenance costs. Bridge inspection frequency would increase as well, if deterioration increases and maintenance work is not kept current.

The bridge truss is designed for 223 pounds per square foot (PSF). Current Forest handbook direction uses 85 PSF, but not less than 65 PSF for backcountry trail bridges. The structural steel

shapes and plates are weathering steel, Grade 50, ASTM A588. The main cables are 2 ¾ inch diameter galvanized class A Roebling Bridge Strand. The design of the hanger beams and cables use 85 PSF. The main cables are designed for 60 PSF which would equal about 120 cows at 1,000 lbs. per cow. The number of cows should be less to spread the livestock out over the entire bridge.

The last inspection report indicated some loose planks near the west truss expansion joint 4, a need to tighten sway brace cables, a need to tighten or install nuts, secure frayed cables, and repair cracked welds. Maintenance to correct these issues should be completed prior to allowing cattle to cross. The permittee should inspect and rate the bridge for the maximum number of cattle they want to cross at any one time. They should provide the inspection report and rating as part of their request. Inspection frequency could be increased to two years to monitor any increase in wear and tear. Increased inspections could determine if long-term use would work. Any inspections and ratings shall be done under the direct supervision of an Arizona Registered Professional Engineer.

Socioeconomics

Affected Environment

Allotments within the project are located predominately in Yavapai County, Arizona, on the Cave Creek Ranger District. Yavapai County encompasses approximately 8,123 square miles. In 2011 Yavapai County had an estimated population of 211,888 (<http://quickfacts.census.gov>). Major employment in Yavapai County includes retail trade, mining, construction, and public administration.

Within the county, ownership or administrative control occurs as follows: U.S. Forest Service - 38 percent of the land; Bureau of Indian Affairs and National Park Service - less than 0.5 percent; individuals and corporations - 25 percent; U.S. Bureau of Land Management - 11.6 percent; State of Arizona and other public lands - 25 percent.

The U.S. Government makes payments to Yavapai County under various programs, the two most important being:

- Payments in Lieu of Taxes (PILT). These payments are made to the local governments based upon the acreage of federal land within the county, population, consumer price index and previous year payments. In 2012, Yavapai County received approximately \$2,985,878 from this program (<http://www.doi.gov/pilt/>).
- *Secure Rural Schools and Community Self Determination Act of 2000* (PL 106-393). Traditionally, the federal government had returned 25 percent of the revenues collected on National Forest lands from grazing permits and timber sales to the counties on which these revenues were generated. With decreased timber sales and fees generated from grazing permits, the above Act was designed to "...restore stability and predictability to the annual payments made to States and counties containing National Forest System lands and public domain lands managed by the Bureau of Land Management for use by the counties for the benefit of public schools, roads and other purposes." In 2011 Yavapai County received \$1,436,561.86 from this program (USDA 2011).

Social Environment

The social environment is perhaps the most diverse and emotionally charged arena in ecosystem management. The social environment for this analysis comprises the people living in and adjacent to the Tonto NF. Forest resources play an important social role for the people of the Southwest. The goods, services, and uses available from the national forests represent major components in the lives of many residents within the area of the Tonto NF, especially those in rural areas.

Geographically this region has two types of very distinct population centers. There are several small, rural communities scattered along and within the boundaries of the Forest. In addition, the Phoenix metropolitan area abuts the Forest along its western boundary. Smaller communities tend to rely at least partially on forest resources (mining, ranching and timber) for their economic development. The Phoenix metropolitan area has experienced great population growth in recent years. An influx of people in recent decades has also brought about more diverse views and public opinion regarding appropriate uses of the public lands. The demand for recreational type activities on public lands is greatly increasing.

Few generalizations can be made about the communities across the Southwest. They are as diverse as the people who live there and due to the increasing desirability of the Southwest as a living location. The diversity is ever increasing. It should not be expected that all residents have the same or even similar points of view on various issues.

Lifestyles

Ranching and the grazing of domestic livestock have been a part of the Southwest culture for 400 years. Grazing sheep and cattle in the Southwest was introduced by the Spanish in the late 16th century. The tradition of an open range endured for several hundred years before Anglo-Americans arrived in the Southwest, and when they came, the new arrivals expanded the traditional pastoral practices into modern range cattle and sheep industries. In the Southwest, the national forests were of equal or greater importance to the people for their range resources as they were significant for timber, watershed, or mineral resources (Baker, et al., 1988).

Economic Impacts

Other than reported actual livestock numbers (from bills for collection) that have been placed on the three allotments within the project area, data has not been provided to the Forest Service in regards to the economic returns from ranching operations or expenses incurred for maintenance of range improvements. Stocking rates have been quite variable throughout recent history on the allotments due to fluctuating resource conditions, recurrent drought, and economic considerations.

Research is available that discusses the influence stocking rates can have on economic returns. Generally, heavier stocking rates result in the greatest gross economic returns, while moderate stocking rates maximize net economic returns (Holechek 2004). Over time, heavy stocking tends to result in higher death loss and a greater need for supplemental feeding, especially in years of below average precipitation, and lower weaning weight percentages.

Under heavy stocking rates, livestock tend to make high gains for a few years, especially when precipitation remains at average or above average levels. However, during drier periods, livestock productivity tends to reduce per animal unit and per unit area. The severity of reduction is related

to the stocking density, i.e., heavier stocking rates result in more severe reductions in economic returns than moderate stocking rates, especially in drought years. Under the adaptive management proposal, desirable stocking rates would be moderate over the long term to achieve desired resource conditions.

Environmental Consequences - Alternative 1 (No Action)

A *no grazing alternative* would not affect future payments received through PILT or PL 106-393. Yavapai County could be affected by a *no grazing alternative* due to the amount of money made by the permittee and how much is spent in the local economy. This is related to a multiplier effect or that monies made in a community are often respend in that community. Multipliers in rural communities are generally lower than for large municipal areas as expenditures for large ticket items are usually made outside the local area. Multipliers of 1.25 to 1.75 are common in rural areas associated with adjacent public lands (Loomis, J. 1993).

Removal of livestock could result in the loss of some culture and lifestyle tied to ranching. This could intensify feelings of mistrust, loss of personal control, and threaten lifestyles, resulting in negative attitudes towards the Forest Service, and other federal agencies in general.

Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel increased trust and increased positive attitude towards the Forest Service, and other federal agencies in general. These individuals may perceive an increased social benefit from livestock removal.

Environmental Consequences - Alternative 2 (Current Management)

Personal characteristics such as self-sufficiency, independence, hard work, and other traits associated with the ranching lifestyle would most likely be protected under these alternatives.

Continuation of ranching operations in a sustainable manner would provide for continuation of the culture and lifestyle tied to ranching in this area.

Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel decreased trust and increased negative attitude towards the Forest Service, and other federal agencies in general. These individuals may perceive a decreased social benefit from continuing grazing or expanded grazing.

Federal, state and local contracts would be maintained, providing improved management possibilities for livestock operators.

Environmental Consequences - Alternative 3 (Proposed Action)

Same as described for alternative 2.

Environmental Justice

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Toward attaining EJ for all communities and persons in the United States, *Executive Order 12898*

(February 11, 1994) directed all Federal agencies to evaluate their proposed actions to determine the potential for disproportionate adverse impacts to minority and low-income populations.

In the memorandum to heads of departments and agencies that accompanied *Executive Order 12898*, the President specifically recognized the importance of procedures under NEPA for identifying and addressing environmental justice concerns. The memorandum states that “each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by NEPA.”

Implementation of any alternative evaluated in this EA would not result in adverse impacts to environmental resources and socioeconomic conditions. Therefore, disproportionate direct, indirect, or cumulative adverse impacts on low income or minority populations would not occur.

Chapter 4: Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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Federal, State, and Local Agencies

Arizona Game and Fish Department

Bureau of Reclamation

Arizona Department of Environmental Quality

Natural Resources Conservation Services

U.S. Fish and Wildlife Service

Arizona Department of Water Resources

Arizona Department of Transportation - Natural Resources

Arizona State Land Department

Tribes

White Mountain Apache Tribe

Ft. McDowell Yavapai Nation

Tonto Apache Tribe

Yavapai-Apache Nation

Zuni Pueblo

Gila River Indian Community

Yavapai-Prescott Tribe

San Carlos Apache Tribe

The Hopi Tribe

Others

Gila County Cattlegrowers

Center for Biological Diversity

Western Watersheds Project

Sierra Club

Local stakeholders, including outfitters, land owners, and permittees

Arizona Public Service

Salt River Project

Spur Cross Ranch Conservation Area

Appendix A: Maps

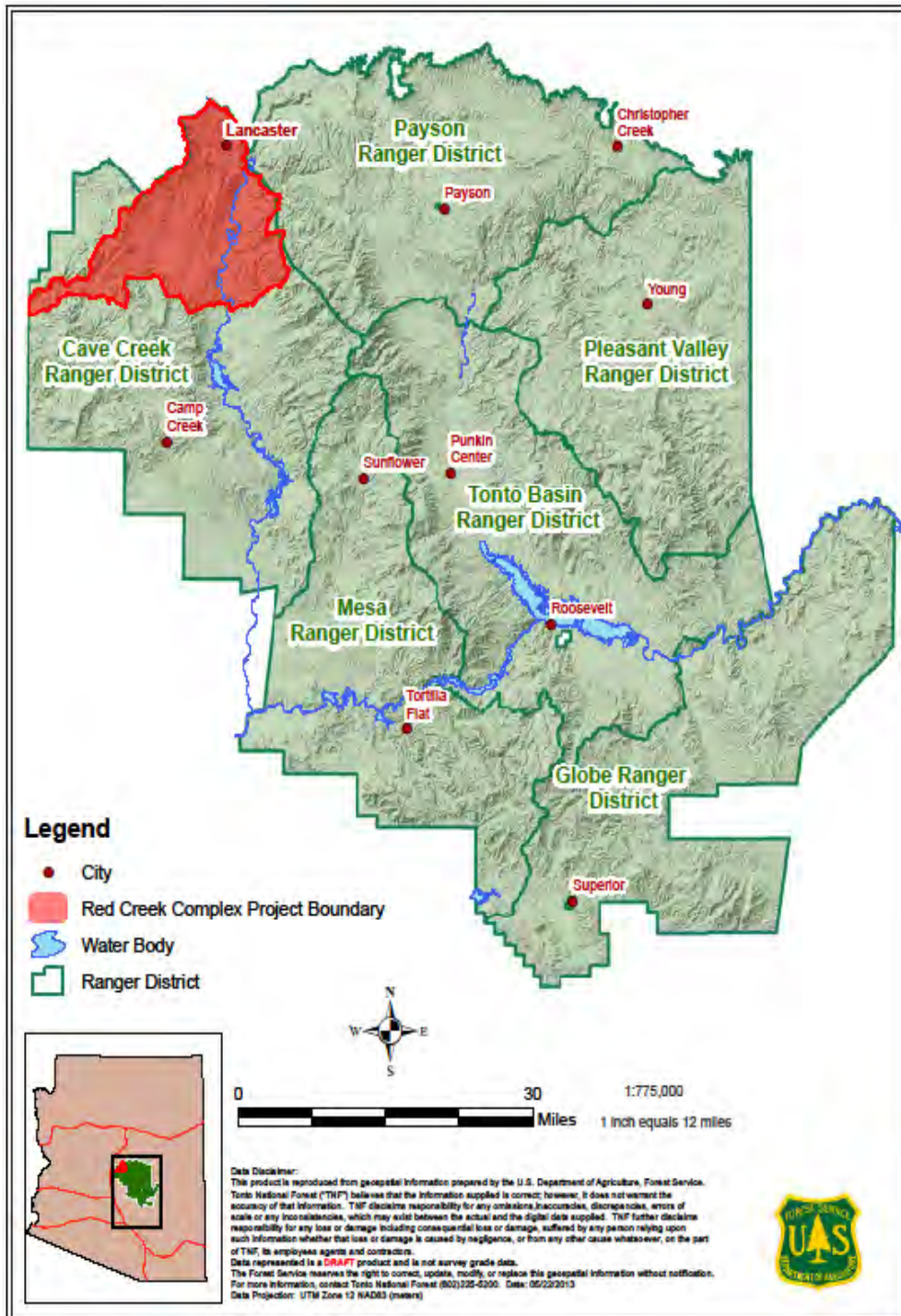


Figure 1: Vicinity Map

Appendix A: Maps

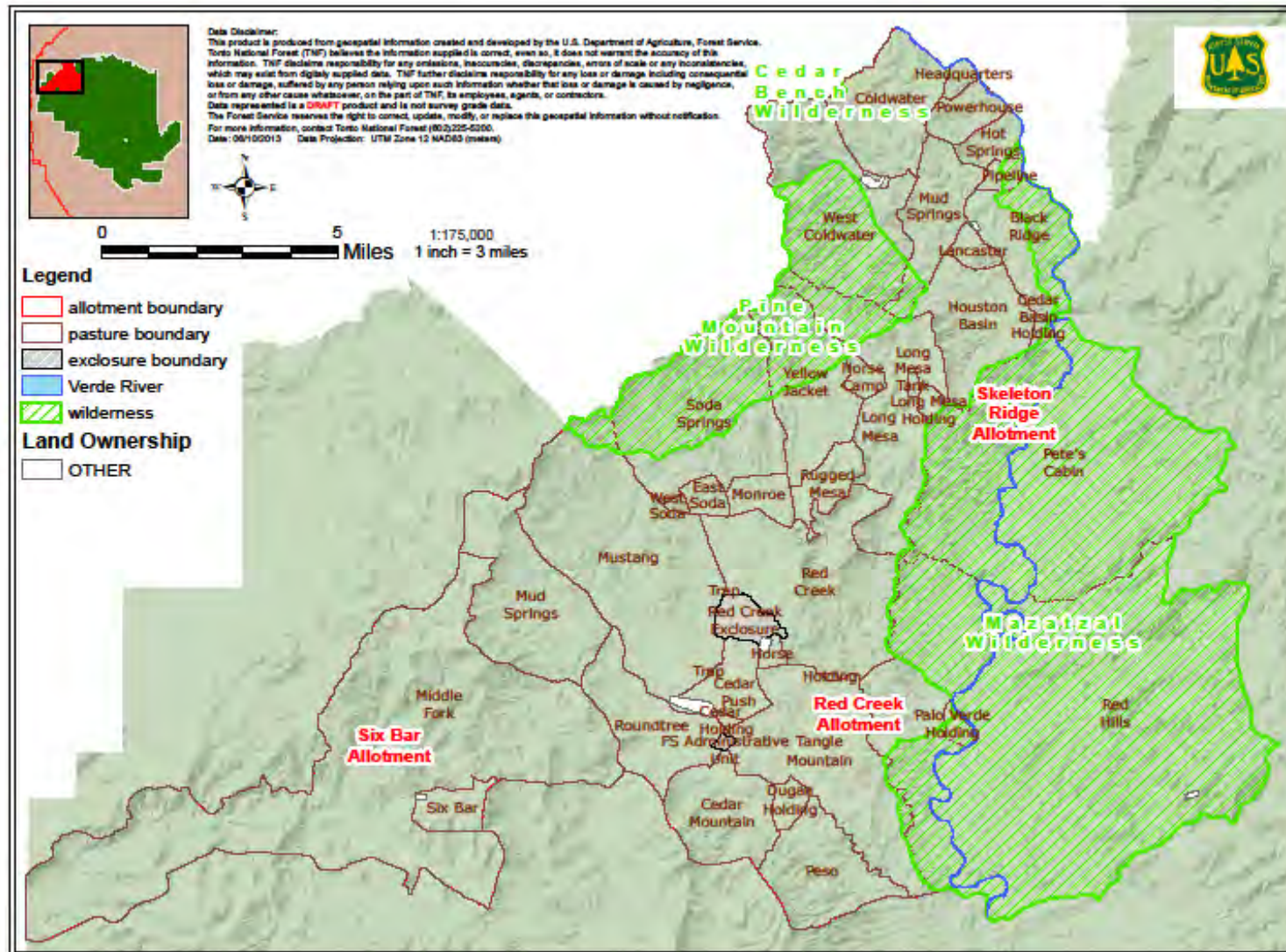


Figure 2: Allotment Pasture Boundaries Map

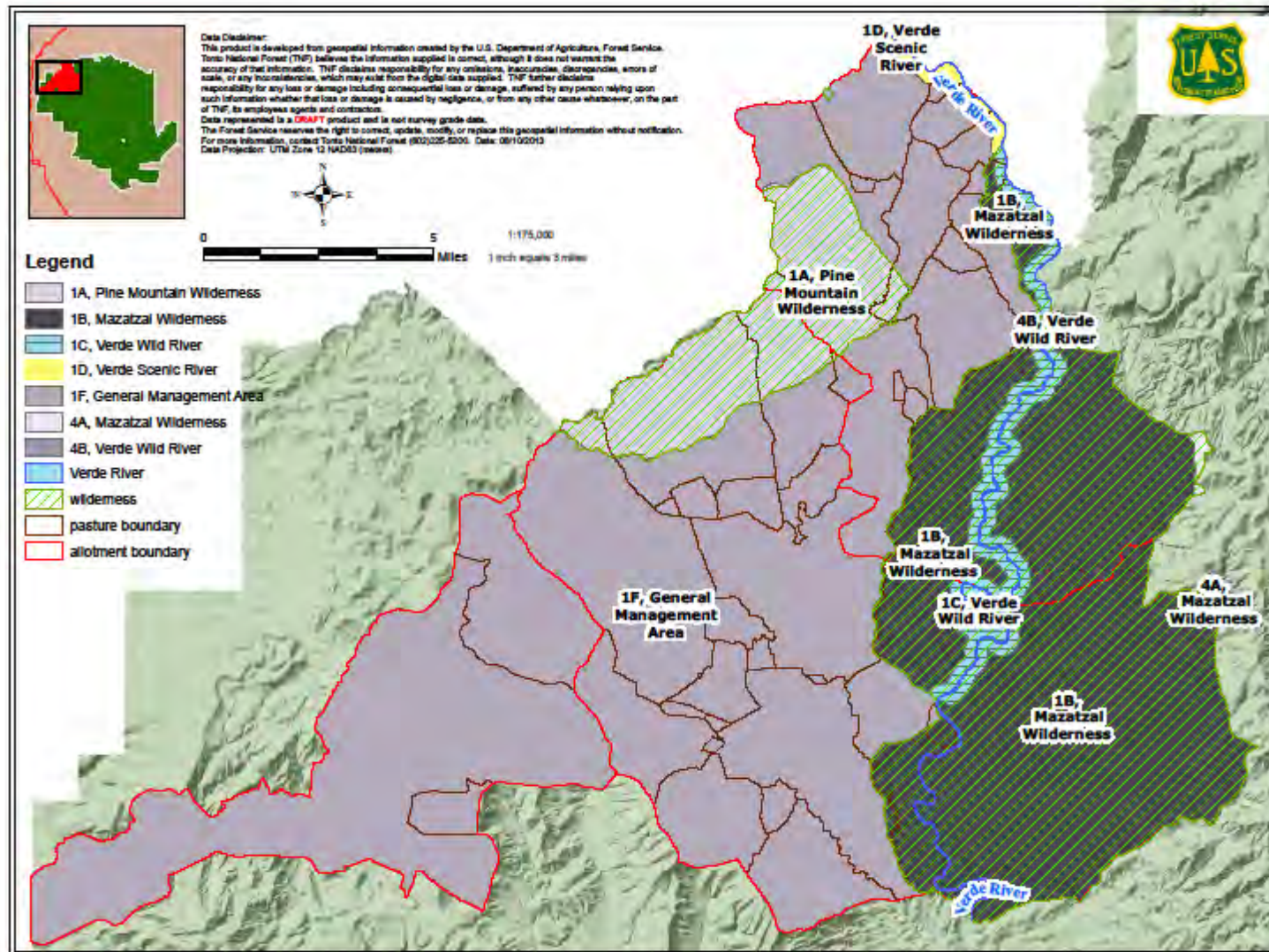


Figure 3: Management Area Map



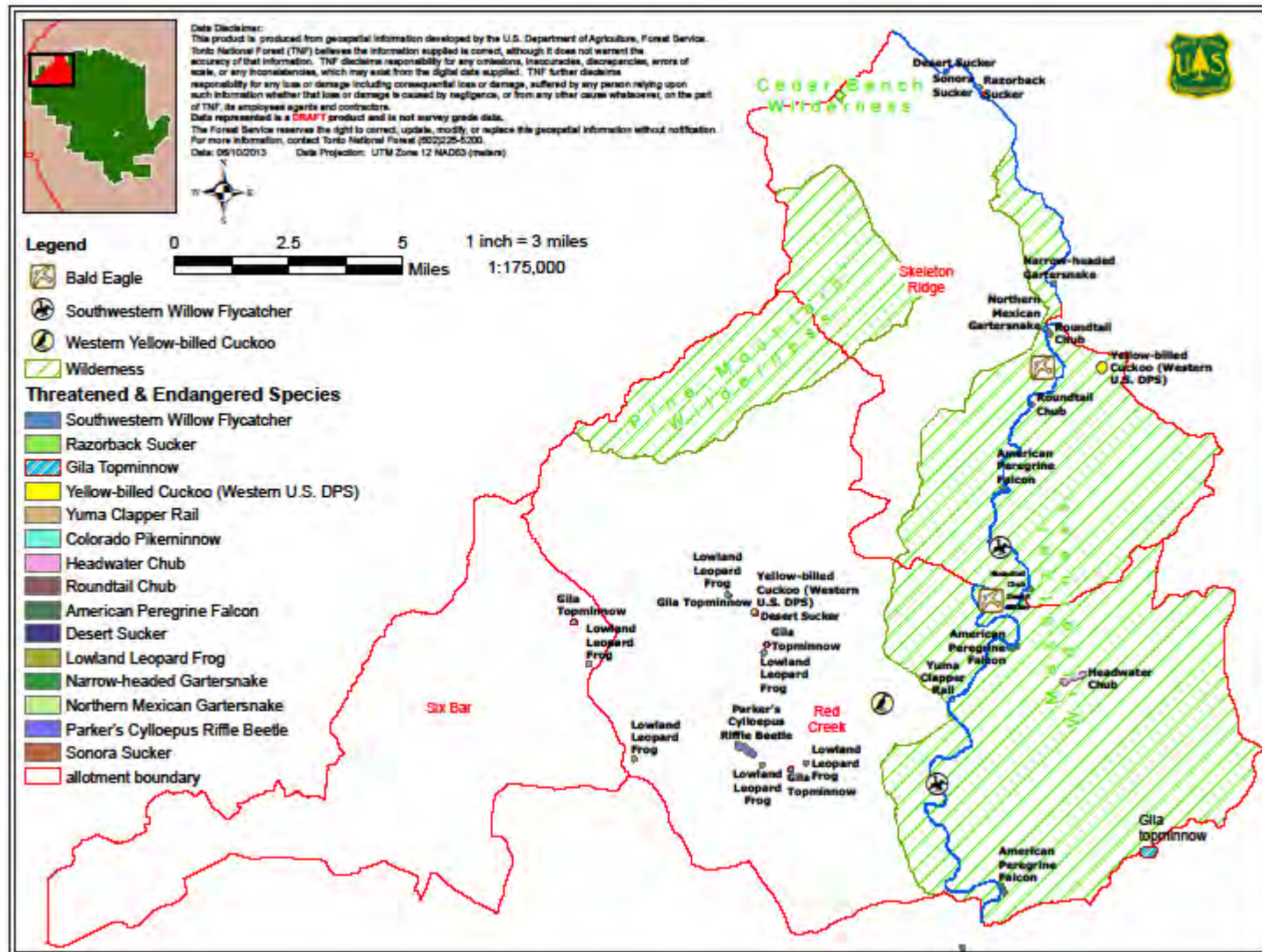


Figure 6a: Wildlife Threatened, Endangered, and Sensitive Species Map

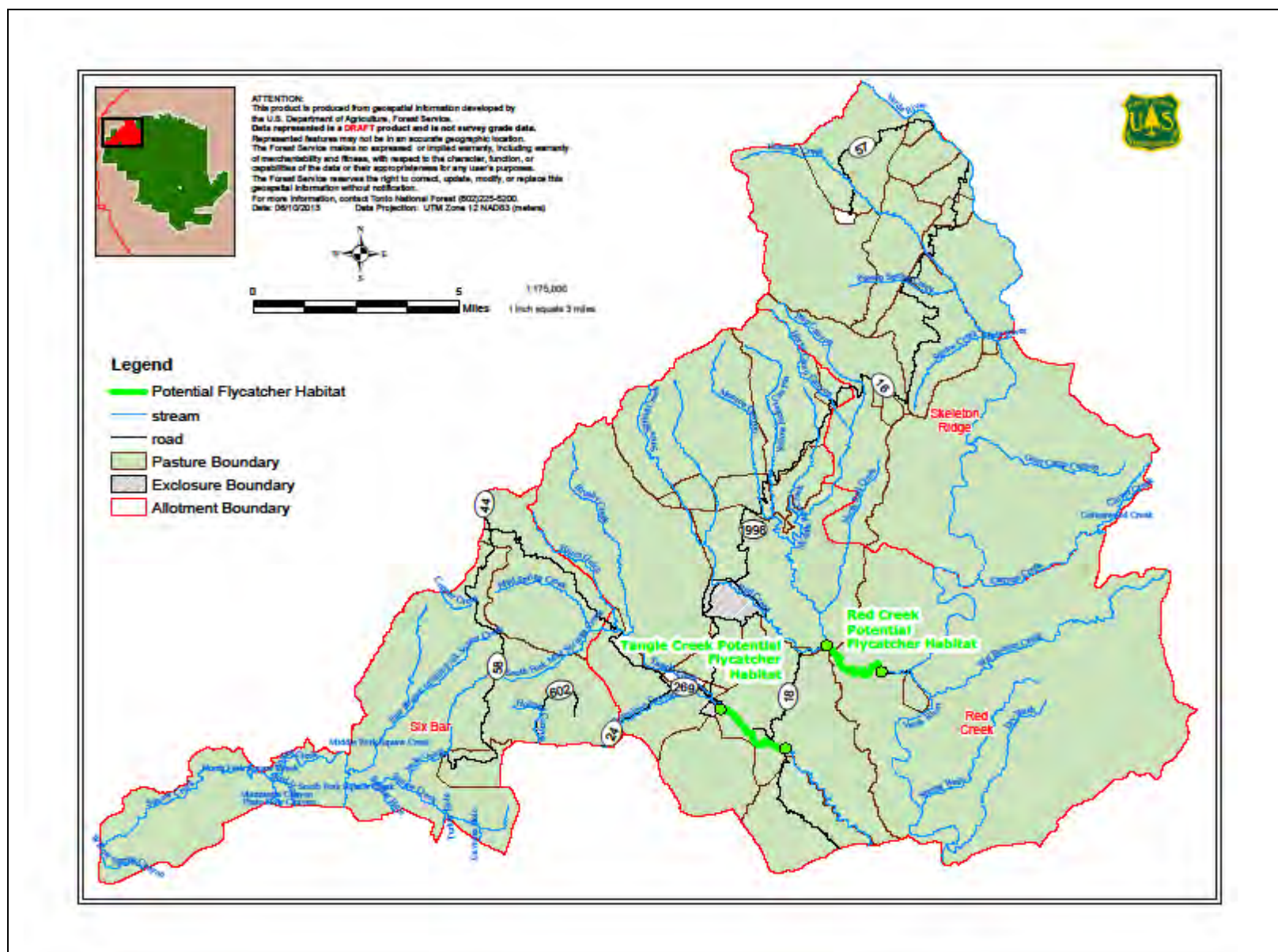


Figure 6b: Wildlife Potential Habitat for Southwestern Willow Flycatcher Map

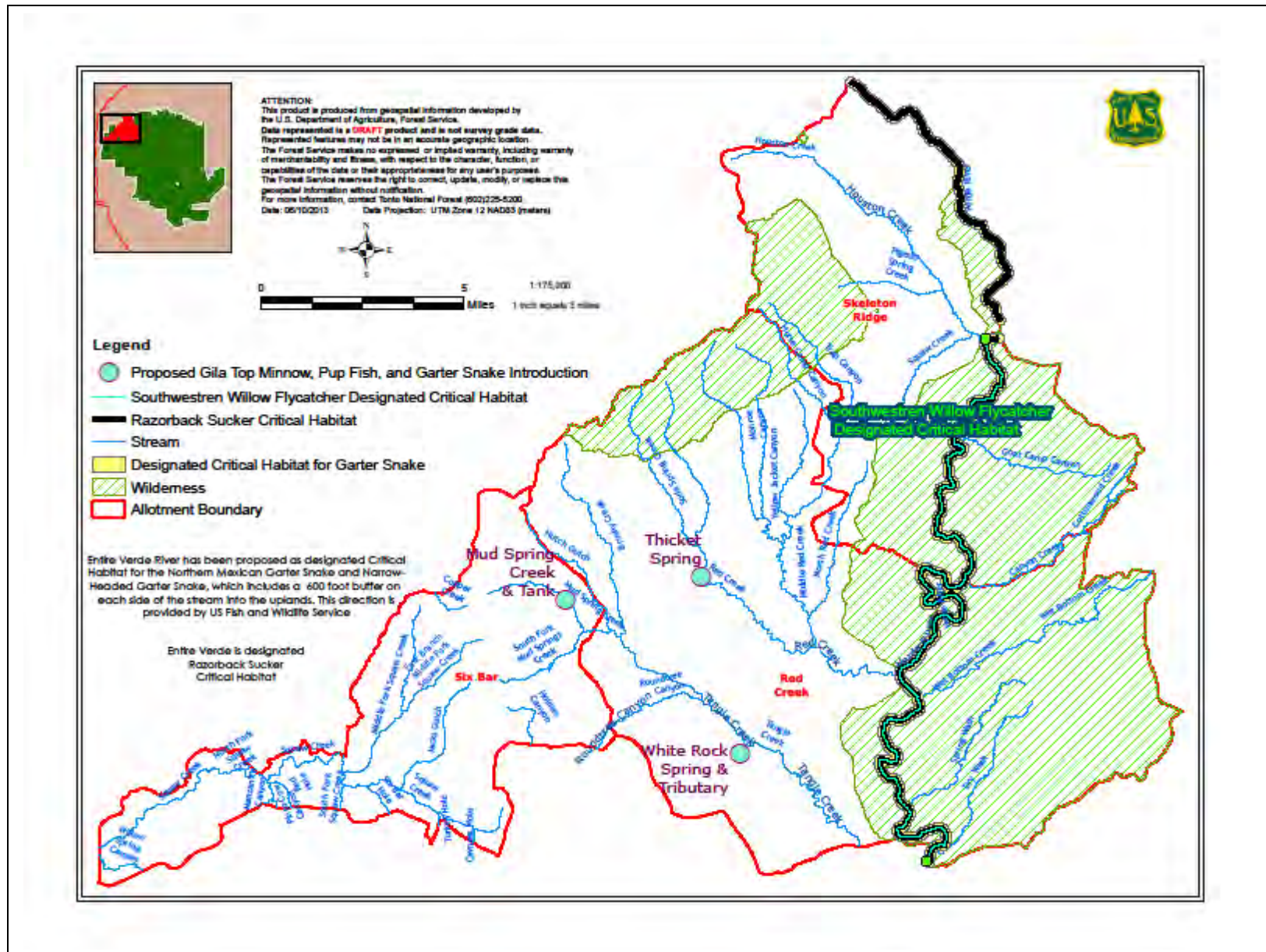


Figure 6c: Wildlife Designated and Proposed Critical Habitat and Proposed Introductions Map

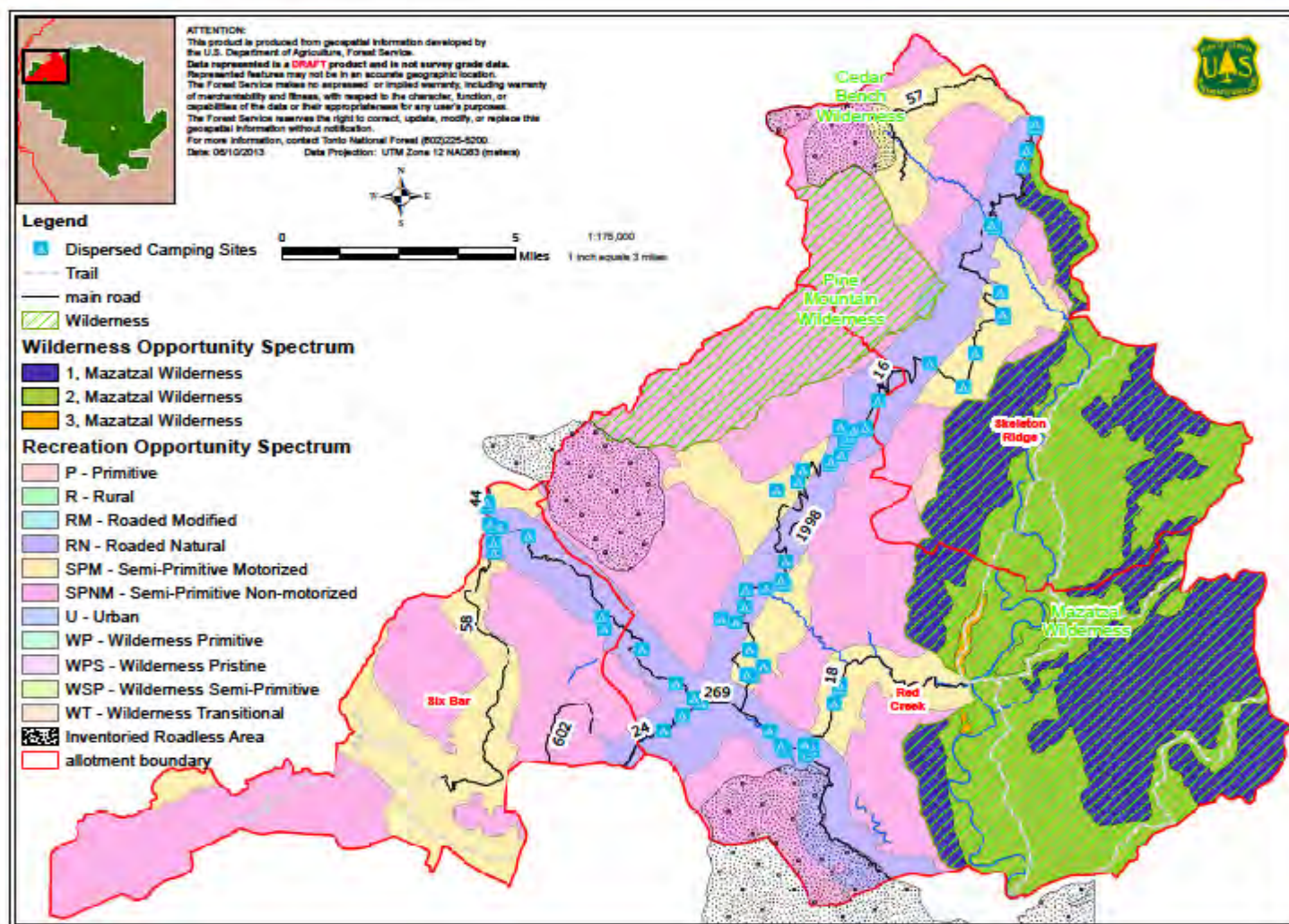


Figure 7: Wilderness and Recreation Map

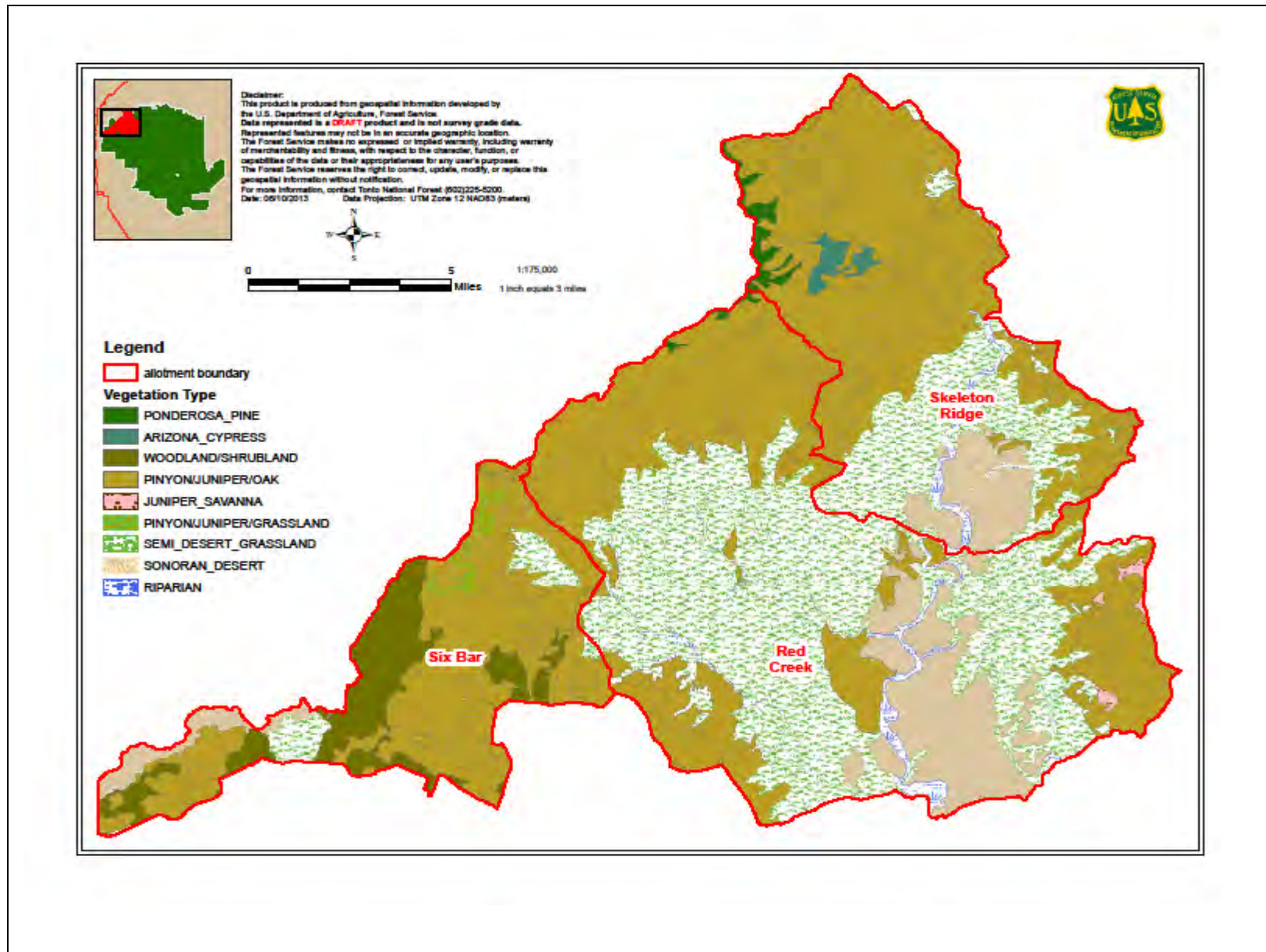


Figure 8: Vegetation Map

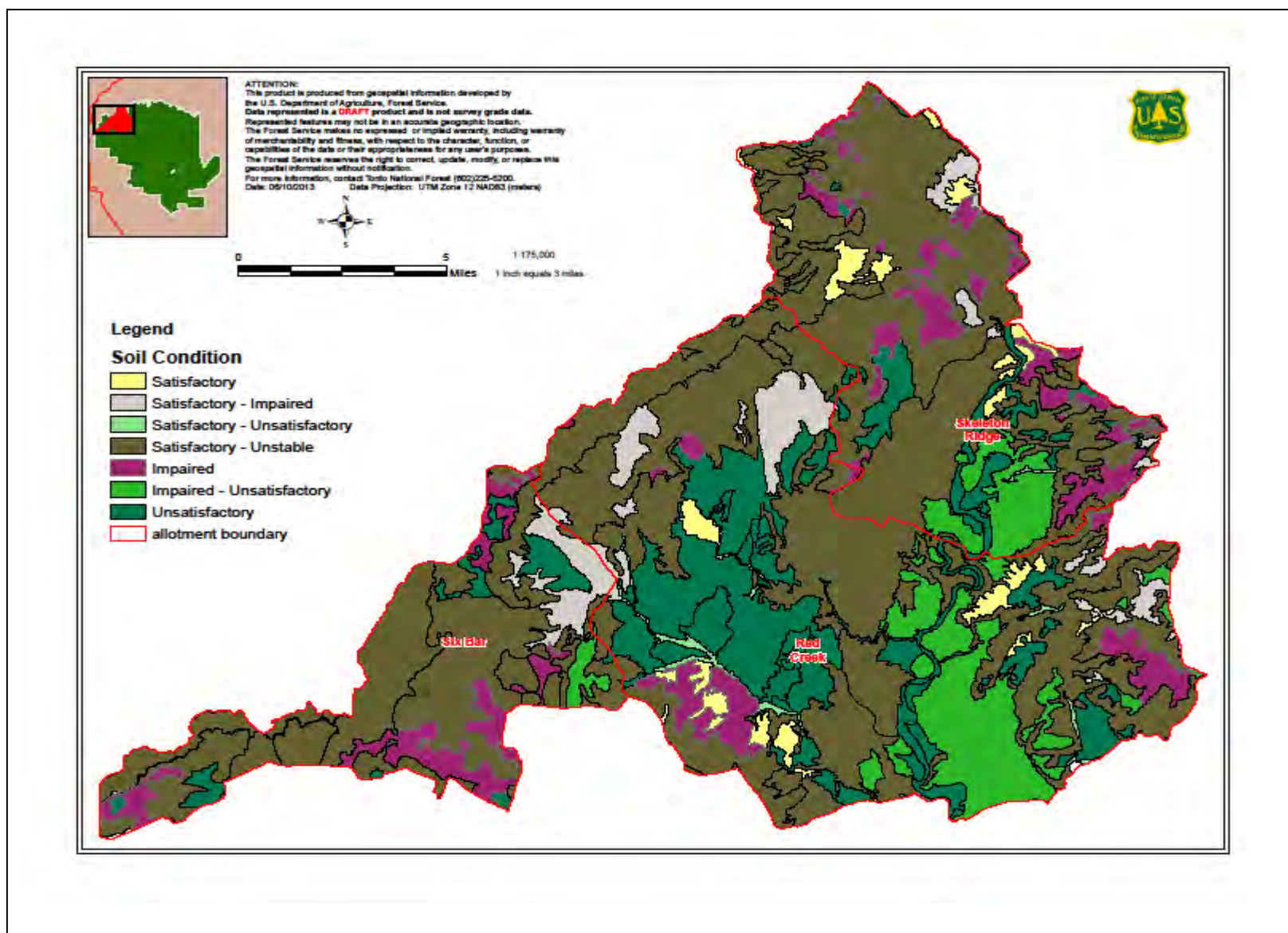


Figure 9: Soils Map

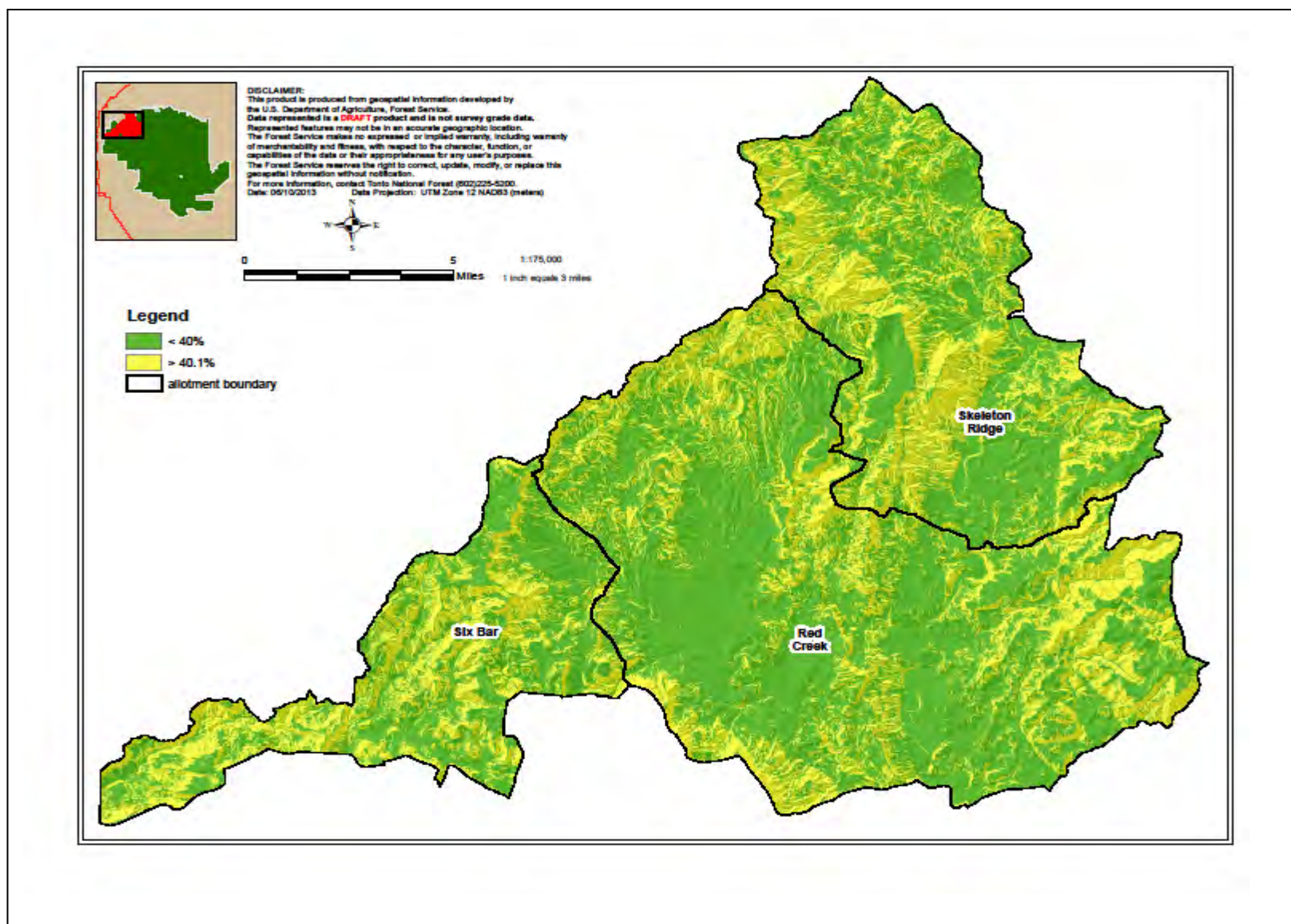


Figure 10: Slope Map

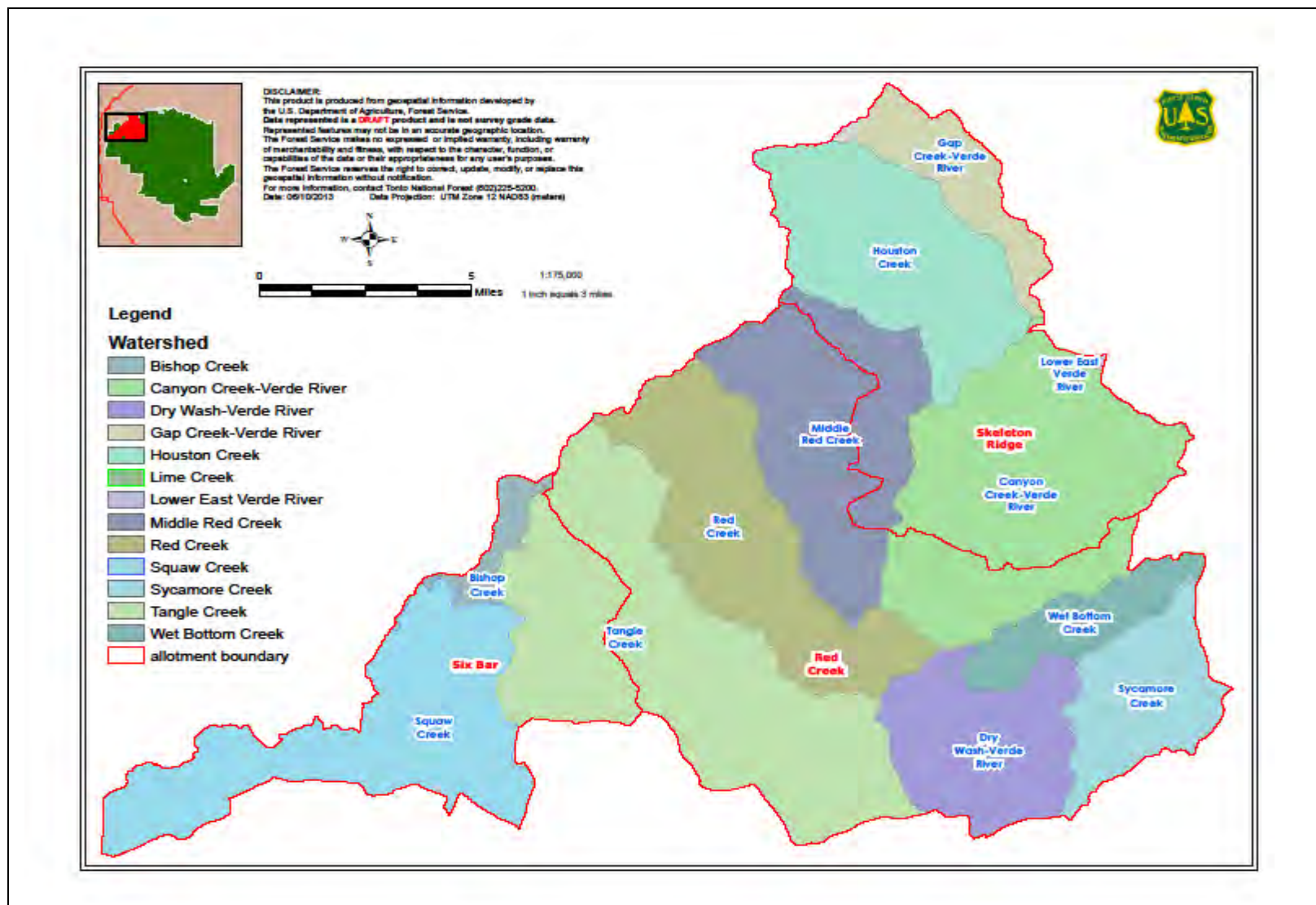


Figure 11: Sixth Code Watersheds Map

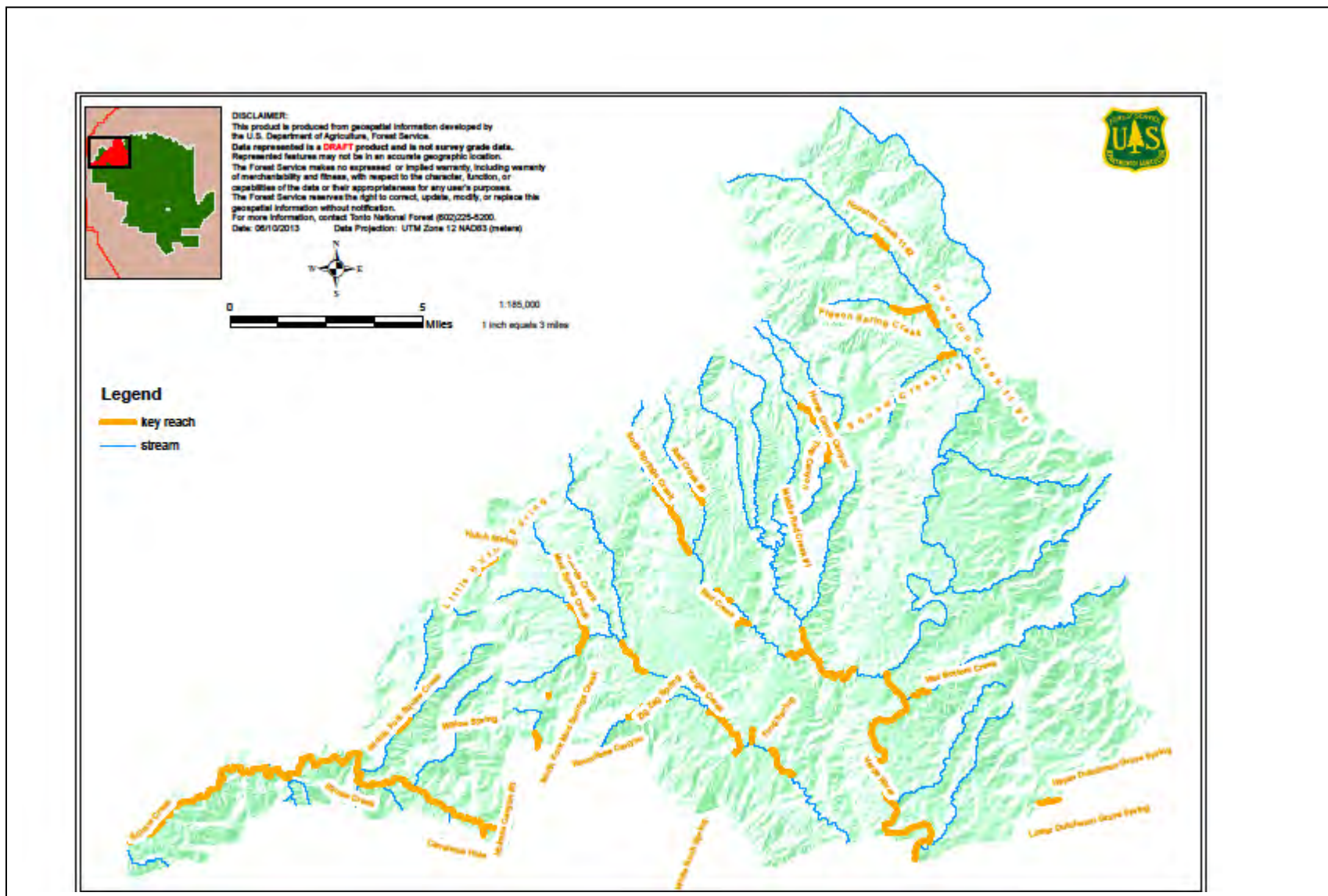


Figure 12: Major Streams Map

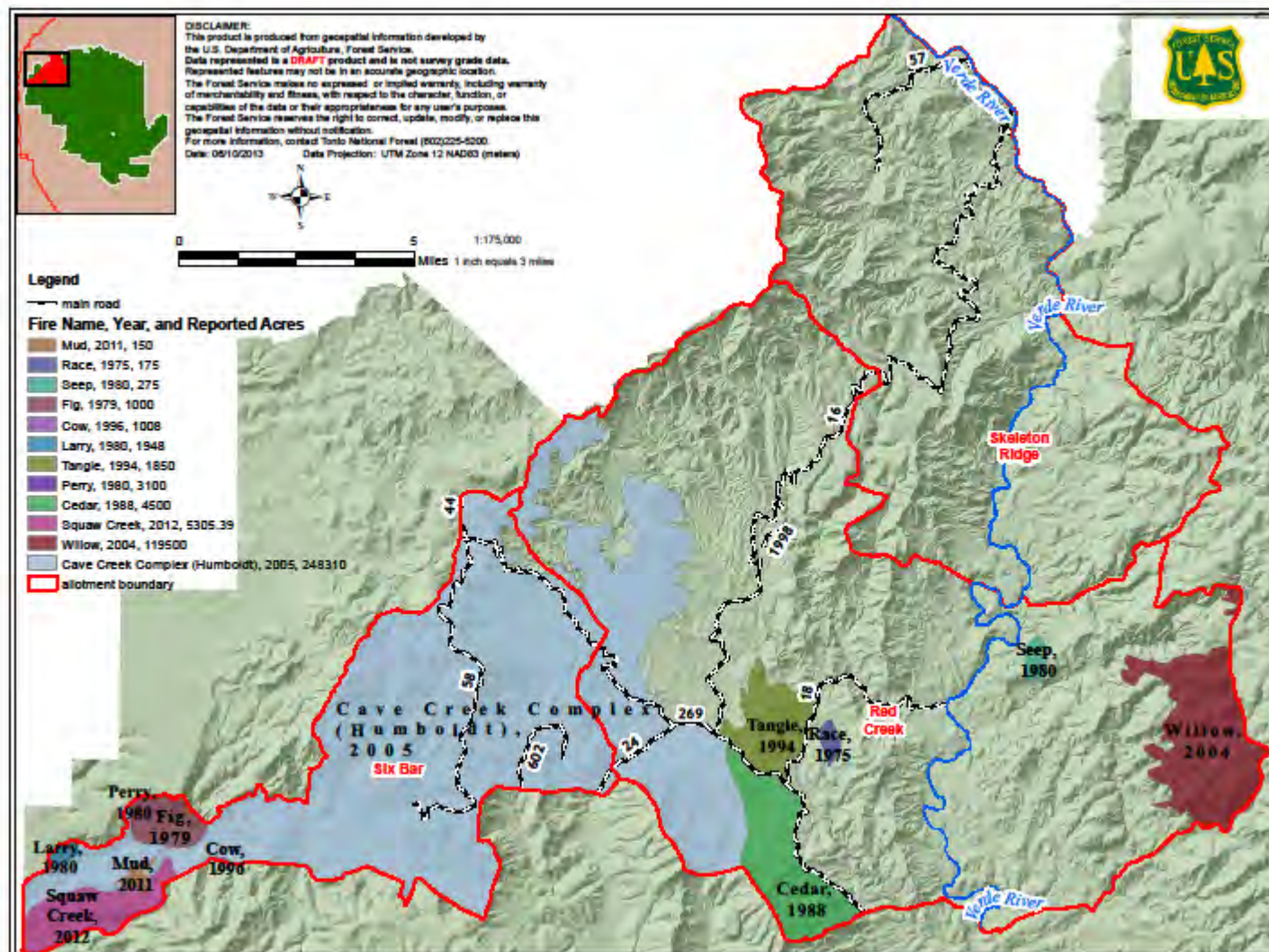


Figure 13: Fire History Map

Appendix B: Vegetation and Soils

Table B1: Red Creek, Skeleton Ridge, and Six Bar allotments map units (sorted by erosion hazard)

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
Private					20.54	
Unknown					32.90	
9	Unsat	0-10	Riparian	---	2,478.05	
15	Sat-Unsat	0-10	Riparian	---	1,073.37	
20	Sat	0-5	Riparian	---	89.58	
Total					3,641.00	2.4%
380	Unsat	0-15	Semidesert Grassland	Slight	11.96	
382	Imp	0-15	Semidesert Grassland	Slight	2.30	
424	Imp	0-15	Woodland/Shrubland	Slight	12.09	
485	Unsat	0-15	Pinyon/Juniper/Grassland	Slight	383.44	
1770	Imp-Unsat	0-40	Sonoran Desert	Slight	12,382.18	
3230	Unsat	0-15	Semidesert Grassland	Slight	304.02	
3306	Unsat	0-15	Semidesert Grassland	Slight	1,441.26	
3333	Unsat	0-15	Pinyon/Juniper/Oak	Slight	124.41	
3520	Unsat	0-15	Pinyon/Juniper/Oak	Slight	1,820.33	
3710	Imp-Unsat	0-15	Juniper Savanna	Slight	369.50	
3760	Unsat	0-15	Semidesert Grassland	Slight	52.97	
4170	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Slight	1.40	
5250	Sat	0-15	Ponderosa Pine	Slight	0.02	
5550	Sat	0-15	Ponderosa Pine	Slight	119.55	
Total					17,025.43	11.4%
416	Sat	15-40	Juniper Savanna	Moderate	28.36	
431	Unsat	0-15	Juniper Savanna	Moderate	643.31	
489	Unsat	0-15	Pinyon/Juniper/Grassland	Moderate	296.31	
1120	Unsat	0-15	Sonoran Desert	Moderate	1,637.07	
3187	Unsat	0-15	Semidesert Grassland	Moderate	619.28	
3231	Sat-Imp	15-40	Pinyon/Juniper/Oak	Moderate	6,847.91	
3730	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Moderate	48.68	
3752	Imp	15-40	Pinyon/Juniper/Oak	Moderate	1,341.54	
3770	Imp	15-40	Pinyon/Juniper/Oak	Moderate	266.22	
Total					11,728.68	7.8%

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
252	Sat-Unsuited	40-80	Sonoran Desert	Severe	1,468.83	
342	Sat-Unsuited	40-80	Semidesert Grassland	Severe	874.55	
353	Imp	0-40	Semidesert Grassland	Severe	34.60	
373	Sat-Unsuited	40-120	Juniper Savanna	Severe	52.97	
407	Imp-Unsat	15-40	Pinyon/Juniper/Oak	Severe	627.27	
429	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Severe	368.34	
430	Sat-Unsuited	40-80	Juniper Savanna	Severe	8,417.26	
432	Imp	15-40	Juniper Savanna	Severe	3,131.53	
435	Imp	15-40	Woodland/Shrubland	Severe	665.31	
436	Sat-Unsuited	40-120	Woodland/Shrubland	Severe	5,130.64	
450	Sat-Unsuited	40-80	Woodland/Shrubland	Severe	940.72	
451	Sat-Unsuited	40-120	Juniper Savanna	Severe	32.20	
3050	Sat	0-15	Semidesert Grassland	Severe	3,058.62	
3124	Unsat	15-40	Semidesert Grassland	Severe	12,783.67	
3339	Sat-Unsuited	40-80	Pinyon/Juniper/Oak	Severe	28,186.16	
3351	Imp	15-40	Pinyon/Juniper/Oak	Severe	96.10	
3371	Imp	0-40	Pinyon/Juniper/Oak	Severe	1,056.50	
3521	Imp	15-40	Pinyon/Juniper/Oak	Severe	6,233.60	
3753	Sat-Unsuited	40-80	Pinyon/Juniper/Oak	Severe	68.87	
3821	Sat-Imp	15-40	Pinyon/Juniper/Oak	Severe	682.70	
4468	Sat	15-40	Arizona Cypress	Severe	710.22	
5075	Sat-Unsuited	15-80	Pinyon/Juniper/Oak	Severe	503.88	
5252	Sat	40-80	Ponderosa Pine	Severe	123.90	
5352	Sat	40-80	Ponderosa Pine	Severe	181.38	
5452	Sat-Unsuited	40-80	Ponderosa Pine	Severe	643.84	
7606	Unsat	0-15	Semidesert Grassland	Severe	1,623.90	

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
9239	Sat-Unsuited	40-120	Semidesert Grassland	Severe	27,315.39	
9349	Sat-Unsuited	40-120	Pinyon/Juniper/Oak	Severe	12,298.44	
9459	Sat-Unsuited	40-120	Pinyon/Juniper/Oak	Severe	140.01	
Total					117,451.40	78.4%

Table B2: Red Creek, Skeleton Ridge, and Six Bar Allotment Map Units sorted by soil condition

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
Private					20.54	
Unknown					32.90	
20	Sat	0-5	Riparian	---	89.58	
3050	Sat	0-15	Semidesert Grassland	Severe	3,058.62	
416	Sat	15-40	Pinyon/Juniper/Oak	Moderate	28.36	
4468	Sat	15-40	Arizona Cypress	Severe	710.22	
5250	Sat	0-15	Ponderosa Pine	Slight	0.02	
5550	Sat	0-15	Ponderosa Pine	Slight	119.55	
Total					4,006.35	2.7%
3231	Sat-Imp	15-40	Pinyon/Juniper/Oak	Moderate	6,847.91	
3821	Sat-Imp	15-40	Pinyon/Juniper/Oak	Severe	682.70	
Total					7,530.61	5.0%
15	Sat-Unsat	0-10	Riparian	---	1,073.37	0.7%
Total					1,073.37	0.7%
353	Imp	0-40	Semi-Desert Grassland	Severe	34.60	
382	Imp	0-15	Semi-Desert Grassland	Slight	2.30	
424	Imp	0-15	Woodland/Shrubland	Slight	12.09	
432	Imp	15-40	Pinyon/Juniper/Oak	Severe	3,131.53	
435	Imp	15-40	Woodland/Shrubland	Severe	665.31	
3351	Imp	15-40	Pinyon/Juniper/Oak	Severe	96.10	
3371	Imp	0-40	Pinyon/Juniper/Oak	Severe	1,056.50	
3521	Imp	15-40	Pinyon/Juniper/Oak	Severe	6,233.60	
3752	Imp	15-40	Pinyon/Juniper/Oak	Moderate	1,341.54	
3770	Imp	15-40	Pinyon/Juniper/Oak	Moderate	266.22	
Total					12,839.79	8.6%
407	Imp-Unsat	15-40	Pinyon/Juniper/Oak	Severe	627.27	

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
429	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Severe	368.34	
1770	Imp-Unsat	0-40	Sonoran Desert	Slight	12,382.18	
3710	Imp-Unsat	0-15	Juniper Savanna	Slight	369.50	
3730	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Moderate	48.68	
4170	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Slight	1.40	
Total					13,797.37	9.2%
9	Unsat	0-10	Riparian	---	2,478.05	
380	Unsat	0-15	Semidesert Grassland	Slight	11.96	
431	Unsat	0-15	Juniper Savanna	Moderate	643.31	
485	Unsat	0-15	Pinyon/Juniper/Grassland	Slight	383.44	
489	Unsat	0-15	Pinyon/Juniper/Grassland	Moderate	296.31	
1120	Unsat	0-15	Sonoran Desert	Moderate	1,637.07	
3124	Unsat	15-40	Semidesert Grassland	Severe	12,783.67	
3187	Unsat	0-15	Semidesert Grassland	Moderate	619.28	
3230	Unsat	0-15	Semidesert Grassland	Slight	304.02	
3306	Unsat	0-15	Semidesert Grassland	Slight	1,441.26	
3333	Unsat	0-15	Pinyon/Juniper/Oak	Slight	124.41	
3520	Unsat	0-15	Pinyon/Juniper/Oak	Slight	1,820.33	
3760	Unsat	0-15	Semidesert Grassland	Slight	52.97	
7606	Unsat	0-15	Semidesert Grassland	Severe	1,623.90	
Total					24,219.98	16.2%
252	Sat-Unsuited	40-80	Sonoran Desert	Severe	1,468.83	
342	Sat-Unsuited	40-80	Semidesert Grassland	Severe	874.55	
373	Sat-Unsuited	40-120	Pinyon/Juniper/Oak	Severe	52.97	
430	Sat-Unsuited	40-80	Pinyon/Juniper/Oak	Severe	8,417.26	
436	Sat-Unsuited	40-120	Woodland/Shrubland	Severe	5,130.64	
450	Sat-Unsuited	40-80	Woodland/Shrubland	Severe	940.72	
451	Sat-Unsuited	40-120	Pinyon/Juniper/Oak	Severe	32.20	
3339	Sat-Unsuited	40-80	Pinyon/Juniper/Oak	Severe	28,186.16	

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
3753	Sat-Unsuited	40-80	Pinyon/Juniper/Oak	Severe	68.87	
5075	Sat-Unsuited	15-80	Pinyon/Juniper/Oak	Severe	503.88	
5252	Sat-Unsuited	40-80	Ponderosa Pine	Severe	123.90	
5352	Sat-Unsuited	40-80	Ponderosa Pine	Severe	181.38	
5452	Sat-Unsuited	40-80	Ponderosa Pine	Severe	643.84	
9239	Sat-Unsuited	40-120	Semidesert Grassland	Severe	27,315.39	
9349	Sat-Unsuited	40-120	Pinyon/Juniper/Oak	Severe	12,298.44	
9459	Sat-Unsuited	40-120	Pinyon/Juniper/Oak	Severe	140.01	
Total					86,379.04	57.6%
Total Acres					149,846	

Table B3: Soil Condition by Pasture

Allotment	Pastures - acres	Satisfactory	Satisfactory - Impaired	Satisfactory - Unsatisfactory	Impaired	Impaired - Unsatisfactory	Unsatisfactory	Satisfactory - Unsited	Total Acres
Red Creek	Cedar	376.0		12.4	1,208.3			1,186.8	2,783.5
	Cedar Push Holding						1,159.6		1,159.6
	Dugan Holding	169.0		50.4			15.7	173.5	408.6
	Horse Camp						71.9	290.1	362.0
	Horse			25.4			148.0	39.6	213.0
	Lower Soda		188.2		37.1		909.2	164.2	1,298.8
	Mustang	362.8	884.1	122.2	60.5	1.4	2,660.1	5,545.6	9,636.7
	North Red Hills					433.2	152.5	1,923.1	2,508.8
	Palo Verde Holding					146.7	85.8		232.5
	Peso	275.1		21.3	0.4	0.6	651.1	1,999.1	2,947.6
	Red Creek	47.1	1.5	43.3	85.0		2,372.0	4,247.6	6,796.5
	Red Hills	810.5	887.8	202.4	1,424.2	8,501.6	4,071.6	12,719.7	28,617.8
	Roundtree	247.1	76.9	197.0	458.0	11.6	889.8	873.8	3,019.4
	Rugged Mesa		68.7				595.4	327.3	991.4
	Soda Springs	93.3	775.7		208.5		122.2	5,251.6	6,451.3
	Tangle Mountain			114.7	240.5	268.8	3,320.0	2,298.4	6,242.4
	Trap			0.1	4.7				4.8
	Yellowjacket	88.1	1,536.0				144.5	1,866.6	3,635.2

Allotment	Pastures - acres	Satisfactory	Satisfactory -Impaired	Satisfactory-Unsatisfactory	Impaired	Impaired-Unsatisfactory	Unsatisfactory	Satisfactory-Unsuited	Total Acres
Skeleton Ridge	Black Ridge		9.7		557.4		96.7	2,056.1	2,719.9
	Cedar Basin Holding		44.5				6.0	52.3	102.8
	Coldwater				373.0		81.7	2,836.7	3,291.4
	Headquarters	73.3					11.7	176.6	261.6
	Hot Springs	129.8	452.8				21.4	125.6	729.6
	Houston Basin		222.8		838.1		5.4	2,104.9	3,171.2
	Lancaster				186.8			241.5	428.3
	Long Mesa Holding						184.9	7.3	192.2
	Long Mesa		9.6		473.4		998.0	3,734.2	5,215.2
	Long Mesa Tank				31.8		38.6	14.2	84.6
	Mud Springs	106.6	70.7		121.8			2,010.9	2,310.0
	Pete's Cabin	499.7	130.6	76.3	2,137.1	3,449.5	2,104.2	8,821.3	17,218.7
	Pipeline	82.2	76.5		135.8		4.1	32.2	330.8
	Powerhouse	2.1	23.3				21.1	865.4	911.9
	West Coldwater	849.6			316.2		25.0	4,838.3	6,029.1
Six Bar	Middle Fork	89.6	864.7		3,018.9	368.3	1,215.7	17,010.1	22,567.3
	Mud Springs		1,822.1		427.3		1,038.2	1,683.9	4,971.5
	Six Bar				399.7			486.6	886.3

Appendix C: Hydrology and Riparian

Table C1: Stream type, condition assessment and/or summary of monitoring notes for stream reaches with field data

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Admin site	Tangle Creek #3	04/14/1997 07/18/1997	F		Cross sections by the admin site for stream restoration. Bank was reinforced, vegetation planted and moved channel away from the bank.
Red Creek	Admin site	Tangle Creek #3	01/05/1992			Cross section established.
Red Creek	Cedar	Tangle Creek Tributary (White Rock Spring)	03/06/2008			Probably only perennial in this short reach because of hill slope springs. The Cave Creek fire of 2005 killed many overstory trees, mostly velvet ash. There were a few deergrass and Juncus species plants above White Rock Spring confluence on the unnamed tributary. There are many dead and down trees from the fire. There were several water developments linked to White Rock Spring. This spring was fenced, but falling trees have compromised it.
Red Creek	Exclosure	Tangle Creek #5	11/21/2002	Bc		Right rebar was gone, so we put a new one on the terrace.
Red Creek	Exclosure	Tangle Creek #5	07/18/1997	Bc	Unstable	Cows present. Fence across creek down. Vegetation and banks are highly impacted. Vegetation was starting to narrow channel, but got eaten.
Red Creek	Exclosure	Tangle Creek #5	01/08/1992	B		
Red Creek	Exclosure	Red Creek #1	01/24/1992	F		
Red Creek	Horse Camp	Horse Camp Canyon #1	08/26/2009	F	Unstable	The main channel is a downcut, dry, cobbly F with no riparian vegetation.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Horse Camp	Horse Camp Canyon #2	08/26/2009	A	Stable	The stream is used by cattle to water immediately below the road for less than 50 feet. Below that, channel narrows and a small waterfall restricts cattle access. A few cattle do trail above the creek on the north to the allotment boundary fence, but use was incidental. Channel is mostly bedrock and supports lush deergrass. The reach is very narrow (< 10 ft.) and supported surface water almost to the fence. The deergrass cover was between 75 to 100 percent in the channel. There was cattail. The trees were mostly seedlings and saplings, indicating a change in management that is allowing trees to establish. The stream was dry in the Long Mesa Pasture, but the deergrass cover was still high. The fence was maintained with many stays. There was one pile of manure in the channel in the Long Mesa Pasture, but no use was visible.
Red Creek	Horse Camp	Horse Camp Canyon Tributary	08/26/2009	B/F	Impaired	Very narrow channel. Mostly bedrock imbedded with gravel. From road to spring, deergrass is intermittently thick with some ash, sycamore, and seep willow. Cows water at the trough, which is right next to the channel, and spots with water. A couple spots with high use on deergrass. Most deergrass is large with light to no use. Below water lot is a short perennial reach with high use and impacts. The water lot is shared by the Yellowjacket Pasture, and Long Mesa Pasture in the Skeleton Ridge Pasture. The water lot includes about 1/4 mile of stream channel. This reach supports an overstory canopy of sycamore, red and Goodding's willow, velvet ash and some Fremont cottonwood.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Mustang	Tangle Creek #6	10/30/2008	B5c	Impaired	Lots of regeneration of cottonwood, willow, some ash. Spotty deergrass, very large, some young. Couple spots with thick rushes. Channel wide and shallow. Has eroding banks on at least one side, still widening. The more confined reaches are probably an F. Sediment consists of sand and gravel with a few cobbles.
Red Creek	Mustang	Tangle Creek #6	02/08/2008			Evidence of the recent rain and high flow events from December 2007 through January 2008 were evident. There is little stream bank or floodplain development. Vegetative cover is low along the greenline/stream bank, providing little protection from erosion during flow events. There are small linear patches of herbaceous vegetation in some areas, comprised of deergrass and Bermuda grass. Although over herbaceous cover is low, the vigor of deergrass plants was high. This reach is perennial because of flow from LX spring. The area supports a broadleaf, deciduous overstory of Fremont cottonwood, Goodding's and red willow, and Arizona sycamore. Most of the trees are old.
Red Creek	Mustang	Tangle Creek #6	07/02/2007			All desirable woody species have been used heavily, the lowest average being 65 percent. Heavy trailing has occurred throughout the bottom of the riparian area. Trampling of seedling willows, ash, and cottonwood trees has occurred. This reach of riparian area has a high potential for recovery. A large number of seedling willows, ash and cottonwood are present as well as deergrass. The group went to an enclosure further downstream on Tangle Creek to observe the effects of wildlife on a riparian area not grazed by cattle. An ocular estimate of use by wildlife on woody species within the enclosure was less than one percent. There was no detectable use on the deergrass within the enclosure.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Mustang	Tangle Creek #6	06/27/2007			All riparian vegetation was leafed out and green. We observed a number of seedling red willows. There were cottonwoods roughly seven feet tall that were heavily utilized. It appeared that livestock were leaning the trees over to graze the tops of these trees. American bulrush was grazed to eight inches. We did not measure stream bank alteration due to a lack of definable features and significant trampling by livestock.
Red Creek	Mustang	Tangle Creek #6	08/23/2004			Livestock still in pasture. Very little surface water is present. A few lowland leopard frogs and fish were observed below the reach. Use levels appear similar to previous visit.
Red Creek	Mustang	Tangle Creek #6	08/05/2004	F		Very little surface water present. Recent livestock sign observed. No stream bank or greenline features present to measure. Low species diversity of riparian vegetation. Dominant woody plant species is <i>Baccharis salicifolia</i> . A trace amount of salt cedar present. Reach is paralleled by abandon floodplains with mature riparian trees and an understory of juniper. There was surface flow below the small dam - and tadpoles and small fish. Bulrush and deergrass were present. Use on deergrass was high.
Red Creek	Mustang	Tangle Creek #6	07/05/2001			Vegetative diversity low. Few deergrass plants or palatable seedlings present. Overstory canopy of sycamore, cottonwood, ash, willow - but no seedlings, few of intermediate size. Mostly seep willow. Large amounts of sediment. Poorly defined fluvial features. Recent rains may have washed away evidence of bank alteration. Some terraces displayed use. Site has high potential for recovery. No woodies to measure. Manager said he worked to keep cows out of area.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Mustang	Tangle Creek #6	09/09/1999			Recent heavy flooding has covered most deergrass plants in debris and has lain down and stripped 60 percent of cottonwood, willow and ash seedlings. Both woody and herbaceous plants that are visible and not water damaged show no signs of use in the last year. At LX Spring: high cover of seep willow in channel and greater density of ash and cottonwood 6 to 15 ft. tall. Stream banks more discernible. Cattle tracks trailing in streambed throughout entire reach. Moderate bank alteration taking place. Three leopard frogs seen at spring.
Red Creek	Mustang	Tangle Creek #6	09/01/1998	F3	Unstable	Some deer grass with high use about 4 inches high. All point bars trampled. Large cut banks contributing sediment to the creek.
Red Creek	Mustang	Tangle Creek #6	07/21/1998			Limited amount of young palatable species available. Most vegetation has high utilization, including less palatable vegetation. Recruitment on palatable woody species is low. Stream channel is wide and shallow.
Red Creek	Mustang	Red Creek Tributary (Dog Spring)	01/21/2009	B		There is quite a lot of deergrass by the spring and down about 400 feet. This section also contains mostly soil banks and floodplains. We estimated use to be about 20 percent or less on the deergrass. The channel and all soil banks were highly impacted by trampling. There were fresh cow hoof prints. Moving downstream, the channel and floodplain became mostly bedrock in the steep sections with small, flat sections of soil in between. The flat areas supported willow and cottonwood with high use.
Red Creek	Mustang	Brushy Creek	07/5/2001	F4	Unstable	Brushy has downcut in the past, maybe early 80s, and is continuing to headcut and cut laterally.
Red Creek	Mustang	Brushy Creek	09/1/1998	F4	Unstable	Stream has downcut historically and is continuing to headcut and widen. Channel needs to widen to form new floodplain.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	No grazing	Red Creek #4	01/11/2006			Deergrass use is low; however, other herbaceous components such as horsetail, sedge, and an unknown grass (likely rabbit's foot) show signs of moderate to high use. Stream banks were measured and do contain moderate to high amounts of fine materials varying throughout the reach. Bank building is apparent throughout. The channel bottom is mostly sand to gravel size sediment. Trailing was observed along the channel. Most obligate woody species range between sapling and medium sized dbh. Juniper and other upland species were observed along the floodplains. Monkey flower is quite common along banks and most herbaceous plants were small and recently emerging. OHV tracks were observed within the drainage as well as recreational use near the road. Spikedace and one lowland leopard frog were observed. Horse tracks were present throughout the reach possibly indicating that the livestock may have been removed from the pasture.
Red Creek	No grazing	Red Creek #4	07/22/2002			Livestock were observed in Red Creek between 16 and 16A road. Water is present with an active channel width of about 10 to 40 feet wide that is braided within an almost exclusively sandy substrate. Deergrass regrowth is minimal - we were often measuring 10 to 15 blades to determine average stubble on this year's growth. Floodplains show high use and contain many large to very large obligate species. Very low recruitment of woody obligates, only a few ash observed.
Red Creek	No grazing	Red Creek #4	01/27/1999	F4	Impaired	Almost no herbaceous. Few deergrass plants. Woody roots exposed. No regeneration. Browsing high on all sprouts from mature trees, old floodplain eroding with high flows, some large deer grass.
Red Creek	No grazing	Red Creek Tributary (Zig Zag Spring) #2	01/27/1999	F	Impaired	Many headcuts. Multiple channels at low flow. Dam upstream is filled in.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	No grazing	Red Creek Tributary (Zig Zag Spring) #1	01/27/1999	A1	Stable	Lower reach dominated by bedrock and dense deergrass, ash, willow, sycamore older age classes. Channel head cutting.
Red Creek	Peso	Tangle Creek #10	07/26/2007			The creek was flowing due to rain the day before. No cows were seen in the riparian area during this visit. Frogs, beetles, and small fish were present in the stream channel. Approximately 20, two-inch Freemont cottonwood seedlings were noted in this reach of the stream channel.
Red Creek	Peso	Tangle Creek #10	07/19/2007			There appeared to be more cattle in the area due to more trailing. Seep willow was present where deergrass was less abundant. The majority of woodies were mature and out of the reach of livestock. Stream bank alteration was not monitored. Frogs and small fish were present in the areas with surface water. American bulrush was grazed to 10 inches. Freemont cottonwood seedlings were noted in the stream channel.
Red Creek	Peso	Tangle Creek #9	07/26/2007			The creek was flowing due to rain the day before. Debris in the trees suggested a bank full event. No cows were seen in the riparian area during this visit.
Red Creek	Peso	Tangle Creek #9	07/19/2007			The active channel is wide; however, mature deergrass and riparian trees line either side of the channel forming stabilized banks. Stream bank alteration was not measured. There were a small number of salt cedars present as well as a trace of seep willow. Other plant species included cottonwoods, red willow, Goodding's willow, American bulrush, deergrass, and velvet ash. Seedling velvet ash and willows were present in the stream bed. Livestock have been trailing up and down Tangle Creek because there were hoof prints and cow feces present in the riparian area.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Peso	Tangle Creek #9	05/22/2003			Livestock sign throughout, i.e., hoof prints, pies, and trailing. Emergents show high use. Most of the deergrass plants show use. Many seedling ash and red willow were observed throughout; use on ash was very low.
Red Creek	Peso	Tangle Creek #9	05/07/2003			Cattle trampling high in base flow channel sediment. Scirpus grows throughout active channel and mature deergrass plants line the wetted zone. Grazing on both of these species is low to moderate.
Red Creek	Peso	Tangle Creek #9	05/01/2003			Channel is lined with dense stands of common reed grass. Other species include: sections of dense bulrush and deergrass, watercress, monkey flower, Bermuda grass, red brome, wild oats, seep willow, burro brush, sycamore, AZ ash, cottonwood, Goodding's willow, and a variety of annual forbs. No utilization was observed throughout our walk up this drainage.
Red Creek	Peso	Tangle Creek #9	04/15/2003			Ungrazed Scirpus plants were approximately 5 to 7 inches tall - grazing resulted in 2 to 3 inches stubble height on some individuals. Trampling was notable in the active channel and along the greenline feature, as over 80 percent of the sampled reach was alterable substrate. Thirty percent of stream bank alteration was attributed to livestock use. Obligate riparian trees are well represented - Arizona ash, Fremont cottonwood, Goodding's willow, and red willow were growing in the active channel, along the greenline, and on abandoned floodplain.
Red Creek	Red Creek	Red Creek #2	08/07/1998	F4	Unstable	Road runs in and out of channel causing excessive sediment. Channel is downcut and contains an extreme amount of sediment. Floodplains support mostly Bermuda and could support a lush riparian community. Some deergrass. Channel has downcut to bedrock in many places. Cobbles are embedded with sand and gravel.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Red Hills	Wet Bottom Creek	04/24/2001	F		
Red Creek	Red Hills	Wet Bottom Creek	06/10/1998			Some use (trailing, feces) appears to be about 2 to 4 weeks old. Current year's growth 20 to 40 percent on deergrass and willow. Stream bank alteration 20 to 40 percent. Downstream area is heavier used and downcut. Upstream area is cobble.
Red Creek	Red Hills	Verde River #2	04/29/1998		Unstable	Alterable bank was 30 to 35 percent. There were a lot of lower banks that were eroded down and the river had cut behind them in some spots. These lower banks were vegetated with Bermuda and consisted of sand with a few cobbles.
Red Creek	Red Hills	Verde River #5	04/29/1998			Beaver present. Deergrass had no use last year.
Red Creek	Red Hills	Verde River #6	04/29/1998			Beaver utilization, river left. 1997 use seen.
Red Creek	Red Hills	Verde River #7	04/29/1998			Tamarisk being used. All cottonwoods are hedged to less than 3 feet tall. Phragmites heavily grazed. River left.
Red Creek	Red Hills	Verde River #8	04/29/1998			River left. Minor beaver use. There are no apparent impacts (washed away). The bank is now a ridge and the river has cut behind it. A few small trees on it showed high use. Herbaceous cover is Bermuda grass. This reach has been impacted for so long the bank is disappearing and the large trees are falling in.
Red Creek	Red Hills	Red Creek #3	9/2/1998	C4	Impaired	Upper banks are fairly flat but eroding and support mostly Bermuda and seep willow. Good potential for recovery. Channel is full of sediment from road. Mostly Bermuda, Scirpus, thin green line.
Red Creek	Red Hills	Sycamore Creek 11 Tributary (Upper Dutchman Grave Spring)	9/24/1998			Mushrooms have dried up, but there is still the same amount of water in the reach. Leopard frogs are present. Use on deergrass was heavier towards eastern half of reach. However, none of the use appears recent. No recent signs of cattle.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Red Hills	Sycamore Creek 11 Tributary (Upper Dutchman Grave Spring)	09/09/1998			Mushrooms present. Leopard frogs present.
Red Creek	Red Hills	Sycamore Creek 11 Tributary (Upper Dutchman Grave Spring)	08/27/1998			Cattle are present in reach. Majority of use was noted on deergrass, some use on willow and cottonwood.
Red Creek	Red Hills	Sycamore Creek 11 Tributary (Lower Dutchman Grave Spring)	09/08/1998	B		No use from this year or recent years. Robust deergrass. Bedrock/boulder dominated channel. B type, downcut, gallery forest.
Red Creek	Roundtree	Roundtree Canyon #2	01/22/1992			No observable features.
Red Creek	Roundtree	Roundtree Canyon #3	05/17/2007			By moving cattle when the trigger point was met, utilization in Roundtree was only 36 percent. There is no fresh sign of livestock. There is recruitment of velvet ash and deergrass.
Red Creek	Roundtree	Roundtree Canyon #3	04/02/2007			Fremont cottonwood and red willow had leafed out, sycamore was just beginning. Deergrass along the greenline and floodplain was trapping sand, gravel, and silt. Young deergrass plants are becoming established away from the channel on the floodplain. American bulrush an emergent, was grazed to ~ 4 inch stubble height (ocular). Some trailing by livestock was observed within the riparian area. This reach has moderate to high potential for recovery.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Roundtree	Roundtree Canyon #3	06/08/2004	B3	Impaired	Sediment is cobble and silt. Banks are chronically trampled soil with some deergrass. High potential. This stream is the primary water source for this pasture. Recent livestock use is evident and trampling in the bottom is high. Recruitment of ash and deergrass is low. Most of the ash trees are three to five years old; historical use has kept them under four feet in height. Their growth form is more shrublike than treelike, due to repeated hedging. A permanent stream channel cross section was established. Dispersed recreation is high particularly near the end point of the transect. Use on new growth of willows occasionally exceeds six feet in height.
Red Creek	Roundtree	Roundtree Canyon #3	11/09/2001			Cattle sign noted throughout reach. Bank alteration not measured because of high bedrock, boulder content. High recreation used observed throughout reach.
Red Creek	Roundtree	Roundtree Canyon #3	04/03/2000			Very high recruitment of ash in upper portion of reach, seep willow in lower portion of reach. Ash, sycamore, red willow, Juncus, and Carex. Cattle trails located on either side of stream through reach. Deergrass is plentiful through entire area. Use increased towards the end of reach. Many plants appeared to have been heavily browsed in the past, but not during the current season.
Red Creek	Tangle Mountain	Tangle Creek #4	11/21/2002			Some Deer grass along banks, some young sycamore and seep willow. TRIMM was repeated on this date. The right rebar was gone so we put in a new one. The orange spot was still on the boulder (BM). There was no BF feature.
Red Creek	Tangle Mountain	Tangle Creek #4	07/18/1997	C	Unstable	No bank full indicators.
Red Creek	Tangle Mountain	Tangle Creek #4	01/08/1992	C		

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Tangle Mountain	Tangle Creek #7	05/22/2003			Livestock sign throughout. Water has receded a little since last site visit. Small fish, tadpoles, and brown headed cowbirds observed along reach. ATV road noted crossing channel toward end of reach, leads into well used terrace. Obligate tree species have fully leafed out. Some deergrass plants remain ungrazed as well as a few seedling ash along reach. Many red willow show moderate to high use.
Red Creek	Tangle Mountain	Tangle Creek #7	05/07/2003			Cattle impacts notably higher than previous site visit. Trampling clearly caused by cattle in baseflow channel and bank sediment. Deergrass, bulrush and rabbit's foot grass were grazed throughout transect length. Streambank alteration clear in and around Scirpus. Scirpus grazed to an average height of 5.5 inches, ungrazed average height is 27 inches. Streambank alteration by livestock has increased. Red willow and Goodding's willow leaders are moderately browsed, heavy use on terminal and branching leaders noted at cattle crossings - two crossings within transect. Small fish and one leopard frog observed.
Red Creek	Tangle Mountain	Tangle Creek #7	04/15/2003			Deergrass recruitment throughout reach, utilization evaluated on both young and mature plants. Utilization showed minimal use. Use on Juncus evident but minimal. Sign of livestock throughout reach - more trampling than previous sampling period. Ash, Goodding's, and red willows present in multiple age/size classes. Recruitment of ash, red and Goodding's willow observed along banks. Juncus species vegetating point bars and growing in the water. ATVs using active channel as travel corridor - impacts most evident at one crossing toward end of reach.
Red Creek	Tangle Mountain	Tangle Creek #7	04/04/2003			Ranch managers invited, could not attend.
Red Creek	Tangle Mountain	Tangle Creek #7	03/07/2003			Photo in file.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Tangle Mountain	Tangle Creek #7	04/22/2002			Moderate recruitment of obligate spp. including sycamore, willow, ash, and cottonwood. Browse is moderate on woody spp. - 27.4 percent. Utilization on deergrass throughout the reach is relatively light - 12 percent. Large ash and sycamore present on secondary floodplain. Alterable banks have been heavily impacted by livestock.
Red Creek	Tangle Mountain	Tangle Creek #8	05/14/2003			Livestock observed (6 to 7) in reach. Some recreational use (ATV) within reach along stream bank. Pole to very large obligate species within floodplains. Ash and red willow seedlings observed throughout.
Red Creek	Tangle Mountain	Tangle Creek #8	04/23/2003			Evidence of use by livestock absent from this key reach. New growth observed on deergrass and seedling trees. Large and very large trees supported including: red willow, sycamore, cottonwood, and ash. Deergrass cover low in this section, less than one percent. No emergents observed throughout reach. Channel is comprised primarily of sand and gravel size sediment.
Red Creek	Tangle Mountain	Tangle Creek #8	04/22/2002			Some trailing occurring. Large to very large ash, sycamore, red willow, and cottonwood trees are present on secondary floodplain. High recruitment of seedling ash was noted throughout reach.
Red Creek	Tangle Mountain	Tangle Creek #8	11/09/2001			Fencing down. Cattle sign was observed throughout reach. Recreational use (ATVs) was noted within and in close proximity to Tangle Creek. Did not measure bank alteration - too much variability along greenline and bank features. Fair numbers of lowland leopard frogs were observed throughout reach.
Red Creek	Tangle Mountain	Tangle Creek #8	07/03/2000			Vegetation use within guidelines. High bank alteration by wildlife.
Red Creek	Tangle Mountain	Tangle Creek #8	02/04/1999			Repeat of 1992 TRIMM survey. Sycamore/ash community.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Tangle Mountain	Tangle Creek #8	06/22/1992			Ash/sycamore community.
Red Creek	Tangle Mountain	Tangle Creek #8	01/05/1992			Cross section established.
Red Creek	Tangle Mountain	Tangle Creek #11	05/14/2003			Eroded banks are fairly common throughout. Livestock trailing along active part of the channel, increases from about the first one third of transect to its end. Livestock sign throughout. Use on palatable woody species has increased since previous site visit. Recruitment of ash was higher than that of other obligate species present.
Red Creek	Tangle Mountain	Tangle Creek #11	04/23/2003			Light use. Old livestock sign present in addition to deer and javelina sign. Fish were present in creek. Observed cut banks with exposed roots in transect. Large to very large ash, red willow, cottonwood, and sycamore on floodplains. Observed recruitment of seedling ash, cottonwood, and willow.
Red Creek	Tangle Mountain	Tangle Creek #11	04/04/2003			Light use.
Red Creek	Tangle Mountain	Tangle Creek #11	04/22/2002			Fish were present in creek. Larger ash, red willow, cottonwood, and sycamore on secondary floodplains. Observed high recruitment of ash, cottonwood, and willow. Trace of salt cedar noted.
Red Creek	Tangle Mountain	Tangle Creek #11	07/05/2000			Heavy flood debris and damage. Cattle in stream channel, permittee moving cattle through and across channel.
Red Creek	Tangle Mountain	Tangle Creek #11	11/19/1998			No use found. Sycamore, cottonwood, ash, almost all age/size classes present in trace or 1 to 5 percent amounts. Seedling, sapling, pole size willows were present.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Tangle Mountain	Tangle Creek Tributary (Frog Spring)	03/06/2008			This small channel lies in a narrow valley bottom less than 20 feet wide. It is an extremely rare riparian area on the Tonto NF, bordering on being a wetland. There are only a few small riparian trees, willow. Most of the vegetation is herbaceous and includes a blanket of Bermuda grass, deergrass and small patches of American bulrush. These species are holding a deep layer of fine sediments, mostly sand and small gravel.
Red Creek	Upper Soda	Red Creek #5	09/03/2010			We hiked up from the FR 39 crossing. Most of the way it was a wide, cobbly, dry F. There is a trough on the slope just above the water gap fence in East Soda that is fed by Red Creek Spring. Before we got to the spring, the valley narrowed to about 30 to 40 feet. Just below the spring, the channel had downcut a couple feet, probably from the January flows. The floodplain was covered with thick, tall Bermuda grass. Bedrock on the other bank. There was water in the channel and seeps all along the base of the valley wall. There was a patch of seep willow and one deergrass. This spot has high potential. The whole floodplain should be covered with deergrass and maybe some woody species, though there seems to be a limited seed source at this point. There is nothing to monitor. This spring area needs rest. Water is being piped downstream to two troughs. We discussed fencing out the spring area when we do NEPA.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Upper Soda	Red Creek #5	04/24/2009	Bc		We walked into the western edge of Red Creek at the far eastern end of the West Soda Pasture to look at the two metal troughs fed by Red Creek Spring. We talked about management options for West Soda and Soda Springs Creek. Toad told me he only used this pasture every other year. I told him that I did not know how he could use this pasture, especially in the summer, and not have unacceptable impacts to the Soda Springs Creek riparian area. There is an unmaintained fence on the west slope of Soda Springs Creek that might provide some management options.
Red Creek	Upper Soda	Red Creek #5	09/08/2004			The Lower Red Creek Spring tank is dry and the source must be Red Creek Spring located one-half mile upstream. The fence between Red Creek and Lower Soda pastures is blown out in the Red Creek channel. Observed light, recent use.
Red Creek	Upper Soda/Lower Soda	Soda Spring Creek	09/03/2010	F		There were some big flows in January 2010 which presumably washed out much vegetation and impacted banks. We walked the creek above the road for about 1/8 mile. It is a wide, dry, cobbly F with no riparian vegetation except old, remnant sycamores. Below the road about 1/4 mile is a short wet reach with seedlings and deergrass. The seedlings are growing along the water's edge, which is about three feet across. There is no defined channel. Deergrass increases downstream. This reach is severely degraded and this spot is just beginning to recover. This is a large pasture that is poorly watered. These riparian areas that contain water will be impacted quickly.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Upper Soda/Lower Soda	Soda Spring Creek	06/24/2009			There is a well-used cattle trail that leads north from the tank and contours down in Soda Springs Creek. There is no use downstream because of constrictive bedrock that limits passage. Cattle concentrate use upstream of the trail in the perennial reach. Cattle concentrate in the channel and lower valley side slopes under the tall broadleaf deciduous riparian forest of velvet ash, sycamore, willows, Fremont cottonwood, and walnut, and the adjacent mesquite bosque that also supports juniper and pinyon pine. There are very few understory plants because of the concentrated use the riparian area is receiving. The channel is downcut. Bare dirt dominates all the fluvial surfaces. The channel is trampled and cattle feces are common in the water. There was very little to no use in the upstream, intermittent reach.
Red Creek	Upper Soda/Lower Soda	Soda Spring Creek	01/09/2007			Livestock sign was observed throughout the reach. Water was present throughout the reach with exception of the last few transects. Trailing was observed along the stream. Regrowth was observed on the few seedling and sapling size palatable woody species present. Most obligate tree species had dropped their leaves. Ash was the most common tree within the reach. Low recruitment of woody species was observed. The majority of deergrass plants were mature. Deergrass was partially green with a low to moderate number of plants containing maturing seed heads. Stream bank formation was observed intermittently along the channel. Very small portions were covered by deergrass, aiding in the apparent protection and stability of the bank.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Red Creek	Upper Soda/Lower Soda	Soda Spring Creek	09/08/2004	F		We observed recent cattle sign (manure and tracks) in Lower Soda, Soda Springs and Mustang pastures and cattle in the Red Creek Pasture. The only source of water we observed was in Soda Spring Creek. The stream channel is a bimodal Rosgen F. Dominant trees are ash and sycamore. There are some Fremont cottonwood and Goodding's willow. Seep willow is common, as are desert broom and Squaw waterweed. American bulrush, deergrass, equisetum and some rushes are present where there is water. There are many facultative plants in the riparian area.
Six Bar	Middle Fork	Holmes Canyon #3	05/02/2002	F5		Channel is an F5, and widening because of flood disturbance and traveling. Deergrass holds the sandy floodplain in place. Trailing by livestock was observed along the floodplain. Recent sign of livestock and heavy utilization in the uplands was noted throughout the pasture, from the allotment boundary with Blackjack to 0.25 mi. north of Willow Springs in Holmes Canyon. All of the deergrass plants in the channel had been grazed to an average stubble height of 2.3 inches. The plants were also pedestaled.
Six Bar	Middle Fork	Caveness Hole	04/25/2002	B1/B3	Stable	Channel is full of ungrazed deergrass. Small floodplain. Some water in pools with moss and algae.
Six Bar	Middle Fork	Jacks Gulch #1	06/28/1993	B3		Some parts of channel braided, but the dominant is like the x-sec.
Six Bar	Middle Fork	Jacks Gulch #2	01/15/1992	B		
Six Bar	Middle Fork	Squaw Creek 11 #1	06/22/1993	D3		Extremely narrow flood prone area prohibits development of large stands of riparian herbs. Channel substrate is also a factor.
Six Bar	Middle Fork	Squaw Creek 11 #2	01/15/1992	F		

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Six Bar	Middle Fork	Middle Fork Squaw Creek	06/29/1993	D w/ F		Channel is extensively scoured and 3/4 of reach is braided.
Six Bar	Middle Fork	Bishop Creek Tributary (Little Hutch Spring) #1	11/20/2003			Very high use throughout the area by both livestock and recreationists. Drainage contains no other obligate species other than deergrass. Only puddles remain in a few spots from recent rains. Braiding is common throughout. Upland species occur within channel such as side oats grama.
Six Bar	Mud Springs	Mud Spring Creek #1	01/16/2009	F4	Unstable	The channel is full of sediment from the high flows after the 2005 CCC Fire. Thick deergrass in spots. Little regeneration of woody vegetation.
Six Bar	Mud Springs	Mud Spring Creek #1	02/06/2007			Post-fire flooding caused dramatic changes in the channel and loss of vegetation. Very little herbaceous vegetation remains. There are residual patches of deergrass. There are red and Goodding's willow and Fremont cottonwood trees of sapling, pole and larger size classes present.
Six Bar	Mud Springs	Mud Spring Creek #1	05/10/2005			Physical impacts and use on deergrass have remained unchanged. Deergrass has produced new growth and some seed stalks.
Six Bar	Mud Springs	Mud Spring Creek #1	03/28/2005			Deergrass plants are concentrated in several areas with small breaks between occurrences. Use on deergrass appeared higher downstream, near the end of the transect and closer to Mud Spring. Historic use was observed on ash and willow.
Six Bar	Mud Springs	Mud Spring Creek #1	07/20/1993	C3		
Six Bar	Mud Springs	Mud Spring Creek #2	01/16/2009	B	Impaired	Banks and flood plain covered with deergrass. Lots of sediment in channel, but shows recovery.
Six Bar	Mud Springs	Mud Spring Creek #2	11/25/2008	B		Floodplain covered with deergrass. Cottonwood and willow seedlings line the channel.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Six Bar	Mud Springs	Mud Spring Creek #2	09/27/2004			No recent livestock use was observed. The stream was flowing intermittently along this reach. Deergrass has vigorous re-growth and is producing seed heads. Re-growth upon woody species was also observed. Historical use was apparent on both deergrass and palatable woody species. Some light use of deer grass was observed. Recent deer tracks and tadpoles in a few pools that may be lowland leopard frogs were seen along this reach.
Six Bar	Mud Springs	Mud Spring Creek #2	04/29/2004			There is evidence of recent trailing and the use of deergrass and browse species. The stream is currently flowing. Tamarisk and Typha are present in isolated amounts. Dusty expressed interest in putting in a drift fence to avert livestock trailing in the bottom of the drainage.
Six Bar	Mud Springs	Mud Spring Creek Tributary #1	01/16/2009	A	Stable	Little spring fed channel in bedrock. Full of sediment from floods after fire. Spotty deergrass. Rancher says it runs all year.
Six Bar	Mud Springs	Mud Spring Creek Tributary #2 (Mule Spring)	01/16/2009	F4	Unstable	There is no longer a spring. There was water running in spots. Its downcut and full of sediment, probably from floods after fire.
Six Bar	Mud Springs	Mud Spring Creek Tributary #3	01/16/2009	F4	Unstable	Channel is narrow, downcut and full of sediment, probably from the floods after the fire. Vegetation consists of upland grasses. There is a spring about 1/8 mile upstream from road with two seep willows and one dead willow on left terrace.
Six Bar	Mud Springs	South Fork Mud Springs Creek	01/16/2009			The South Fork, has not recovered enough to be grazed.
Six Bar	Mud Springs	South Fork Mud Springs Creek	11/25/2008	F4	Unstable	Channel full of sediment, vegetation got washed out in floods after 2005 CCC Fire.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Six Bar	Mud Springs	South Fork Mud Springs Creek	02/06/2007	F		Post fire floods have altered the channel, eroded valley side slopes, and removed most of the riparian vegetation, stream banks and fine sediments. There are small pockets of riparian vegetation that persist. We noted deergrass, sedges, some rushes, rabbit foot grass, Bermuda, monkey flower and loosestrife. Velvet ash is the most common residual tree. There were a few Fremont cottonwood, Goodding's and red willows, and salt cedars present.
Six Bar	Mud Springs	South Fork Mud Springs Creek	05/10/2005			Deergrass plants in this reach are beginning to produce seed heads and are vigorous. Cattle have been removed from the pasture and there are no signs of use in the recent past.
Six Bar	Mud Springs	South Fork Mud Springs Creek	03/28/2005			Livestock sign was present (pie and tracks). Livestock trailing was pronounced along the floodplain features of this reach. Historical use was observed on seedling/sapling ash with new leader growth emerging.
Six Bar	Mud Springs	South Fork Mud Springs Creek	09/27/2004			No recent livestock use was observed. The stream was flowing intermittently along the reach. Deergrass has vigorous regrowth and is producing seed heads. Regrowth on woody species was also observed.
Six Bar	Mud Springs	South Fork Mud Springs Creek	04/29/2004			Ranch manager Dusty Kirby observed that cattle use the South Fork to travel from the top of the pastures to the bottom. He also had to use the confluence of the creeks as a holding area to gather cattle to move to the next pasture. Past use is evident. Tamarisk and Typha are present in isolated amounts.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Six Bar	Mud Springs	South Fork Mud Springs Creek	01/22/2002	B		Channel bank features visible, marked by deergrass and occasional seedling/sapling. Floodplain dominated by deergrass and occasional woody spp. Size classes mostly seedling/saplings, very few poles, and an occasional large tree or old snag. Trailing by livestock, on floodplain and in channel. Deergrass are well used and have a mounding appearance. Floodplain eroded around base of plants. Cottonwood and ash are dominant obligate trees. Todd said he recently, within last 2 days, moved 30 cows through drainage, which is why the trailing is evident. Todd said that he'd like to work on a way to provide a water gap, but exclude cattle from most of the channel.
Six Bar	Middle Fork	S. Fork Mud Springs Tributary (Willow Spring)	05/02/2002			Use in the pasture was very high (from the allotment boundary to Willow Springs). The herbaceous vegetation had been both heavily grazed and trampled. There were about 40 to 50 deergrass plants at the edge of the spring. Green blades were grazed to 3 to 4 inches and previous year's growth was grazed to 2 inches. Cattail plants were grazed to 1 inch stubble height or less. One Goodding's willow remained at the spring, but no recruitment was observed. The spring was heavily trampled by livestock.
Skeleton Ridge	Black Ridge	Houston Creek 11 #1	07/21/2006			Evidence of livestock use included consistent use on Arizona ash along the trail. Light use occurred on deergrass, and some trampling and trailing occurred overall. Impacts were minimal and no recent cow pies were observed. The dominant greenline vegetation was Bermuda grass, which was vigorous. Deergrass was also frequent and very vigorous. The woody vegetation was a mix of Arizona ash, cottonwood, Goodding's willow, seep willow, red willow, tamarisk, and sycamore. The age/size class structure of the trees ranged from seedling to large. Banks were forming.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Skeleton Ridge	Black Ridge	Houston Creek 11 #1	06/25/2002	B6	Unstable	Stream shows recent downcutting of about one foot in some areas. Stream contains ash from Pine Mountain Fire (2001) and is cutting through it. Lots of silt is entering the stream from the floodplain, which has little vegetation to stabilize it. Use was high on vegetation and banks.
Skeleton Ridge	Coldwater	MT Ranch Creek	06/20/2002			The channel is armored by boulders and mature trees and their root mass, and bedrock. This reach is not conducive to livestock access and travel through the bottom.
Skeleton Ridge	Hot Springs	Verde River #1	04/27/1998	B3		
Skeleton Ridge	Hot Springs	Verde River #9	04/27/1998			Mostly seep willow along greenline, minimal willow and cottonwood recruitment. <1 percent herbaceous cover. Livestock stream bank alteration visibly high. Distinct bank feature retaining some Bermuda, Equisetum sp. willow, ash.
Skeleton Ridge	Hot Springs	Verde River #15	06/08/1998			Cattle are present (10+ cows/calves/steers). Estimated use is 60 percent+. Right and left stream banks have had high use. Estimated bank alteration 90 percent. Cattle probable cause of alteration. This is the 4th trip made to this site for monitoring since Oct 1997, where use has been high. This reach is one of the few areas in the pasture that offers potential SWWF habitat. Grazing has thinned and delayed the possibility of dense woody growth at this site. Willow and cottonwood are present in mid-channel bar where they were severely thinned and hedges.
Skeleton Ridge	Hot Springs	Verde River #15	04/27/1998			Herbaceous use minimal. Banks covered with Bermuda and bulrush. Few willow spp. and ash, greenline thin.
Skeleton Ridge	Hot Springs	Verde River #16	04/27/1998			Woodies along greenline. No use on very recently greened up herbaceous vegetation. Not much evidence of cattle use. River right.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Skeleton Ridge	Houston Basin	Pigeon Spring Creek #2	04/17/2008	B	Stable	Banks present, some Bermuda banks indicate high historical use. Most of channel is bedrock with gravel. Cobble and sand on "floodplain." Very narrow valley bottom ~50 feet. Some eroding banks.
Skeleton Ridge	Houston Basin	Pigeon Spring Creek #2	06/25/2002			We visited this reach while we were looking at Houston Creek. Lower end very degraded. Large eroding banks. Channel shows recent downcutting, about one foot. Upstream more species diversity - red willow, cattail, juncus, bulrush. Use throughout and fresh cattle sign.
Skeleton Ridge	Houston Basin	Squaw Creek 12	05/09/2008			We observed no grazing. Velvet ash, Fremont cottonwood, Goodding's willow, and sycamore are present. Seedlings and saplings were common, especially ash. There is a diverse herbaceous component and bank features.
Skeleton Ridge	Houston Basin	South Fork Pigeon Spring Creek #2	04/17/2008	G		Channel is downcut near road and below. The southernmost tributary supports perennial water from the spring to its confluence with the North Fork.
Skeleton Ridge	Lancaster	Pigeon Spring Creek #1	04/17/2008	B	Impaired	Heard a black hawk. Main sediment is boulder, but pools are full of gravel. No herbaceous. This is a water gap. All impactable banks altered.
Skeleton Ridge	Lancaster	North Fork Pigeon Spring Creek	04/17/2008			The North Fork has the least amount of riparian vegetation. There was a short reach of surface water above and below the road with a few sycamore and deergrass plants, but the riparian vegetation does not extend upstream. Downstream in the Lancaster Pasture the North Fork of Pigeon Creek is intermittent, a cobbly F4 with little riparian vegetation or water.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Skeleton Ridge	Long Mesa	Trap Canyon #1	12/17/2009			Ash and red willow are the dominant woody species within the reach and are represented by all size classes. Carex are present within the channel and were approximately 8 inches in height. Deergrass lines the banks and is trapping sediment. Few seep willow were observed in this reach, Livestock were watering within Trap Canyon and moving back to the adjacent uplands to graze. Livestock were browsing on any woodies within their reach. There was not significant trampling within the stream bed or on the stream banks.
Skeleton Ridge	Long Mesa	Trap Canyon #1	11/15/2001	F		Upper portion of Trap Canyon consists of perennial water and obligate species. Stream has been downcut. Shows some indication of floodplain rebuilding. Few areas with alterable bank; however, areas which were alterable showed signs of alteration by cattle.
Skeleton Ridge	Long Mesa	Trap Canyon #2	12/17/2009			Ash and red willow are the dominant woody species within the reach; however, there are less trees and a much more open mature canopy. There is still a large number of deergrass present within the channel and along the banks. Water was flowing the entire length of the transect. Carex were also present in this lower reach, although not as many plants.
Skeleton Ridge	Long Mesa	Trap Canyon #2	11/15/2001	B		Some incised channels that are relatively inaccessible have cover of seedlings and saplings. Emergents along greenline show high use. Sapling and pole size sycamores dominant throughout reach.

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Skeleton Ridge	Long Mesa	Horse Camp Canyon #3	11/15/2001			Species and use were similar to that in Trap Canyon. The stream channel is downcut in the perennial section. The upstream intermittent section is wider, with occasional deergrass and sycamore, willow, and cottonwood trees. Just above the pasture boundary, there is a small water gap that receives little use. The reach is perennial and lined with thick deergrass cover.
Skeleton Ridge	Mud Springs	South Fork Pigeon Spring Creek #1	04/18/2008	A	Stable	Had running water. Above is steep and very narrow. Boulder steps with gravel and sand. Little herbaceous. Sycamore and walnut on terrace.
Skeleton Ridge	Mud Springs	Houston Creek 11 #2	03/13/2008			The greenline and floodplain zone are dominated by red willow that was just beginning to leaf out. Other tree species included Arizona sycamore, velvet ash, Fremont cottonwood, and Arizona alder. The pole size was dominant, with seedlings and saplings, but few larger sized trees. The understory includes seep willow, Bermuda grass, and traces of deergrass, horsetail, sedge, and rush species. There was very little use of woody plants.
Skeleton Ridge	Mud Springs	Houston Creek 11 #2	02/21/2006			Recent livestock sign occurred throughout the reach and three head of cattle were seen at the upstream end of the reach. Use on riparian species was light overall; however, trailing was consistent the full length of the reach. The overstory was diverse and includes cottonwood, ash, red willow, alder, seep willow, and sycamore. There was very infrequent browsing on the obligate woody species.
Skeleton Ridge	Mud Springs	Houston Creek 11 #2	06/19/2002			We only measured stream bank alteration and use on woody species. Young deergrass plants were observed, but too infrequent to measure. Recent sign of livestock was evident along creek, but no cows were observed. Brian stated livestock do have access to springs in the uplands (about one mile from creek).

Allotment	Pasture	Stream Name	Date	Type	Condition	Comments
Skeleton Ridge	Mud Springs	Pigeon Spring Creek #3	04/18/2008	B	Severely Impaired	Valley bottom very narrow, ~30 feet. Channel covers whole valley bottom. Main sediment is boulder with sand and gravel. No herbaceous. A few old sycamores on terrace. Channel is downcut and has some eroding cut banks.
Skeleton Ridge	Pete's Cabin	Verde River #10	04/28/1998			At least five feet of growth last year on willow at first part of transect. Beaver use. Greenline=woody vegetation. Alterable bank. Area where cattle are collected and driven upland.
Skeleton Ridge	Pete's Cabin	Verde River #11	04/28/1998			Alterable bank recorded at 30.5 on river left. All cottonwood grazed and under 4 feet tall. Equisetum spp. and Scirpus spp. died back after flooding, starting to green up again. All browsed stems from 1997 growth, new leaders are 2 to 6 foot long. No bank feature to measure.
Skeleton Ridge	Pete's Cabin	Verde River #12	04/28/1998			No use also noted on February mapping. Typha spp. No use on old growth. Beaver sign, several small <1 inch stems cut.
Skeleton Ridge	Pete's Cabin	Verde River #13	04/29/1998			Cobble bar has no use. Greater saplings than seedlings. Opposite side stream bank alteration. Cattle on shore. River left. Just downstream cows present with 100 percent bank alteration. Approximately 200 feet long with heavy tamarisk and Bermuda grass cover.
Skeleton Ridge	Pete's Cabin	Verde River #14	04/29/1998			High beaver use on willow saplings. Willow establishing at bend next to rapid. Floodplain contains Hymenoclea spp. and Baccharis.

Table C2: Water sources and inventory data for Six Bar Allotment

State File Number	Use Name	Date	Remarks
	South Copper Creek Stock Tank		
36-13663	Surprise Spring		
36-13664	Willow Spring	05/02/2002	Functioning; heavily trampled by livestock.
36-13665	Walnut Spring		
36-13666	Sycamore Spring		
36-13667	Rincon Spring		
36-13669	Mule Spring	03/11/2007	Could not locate.
36-13670	Mud Spring	03/09/2007	Not developed; spring emergence is in a wash.
36-13671	Middle Fork Spring		
36-13672	Little Hutch Spring	06/08/2006	Not functioning; fenced but fence is open.
36-13673	Juniper Spring		
36-13674	Indian Spring		
36-13675	Hummingbird Spring		
36-13676	Hogan Spring		
36-13677	Goat Camp Spring		
36-13678	Cottonwood Spring		
36-13679	Escondido Spring		
36-14711	Caveness Spring		
36-23996	Lower Hutch Spring	06/12/2006	Not developed; covered with riparian vegetation.
36-25405	Unnamed Spring		
36-25406	Unnamed Spring		
38-13538	Double Corral Tank		
38-13539	Quinine Bush Tank		
38-13540	North Pass #1		
38-13541	Unnamed Tank		
38-13542	Unnamed Tank		
38-13552	Sheep Camp Tank		
38-13553	Little Red Tank		
38-13563	Juniper Spring Tank		
38-13564	Little Hutch Spring Tank	06/08/2006	Functioning.

State File Number	Use Name	Date	Remarks
38-13565	Unnamed Tank		
38-13566	Hardscrabble Tank	01/29/2009	Functioning.
38-13567	North Pass Tank #2		
38-13568	Brooklyn Tank		
38-13569	Hogan Tank #2		
38-13570	Hogan Tank #1		
38-13571	Hutch Tank		
38-13572	Six Bar Mesa Tank		
38-13573	Picnic Tank		
38-13574	Johns Tank		
38-13575	Middle Fork Tank		
38-13576	Narrows Tank	04/18/2008	Functioning.
38-13577	Copper Creek Tank		
4A-3250	Hutch Spring	02/18/2009	Functioning; fence down; large deergrass.
55-600850	Whitehorse Tunnel Well		

Table C3: Water sources and inventory data for Red Creek Allotment

State File Number	Use Name	Date	Remarks
33-87287	Horse Camp Spring	08/26/2009	Functioning; channel supports deergrass.
33-87289	Upper Yellowjacket Spring	12/07/2010	Could not locate.
33-87747	Cypress Spring		
33-87748	Goslin Spring		
33-87749	HK West Spring		
33-89715	Buck Spring		
33-90038	Three Wall Spring	01/12/2011	Not developed.
33-90039	Wet Bottom Spring	01/12/2011	Not developed; seep willow and grasses.
33-96142	Broken Shovel Spring	01/11/2011	Functioning; area is fenced.
33-96143	Boghole Spring	01/11/2011	Not functioning.
36-105433	Canyon Spring	07/10/2006	Functioning.
36-13692	Wild Spring		
36-13701	LX Spring	04/07/2007	In Tangle Creek wash; heavily vegetated; heavily utilized by wildlife and livestock.
36-13702	Alkali Seep		

State File Number	Use Name	Date	Remarks
36-13703	Cockleburr Spring		
36-13704	Corral Spring		
36-13705	Dog Spring	11/19/2008	Not functioning; not located correctly on map; riparian vegetation is present.
36-13706	Frog Spring	03/06/2008	Not developed; wetland-like.
36-13707	Grapevine Spring		
36-13708	Javelina Spring		
36-13709	Lizard Spring		
36-13710	Metate Spring		
36-13711	Peso Spring		
36-13712	Picnic Spring	04/28/2009	Functioning; small fenced area.
36-13713	Pit Spring		
36-13714	Quail Spring		
36-13715	Red Rock Spring		
36-13716	Tear Spring		
36-13717	Unnamed Spring	04/09/2007	Not developed; use by campers, horses, ATVs.
36-13718	White Rock Spring	03/06/2008	Not functioning; fence down; riparian vegetation present.
36-13719	Tumbleweed Spring		
36-13720	T T Spring		
36-13721	Thicket Spring	11/19/2008	Functioning; associated with tank (38-13617).
36-13722	Four Corners Spring	06/24/2009	Functioning.
36-13723	Red Rock Spring #2		
36-13724	Coyote Spring		
36-14657	H K Spring		
36-23980	Red Creek Spring	06/24/2009	Functioning; riparian vegetation present.
36-24056	Monroe Spring	10/21/2008	Functioning.
36-24057	Mockingbird Spring	12/06/2010	Not functioning; fence down.
36-24065	Unnamed Spring	12/07/2010	Not functioning.
36-24070	Middle Spring	08/26/2009	Functioning.
36-24075	Soda Spring # 2	06/24/2009	Functioning; riparian vegetation present.
36-24076	Soda Spring # 1	10/20/2008	Functioning; seep willow.
36-25325	Lost Spring	12/21/2010	Not developed; some riparian vegetation present.

State File Number	Use Name	Date	Remarks
36-25327	Dry Wash Spring		
36-25330	Carrissa Spring		
36-25331	Yellow Jacket Spring		
36-25410	Marie Spring	12/21/2010	Not functioning.
38-13558	Horseshoe Tank	06/08/2009	Not functioning.
38-13559	High Tank	12/05/2010	Functioning.
38-13560	Table Mountain Tank	12/21/2010	Functioning.
38-13561	Dugan Tank	04/01/2007	Silted in.
38-13562	Tangle Peak Tank	03/31/2007	Functioning.
38-13578	Night Trap Tank	06/27/2006	Functioning.
38-13579	Trail Tank	04/01/2007	Functioning.
38-13580	Best Tank		
38-13581	Bottle Tank	06/29/2006	Functioning.
38-13582	Rusty Tank		
38-13583	Sahuaro Tank	06/29/2006	Functioning.
38-13584	Juniper Tank	06/29/2006	Functioning.
38-13585	Dugan Rock Tank	06/30/2006	Functioning.
38-13586	Doe Tank		
38-13587	Shipping Pasture Tank	06/27/2006	Functioning.
38-13588	Hidden Tank	04/06/2007	Could not locate.
38-13589	Airport Tank	11/19/2008	Needs to be cleaned out.
38-13590	Junction Tank	07/27/2009	Functioning.
38-13591	Javelina Tank	06/27/2006	
38-13592	Cliff Tank	04/01/2007	Functioning.
38-13593	Gila Monster Tank	04/01/2007	Functioning.
38-13594	Lower Double Tank	06/30/2006	Functioning.
38-13595	Upper Double Tank	06/30/2006	Functioning.
38-13596	Cholla Tank	12/21/2010	Could not locate.
38-13597	Dead Tree Tank	07/27/2009	Functioning.
38-13611	Cement Tank	06/30/2006	Not functioning.
38-13612	Mustang Tank		
38-13613	Turtle Tank	11/19/2008	Functioning.
38-13614	Big Buck Tank		
38-13615	Roadside Tank	11/19/2008	Functioning; needs to be cleaned out.
38-13616	Ruin Point Tank		

State File Number	Use Name	Date	Remarks
38-13617	Thicket Spring Tank	11/19/2008	Functioning; associated with Thicket Spring (36-13721).
38-23840	Christmas Tree Tank	12/07/2010	Functioning; nearly completely silted in.
38-23841	Yellowjacket Tank #3	12/17/2009	Functioning.
38-23842	Horse Camp Tank	10/24/2007	Functioning.
38-23843	Carrissa Tank	12/06/2010	Not functioning.
38-23844	Rugged Mesa Tank		
38-23846	Yellowjacket Tank #1	10/24/2007	Functioning.
38-23847	Pistol Saddle Tank	10/24/2007	Functioning.
38-23848	Pistol Saddle Tank #2	07/24/2008	Functioning; needs to be cleaned.
38-23848	Pistol Saddle Tank #2	04/30/2007	Functioning.
38-23856	Unnamed Tank	12/07/2010	Functioning; spillway incised.
38-23857	Unnamed Tank	12/07/2010	Not functioning.
38-23861	Stock Tank # 7		
38-23862	Tony Tank	04/09/2007	Functioning.
38-23864	Yellowjacket Tank #2	07/24/2008	Functioning; needs to be cleaned out.
38-23865	Roundup Basin Tank	12/07/2010	Functioning.
38-23876	Beal Tank	04/30/2007	Not functioning.
55-600847	Monroe Windmill	07/13/2009	Functioning; not connected.

Table C4: Water sources and inventory data for Skeleton Ridge Allotment

State File Number	Use Name	Date	Remarks
33-87288	Sycamore Spring	12/18/2010	Not developed; deergrass.
33-87819	Goat Camp Spring	01/11/2011	Not developed.
33-87822	Hackberry Seep	01/11/2011	Not developed.
33-89034	Squaw Creek Seep	12/09/2010	Not developed.
33-89637	Power Line Spring	12/18/2010	Not developed.
33-89638	Cold Water Spring	12/17/2010	Not functioning.
33-89656	North Mud Spring	12/19/2010	Not developed.
33-89657	Black Ridge Spring	12/15/2010	Not developed.
33-90040	Debbie Spring		
33-90041	Horseshoe Spring	12/15/2010	Not developed.
33-90517 36-105617	Squaw Butte Spring	12/20/2010	Not developed.

State File Number	Use Name	Date	Remarks
33-90518	Doe Spring	12/15/2010	Not developed; one cottonwood.
36-14659	Tonys Spring	01/11/2011	Functioning.
36-23978	Black Spring	12/10/2010	Not functioning.
36-23979	Corner Spring	12/19/2010	Could not locate.
36-23992.13	Deer Stockpond	12/08/2010	Not functioning.
36-24055	Pasture Spring	12/10/2010	Functioning; fence is down.
36-24058	Pigeon Spring	04/18/2008	Functioning.
36-24059	Pipeline Spring #2	12/15/2010	Not developed.
36-24060	Racetrack Spring	12/09/2010	Not functioning.
36-24061	Rock Spring	12/16/2010	Not functioning; some riparian vegetation.
36-24062	M T Spring	12/17/2010	Not developed.
36-24063	M T Saddle Spring	12/17/2010	Not functioning.
36-24064	White Spring	12/19/2010	Not functioning.
36-24066	Goat Peak Spring	12/19/2010	Could not locate.
36-24067	Houston Seep	12/19/2010	Could not locate.
36-24068	Lime Spring	12/18/2010	Not functioning.
36-24069	Lower Houston Spring	12/20/2010	Not developed; riparian vegetation present.
36-24071	Mud Spring	12/04/2007	Functioning.
36-24072	Negro Spring	12/20/2010	Not functioning; riparian vegetation present.
36-24073	North Spring	12/19/2010	Not developed; deergrass and willow.
36-24074	Squaw (Roadside) Spring	04/18/2008	Functioning; fenced, but fence was open.
36-24077	Baca Spring	12/04/2007	Not developed.
38-23837	Stock Tank # 10	12/09/2010	Functioning, needs maintenance.
38-23838	Stock Tank # 9	12/08/2010	Functioning.
38-23839	Long Mesa Tank	12/08/2010	Functioning.
38-23845	Chicken Tank	12/08/2010	Not functioning.
38-23850	Stock Tank # 14	12/18/2010	Functioning.
38-23851	Stock Tank # 16	12/19/2010	Not functioning.
38-23852	Stock Tank # 17	12/15/2010	Could not locate
38-23853	Stock Tank # 18	12/10/2010	Functioning but spillway is almost breached.
38-23854	Racetrack Tank	12/09/2010	Could not locate.
38-23855	Unnamed Tank	12/08/2010	Functioning, needs maintenance.

State File Number	Use Name	Date	Remarks
38-23857	Unnamed Tank	12/07/2010	Not functioning.
38-23859	Stock Tank # 13	12/18/2010	Functioning.
38-23860	Squaw Creek Tank	04/17/2008	Functioning.
38-23863	Beck Tank	12/15/2010	Functioning.
38-23866	Peach Tank	12/08/2010	Not functioning.
38-23867	Cedar Basin Tank	05/09/2008	Needs to be cleaned.
38-23869	Unnamed Tank	12/09/2010	Functioning.
38-23870	Horse Pasture Tank	10/16/2007	Functioning; needs to be cleaned.
38-23871	Sinkhole Tank	10/17/2007	Not functioning.
38-23872	Coldwater Tank #2	12/18/2010	Functioning.
38-23873	Verde Saddle Tank	10/17/2007	Functioning; needs to be cleaned.
38-23874	Rock Spring Tank	12/17/2010	Functioning.
38-23875	Unnamed Tank	12/16/2010	Not functioning.
38-23877	Trap Canyon Tank	12/08/2010	Not functioning.
38-89840	Headquarter Tank	12/17/2010	Functioning.

Criteria for the Outstandingly Remarkable Values (ORVs) for the Verde River (NPS 2011)

Recreation (R): Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing, and boating.

Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the region of comparison.

The river may provide, or have the potential to provide, settings for national or regional usage or competitive events.

Scenery (S): The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions. When analyzing scenic values, additional factors -- such as seasonal variations in vegetation, scale of cultural modifications, and the length of time negative intrusions are viewed -- may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment.

Fish (F): Fish values may be judged on the relative merits of fish populations, habitat, or a combination of these river-related conditions.

Populations: The river is nationally or regionally an important producer of resident and/or anadromous fish species. Of particular significance is the presence of wild stocks and/or

federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."

Habitat: The river provides exceptionally high quality habitat for fish species indigenous to the region of comparison. Of particular significance is habitat for wild stocks and/or federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of habitats is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."

Wildlife (W): Wildlife values may be judged on the relative merits of either terrestrial or aquatic wildlife populations or habitat or a combination of these conditions.

Populations: The river, or area within the river corridor, contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique, and/or populations of federal or state listed (or candidate) threatened, endangered, or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."

Habitat: The river, or area within the river corridor, provides exceptionally high quality habitat for wildlife of national or regional significance, and/or may provide unique habitat or a critical link in habitat conditions for federal or state listed (or candidate) threatened, endangered or sensitive species. Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of habitats is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."

Prehistory (P): The river, or area within the river corridor, contains a site(s) where there is evidence of occupation or use by Native Americans. Sites must have unique or rare characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; and/or may have been used by cultural groups for rare sacred purposes. Many such sites are listed on the National Register of Historic Places, which is administered by the NPS.

History (H): The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare or one-of-a-kind in the region. Many such sites are listed on the National Register of Historic Places. A historic site(s) and/or features(s) is 50 years old or older in most cases.

Cultural (C): The river or area within the river corridor contains archaeological sites or areas significant to traditional cultures. Examples might be American Indian burial grounds, petroglyphs, the oldest known human use site in a region, or streams that support traditional agriculture, subsistence fishing, or religious ceremonies.

Appendix D: Wildlife

Table D1: Southwestern Willow Flycatcher Recover Plan Table

Southwestern Willow Flycatcher Recovery Plan

August 2002

Table 2. General guidelines for domestic livestock grazing in southwestern willow flycatcher habitat.

Site Conditions			Site-Specific Guidelines	
Habitat Status	Flycatcher Status	Season	Low-Stature Habitat: 3-4m shrubby willow	All other habitat types ≤ 1830 m or 6000 ft elevation
1. Restorable or Regenerating Habitat ¹	1A. Unoccupied	Growing Season ²	No grazing.	No grazing.
	1B. Unoccupied	Non-Growing Season	No grazing.	Provisional grazing ³ (assumes grazing is not a major stressor).
2. Suitable Habitat	2A. Unoccupied	Growing Season	No grazing.	No grazing, but at discretion of USFWS, provision for a limited number of small-scale, well-designed experiments to determine levels of pre-breeding season grazing that do not adversely affect southwestern willow flycatcher habitat attributes. Grazing not to exceed 35% utilization of palatable, perennial grass or grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use ⁴ not to exceed 10%. ⁵
	2B. Unoccupied	Non-Growing Season	Conservative grazing with average utilization not to exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Woody utilization not to exceed 40% on average.	Conservative grazing with average utilization not to exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Woody utilization not to exceed 40% on average.
	2C. Occupied	Growing Season	No grazing.	No grazing until research in comparable unoccupied habitat demonstrates no adverse impact; if unoccupied habitat becomes occupied habitat, continue existing management (grazing should not exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%).

Table D1, page 2

Southwestern Willow Flycatcher Recovery Plan

August 2002

Table 2. General guidelines for domestic livestock grazing in southwestern willow flycatcher habitat.				
	2D. Occupied	Non-Growing Season	No grazing.	Conservative grazing with average utilization not to exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Woody utilization not to exceed 40% on average.
3. Uplands & Watershed Condition ⁶	3. Occupied & Unoccupied	For any season of use	Average utilization of palatable, perennial grasses and grass-like plants not to exceed 30-40%. Use stubble height guidelines: 3" for short grass, 6" for midgrass, 12" for tall grass. Determine monitoring species prior to grazing.	Average utilization of palatable, perennial grasses and grass-like plants not to exceed 30-40%. Use stubble height guidelines: 3" for short grass, 6" for midgrass, 12" for tall grass. Determine monitoring species prior to grazing.

¹"Restorable" means riparian systems that are degraded but have the appropriate hydrological and ecological setting to be restored to suitable flycatcher habitat, and could be restored with reasonable costs and actions. Lack of regeneration due to grazing is one factor contributing to habitat degradation; conditions in each habitat should include adequate plant regeneration to ensure habitat sustainability into the future. At these sites, flycatcher habitat is precluded largely or solely by livestock impacts. "Restorable" habitats are those that would be suitable if not for grazing, alone or in combination with other major stressors. This means cessation of grazing is a necessary, but not necessarily a sufficient action.

²Growing season is defined as bud break to leaf drop for cottonwood and willow species. Non-growing season is defined as leaf drop to bud break for cottonwood and willow species.

³Grazing should only be conducted if it is not a major stressor and does not preclude satisfactory progress toward suitability.

⁴Damage to stream banks from livestock use includes: bank chiseling, trampling, trailing, soil compaction, breakage of vegetation, bank sloughing, etc.

⁵Alterable stream banks are those portions of banks containing exposed soil or vegetation and not composed of bedrock, boulders, or large cobbles (Fleming et al. 2001).

⁶Uplands and watersheds, or portions of watersheds, associated with areas identified as restorable, regenerating, or suitable southwestern willow flycatcher habitat. General guidelines should be implemented unless site-specific data clearly indicate that deviation from the guidelines will not prevent or slow progression toward suitability and/or maintenance of suitable habitat conditions.

Appendix E: Soils

Table E1: Analysis Area Soil Condition by Map Unit

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
Private					20.54	
Unknown					32.90	
3050	Sat	0-15	Semi-Desert Grassland	Severe	3,058.62	
416	Sat	15-40	Woodland/Shrubland	Moderate	28.36	
4468	Sat	15-40	Arizona Cypress	Severe	710.22	
5250	Sat	0-15	Ponderosa Pine	Slight	0.02	
5550	Sat	0-15	Ponderosa Pine	Slight	119.55	
Total					3,916.77	2.7%
3231	Sat-Imp	15-40	Pinyon/Juniper/Oak	Moderate	6,847.91	
3821	Sat-Imp	15-40	Pinyon/Juniper/Oak	Severe	682.70	
				Total	7,530.61	5.0%
15	Sat-Unsat	0-10	Riparian	---	1,073.37	
20	Sat-Unsat	0-5	Riparian	---	89.58	
Total					1,162.95	0.8%
353	Imp	0-40	Semi-Desert Grassland	Severe	34.60	
382	Imp	0-15	Semi-Desert Grassland	Slight	2.30	
424	Imp	0-15	Woodland/Shrubland	Slight	12.09	
432	Imp	15-40	Woodland/Shrubland	Severe	3,131.53	
435	Imp	15-40	Woodland/Shrubland	Severe	665.31	
3351	Imp	15-40	Pinyon/Juniper/Oak	Severe	96.10	
3371	Imp	0-40	Pinyon/Juniper/Oak	Severe	1,056.50	
3521	Imp	15-40	Pinyon/Juniper/Oak	Severe	6,233.60	
3752	Imp	15-40	Pinyon/Juniper/Oak	Moderate	1,341.54	
3770	Imp	15-40	Pinyon/Juniper/Oak	Moderate	266.22	
Total					12,839.79	8.6%
407	Imp-Unsat	15-40	Pinyon/Juniper/Oak	Severe	627.27	
429	Imp-Unsat	0-15	Juniper Savanna	Severe	368.34	
1770	Imp-Unsat	0-40	Sonoran Desert	Slight	12,382.18	
3710	Imp-Unsat	0-15	Juniper Savanna	Slight	369.50	
3730	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Moderate	48.68	
4170	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Slight	1.40	
Total					13,797.37	9.2%

Appendix E: Soils

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
9	Unsat	0-10	Riparian	---	2,478.05	
380	Unsat	0-15	Semi-Desert Grassland	Slight	11.96	
431	Unsat	0-15	Juniper Savanna	Moderate	643.31	
485	Unsat	0-15	Pinyon/Juniper/Grassland	Slight	383.44	
489	Unsat	0-15	Pinyon/Juniper/Grassland	Moderate	296.31	
1120	Unsat	0-15	Sonoran Desert	Moderate	1,637.07	
3124	Unsat	15-40	Semi-Desert Grassland	Severe	12,783.67	
3187	Unsat	0-15	Semi-Desert Grassland	Moderate	619.28	
3230	Unsat	0-15	Semi-Desert Grassland	Slight	304.02	
3306	Unsat	0-15	Semi-Desert Grassland	Slight	1,441.26	
3333	Unsat	0-15	Pinyon/Juniper/Oak	Slight	124.41	
3520	Unsat	0-15	Pinyon/Juniper/Oak	Slight	1,820.33	
3760	Unsat	0-15	Semi-Desert Grassland	Slight	52.97	
7606	Unsat	0-15	Semi-Desert Grassland	Severe	1,623.90	
Total					24,219.98	16.2%
252	Sat-Unstable	40-80	Sonoran Desert	Severe	1,468.83	
342	Sat-Unstable	40-80	Semi-Desert Grassland	Severe	874.55	
373	Sat-Unstable	40-120	Woodland/Shrubland	Severe	52.97	
430	Sat-Unstable	40-80	Pinyon/Juniper/Oak	Severe	8,417.26	
436	Sat-Unstable	40-120	Woodland/Shrubland	Severe	5,130.64	
450	Sat-Unstable	40-80	Woodland/Shrubland	Severe	940.72	
451	Sat-Unstable	40-120	Pinyon/Juniper/Oak	Severe	32.20	
3339	Sat-Unstable	40-80	Pinyon/Juniper/Oak	Severe	28,186.16	
3753	Sat-Unstable	40-80	Pinyon/Juniper/Oak	Severe	68.87	
5075	Sat-Unstable	15-80	Pinyon/Juniper/Oak	Severe	503.88	
5252	Sat-Unstable	40-80	Ponderosa Pine	Severe	123.90	
5352	Sat-Unstable	40-80	Ponderosa Pine	Severe	181.38	

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
5452	Sat-Unstable	40-80	Ponderosa Pine	Severe	643.84	
9239	Sat-Unstable	40-120	Semi-Desert Grassland	Severe	27,315.39	
9349	Sat-Unstable	40-120	Pinyon/Juniper/Oak	Severe	12,298.44	
9459	Sat-Unstable	40-120	Pinyon/Juniper/Oak	Severe	140.01	
Total					86,379.04	57.6%
Total Acres					149,846	

Table E2: Analysis Area Soil Condition by Allotment and Pasture

Allotment	Pastures	Sat	Sat-Imp	Sat-Unsat	Imp	Imp-Unsat	Unsat	Sat-Unstable	Total Acres
Red Creek									
	Cedar Holding						73.3		73.3
	Cedar Mountain	376.0		12.4	1,208.3			1,186.8	2,783.5
	Cedar Push Holding						1,159.6		1,159.6
	Dugan Holding	169.0		50.4			15.7	173.5	408.6
	East Soda				21.7		359.7	58.1	439.5
	Holding						28.1	7.0	35.1
	Horse			25.4			148.0	39.6	213.0
	Horse Camp						71.9	290.1	362.0
	Monroe		188.3				545.1	37.1	770.5
	Mustang	362.8	884.1	122.2	60.5	1.4	2,660.1	5,545.8	9,636.9
	Palo Verde Holding					146.7	85.8		232.5
	Peso	275.1		21.3	0.4	0.6	651.1	1999.2	2,947.7
	Red Creek	47.1	1.5	43.3	85.0		2,372.0	4247.5	6,796.4
	Red Creek Exclosure			71.1			608.9	37.7	717.7
	Red Hills/North Red Hills	810.5	887.8	202.4	1424.2	8,934.8	4,224.1	14,642.8	31,126.6
	Roundtree	247.1	88.5	197.0	458.0		1,155.0	873.8	3,019.4
	Rugged Mesa		68.7				595.4	327.3	991.4
	Soda Springs	93.3	775.7		208.5		122.2	5251.9	6,451.6
	Tangle Mountain			114.7	240.5	268.8	3,320.0	2298.4	6,242.4

Allotment	Pastures	Sat	Sat-Imp	Sat-Unsat	Imp	Imp-Unsat	Unsat	Sat-Unstable	Total Acres
	Trap (NW Red Creek Exc)			0.1			1.3		1.4
	Trap (NW Cedar Push)						3.4		3.4
	Yellowjacket	88.1	1,536.0				144.5	1,866.7	3,635.3
Skeleton Ridge									
	Black Ridge		9.7		557.4		96.7	2,056.1	2,719.9
	Cedar Basin Holding		44.5				6.0	52.3	102.8
	Coldwater/West Coldwater	849.6			689.2		106.7	7,675.0	9,320.5
	Headquarters	73.3					11.7	176.7	261.7
	Hot Springs	129.8	452.8				21.4	125.6	729.6
	Houston Basin		222.8		838.1		5.4	2,104.9	3,171.2
	Lancaster				186.8			241.5	428.3
	Long Mesa Holding						184.9	7.4	192.3
	Long Mesa		9.6		473.4		998.0	3,734.2	5,215.2
	Long Mesa Tank				31.8		38.6	14.2	84.6
	Mud Springs	106.6	70.7		121.8			2,010.7	2,309.8
	Pete's Cabin	499.7	130.6	76.3	2,137.1	3,449.5	2,104.2	8,821.3	17,218.7
	Pipeline	82.2	76.5		135.8		4.1	32.2	330.8
	Powerhouse	2.1	23.3				21.1	865.4	911.9
Six Bar									
	Middle Fork		249.1	89.6	3,018.9	983.9	1,215.7	17,010.0	22,567.2
	Mud Springs		1,822.1		427.3		1,038.2	1,683.9	4,971.5
	Six Bar	32.7			367.0			486.6	886.3

Table E3: Analysis Area Erosion Hazard Acres

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
Private					20.54	
Unknown					32.90	
9	Unsat	0-10	Riparian	---	2,478.05	
15	Sat-Unsat	0-10	Riparian	---	1,073.37	
20	Sat-Unsat	0-5	Riparian	---	89.58	
Total					3,641.00	2.4%

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
380	Unsat	0-15	Semi-Desert Grassland	Slight	11.96	
382	Imp	0-15	Semi-Desert Grassland	Slight	2.30	
424	Imp	0-15	Woodland/Shrubland	Slight	12.09	
485	Unsat	0-15	Pinyon/Juniper/Grassland	Slight	383.44	
1770	Imp-Unsat	0-40	Sonoran Desert	Slight	12,382.18	
3230	Unsat	0-15	Semi-Desert Grassland	Slight	304.02	
3306	Unsat	0-15	Semi-Desert Grassland	Slight	1,441.26	
3333	Unsat	0-15	Pinyon/Juniper/Oak	Slight	124.41	
3520	Unsat	0-15	Pinyon/Juniper/Oak	Slight	1,820.33	
3710	Imp-Unsat	0-15	Juniper Savanna	Slight	369.50	
3760	Unsat	0-15	Semi-Desert Grassland	Slight	52.97	
4170	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Slight	1.40	
5250	Sat	0-15	Ponderosa Pine	Slight	0.02	
5550	Sat	0-15	Ponderosa Pine	Slight	119.55	
Total					17,025.43	11.4%
416	Sat	15-40	Woodland/Shrubland	Moderate	28.36	
431	Unsat	0-15	Juniper Savanna	Moderate	643.31	
489	Unsat	0-15	Pinyon/Juniper/Grassland	Moderate	296.31	
1120	Unsat	0-15	Sonoran Desert	Moderate	1,637.07	
3187	Unsat	0-15	Semi-Desert Grassland	Moderate	619.28	
3231	Sat-Imp	15-40	Pinyon/Juniper/Oak	Moderate	6,847.91	
3730	Imp-Unsat	0-15	Pinyon/Juniper/Oak	Moderate	48.68	
3752	Imp	15-40	Pinyon/Juniper/Oak	Moderate	1,341.54	
3770	Imp	15-40	Pinyon/Juniper/Oak	Moderate	266.22	
Total					11,728.68	7.8%
252	Sat-Unstable	40-80	Sonoran Desert	Severe	1,468.83	
342	Sat-Unstable	40-80	Semi-Desert Grassland	Severe	874.55	

Appendix E: Soils

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
353	Imp	0-40	Semi-Desert Grassland	Severe	34.60	
373	Sat-Unstable	40-120	Woodland/Shrubland	Severe	52.97	
407	Imp-Unsat	15-40	Pinyon/Juniper/Oak	Severe	627.27	
429	Imp-Unsat	0-15	Juniper Savanna	Severe	368.34	
430	Sat-Unstable	40-80	Pinyon/Juniper/Oak	Severe	8,417.26	
432	Imp	15-40	Woodland/Shrubland	Severe	3,131.53	
435	Imp	15-40	Woodland/Shrubland	Severe	665.31	
436	Sat-Unstable	40-120	Woodland/Shrubland	Severe	5,130.64	
450	Sat-Unstable	40-80	Woodland/Shrubland	Severe	940.72	
451	Sat-Unstable	40-120	Pinyon/Juniper/Oak	Severe	32.20	
3050	Sat	0-15	Semi-Desert Grassland	Severe	3,058.62	
3124	Unsat	15-40	Semi-Desert Grassland	Severe	12,783.67	
3339	Sat-Unstable	40-80	Pinyon/Juniper/Oak	Severe	28,186.16	
3351	Imp	15-40	Pinyon/Juniper/Oak	Severe	96.10	
3371	Imp	0-40	Pinyon/Juniper/Oak	Severe	1,056.50	
3521	Imp	15-40	Pinyon/Juniper/Oak	Severe	6,233.60	
3753	Sat-Unstable	40-80	Pinyon/Juniper/Oak	Severe	68.87	
3821	Sat-Imp	15-40	Pinyon/Juniper/Oak	Severe	682.70	
4468	Sat	15-40	Arizona Cypress	Severe	710.22	
5075	Sat-Unstable	15-80	Pinyon/Juniper/Oak	Severe	503.88	
5252	Sat-Unstable	40-80	Ponderosa Pine	Severe	123.90	
5352	Sat-Unstable	40-80	Ponderosa Pine	Severe	181.38	
5452	Sat-Unstable	40-80	Ponderosa Pine	Severe	643.84	
7606	Unsat	0-15	Semi-Desert Grassland	Severe	1,623.90	

Map Units	Soil Condition	Slope	Vegetation Type	Erosion Hazard	Acres	Total (%)
9239	Sat-Unstable	40-120	Semi-Desert Grassland	Severe	27,315.39	
9349	Sat-Unstable	40-120	Pinyon/Juniper/Oak	Severe	12,298.44	
9459	Sat-Unstable	40-120	Pinyon/Juniper/Oak	Severe	140.01	
Total					117,451.40	78.4%
Private					20.54	