United States Department of Agriculture

Copper Creek Allotment Grazing Authorization

Final Environmental Assessment

Forest Service Tonto National Forest, Cave Creek Ranger District August 2017

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Allotment Description and Location

Copper Creek allotment is approximately 35,000 acres in southeast Yavapai County, 50 miles north of Phoenix, Arizona (Figure 1). It is located at the northwest portion of the Cave Creek Ranger District of the Tonto National Forest. Vegetation on the allotment is made up of tobossa grassland, semi desert grassland, and desert scrub in the higher elevations. Copper Creek allotment consists primarily of five pastures: Bobcat, Brooklyn, Cornstalk, Granite-Mesa Butte, and Perry Mesa.

Topographical features range from nearly level mesa tops in the southwest to rolling hills in the north and steep mountains in the west. Elevations range from approximately 3,000 feet near the south end of Perry Mesa to 5,800 feet in the northeast portion of the allotment. Mean annual precipitation is about 14 inches (Bureau of Land Management 2014).

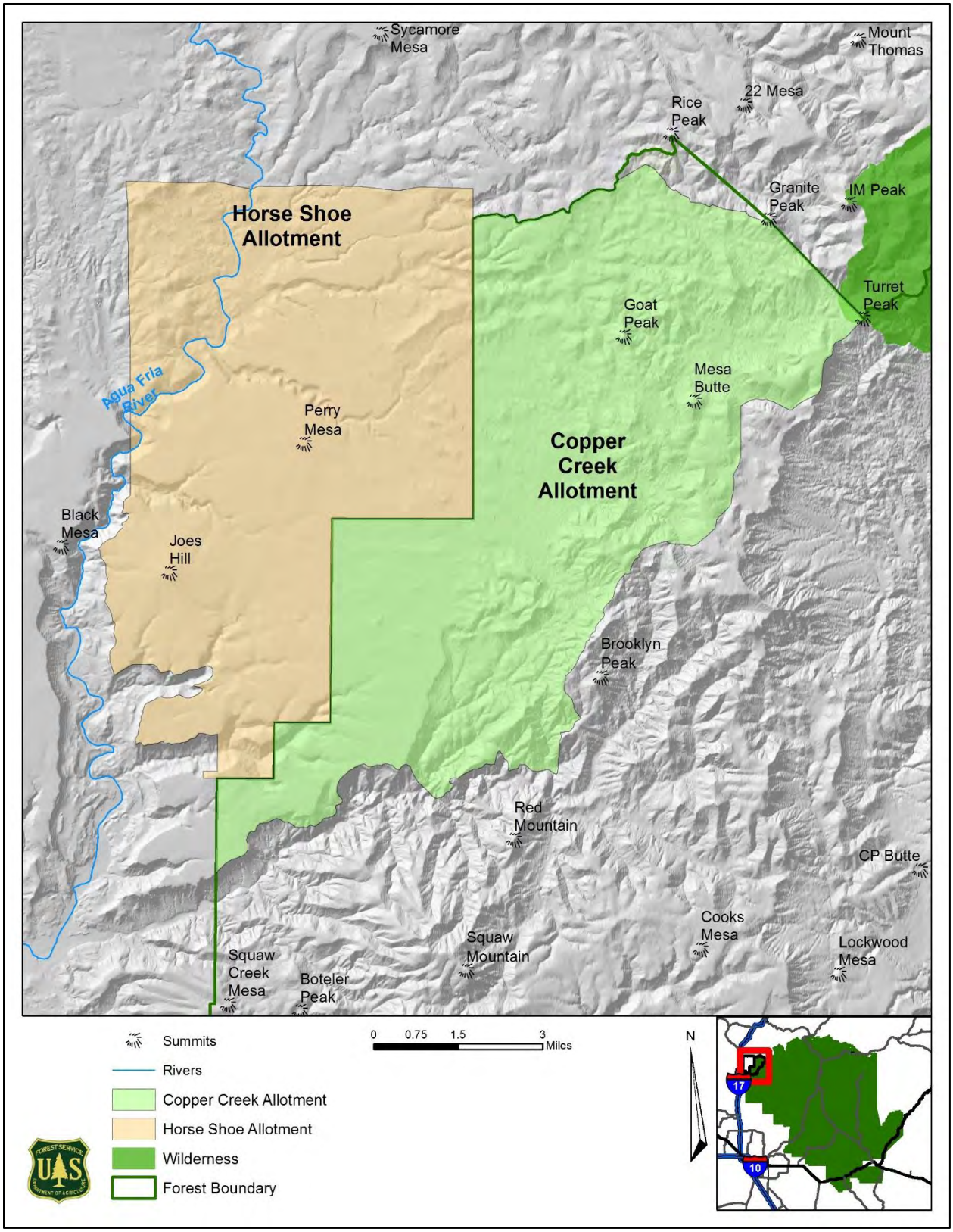

Figure 1: Location of the Copper Creek Allotment on the Tonto National Forest and BLM's Horseshoe Allotment

Within the allotment, from north to south, Silver Creek, Bishop Creek, and Copper Creek are the major tributaries to the Agua Fria River and support most of the riparian habitat within the allotment (Figure 2). Riparian areas can be affected by many factors, including historic and recent livestock grazing, roads, mining, fire suppression, wildfire, recreational activities, drought, and floods. The Cave Creek Complex Fire occurred in June and July 2005 and burned most of the Copper Creek Allotment (Forest Service 2007). All of these streams, east of Forest Road 677, experienced direct effects from the fire. The upland soils associated with these streams were comprised of soils derived from decomposed granitic parent material which are highly erosive and readily mobilized under post-fire conditions. Prior to the Cave Creek Complex fire, Silver Creek had intermittent flow for approximately half a mile upstream of the Forest boundary. However, until recently, no surface flow had been observed due to infilling of the channel with excess sediment resulting from high energy post-fire runoff events. Although upland watershed conditions have continued to stabilize and improve, there will be a period of transition before the excess sediment is flushed downstream and the pre-fire cobble boulder channel morphology system returns.

Additionally, in July 2017, the Brooklyn Fire, caused by a lightning strike, burned through approximately 45 percent of the Copper Creek Allotment. This was a lower severity fire and overlapped with much of the previous burn scar of the Cave Creek Complex Fire (Figure 3).

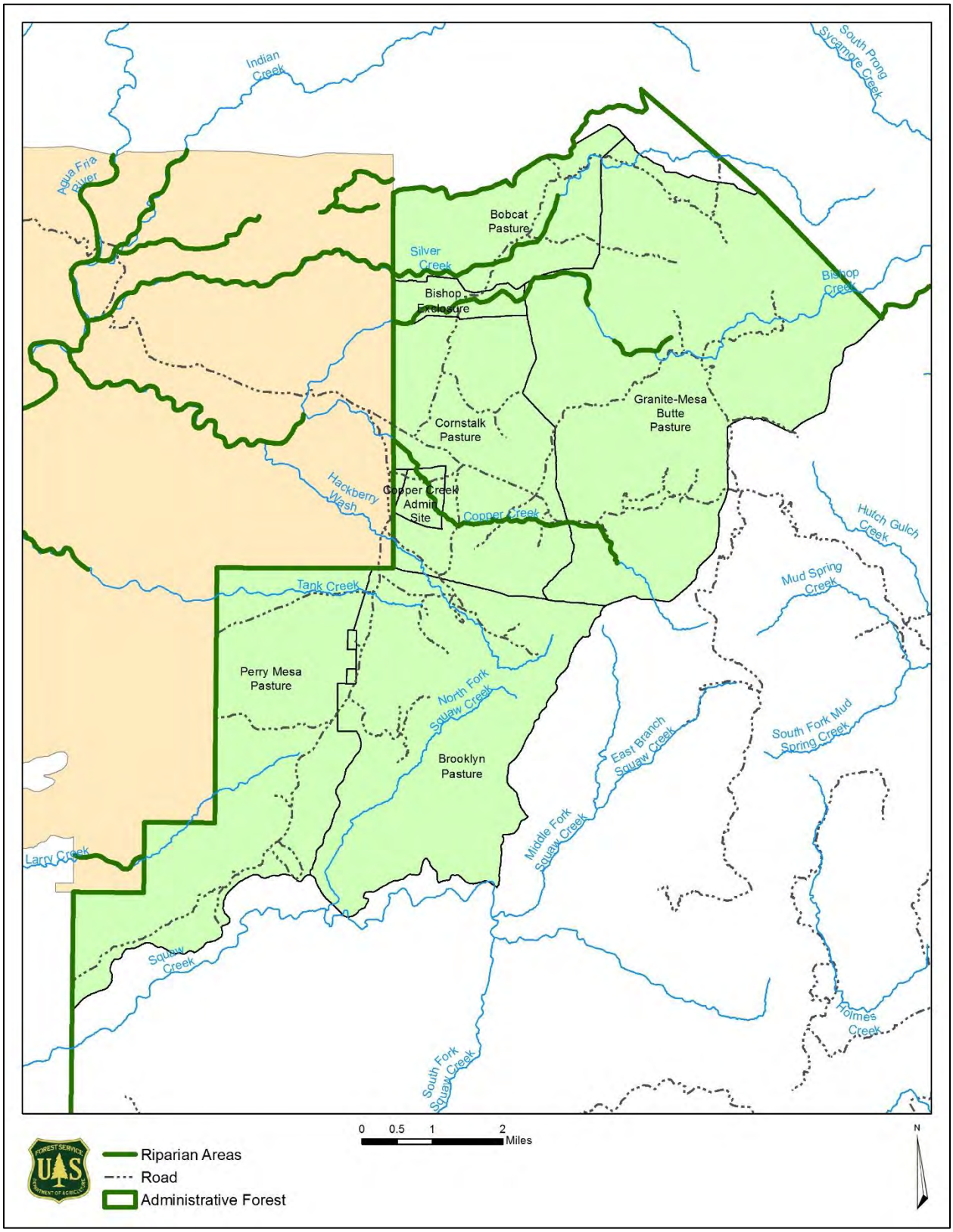

Figure 2: Riparian Areas and Streams on the Copper Creek Allotment

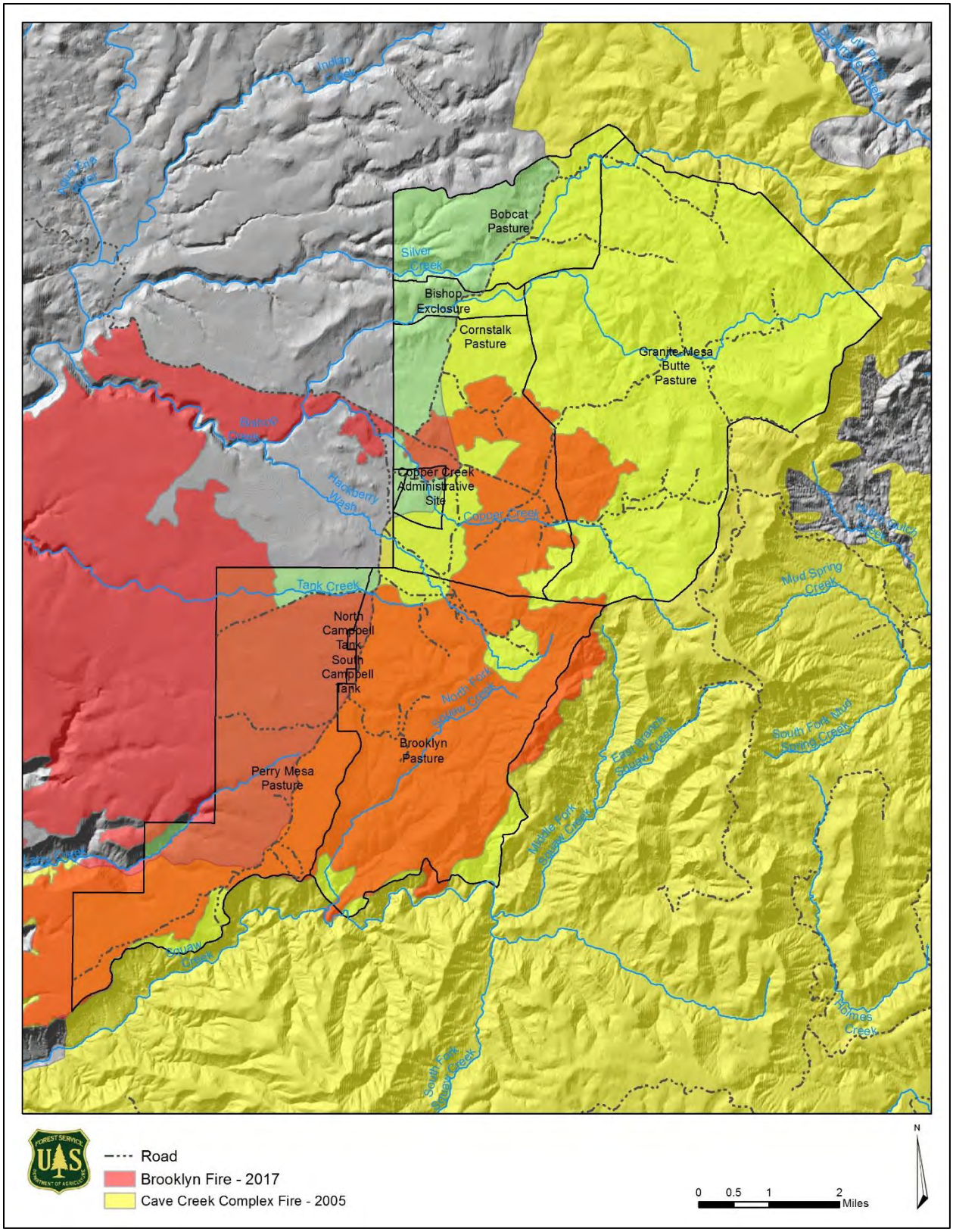

Figure 3: Map of the Brooklyn Fire and Cave Creek Complex Fire in Relationship to the Copper Creek Allotment

Allotment Management History

Historically, a portion of the Copper Creek Allotment was part of the Tangle Creek Sheep Driveway from the area of present day north Phoenix to the Prescott National Forest. The driveway was used to trail bands of sheep to the high country in spring and back to the desert in fall. The area was also used simultaneously by cattle which resulted in higher grazing levels than are currently authorized. The driveway has not been used for sheep since the 1970s and there is no longer any permitted sheep grazing currently on the Cave Creek Ranger District.

Copper Creek was also used as a winter sheep range until 1948 when permitted use was converted to cattle. From 1960 through 1994, Copper Creek was under permit to the Wingfields of the Horseshoe Ranch. The Wingfields also operated the neighboring Horseshoe allotment to the west[1]. During this period, they ran between 700 and 800 head of cattle between the Horseshoe and Copper Creek Allotments. In 1994, CTW Cattle Company acquired the Copper Creek permit and grazed up to 1,350 yearlings in the winter. In 1998, the permit was modified and permitted livestock numbers allowed 450 to 500 adult cattle yearlong and 375-950 yearlings from October 15 to May 15. Yearling numbers were often adjusted in response to winter precipitation and available forage on the allotment. In 2004, the grazing permit associated with the allotment was waived to Red Mountain Mining. Approximately 270 adult cattle grazed from 2004-2005.

In 2005, the Cave Creek Complex fire (Complex fire) burned 243,800 acres of the Cave Creek Ranger District including most of the Copper Creek Allotment. After the fire, the allotment was put into non-use for resource protection and development while conditions were allowed to improve. Cattle were restocked on Copper Creek in 2012 when the permit changed hands to JH Grassfed Inc. Since 2012, there have been 170 to 285 adult cattle plus their calves (natural increase) on the allotment.

Coordinated Resource Management Plan

In the mid-1990s, a Coordinated Resource Management Plan (Coordinated Plan) was proposed that would allow Copper Creek to be grazed in conjunction with Bureau of Land Management's (the Bureau) adjacent Horseshoe Allotment. The goal of the Coordinated Plan was to achieve desired conditions across the two allotments by running one livestock operation with a common herd of cattle. With implementation of the Coordinated Plan, it was anticipated that range conditions would improve by allowing the livestock operator to have greater flexibility in grazing patterns and stocking levels.

An environmental assessment was completed in 1997 to evaluate the effects of implementing the Coordinated Plan under the *National Environmental Policy Act* (NEPA)[2]. That same year a Decision Notice was signed by both the Forest Service and the Bureau. The resulting Coordinated Plan was signed in spring of 1998. Since the Coordinated Plan was implemented in 1998, the Copper Creek and Horseshoe Allotments have been run as a single operation. The Forest Service, the Bureau, and permit holder (permittee) are partners in the implementation of the grazing plans.

[1] Land management of the adjacent Horseshoe allotment was originally under Arizona State Land Department but is now part of the Bureau of Land Management land.
[2] Environmental Assessment #AZ-024-95-60: "Horseshoe/Copper Creek Allotments Coordinated Resources Management Plan".

Grazing Management Prescribed by the Coordinated Plan

Grazing management under the 1998 Coordinated Plan called for a cow/calf herd that utilized both allotments with Copper Creek occupancy typically between October and April. It was anticipated calves would use the rougher portion of the allotment. Younger cattle, generally more agile than mature cows, will graze more uniformly over steeper terrain (Vallentine 1990). Bobcat and Granite-Mesa pastures have riparian areas and limited water in the uplands so livestock were limited in these pastures to winter use when there is more available water, November 1 to March 1. Because of the Copper Creek riparian area and limited water in the pasture, Cornstalk pasture was scheduled for grazing one and a half to two months, four years out of five, between February and May. Perry Mesa pasture was scheduled four years out of five, for three to four months, typically between spring and fall and alternating the month cattle entered the pasture annually. Brooklyn pasture was used by yearlings annually between March and May. Pasture moves were planned with consideration of prescribed burning on the Agua Fria Grassland. Pastures that fell within planned burn areas, would be rested January through July prior to burning and then one growing season post burning. Cow/calf numbers were planned for a sustained herd of 500 head yearlong although herd numbers could fluctuate from 375 to 950 adult cattle depending on current conditions. Numbers in the calf herd were to be flexible to allow for reductions during drought or when rest is needed for pastures that have been treated with prescribed fire[3]. Allowable use was 40 percent of the current year's growth of key species in the uplands and 50 percent of herbaceous growth in riparian areas.

Grazing Permit and Annual Operating Instructions

Every year, annual operating instructions are developed for the grazing management on the Copper Creek Allotment in coordination with the permittee and the Bureau in relationship to their management of the Horseshoe Allotment. These instructions are within the bounds and constraints of the original 1997 decision and are guided by the Coordinated Plan. However, conditions within the allotment have changed since the 1998 Coordinated Plan and the 1997 decision. In addition, the 1997 decision was to implement the Coordinated Plan, which had specific dates, schedules, and limitations on when certain pastures could be used, and the recent instructions are outside of these specific timelines for pastures used. The most recent operating instructions were developed within revised policy[4] that administratively authorizes additional flexibility in grazing schedules on a trial basis within specific utilization standards that have been adhered to for this allotment. Authorized date and numbers of cows are different than what is authorized by the 1997 decision. However, the intent behind that 1997 decision notice is still being achieved. The current permittee's herd size has ranged from 170 to 285 adult cattle. Numbers have increased as the permittee continues to develop their ranching operation.

Table 1 shows the authorized number of cattle and duration of authorized use for both the Bureau's Horseshoe Allotment and the Copper Creek Allotment under the current grazing permits.

[3] Prescribed burning was included in the 1998 Coordinated Resource Management Plan. However, since the Complex Fire burned through the area in 2005, any further prescribed burning activities would require additional environmental analysis under the *National Environmental Policy Act*.
[4] Forest Service Handbook 2209.13, Chapter 90.

Table 1: Currently Permitted Number of Livestock

Allotment	Begin Date	End Date	Authorized Number of Cattle (AUMs[5])
Horseshoe	03/01	02/28	381 (4,572)
Copper Creek	03/01	02/28	285 (3,420)[6]

Existing and Desired Conditions

Existing conditions describe the current management situation and environmental conditions within the project area. Desired conditions describe how the resource should function after the project is implemented and are defined by Forest Plan guidance and the best available scientific information.

The Forest Plan identifies management prescriptions and management emphasis for particular management areas across the Tonto National Forest. The Copper Creek Allotment is entirely within Management Area 1F (Forest Service 1985). Management emphasis for area 1F is to manage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, livestock forage production, and dispersed recreation.

Resources chosen to illustrate the existing and desired condition for this project are indicators of range management: vegetation, soils, riparian, water quality, and watershed conditions. For resource managers to determine if a project is moving toward its desired condition, the resource's condition must be measurable over time.

Range

Existing Conditions

Copper Creek consists of approximately 17,200 acres of interior chaparral, 14,000 acres of semi-desert grassland, 2,600 acres of Sonoran desert scrub, and 870 acres of great basin conifer woodland (Brown 1994) (Figure 4). Small areas of riparian vegetation occur in some drainages, approximately 12 miles, throughout the allotment.

[5] More information on how animal unit months are calculated can be found in Appendix A.

[6] Current permitted AUMs may vary annually based on current range condition but they may not exceed what is authorized in a previous NEPA decision, which is 6000 AUMs (or 500 adult cattle).

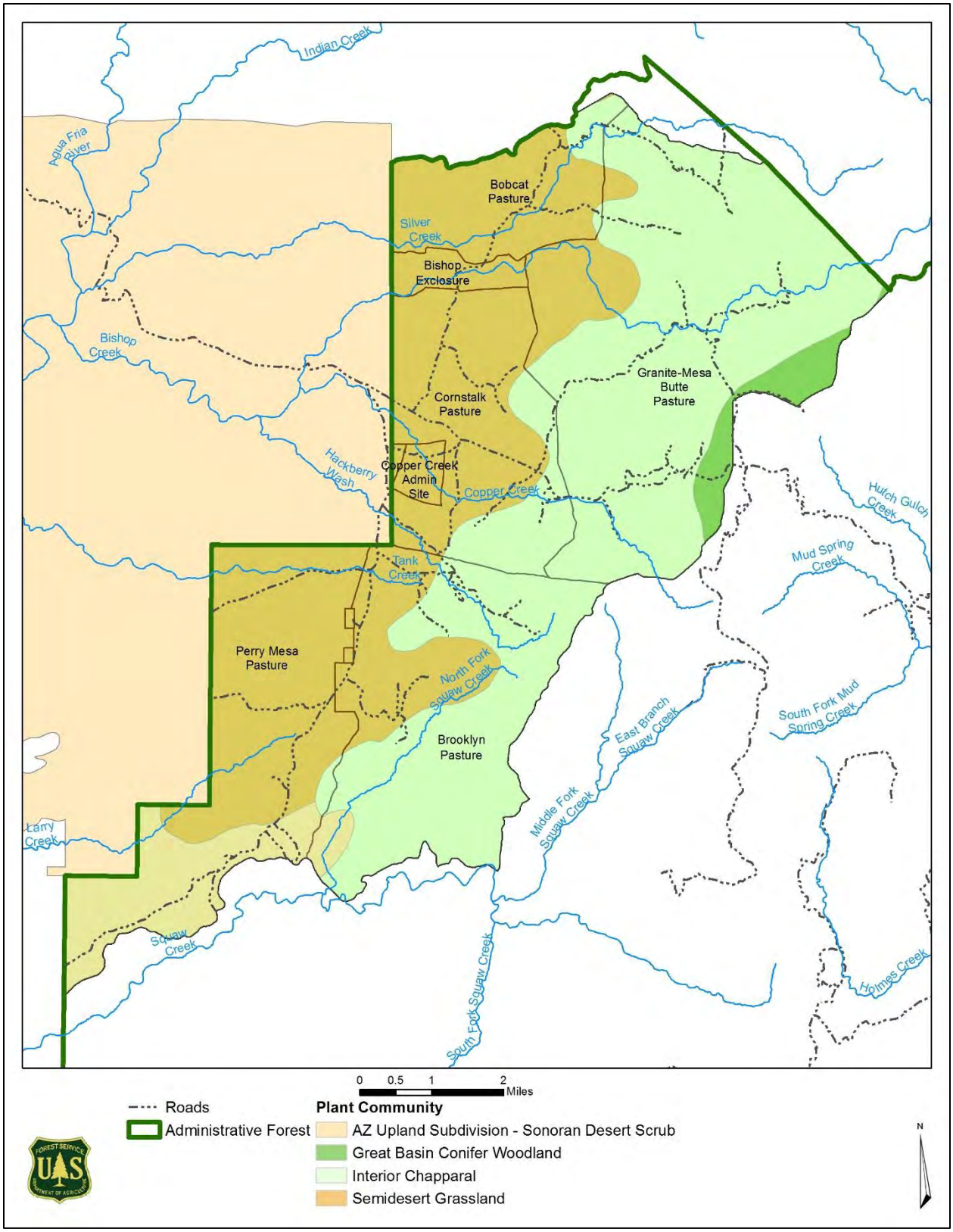

Figure 4: Copper Creek Allotment Vegetation Communities

Various monitoring techniques were used to assess the current condition of the Copper Creek Allotment such as Parker three-step monitoring, common non-forested vegetation sampling procedures, and key area monitoring[7]. There has been improvement on most of the allotment vegetative conditions under current management. However, areas in need of improving have been identified in several areas. Monitoring data collected between 2013 and 2014 shows most of the Parker cluster key areas received vegetative ratings of fair or good. Two key areas received poor ratings, and of these one showed an upward trend indicating conditions here may be improving. Trend data was assessed by comparing the most recent vegetation rating to the previous monitoring data at the site, which for most sites was in 1994 and 1995.

There are three drainages with portions that have been identified as the primary riparian areas of the allotment: Bishop, Copper, and Silver Creeks. Riparian vegetation is based on aquic soils that have been mapped by Terrestrial Ecosystem Unit Inventory which is ongoing for the Tonto National Forest (Forest Service 2014). This inventory is complete for the allotment area and is currently in draft status.

Currently, there is a grazing exclosure that prevents cattle from accessing approximately two miles of the Bishop Creek drainage. This exclosure was originally built to keep cattle from accessing the riparian area, where their use is often concentrated due to a lack of available water in the uplands. However, there is no longer perennial water in this area that would attract cattle due to sediment running off and filling the drainage after the Cave Creek Complex fire.

Desired Conditions

According to the Forest Plan, the Tonto National Forest should manage vegetation types such as: chaparral, semi-desert grasslands, and desert scrub to meet the needs of both livestock and wildlife (pp. 66-68). The overall goal of vegetation management in relation to rangeland management is to maintain 30 percent ground cover where the current level of development allows and where opportunities exist while providing for multiple use of the range for domestic livestock grazing (Forest Plan p. 68-1).

In order to optimize production and utilization of forage allocated for livestock, as well as reach the management goal of 30 percent ground cover, it is our objective to balance permitted grazing use with available forage allocated for use by domestic livestock. To determine if and where management goals are being reached, evaluations are made on the ground[8]. This is done by identifying key ungulate forage monitoring areas. These key areas will normally be one quarter mile from water, located on productive soils on level to intermediate slopes and be readily accessible to grazing. Size of the key forage areas should be 20 to 500 acres. Within key forage monitoring areas, an appropriate key species is selected to monitor average allowable use (Forest Plan p. 42-1). Allowable use is one of the factors used to determine condition rating and trend at each site. Desired conditions are condition ratings for each site or key area that are in alignment with the Tonto National Forest Plan and its management objectives (Forest Service 1985). In other words, the desired condition for these key species would then be for maintenance of satisfactory conditions and improvement of less than satisfactory conditions of preferred herbaceous and

[7] More information on these monitoring techniques and specific findings can be found in the Upland Vegetation section of Chapter 3 of this document.

[8] More information on how vegetative condition is determined and monitored, as well as existing key area locations can be found in the Vegetation Resources section in Chapter 3.

browse species for cattle and native ungulates, as well as maintenance or improvement in canopy and basal cover for soil protection.

Soils

Existing Conditions

The Copper Creek Allotment contains variable soil types due to the variety of parent materials, landforms, and natural processes which form them. Soils in the higher eastern portions of the allotment like the Rugged Mesa area have developed in basalt parent material. In the center of the allotment the soils in a strip trending north to south have developed from granitic sources exposed as result from erosion of the basalt. The western portion grasslands adjacent to the Agua Fria National Monument have developed from basalt.

The soils of the allotment were originally mapped and described in the North Tonto National Forest Terrestrial Ecosystem Survey Report (Forest Service 1985). The soil data for the allotment are currently being updated to current standards in the Terrestrial Ecosystem Unit Inventory which is ongoing for the Tonto National Forest (Forest Service 2014). This inventory is currently in draft status.

Soil condition data were collected at five locations on the Copper Creek Allotment in 2009[9] (Figure 5) (Robertson *et al.* 2014). Forty percent of the sites were in satisfactory condition and sixty percent were in impaired condition. A field review of the allotment was conducted in February 2015 (Figure 6). Soil condition was assessed at six of the key areas visited. In April 2015, soil condition assessments were completed at six additional representative locations on the allotment. Soil condition was satisfactory at ten of the twelve sites, or approximately 83 percent. The sites in satisfactory condition were stable, had good soil structure, and had a good cover of perennial grass. Two sites were in impaired condition. The impaired ratings were a result of lack of soil stability and a reduction in nutrient cycling.

Soil condition on the allotment has continued to improve since the Cave Creek Complex Fire that occurred in 2005. The fire burned 77 percent of the allotment which included the approximate eastern three quarters of the allotment area (Forest Service 2007).

[9] More information on soil condition monitoring can be found in the Soil Resources section of Chapter 3 of this document.

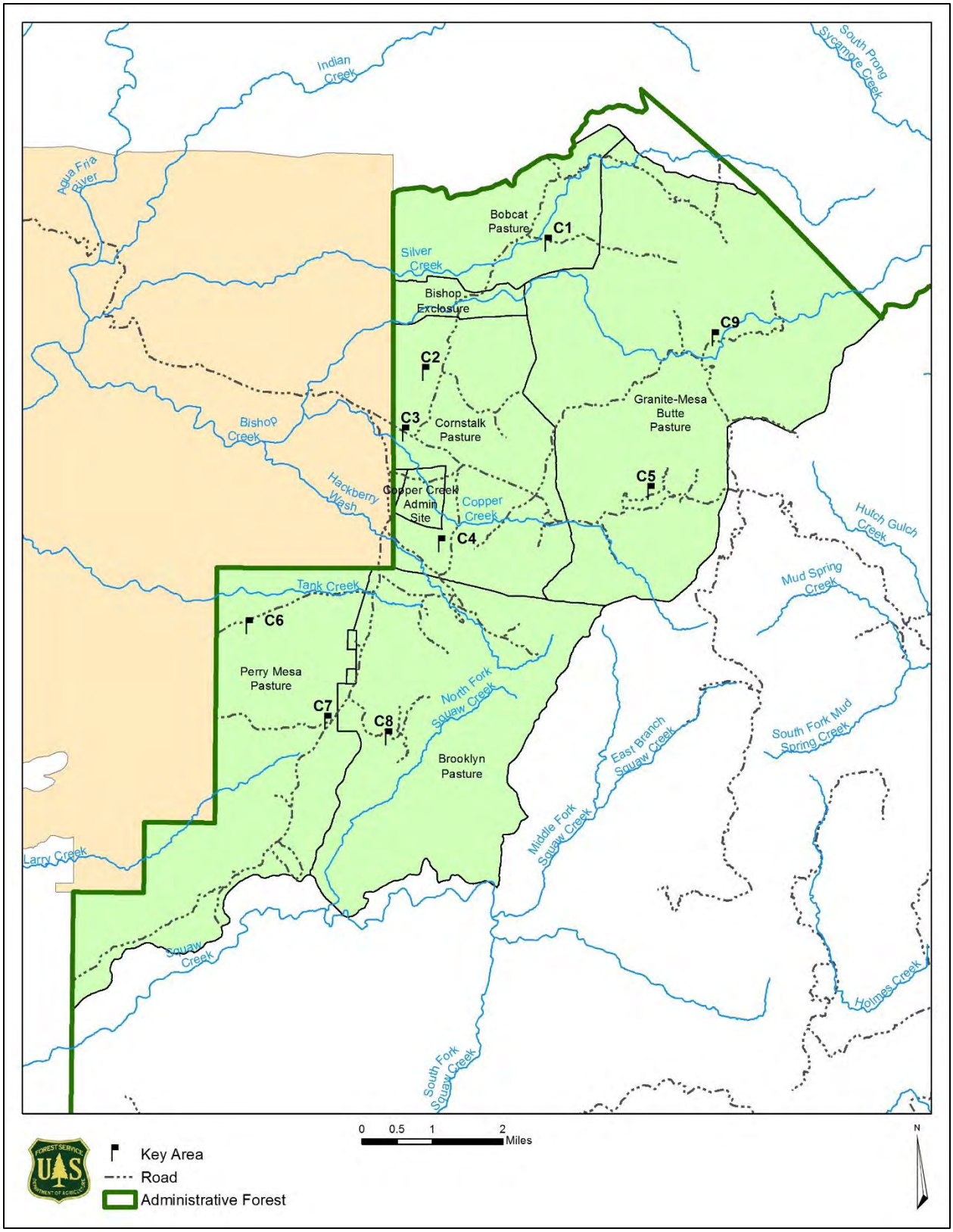

Figure 5: Key Areas on the Copper Creek Allotment

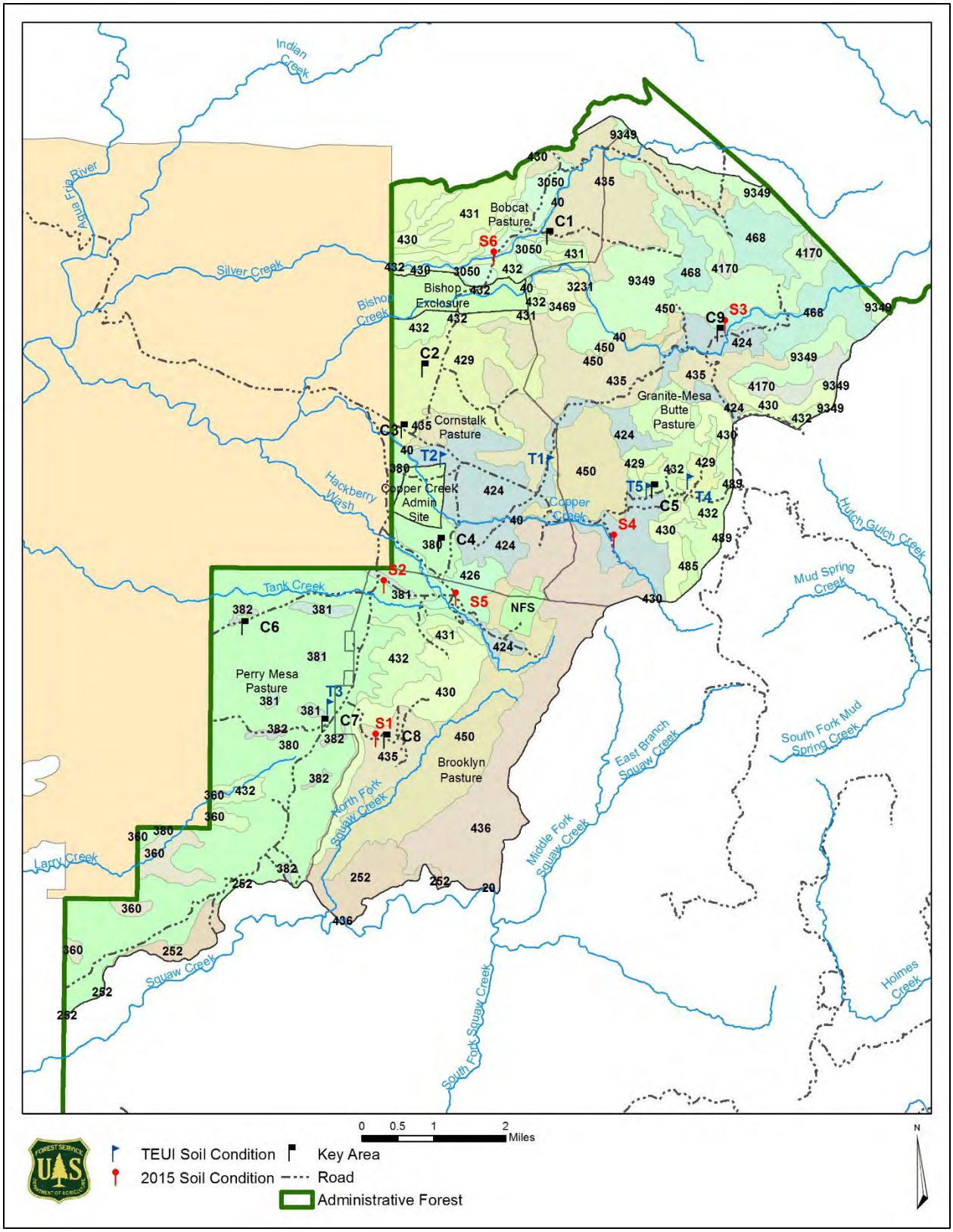

Figure 6: Copper Creek Allotment TEUI Classifications, Key Areas, and Soil Monitoring Locations.

Desired Conditions

Recovery times for soils in desert ecosystems can be extremely slow. This is attributed to the fact that deserts are generally considered to have both low resistance and resilience to disturbance, though, it is expected that resistance and resilience to disturbance can vary among deserts and among ecosystems in general (Belnap 2002). Rates of recovery will differ depending on several factors such as magnitude of past soil loss, inherent soil properties, current vegetation ground cover, and the type of ecosystem.

According to Forest Service Manual 2550.2, the desired conditions for soils are to "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." Further, the Forest Plan indicates that projects should improve soil productivity (p. 19).

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 that are critical in sustaining soil productivity (Forest Service 2012).

It would be desirable for all soils within the allotment to be in satisfactory; however, soil improvement may take longer than the anticipated ten years for this authorization. Therefore, the desired condition would be to maintain soils currently in satisfactory condition and to manage for upward trend of the soils that are in impaired condition within grazing management practices.

Watersheds

Existing Conditions

In 2010, a national effort was completed by the Forest Service to assess the condition of all 6th code watersheds on National Forest System land. Sixth code watersheds 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 regime or wildfire effects, rangeland vegetation, terrestrial invasive species, forest cover, and forest health. Each indicator has its own definition of "good" (functioning properly), "fair" (functioning at risk), and "poor" (impaired function) and was assessed a point value based on its condition[10]. Each 6th code watershed was given an overall rating of functioning, functioning at risk, or impaired based on the indicator scores. The results of the assessment for the 6th code watersheds in the project area are shown in (Table 2). All the watersheds were rated as being in a condition class of "functioning at risk" with the exception of Bishop Creek rated as being in an "impaired" condition. The indicators in Bishop Creek watershed that were rated as being in poor condition included: riparian/wetland, water quality, aquatic habitat, roads and trails, and soil condition. The Bishop Creek watershed also has the greatest proportion (59 percent) of the project area within a 6th code watershed.

[10] More information can be found in the Hydrology, Riparian, and Watershed Resources section in Chapter 3.

Table 2: Watershed Condition for 6th Code Watersheds in Project Area

6th Code Watershed	Percent of 6th Code Watershed within Allotment	Condition
Bishop Creek Watershed	59	Impaired
Tank Creek Watershed	43	Functioning at risk
Silver Creek Watershed	42	Functioning at risk
Squaw Creek Watershed	15	Functioning at risk
Lousy Canyon-Agua Fria River Watershed	13	Functioning at risk

Desired Conditions

According to the Forest Plan, the Tonto National Forest should manage watersheds so as to improve them to a satisfactory or better condition. As the Watershed Condition Framework is currently the Forest Service's accepted measure of watershed condition, satisfactory equates to a rating of "functioning properly".

Water Quality and Quantity

Existing Conditions

The Arizona Department of Environmental Quality (ADEQ) evaluates the water quality in a Status of Water Quality Report (2015). The three intermittent streams within the allotment—Silver, Bishop, and Copper Creeks—are considered unlisted tributaries to the Agua Fria River (Figure 7) and are therefore not assessed by ADEQ. The assessed reach of Agua Fria River from Sycamore Creek to Bishop Creek, which is approximately nine miles in length, receives flow from Silver Creek approximately a mile upstream from the end of the reach. Water quality standards are intended to protect their designated uses.

Designated uses for non-ephemeral, unlisted tributaries below 5,000 feet are: aquatic and wildlife warm water fisheries, fish consumption, and full body contact recreation. The designated uses for the Agua Fria River from Sycamore Creek to Bishop Creek include these three designated uses, as well as the designation of domestic water source, agriculture irrigation, and agriculture livestock watering (ADEQ 2015). This section of the Agua Fria River is listed as "attaining" or "inconclusive" with respect to all designated uses, with the exception of an impairment for full body contact recreation because of *E. coli* exceedances. This was listed by the Arizona Department of Environmental Quality as a high priority for collection of additional samples for total maximum daily load development.

The availability of alternative water within a pasture can determine the amount of time livestock may spend in riparian areas. Water on the allotment was located using the water points layer in the Tonto National Forest's Geographic Information System (GIS). The layer contains springs, wells, and tanks for which the Tonto has water right claims, as well as other sources indicated on topographic maps (Table 3).

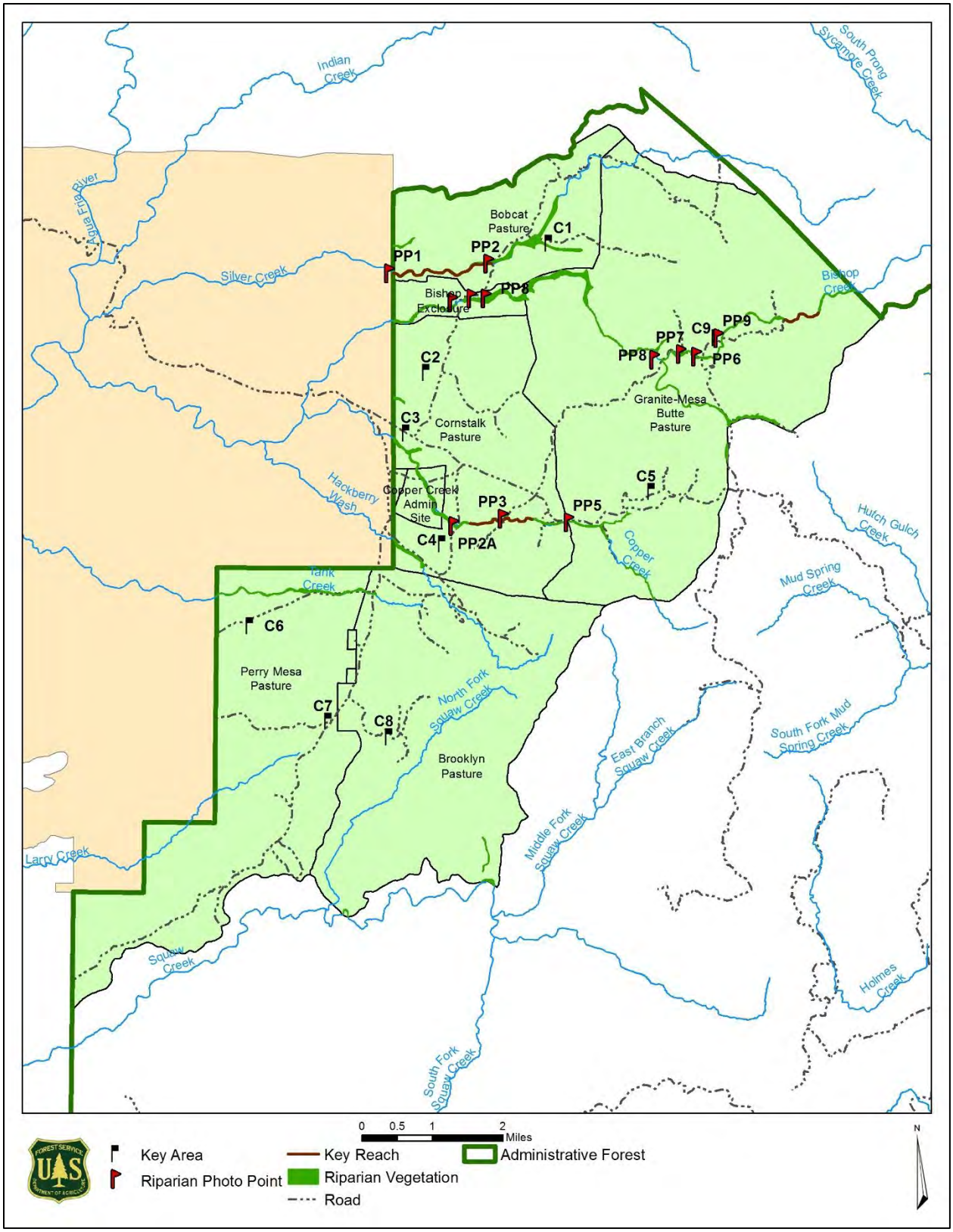

Figure 7: Copper Creek Allotment Key Areas and Riparian Photo Point Locations

Table 3: Cave Creek Allotment Alternative Water Sources to Riparian Areas

Pasture	Number of Springs	Number of Wells	Number of Tanks	Total Alternative Water Sources
Bobcat	1	0	1	2
Cornstalk	0	1	3	4
Brooklyn	1	1	4	6
Perry Mesa	0	0	4	4
Granite Mesa	4	2	5	11
Totals	6	4	17	27

Silver Creek

Silver Creek is mostly an intermittent stream supporting 3.1 miles of riparian habitat across the Bobcat pasture. This stream flows from east to west exiting the allotment and entering the Agua Fria National Monument. Two permanent photo point locations are located within the allotment, number one, near Silver Spring located at the extreme western part of the allotment, and number two, at the Forest Road 677 road crossing (Figure 7). The most recent photos taken at the photo point locations were in 2015. Also in 2015, the stream reach from Forest Road 677 to the Agua Fria National Monument boundary was assessed. Pools were present over approximately five percent of the length of the reach. The channel was observed to be embedded with sand size particles, however the stream banks were well vegetated with woody riparian vegetation such as Arizona sycamore, Arizona ash, Fremont cottonwood, deergrass, bermudagrass, and areas of tamarisk. The riparian vegetation exhibited the presence of diverse age classes and recruitment was occurring. The woody vegetation was providing stability with recent flood debris present. This reach was assessed to be functioning properly (Prichard *et al.* 1998) in relation to its ability to dissipate stream energy.

Bishop Creek

Bishop Creek is an intermittent stream supporting 5.8 miles of riparian habitat starting in the Granite-Mesa Butte pasture and continuing through the Bishop Creek exclosure (Figure 7). The stream flows from east to west, eventually leaving the allotment and entering the Agua Fria National Monument. Eight permanent photo point locations are located along the stream corridor (Figure 7). Photos were taken in 2015 showing the existing condition of the stream at selected photo point sites. In 2015, the reach above the Forest Road 677 crossing and the reach above the Forest Road 1981 crossing was assessed. The upper reach was flowing and intermittent pools present in the lower reach. Much of the reach was embedded with sand size particles but appeared to be stable. The riparian vegetation present included Arizona sycamore, Arizona ash, Fremont cottonwood, deergrass and others supported in abundance by this intermittent system. The reaches were assessed as functioning properly (Prichard *et al.* 1998) in relation to its ability to dissipate stream energy.

Copper Creek

Copper Creek is an intermittent stream supporting 4.5 miles of riparian habitat originating at Copper Spring in the Granite-Mesa Butte pasture and continuing into the Cornstalk pasture, eventually crossing the administrative site exclosure (Figure 7). As with Silver and Bishop Creeks, the stream flows from east to west leaving the allotment and entering the Agua Fria National Monument. There are eight permanent photo point locations along the stream corridor (Figure 7). Photos were taken in 2015 showing the existing condition at selected photo point sites. The stream corridor and riparian habitat were observed at

several locations. Much of the lower channel length was embedded with sand size particles, but appeared to be geomorphically stable. In the upper reach, in the vicinity of Copper Spring and downstream, the excess sand deposited after the Cave Creek Complex Fire has been flushed out returning the channel back to a cobble boulder substrate. The riparian vegetation present included Arizona sycamore, Arizona ash, Fremont cottonwood, deergrass and others supported in abundance by the intermittent system. The observed stream reaches were determined to be functioning properly (Prichard *et al.* 1998) in relation to ability to dissipate stream energy.

Springs

Silver and Copper Springs are located within the stream channels of their respective creeks (Figure 7). Silver Spring was filled in by accumulation of excess sand as observed during a site visit in the spring of 2015. Copper Spring is located in the headwaters of Copper Creek. At the time of the last site visit in May 2015, there was a large pool present at the source of the spring. Riparian vegetation extended several hundred feet downstream from the source area and was assessed as properly functioning with a very diverse composition of riparian species present including: Arizona sycamore, Arizona ash, Fremont cottonwood, willows, deergrass, and many others.

There are four upland springs within the allotment. From north to south these include; Bishop, Shirttail, Little Hutch, and Rosalie. Bishop, Shirttail, and Little Hutch are all developed with troughs (Figure 7). They have small associated riparian areas that are fenced off. Shirttail has an associated 180 foot long channel which is dominated by deergrass. Rosalie has a small water pool and riparian area at the source that is not fenced. Riparian vegetation present at the springs includes deergrass, willow, and Fremont cottonwood. In 2015, photos were taken at the springs showing their condition[11].

Desired Conditions

The following are desired conditions as they relate to stream function and water quality:

- Water quality meets or exceeds Arizona State standards or Environmental Protection Agency water quality standards for designated uses.
- Stream condition is sufficient to withstand floods without disrupting normal stream characteristics (e.g., water transport, sediment, woody material) or uncharacteristically altering stream dimensions (e.g., bankfull width, depth, slope, sinuosity).
- Water quality, stream channel stability, and aquatic and riparian habitats retain their inherent resilience to natural and other disturbances.
- Water quantity meets the needs for forest administration and authorized activities (e.g., livestock grazing, recreation, firefighting, domestic use, road maintenance).

Purpose Of and Need for Action

The Copper Creek Allotment is a priority for completing grazing allotment planning in conformance with the requirements of the *National Environmental Policy Act* on the Cave Creek Ranger District. Completing this effort on time and to standard is essential. Tonto National Forest Land Management Plan (Forest Plan) identifies the Copper Creek Allotment as suitable for domestic livestock. The purpose of this action is to consider livestock grazing opportunities on public lands where consistent with

[11] This information can be viewed on the Friends of the Tonto website at http://www.friendsofthetonto.org/photo-point.html

management objectives. In addition, per Forest Service Handbook 2209.13, Chapter 90, section 92.22, the purpose of this action is to authorize livestock grazing in a manner consistent with direction to move ecosystems towards their desired conditions.

Authorization is needed on this allotment because:

- Where consistent with other multiple use goals and objectives, there is Congressional intent to allow grazing on suitable lands (Multiple Use Sustained Yield Act of 1960, Wilderness Act of 1964, Forest and Rangeland Renewable Resources Planning Act of 1974, Federal Land Policy and Management Act of 1976, National Forest Management Act of 1976).
- This allotment contains lands identified as suitable for domestic livestock grazing in the Tonto National Forest Plan and continued domestic livestock grazing is consistent with the goals, objectives, standards, and guidelines of the Forest Plan (Forest Plan, pages 24, 91 - 118).
- It is Forest Service policy to make forage available to qualified livestock operators from lands suitable for grazing consistent with land management plans (FSM 2203.1; 36 CFR 222.2 (c)).
- It is Forest Service policy to continue contributions to the economic and social well-being of people by providing opportunities for economic diversity and by promoting stability for communities that depend on range resources for their livelihood. (FSM 2202.1)

Additionally, there is a need to coordinate management of the Copper Creek Allotment with the adjacent Horseshoe Allotment, under Bureau of Land Management authority, and allow for flexibility in scheduling pasture use and rest periods to meet resource objectives across the two allotments. As part of a collaborative management approach, and consistent with objectives described in the Forest Plan, range and wildlife habitat improvements are needed to facilitate livestock distribution and provide reliable waters for wildlife in the area.

Proposed Action

The proposed action for the Copper Creek Allotment is to authorize livestock grazing in a manner that is consistent with Forest Plan standards, guidelines, and objectives and maintains or improves natural resource conditions. Livestock will be grazed using a flexible rotational system with a selective rest-rotation strategy. Proposed permitted use numbers would vary from 200 to 500 head of livestock[12].

Decision Framework

The Cave Creek District Ranger is the official responsible for the decision regarding management of the Copper Creek Allotment. They will determine the number of livestock permitted on the allotment, from none (as represented by one alternative) up to 500 head (as represented by the proposed action). Based on this analysis, the District Ranger will issue a draft decision notice as to whether or not livestock grazing will continue to be authorized. Since this project will be implemented under the existing Forest Plan, it is subject to the predecisional objection process (*36 CFR 218*). Once a final decision is signed,

[12] This equates to 2,400 to 6,000 Animal Unit Months (AUMs), year-long and up to 250 yearlings (845 AUMs) for natural increase (last year's calves) from January 1 to May 15, annually. The amount of forage needed by an "animal unit" (AU) grazing for one month. The quantity of forage needed, based on the cow's weight, and the animal unit is defined as one mature 1,000 pound cow and her suckling calf. It is assumed that such a cow nursing her calf will consume 26 pounds of dry matter of forage per day. A conversion rate of 3/4 is used to calculate AUs for yearlings.

implementation of this decision to continue livestock grazing would occur through issuance of a new grazing permit.

Public Involvement

Beginning in 2011, the Forest Service joined the Bureau of Land Management (Agua Fria National Monument), the Arizona Game and Fish Department, the Natural Resources Conservation Service, JH Cattle, and numerous stakeholders and interested parties to discuss management of the Copper Creek and Horseshoe allotments and develop a new Coordinated Resource Management Plan:

- Arizona Antelope Foundation
- Archeology Southwest
- Arizona State University
- Audubon - Sonoran
- Arizona Zoological Society
- Arizona Game and Fish Department
- Black Canyon City residents
- BLM-Agua Fria National Monument
- BLM-Tucson Field Office
- Friends of the Agua Fria National Monument
- Friends of the Tonto
- Grand Canyon Trust
- JH –Grass Fed Beef
- Northern Arizona University
- Residents and other interested citizens
- Sierra Club
- Southwest Decision Resources
- The Nature Conservancy
- Upper Agua Fria Watershed Partnership
- USFS - Tonto National Forest
- Western Watershed Project
- Yavapai County

The coordinated plan is intended to be responsive to emerging management objectives (e.g. pronghorn antelope and endangered fish habitat protection) and furthers the coordination amongst agencies in managing natural resources across land management boundaries to develop more holistic ecosystem management. This process identified additional project opportunities, and recommended additional monitoring and adaptive management strategies and mitigation measures to be considered for each of the allotments. As such, the Forest Service and Bureau of Land Management (the Bureau) initially agreed to prepare a joint Environmental Assessment to evaluate the environmental and social impacts of the actions proposed in the current draft Coordinated Resource Management Plan.

In March of 2015, the Forest Service and the Bureau released a combined scoping letter soliciting comments on management of the allotments. Ten written comments were received. Commenters were supportive of the collaborative effort for managing the allotments and many stated they had participated in previous meetings to discuss and support the proposed Coordinated Resource Management Plan. Most comments were focused on protecting the numerous cultural resources in the area, though measures to protect rare plants, soils in riparian areas, fawns during fawning season, and invasive weed control were also raised as concerns. One commenter was also concerned that increasing available water would increase the potential for West Nile Virus.

As the Bureau and Forest Service are with different federal departments (Department of Interior and Department of Agriculture, respectively), regulations governing compliance with the National Environmental Policy Act are also different. As time passed and joint analysis was conducted, each agency decided they would prepare their own environmental analysis to minimize process confusion

(internally and externally) and improve efficiency moving forward. To honor the intent of the Coordinated Resource Management Plan and all of the public involvement to date, the Bureau and Forest Service have committed to coordinate public outreach and required consultation work as much as possible throughout the completion of the planning processes.

As the Forest Service reviewed the management actions proposed by the stakeholder group for the developing Coordinated Resource Management Plan, as it applied to the Copper Creek Allotment, it became clear that many of the suggested management actions could already be authorized under existing authorities, and did not need to be analyzed within a new environmental analysis. For example, the draft coordinated plan suggests inventorying invasive weeds in riparian areas. Forest Service Manual 2080.2 - Noxious Weed Management already allows the Forest Service to do this. Therefore, it is unnecessary to evaluate this practice in this analysis. Additionally, the Forest Service was not considering changing the number of authorized livestock on the Copper Creek Allotment from that authorized under current management.

In April 2016, the Cave Creek District Ranger initiated a review of the 1997 Environmental Assessment for the Copper Creek Allotment consistent with Chapter 10 of FSH 1909.15 to determine whether current management was within the scope of actions considered and analyzed as described in that EA. The review determined that the 1997 Environmental Assessment and Decision Notice/Finding of No Significant Impact was insufficient to authorize grazing in compliance with the draft Coordinated Resource Management Plan, specifically in relationship to management actions on the Gila Chub (Listed; Endangered, 2005). It was further determined there is a need to engage in more current consultation with the U.S. Fish and Wildlife Service and the State Historic Preservation Office.

To comply with NEPA, this environmental assessment, including the proposed action, alternatives, and environmental effects analyses has been prepared to determine if, and in what manner, livestock grazing can continue on the Copper Creek Allotment, and if and to what degree we can incorporate suggested management goals of the stakeholder group and Coordinated Resource Management Plan into further allotment management planning. Despite the Forest Service's decision to prepare a separate environmental assessment from the Bureau, all relevant issues raised during the combined scoping process were considered by the Cave Creek District Ranger when developing alternatives, mitigations/monitoring and environmental analyses for the current action on the Copper Creek Allotment.

Chapter 2: Alternatives, Including the Proposed Action

Alternative A – Proposed Action

The following proposed action[13] was modified from the one scoped on March 11, 2015 in conjunction with the Bureau of Land Management (Bureau). At that time, the two agencies intended to produce one combined environmental analysis for the Horseshoe (Bureau) and Copper Creek (FS) Allotments. As such, the scoped proposed action contained elements which would apply to each allotment individually and those that apply to both allotments. Since the Cave Creek District Ranger and the Bureau Monument Manager will now be preparing separate analyses, the following proposed action does not include those items that would have only occurred on the Horseshoe Allotment. For example, the original proposed action called for implementing study plots. These plots would only occur on upland areas of the Horseshoe Allotment. The following proposed action was updated to focus the analysis only on actions that would occur on the Copper Creek Allotment and specifically related to the reauthorization of grazing.

The proposed action consists of five components: authorization, improvements, monitoring, adaptive management, and management practices[14]. The proposed action follows current guidance from Forest Service Handbook 2209.13, Chapter 90 (Grazing Permit Administration; Rangeland Management Decision making).

Grazing Authorization

The Cave Creek Ranger District of the Tonto National Forest, proposes to authorize livestock grazing in the Copper Creek Allotment under the following terms:

Permitted Livestock Numbers

Proposed permitted use numbers would vary from 200 to 500 head of livestock which is equal to 2,400 to 6,000 Animal Unit Months (AUMs), year-long and up to 250 yearlings (which is equal to 787.5 AUMs for 250 yearlings for four and a half months) for natural increase (last year's calves) from January 1 to May 15, annually. The proposed stocking numbers are based on the currently permitted stocking rate and the results of monitoring data. Table 4 shows the proposed permitted numbers for Copper Creek.

[13] The proposed action represents current management of livestock on the Copper Creek allotment. However, it does include the addition of range improvements and takes into consideration native fish management.
[14] This alternative no longer requires a project-specific amendment related to standards and guidelines for cultural resources. Amendment #29, signed on July 31, 2017, amended the 1985 Tonto National Forest Land and Resource Management Plan to permanently remove forestwide standard and guideline #4 from page 38-1.

Table 4: Proposed Stocking Numbers

Class of animal	Current Stocking in AUMs	Begin Date	End Date	Maximum Stocking[15]	Maximum Stocking in AUMs
Cow/Calf pairs	284/ 3,408 AUMs	1-Mar	28-Feb	200-500	2,400 to 6,000
Yearlings	N/A	1-Jan	15-May	Up to 250	Up to 787.5

Grazing System

Livestock will be grazed using a flexible livestock rotational system with a selective rest-rotation strategy. A selective rest-rotation strategy is comprised of two components. The selective component uses current climatic and on the ground monitoring data along with utilization triggers to prompt livestock rotations. The rest component is a period of no grazing, or deferment, within a pasture to allow for the physiological needs of plant recovery and reproduction after grazing has occurred within that pasture.

Annual authorized livestock numbers are the number of cattle that are determined can be appropriately grazed in a given year based on precipitation, pasture rotation, forage production and other resource concerns. This number can be adjusted from initial stocking levels on a yearly basis but will not exceed the permitted number of livestock. A stock and monitor approach, consistent with regional Forest Service direction Region 3 Supplement to FSH 2209.13 chapter 90, would be used to establish grazing capacity over the long term (five to ten years). Actual permitted levels of grazing would be determined annually by the Cave Creek District Ranger with the permittee based on the results of monitoring and successful implementation of management practices. Additionally annual authorized use would vary based on current range conditions, including forage availability, water availability, current growing conditions, and resource monitoring. Scheduling of pasture use would vary from year to year as detailed in Copper Creek Annual Operating Instructions (AOI). Pasture rotation schedules provide the basis for scheduled use, rest, and recovery periods after scheduled grazing to maintain or improve range and watershed conditions. The length of the grazing period within each pasture will also be considered and managed for the desired grazing intensity and utilization guidelines. Range readiness of pastures may be checked along with rest and recovery of key species to ensure proper rest and recovery of those plant species has occurred, if due to circumstances such as drought, fire, exceedance by wildlife use, or any other possible reason that plants have not recovered sufficiently to meet their key physiological requirements, grazing could be delayed or pushed off until sufficient plant recovery has occurred.

Grazing intensity will be measured using forage utilization. Forage utilization will be managed at a level corresponding to light to conservative grazing intensity in order to provide for grazed plant recovery, increases in herbage production, and retention of herbaceous litter to protect soils. Conservative use equates to 30 to 40 percent on herbaceous species and up to 50 percent use on browse. Consistent patterns of utilization in excess of 40 percent on key species in key areas will

[15] The upper limit of cow/calf pairs.

be used as a basis to modify management practices or take administrative actions necessary to reduce utilization in subsequent grazing seasons. Allowable use for riparian and upland vegetation is summarized in Table 5.

Table 5: Upland and Riparian Utilization Guidelines

Vegetation	Use Threshold
Upland Herbaceous Use	30-40% of current year's growth
Upland Browse Species	50% of current year's growth
Riparian Herbaceous Use	Limited to 40% utilization of plant species biomass of deer grass and maintain 6-8 inches of stubble height for emergent species such as rushes, sedges, cattails, and horsetails; measured during the grazing season.
Riparian Woody Species	Limited to 50% of leaders browsed on upper 1/3 of plants up to 6 feet tall

The goal is to achieve conservative use in the uplands over successive years. This strategy recognizes the importance of the AOI in allowing for modification of management. These actions include, but are not limited to; adjustments of timing, intensity, frequency, and duration of grazing to reach resource objectives (FSH 2209.13 - Chapter 90)[16].

When pasture rotation schedules are determined for the upcoming grazing year, the permittee would be required to follow the prescribed pasture rotation or develop alternative plans with the Forest Service if resource or livestock management concerns arise. Concurrent with this project, the Bureau of Land Management is also evaluating the reauthorization of livestock grazing on the adjacent Horseshoe Allotment. If grazing is authorized on both allotments, pasture use could be scheduled to rotate livestock among the pastures on both the Horseshoe and Copper Creek Allotments. This strategy would maximize management flexibility to respond to resource conditions. In this case, the Cave Creek District Ranger, the Bureau Monument Manager, and the permittee would collaborate to schedule pasture use across both allotments. If livestock grazing is not authorized on the Bureau's Horseshoe Allotment, the Copper Creek Allotment would still be grazed according to a yearlong select-rest rotation grazing strategy that allows for periodic rest of individual pastures. Grazing utilization standards would be maintained as described above and livestock numbers would be maintained at the authorized levels using the stock and monitor approach as previously described.

Management systems would be designed to incorporate at least one growing season of rest or deferment in order to provide grazed plant recovery. Timing of pasture moves would be determined by forage utilization monitoring and resource management objectives specified in the Copper Creek AOI with the following design criteria.

Actual rotation of cattle would be determined annually through the Copper Creek AOI. Modifications to these documents may be implemented at any time throughout the grazing season in response to unforeseen environmental or management concerns. Such changes may be in

[16] For more information on how this strategy will be monitored, see the Monitoring section of this alternative.

response to resource conditions including but not limited to: water availability, forage conditions, drought, fire, and management objectives. This includes using monitoring results to continually modify management in order to achieve desired conditions. This would provide the flexibility to adapt management to current conditions. Such changes may include annual administrative decisions to adjust the number of livestock, dates for grazing (season of use), class of animal, or pasture rotation. These changes would not exceed the limits for timing, intensity, duration, and frequency as defined in the grazing permit.

The Forest Plan (p. 24) identifies the goal of the range program to incorporate the social and economic needs of permittees into the process of balancing permitted grazing use with capacity. Adjustments of livestock numbers must recognize the economic viability of each ranching operation and the time frame for adjustments in livestock numbers for proper management depends considerably on the permittees willingness to implement proper management systems and level of funding for both operation and maintenance of range improvements. The criteria or steps used to implement proper range management include:

1. Through range analysis and production and utilization surveys and/or agreement on a proper level of permitted use with permittees, provide a balance of permitted use with forage capacity.
2. Cooperatively with the permittee, develop an allotment management plan that establishes allotment goals and objectives and provides for grazing systems and management practices that will provide an improving trend in range conditions.
3. Identify the structural and non-structural improvements needed to facilitate implementation of grazing systems and management practices in the allotment management plan.
4. Develop an annual action plan and schedule for improvements, through program planning budgeting system.
5. Monitor allotment management plans to determine if management objectives are being met.

Management Tools

As described in the Public Involvement section of Chapter 1, the Forest Service, Bureau of Land Management, Arizona Game and Fish Department, Natural Resource Conservation Service and the grazing permittee for the allotment, along with a diverse stakeholder group, have begun drafting a revised Coordinated Resource Management Plan (revised Coordinated Plan) for the Copper Creek allotment. This plan would be used in place of a traditional allotment management plan to implement the authorization, mitigation measures, monitoring and adaptive management strategies and objectives described in the Proposed Action. Management actions in the revised Coordinated Plan will be limited to those that fall within the scope of the final decision and those currently authorized by existing law, regulation, and policy. The intent of the revised Coordinated Plan will be to provide a coordinated grazing management strategy across the two allotments while moving natural resources on the Copper Creek Allotment toward the desired conditions.

If monitoring indicates that desired resource conditions outlined in Chapter 1 are not being achieved, in the desired time frame or areas for this allotment, there are tools, or administrative actions that will be used to modify management. Such changes may include annual administrative

actions to adjust the specific number of livestock and/or animal unit months, specific dates for grazing, class of animal, or pasture rotations. These changes will not exceed limits for timing, intensity, duration, and frequency, as described in the proposed action.

Necessary changes will be implemented through the AOI, which will adjust use to be consistent with current productivity and resource conditions. The AOI will also include mitigation measures and Best Management Practices to avoid or minimize effects to wildlife, soil, and water quality. Modifications to the AOI may be implemented at any time throughout the grazing season in response to unforeseen environmental concerns such as drought, fire, flood, etc., or management and livestock operation concerns.

The following is a list of when administrative actions will be necessary in the management of this allotment:

- Monitoring shows management objectives have not been achieved or that trend toward achieving desired conditions is not improving or improving at an adequate rate.
- Annual indicators of grazing use or grazing guidelines are not met.
- Climatic events, fire, flood, or uses and activities detrimentally impact resource conditions and a modification of grazing use is needed to provide for recovery of the site.

There are several types of administrative actions that could take place within the allotment. These actions will comply with the Forest Plan and mitigations detailed later in this section. The following list includes some of these actions:

- Extending or shortening time in a pasture based on utilization levels in uplands and riparian areas;
- Assessing the readiness of a pasture and changing its position in the rotation for the season;
- Time or season of pasture use;
- Resting a pasture for one or more growing seasons;
- High intensity, short duration grazing[17];
- In the event of extended drought, severe fire, or depleted rangelands, complete removal of livestock until rangelands have recovered;
- Decrease or increase herd size within the limits of the permitted numbers;
- Temporarily closing off water in a portion of a pasture to manipulate grazing pressure and intensity of use;
- Use of salt and mineral blocks to aid in distribution, especially away from critical areas such as riparian areas;
- Excluding livestock from specific areas temporarily or permanently for other resource objectives;
- Changing or limiting season of use to minimize impacts to riparian vegetation and water quality.

[17] This tool is not meant to be used as an allotment wide grazing system but rather will be looked at to achieve specific resource goals such as reducing noxious weeds in combination with an integrated weed management plan. Archeological surveys would need to be conducted in any area this tool is planned to be used.

If monitoring indicates desired conditions are not being met, the District rangeland management specialist, in consultation with the permittee and resource specialists, as appropriate, will:

- Evaluate the potential cause for not meeting desired condition or indicator such as utilization;
- Evaluate the need to implement alternative strategies;
- Generate documentation necessary in the AOI and/or permit and allotment files for the action to be implemented; and
- As necessary, conduct additional site specific surveying, such as for cultural resources.

Range Improvements

Existing structural range improvements are critical to the management of livestock on the National Forest. These range improvements allow for management of grazing in conjunction with multiple use objectives by providing control of livestock movements across the allotment. This is done through the construction of barbwire fences, access to water sources and use of handling facilities for the inspection and transportation of livestock. As cattle are fenced into specific areas called pastures and then rotated though these areas, the majority of the allotment at any given time is rested from livestock grazing, thereby providing for plant recovery and reproduction. Additionally springs have been developed to provide water for livestock away from critical riparian areas and to more evenly distribute the grazing pressure from livestock across any given pasture. Livestock can also be excluded from locations where they tend to concentrate or areas that are deemed not suitable for livestock use, such as was done through the Bishop Creek Exclosure or where other multiple use objectives require livestock to be fenced out.

Under the Proposed Action all of the current structural range improvements already located on the allotment would continue to be maintained. Areas where livestock are already excluded will continue to be excluded from livestock such as the Bishop Creek exclosure area. These areas will remain excluded from livestock grazing unless further analysis determines that there is no longer a sufficient reason to do so. The road through the Bishop Creek exclosure may be used to drive cattle when moving between the Cornstalk pasture to or from the Bobcat pasture. Cattle would be driven along Forest Service Road 677 and not be left to graze in the exclosure. The herd should be moved across the Bishop Creek Exclosure within one day; however if the whole herd cannot be gathered in one large group to be driven across through this area, then the herd would be driven in smaller groups, each of which would occur within one separate day's time not to exceed a total of five days.

To improve management of livestock on the allotment, adding fencing, constructing livestock handling facilities, protecting springs, and developing additional watering sources will be beneficial to livestock management, facilitate better livestock distribution, reduce undesirable effects to riparian vegetation and wildlife habitat, or otherwise improve the rangeland resource. Range improvements are proposed to facilitate livestock distribution throughout the allotment and to assist in achieving the desired conditions and management objectives set forth in this analysis.

Currently Identified Range Improvements

The following structural range improvements (Figure 8, Table 6, and Table 7) are planned to be completed in the next two years. However, depending on availability of funding, may take more than two years but not more than five years for actual implementation. Since these new structures are expected to be implemented concurrently during the first two years of this project, it is not necessary for the proposed additional water developments to be completed in a specific order. Each structural improvement project planned to be implemented within this two year time period will require heritage clearances prior to a decision to reauthorize grazing on the allotment. Implementation of the proposed range improvement infrastructure will be based on available funding and management objectives and include Range Betterment funds, permittee contributions and potential grant opportunities.

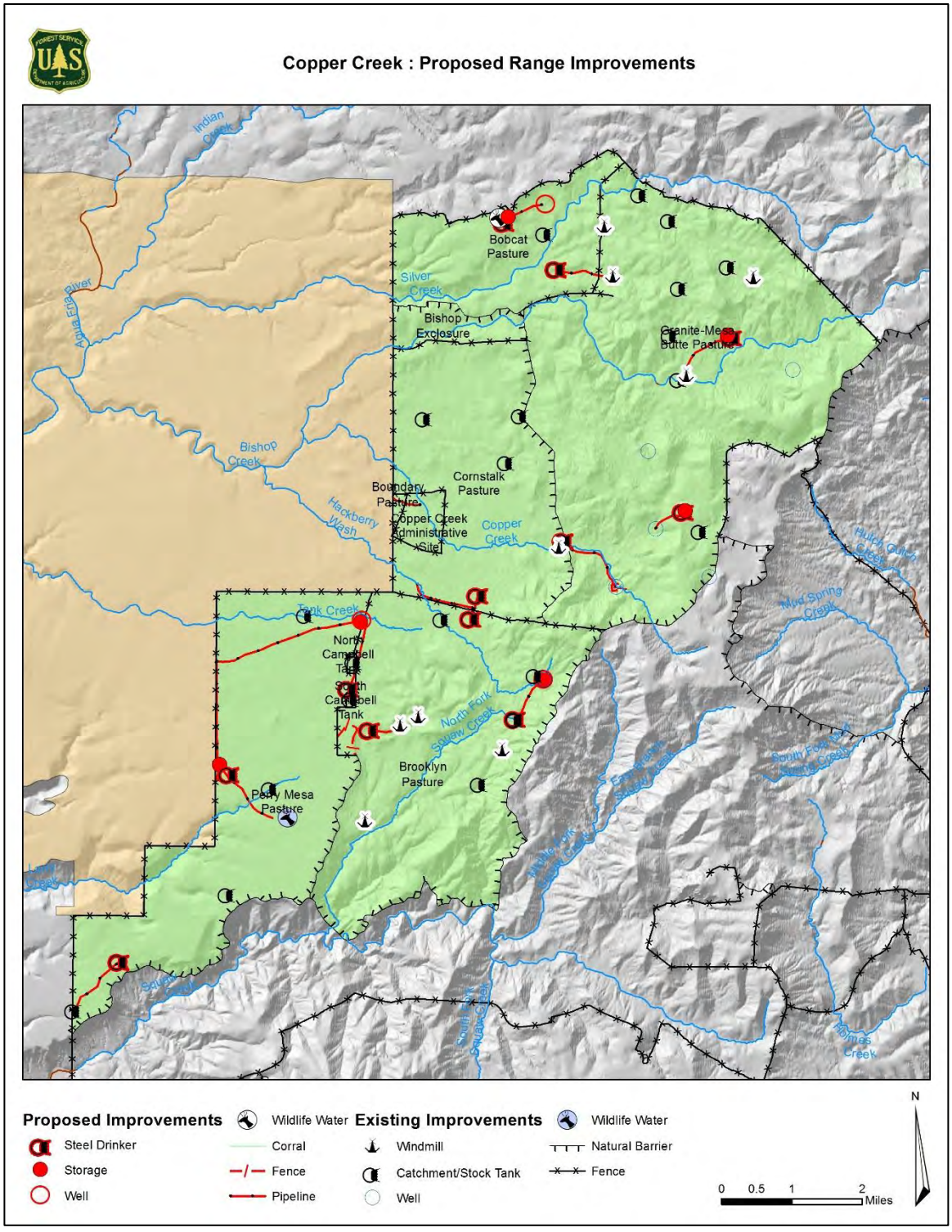

Figure 8: Proposed Range Improvements on the Copper Creek Allotment

Table 6: Proposed Fencing Projects on the Copper Creek Allotment

Improvement ID	Pasture	Legal Location	Description
FN1	Brooklyn	T9.5NR3E Sec.36	Installation of barbwire fence at south end of FR 14 to protect heritage resource from unauthorized vehicular traffic. This fence will be constructed with a pedestrian walk-through for ease of access to monitor the site.
FN2	Granite Mesa	T10NR4E Sec. 26	Develop an approximate 75 foot by 125 foot fenced cattle holding area. This will allow the permittee gather and hold cattle which will improve livestock management. This fence is proposed to be installed within the first two years following a decision[18].

Table 7: Proposed Water Developments on the Copper Creek Allotment

Improvement ID	Pasture	Legal Location	Description[19]
WD1	Granite Mesa	T10NR4E Sect. 26,27,34	Addition of a pipeline, water storage and drinker. This will increase water availability in the uplands and better distribute cattle.
WD2	Perry Mesa	T9.5NR4E Sec.19	Development of a new well and addition of water storage tank. This will increase water availability in the uplands and better distribute cattle.
WD3	Perry Mesa	T9.5NR3E Sec.36, 35	Addition of livestock drinker, pipeline, and water storage on west end near Forest boundary. This will increase water availability in the uplands and better distribute cattle.
WD4	Perry Mesa	T9.5NR3E Sec.25, 26 and T9.5N, R4E, Sec 19	Installation of a pipeline from the previous proposed well to a new drinker. This will increase water availability in the uplands and better distribute cattle.
WD5	Perry Mesa	T9NR3E Sec.16,21	Addition of a drinker and pipeline from the existing Point Extreme well. This will increase water availability in the uplands and better distribute cattle.
WD6	Perry Mesa	T9.5NR3E Sec.25	Addition of a drinker near the South Campbell stock tank. This will increase water availability in the uplands and better distribute cattle.
WD7	Brooklyn	T9.5NR3E Sec. 31	Addition of a drinker and water pipeline from an existing well. This will increase water availability in the uplands and better distribute cattle.
WD8	Brooklyn	T9.5NR3E Sec.20,19 T10NR4E	Addition of a drinker from the Cornstalk solar well. This will increase water availability in the uplands and better distribute cattle.

[18] In compliance with the Programmatic Agreement, cultural clearances will be obtained prior to a decision resulting from this EA for all range improvements which are anticipated to be implemented within the first two years of the decision. See the Heritage section of this alternative for more information.

[19] All water developments are anticipated to be installed within the first two years of this project, and would therefore have cultural clearances completed before a final decision is signed in compliance with the Programmatic Agreement. See the Heritage section of this alternative for more information.

Improvement ID	Pasture	Legal Location	Description[19]
		Sec. 31	
WD9	Granite Mesa	T10NR4E Sec. 33,34	Addition of a water line from Copper Spring to a new drinker and water storage. Development new well, drinker, and storage at north end of sec. 33. This will increase water availability in the uplands and better distribute cattle.
WD10	Granite Mesa	T10NR4E Sec.14	Addition of water pipeline from Rugged Windmill drinker and existing storage. This will increase water availability in the uplands and better distribute cattle.
WD11	Bobcat	T10NR4E Sect. 9, 10	Addition of a drinker and pipeline from Old mine Windmill. This will increase water availability in the uplands and better distribute cattle.
WD12	Brooklyn	T9.5NR3E Sec.28,33	Addition of a water line from Rosalie Spring to a new drinker and water storage. This will increase water availability in the uplands and better distribute cattle.
WD13	Bobcat	T10NR4E Sec. 4,5	Development of a new well, drinker, and storage. This will increase water availability in the uplands and better distribute cattle.

In addition to the structural range improvements listed above, additional structural range improvements may be constructed on the Copper Creek Allotment. The effects of adding any additional infrastructure such as fencing or waters to achieve resource objectives in the future will be disclosed in this document and tiered to this EA. All structures would have heritage clearances prior to implementation. Additionally, a permit modification must be in place and signed prior to any work beginning. All structural range improvements will be constructed in accordance with Forest Service Structural Range Improvement Handbook (FSH 2209.22 R3). All improvements will be built within the sideboards detailed in the management practices and mitigation section of this chapter. Additional sideboards for structural range improvements include the following:

- Motor vehicle and or ATV/UTV access to improvement sites would be on existing roads. If road improvement is needed to access sites, prior approval by the District Office is required (See Travel Management Section).
- Disturbance to obligate riparian vegetation should be minimized, including but not limited to willows, cottonwoods, and sycamores.
- Spring developments will not dewater the spring and must maintain a residual flow for riparian obligate and wildlife species.
- Troughs: an overflow pipe, automatic shut-off valve, and approved wildlife entry/escape ramp should be installed. Troughs should be placed on rocks or concrete to prevent mud holes or sinkholes. Troughs should be painted a color which best blends with surrounding landscapes if using galvanized steel or other reflective surfaces.
- Water should be transported outside riparian areas.
- Storage tanks: should be painted a color which best blends with surrounding landscapes. Open top storage tanks should have approved wildlife escape ramps.
- Pipelines: should be buried when crossing road ways and should not go through campgrounds.
- Fences: a fence comprises four strands, with a smooth bottom wire at 18 inches off the ground and a maximum top wire height of 42 inches. If live trees are used as posts, trees

must be protected from direct contact with the wire to prevent girdling.
- Wells: if using liquid or air drilling mediums, all drilled solids and fluids must be water-misted at exhaust point to reduce air particulates before being moved off-forest. If wells are re-drilled, registration of water rights should be made through Arizona Department of Water Resources in favor of USA-USDA-Forest Service-Tonto National Forest.
- All spring source facilities should be adequately protected or fenced and fences maintained to prevent livestock from getting into the source box. Once fenced, water would be piped to a trough located outside the exclosure to provide livestock water.
- Head box lids or covers shall be in place to prevent dirt, rodents, or other refuse from getting into the head box and prevent wildlife entrapment.

Maintenance of Existing Improvements

All structural range improvements should be maintained to Forest Service Standards as outlined in FSH 2209.22 (Region 3). Any maintenance or reconstruction of improvements should be confined within original site disturbance and construction. Poles, posts, and trough framing materials used in the construction of the water development would be maintained, repaired, or replaced as needed. Open pipe posts would be capped to prevent wildlife entrapment. In addition the following guidance will be followed when maintaining structural range improvements:

Trough, Water System, and Stock Pond Standards

- New spring developments would be constructed with the spring box designed so that residual flow is left at the spring head to prevent dewatering.
- All outlet pipes and valves from head boxes should be functioning and any leaking should be kept to a very minimum.
- All above ground pipeline supported structures would be maintained to keep the pipes at gradient and prevent sagging.
- Pipeline leaks would be repaired or the damaged section would be replaced with materials similar to the original construction materials.
- Pipelines with air and drain valves would be covered with a screen to prevent rodents and dirt from entering the pipe. Screens would be replaced as needed.
- Pipelines with valve covers boxes would be kept covered and repaired when needed.
- Pipelines: should use existing pipeline routes for replacement of existing lines whenever possible. Placement of above or below ground lines would be determined on a site-specific basis.
- Water troughs should be kept at heights that make them useable to livestock. Troughs which become elevated from trampling livestock should be periodically backfilled to maintain a useable height.
- Troughs which become uneven due to settling should be reset and leveled.
- Troughs, storage tanks, and pipelines would be drained and cleaned periodically to prevent moss and debris buildup and damage from freezing.
- Stock water ponds would be kept clear of debris, dead animals, etc. Spillways would be cleaned and maintained to prevent washing out or becoming plugged. Rodent damage and damaging vegetation on dams would be reported to the administrative agency.
- Stock water development components (e.g., rusted out troughs, broken sections of pipe, etc.) replaced during maintenance or reconstruction would be removed and properly disposed of.
- Bottoms of troughs should be kept clear of the ground with at least 2 inches to 4 inches of clearance under the bottom of the trough to prevent rusting or decomposition.
- Water should not be allowed to overflow the sides of the troughs. Overflow pipes must be kept clear. Overflow water would be piped away from troughs at least 50 feet. The end of

the overflow pipe must be protected from trampling by livestock. Water from overflow pipe must be directed away from the trough area and returned to its source.
- Inlet and outlet pipe shall be protected by anchoring to the trough with a single post next to the vertical pipe and a brace or pole supporting the horizontal pipe. Inlet and outlet pipeline would be buried as much as possible for their protection.
- All troughs would be equipped with a wildlife escape ramp from which birds and rodents can escape or drink from the trough.

Fence and Corral Standards

- Broken or rotten posts, broken braces and missing staples would be replaced where and when needed to maintain the fence.
- Wires would be re-stretched where needed.
- Broken or missing stays would be replaced where needed.
- The top wire on all range fences should be kept under 42 inches in height.
- Staples should not be driven so deep into the post that they scar or create a weak spot in the wire.
- Open pipe posts would be capped to prevent wildlife entrapment.
- All gates should be closed before livestock enter the grazing units and opened and tied back after livestock leave the allotment.
- Wire gate tension should be sufficient to prevent the gate from sagging and still be easily opened and closed. Gate loops should be made from smooth wire, not barbed wire.
- Trees which fall on fences would be cut and removed when and where needed; wire, if broken, would be spliced and re-stretched; poles if broken would be replaced.
- Broken or rotten sections of log or pole fences and corrals would be replaced as needed.
- Corrals would be kept clean of litter, in good repair, and in useable condition.
- Metal components of range fences and corrals (e.g., wire, stays, T-posts, gates, etc.) replaced during maintenance or reconstruction would be removed from the Forest and properly disposed of.
- All broken fence wire would be spliced and repaired in such a manner that tension on a wire can be maintained. Wire splices would be made with 12 gauge size tie wire or type of wire used in initial construction.

Adaptive Management: Native Fish Introductions

Forest Plan standards and guidelines and the Forest Service Manual direct the Tonto National Forest to work with other federal, state, and local agencies to manage for the persistence of native fish and wildlife species habitat on the Forest (Forest Service 1985). National Forest System directives also include managing lands and resources for the benefit of both Forest Service sensitive and federally protected fish and wildlife populations and their habitats (listed, candidate, and critical habitat under the Endangered Species Act), establishing objectives for habitat management that provides for recovery of these populations, and placing top priority on conservation and recovery of these species (Forest Service 2005).

The Tonto National Forest currently works cooperatively with the Arizona Game and Fish Department and the U.S. Fish and Wildlife Service to complete recovery actions for federally protected species and their habitats located on forest lands (see Forest Service 2010). Recovery projects for native and protected species are conducted as a partnership between the federal government and the Department through the Arizona Native Fish Coordination Team. Currently, this

coordination team is actively seeking out streams and watered areas to introduce or reintroduce native fish populations to habitable areas on the Forest, potentially including areas within active grazing allotments. Suitable fish introduction areas have not been identified on the Copper Creek Allotment due to habitat loss and degradation from fires. However, there are streams within the Allotment that may become suitable habitat in the future depending on how resource conditions are influenced by weather and climate. Each situation will be evaluated under the federal-state partnership and the forest will work to take all reasonable and prudent measures to protect listed species habitats for recovery.

Adaptive management is a concept for dealing with uncertainty in environmental management and is used where the Forest Service is uncertain of any outcome but fairly certain of the direction they would pursue if a change were necessary (*36 CFR 220.7(b)*). If the Native Fish Coordination Team were to identify suitable habitat for native fish introduction within the Copper Creek Allotment, grazing management would adapt in the following ways:

- If the identified habitat occurs in an area already excluded from grazing, either by existing infrastructure or by natural barriers, then no change in management would be necessary.
- If the identified habitat occurs in an area which is accessible to livestock, and livestock use is anticipated to affect the introduced species, then certain management actions, such as those listed in the Management Practices section of this Chapter, would be taken to reduce or eliminate those effects. In areas where livestock use is minimal, this may be accomplished by herding or salting to further discourage cattle's use of the reintroduction area.
- If herding, salting, or other management practices are not effective to mitigate the effects on the introduced fish, or if introductions occur in areas more heavily used by livestock, fencing would be constructed to exclude livestock from the reintroduction area. In this case, a water source outside of the excluded area would be provided for livestock. Cultural clearances would be completed before ground disturbing fencing is constructed.

Monitoring

The objective of monitoring is to determine if management is being properly implemented and if the actions are effective at achieving or moving toward desired conditions.

Effectiveness Monitoring

Effectiveness monitoring includes measurements to track long-term condition and trend of upland and riparian vegetation, soil, and watersheds. Examples of effectiveness monitoring indicators include, but are not limited to pace transects, pace quadrat frequency, dry weight rank, ground cover, Parker 3-step, repeat photography, and Common Non-forested Vegetation Sampling Procedures which measures; frequency, fetch, dry-weight rank, production, and utilization. Monitoring would occur at established permanent monitoring points. Both qualitative and quantitative monitoring methods would be used in accordance with the Interagency Technical References (1996, revised 1999), Region 3 Rangeland Analysis and Management Training Guide (Forest Service, 1997), and the Region 3 Allotment Analysis Guide. These data are interpreted to determine if management is achieving desired resource conditions, if changes in resource condition are related to management, and to determine if modifications in management are necessary. Effectiveness monitoring would occur at least once over the ten-year term of the grazing authorization or more frequently, if deemed necessary.

Implementation Monitoring

Implementation monitoring will occur yearly and would include such things as inspection reports, forage utilization measurements in key areas, livestock counts, and facilities inspections. Utilization measurements are made following procedures found in the Interagency Technical Reference (1996, revised 1999), or the most current acceptable method, and with consideration of the Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands. The purpose of implementation monitoring is to determine if grazing meets conservative use guidelines in upland and riparian areas.

Utilization would be monitored on key forage species, which are native perennial grasses or browse species that are palatable to livestock. At a minimum monitoring would include use in key areas, but may include monitoring outside of key areas. The Cave Creek Ranger District range personnel, permittee, and cooperators would be responsible for monitoring livestock grazing utilization. Over time, changes in resource conditions or management may result in changes in livestock use patterns. As livestock use patterns change, new key areas may be established and existing key areas may be modified or abandoned in cooperation with the permittee and cooperators.

Information would be collected through routine pasture inspections and end of season utilization monitoring. Specific schedules for monitoring would be flexible from year to year based upon resource needs, which could change with climatic variations and management changes. Monitoring for plant cover, vigor, recruitment, and diversity, using techniques described in aforementioned publications, would ensure that wildlife needs and riparian and watershed conditions were moving toward desired conditions.

Monitoring methods could include, but are not limited to, utilization and stubble height monitoring, annual riparian monitoring, and photo point protocols. Data will be used, along with supporting information to determine when livestock must be moved from one pasture to another and to make any necessary adjustments to livestock numbers and/or season of use (determined in AOI).

Key areas are described in “sampling vegetation attributes” (1996) as indicator areas that are able to reflect what is happening on a larger area as a result of on-the-ground management actions. A key area should be an area representative of the range as a whole, an area where livestock use occurs, located within a single ecological site and plant community, and be a minimum of 100 yards from fence lines, exclosures, roads, and trails. Key areas may be identified in the allotment management plan.

While monitoring techniques as described above would be conducted in key areas, these would not be the sole locations for gathering information from the grazing allotment to make decisions about the timing, intensity, duration, or frequency of livestock grazing in a given grazing season. The overall condition of the allotment, and such things as distribution patterns or rangeland improvement conditions could be assessed at any given time to help make those decisions.

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* (1996, revised 1999) or the most current acceptable method.

In order to achieve Forest Plan Standards and Guidelines the following use guidelines for riparian components are as follows:

- Obligate riparian tree species – limit use to less than 50 percent of terminal leaders (top one third of plant) on palatable riparian tree species accessible to livestock (usually less than 6 feet tall);
- Deergrass – limit use to less than 40 percent of plant species biomass; and
- Emergent species (rushes, sedges, cattails, and horsetails) – maintain six to eight inches of stubble height during the grazing period.

The Forest Plan limits use to 20 percent of tree and shrub annual production *by volume*. The percent of leaders browsed was chosen as a surrogate guideline in place of percent volume because volume is an extremely difficult parameter to assess on an annual basis. The method employed for determining the percent of leaders browsed is an expedient and repeatable sampling technique. Mathematical relationships between the number of twigs browsed and percent of current annual growth removed have been established in previous studies (Stickney 1966).

Utilization limits for herbaceous riparian vegetation are intended to do two things: 1) protect plant vigor; and 2) provide physical protection of streambanks or the sediment on the greenline that could develop into a bank feature. Deergrass was selected as the key species to monitor because it is the most common obligate, riparian, native, perennial grass on the Tonto National Forest. Additionally, deergrass exhibits a number of traits that make it an ideal stream-stabilizing plant. The above ground attributes of deergrass aid in preventing soil loss through decreasing flow velocity, they also trap sediment which aids in the rebuilding of stream banks. Furthermore, deergrass is a bunchgrass with an extensive root system which acts to stabilize streambanks (Cornwall 1998; Clary and Kruse 2003).

Monitoring short-term indicators, such as stubble height and woody utilization, during the grazing season, can help determine if grazing use criteria is moving riparian conditions toward management objectives over time (Burton *et al*. 2011). The document, *Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands* (Smith *et al.* 2005), will provide guidance for utilization data collection and interpretation.

If utilization reaches limits of recommended allowable use, livestock would be moved from the critical area or pasture considering time of year and extent of area involved. Actual use records in combination with utilization measurements will inform if it may become necessary to minimize or remove access to riparian habitat, if grazing pressure becomes a limiting factor in the use of pastures

Heritage Resource Monitoring

In accordance with Appendix H, the *Standard Consultation Protocol for Rangeland Management* (the Protocol) of the *First Amended Programmatic Agreement Regarding Historic Property*

Protection and Responsibilities (Programmatic Agreement) between the USDA Forest Service Region 3, the State Historic Preservation Officers (SHPO) of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation, signed December 24, 2003, 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. The archaeologists will use these opportunities to observe and report on grazing activities, the 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 measured outlined in the Protocol to ensure that the effects are avoided or minimized.

Noxious Weed Monitoring

Noxious weeds located in these allotments would be treated as necessary. Permittee and Forest Service would coordinate weed inventory and treatment. Noxious weed monitoring would be carried out at the same time allotment inspections are conducted. As noxious weed populations are found they are mapped, monitored, and treated. Treatment of invasive species would be carried out in accordance with practices established in Tonto's Environmental Assessment of Integrated Treatment of Noxious or Invasive Weeds as detailed in the decision notice and finding of no significant impact, pages three and four (Forest Service 2012).

Management Practices and Mitigation Measures

Range

Livestock management practices such as herding and salting are critical to achieve proper livestock distribution within each unit/pasture. The Forest will work with the permittee and other specialists to implement strategies in order to achieve proper distribution, protection, and management of cattle on the allotment. Tonto National Forest Grazing Practices are as follows:

- Forest Plan Standards and Guidelines applicable to livestock grazing would be followed (Forest Plan, p. 24).
- Salt and/or supplements will be placed where forage is abundant and current grazing use levels are low. Salt and/or supplements would not be placed any closer than one quarter mile from available water, recreation sites, or designated trails except where prior written approval had been obtained from the District Ranger.
- No salting would occur within or adjacent to identified heritage sites. Salt would be removed from pastures when cattle have left an area, and not placed within a pasture until the cattle arrive. Additionally, salt will not be placed in the same location(s) each year.
- Troughs would be left full of water and operational year round for wildlife accessibility, unless in limited circumstances where extreme freezing conditions may damage facilities.
- When entering the next scheduled pasture, all livestock would be removed from the previous pasture within two weeks (dependent on terrain).
- Permittee would ensure that enough time is allowed to remove livestock to meet the pasture move date(s) and avoid unauthorized and excess use.
- Permittee would ensure all infrastructures are in functioning condition prior to entering the next scheduled pasture.

Travel Management

Tonto National Forest is still in the process of evaluating its Travel Management Plan, which would implement the Travel Management Rule. The Travel Management Rule is aimed at reducing non-essential roads for watershed and resource protection and requires forests to designate a system of roads and trails for motorized vehicle use on the forest. Once the final decision for the Tonto National Forest Travel Management Plan is signed, a Motor Vehicle Use Map will be released, depicting the designated road and trail system. At that point, motorized cross-country travel will not be permitted on the forest. In general, the permittee will be required to follow Travel Management policies and limit the use of motorized vehicles to those roads and trails designated on the Motor Vehicle Use Map.

According the final Travel Management Rule, motor vehicle use exempted from designation includes "Motor vehicle use that is specifically authorized under a written authorization issued under Federal law or regulations" (*36 CFR 261.13(H)*). Grazing permits fall under this exemption.

The following on-going activities requiring motor vehicle use off of designated routes would be authorized by the grazing permit to conduct livestock grazing activities on National Forest System lands within the Tonto National Forest:

- Off-road vehicle use by pickup, trailer, ATV, UTV, or motorcycle needed to transport materials or machinery to maintain or inspect structural range improvements (fences, corrals, cattle guards, pipelines, water delivery systems, troughs, earthen tanks) assigned in Part 3 of the grazing permit as the permit holder's responsibility for maintenance would be authorized. Existing routes or the shortest, most direct route to the improvement must be used and route construction (i.e. blading a path) would not be allowed without additional authorization.
- Using an off-road vehicle to place supplements in strategic locations for livestock management purposes may be authorized by the District Ranger in the Annual Operating Instructions when requested.

Off-road vehicle use to gather or move livestock would not be authorized. Cross-country motorized travel would not be allowed when conditions are such that cross-country travel would cause unacceptable natural and/or heritage resource damage. Off-road use of heavy equipment (i.e. backhoe, dozer, loader, etc.) may be authorized by a separate permit modification for range improvement development, as needed. Cross-country travel to construct new structural or non-structural range improvements and other off-road travel by the permit holder is analyzed in this EA.

No additional Section 106 cultural compliance is required for specific limited-use authorizations already covered by separate decisions under the *National Environmental Policy Act* per The Region 3 Region-wide Travel Management protocol with the Arizona State Historic Preservation Officer. Motor vehicle use in designated wilderness areas would continue to be managed consistent with the provisions of the *Wilderness Act (Section 4(d)(4)(2))* that provides for limited exceptions for grazing livestock as further defined in the Congressional Guidelines (FSM 2323.22).

Wildlife

Since site specific information regarding precise location and timing of all range improvements are not available at this time, the Forest Service will implement the following actions to protect listed species:

- For improvements proposed in the Perry Mesa pasture, Sonoran desert tortoise habitat, if present will be avoided to minimize overlap with livestock concentration areas.
- All water developments would include wildlife access and escape ramps. When possible, waters would be kept available to wildlife year round.
- All fencing would be built to Forest Service standards to provide for wildlife passage through the fence. At a minimum, this would be a four-strand fence with smooth bottom wire 18 inches off the ground and a total height of 42 inches or less.

Riparian

The following are riparian mitigation measures:

- All existing developed and new developed springs will be fenced to exclude livestock access. A trough(s) would be located outside of the exclosure to provide water for wildlife and livestock.
- Construction of developed spring exclosures will be required to have an archeological clearance prior to any construction and will be phased in over time.
- Livestock would not be trailed through riparian areas.
- Salt and/or mineral supplements would be placed at least a quarter mile from riparian areas.
- New spring developments would be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering.
- New troughs would be placed in the uplands, at least 400 feet away from riparian areas.

Heritage

Mitigation of impacts to heritage resources is best accomplished by avoidance of these properties by the placement and construction of all range improvements. It can also be achieved by minimizing opportunities for the localized concentration of animals, improving distribution across the allotment and across each pasture, and by reducing the intensity of grazing for the allotment as a whole. In instances where proposed improvements will involve any potential for ground disturbance, such as stock tanks and other water developments, a 100 percent archaeological survey will be conducted for areas which have no previous survey coverage, or have outdated surveys, which do not conform to current standards.

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 only of those that have been formally determined to be not eligible in consultation with SHPO.

Archeological clearance must be approved with all necessary consultation with SHPO and the potentially interested Tribes prior to issuing any decision regarding the construction, modification, or

removal of all improvements. This approach, based on long-term consultation with SHPO and on Region 3 policy as embodied in the Programmatic Agreement, specifically Appendix H—the Protocol developed pursuant to Stipulation IV.A of the Programmatic Agreement—is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

Protection measures identified under the Protocol 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 use.
- 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 the SHPO as the need arises. The appropriate tribes will be consulted, if the mitigation is invasive or if it affects a TCP or other property of concern for them.

The 1985 Forest Plan and its Amendment 21 (May 3, 1995) establishes standards and guidelines (under Decision Unit 3) that are applicable throughout the Forest regarding the management and protection of prehistoric and historic archaeological sites and other historic properties. The Amendment states that interpretive opportunities for Heritage (archaeological and historic) resources should be pursued as a high priority when opportunities arise. Other management direction, specifically applied toward the protection of archaeological and historic resources from looting or vandalism is found in the *Archaeological Resources Protection Act*. If opportunities to provide educational and interpretive signs are identified in the project area, these may be installed under the direction of the Forest Archeologist and approval of the Cave Creek District Ranger[20].

Alternative B – No Grazing

Grazing Authorization

Forest Service Policy requires the Forest Service to identify no grazing as the no-action alternative (Forest Service Handbook 2209.13). Under this alternative, livestock grazing would be eliminated

[20] Locations for potential educational or interpretive signs have not been identified. Additional cultural clearances or surveys may be necessary before any signs are installed.

from the Forest Service administered lands within the Copper Creek Allotment[21]. The existing grazing permit would be cancelled, following guidance in *36 CFR 222.4* and Forest Service Manual 2231.62.

Range Improvements

No new range improvement projects would be authorized. According to Forest Service Manual, Southwest Region Supplement 2240.3(2), "The Government holds title to all range improvements." All maintenance requirements and agreements for upkeep of rangeland improvement projects (e.g. wells, windmills, troughs, and fences) would be eliminated with the livestock permittee. Developments such as dirt stock tanks, developed springs, and troughs that provide water to livestock also provide water to wildlife. However, without upkeep by a grazing permittee, these developments may not be maintained or may be removed. Interior fences and other infrastructure may be removed, as funding or workforce allows, mitigating potential adverse impacts to wildlife and public users. Water developments, important for wildlife may be maintained where feasible using other program funds or volunteers. Where applicable, boundary fence maintenance responsibilities would be transferred to the neighboring permittee.

Adaptive Management: Native Fish Introductions

The Tonto National Forest currently works cooperatively with the Arizona Game and Fish Department and the U.S. Fish and Wildlife Service to complete recovery actions for federally protected species and their habitats located on forest lands (see Forest Service 2010). Recovery projects for native and protected species are conducted as a partnership between the federal government and the Department through the Arizona Native Fish Coordination Team. Currently, this coordination team is actively seeking out streams and watered areas to introduce or reintroduce native fish populations to habitable areas on the Forest, potentially including areas within active grazing allotments. Currently, suitable fish introduction areas have not been identified on the Copper Creek Allotment due to habitat loss and degradation from fires. However, there are streams within the Allotment that may become suitable habitat in the future depending on how resource conditions are influenced by weather and climate. Each situation will be evaluated under the federal-state partnership and the forest will work to take all reasonable and prudent measures to protect listed species habitats for recovery.

Decisions by the coordination team to reintroduce fish into an area could be made whether or not cattle are present on an allotment. Under this alternative, if the Native Fish Coordination Team were to identify suitable habitat for native fish introduction within the Copper Creek Allotment, the effects of grazing management would not be a consideration. The maintenance or removal of any existing infrastructure surrounding a selected reintroduction area would be the responsibility of the Tonto National Forest. However, if maintenance or removal of that infrastructure would be necessary, it would not be for purposes of excluding cattle.

[21] This alternative no longer requires a project-specific amendment related to standards and guidelines for cultural resources. Amendment #29, signed on July 31, 2017, amended the 1985 Tonto National Forest Land and Resource Management Plan to permanently remove forestwide standard and guideline #4 from page 38-1.

Monitoring

Standard long term monitoring procedures would continue to be implemented as they have on the allotments following corresponding agency protocols. Other short term monitoring such as utilization would no longer be continued as the allotment would no longer be active.

Chapter 3: Affected Environment and Environmental Consequences

This section summarizes the effects from authorizing grazing on the Copper Creek Allotment.

The Affected Environment section for each resource topic describes the existing or baseline condition against which environmental effects are evaluated and from which progress toward the desired condition can be measured. The Environmental Consequences section for each resource topic discusses direct, indirect, and cumulative effects. Effects can be neutral, beneficial, or adverse. Environmental consequences form the scientific and analytical basis for comparison of the alternatives, through compliance with standards set forth in the 1985 Tonto National Forest Land and Resource Management Plan (Forest Plan), as amended, with the *National Environmental Policy Act (NEPA) of 1969,* and the *National Forest Management Act of 1976.*

Range

This section addresses both the existing upland vegetation within the Copper Creek Allotment, along with the effects associated with the management of livestock. This section contains additional information necessary to understand the affected environment and environmental effects associated with the alternatives considered.

Affected Environment

Copper Creek consists of roughly 17,200 acres of interior chaparral, 14,000 acres of semi-desert grassland, 2,600 acres of Sonoran desert scrub, and 870 acres of great basin conifer woodland (Brown 1994) (Figure 4 from Chapter 1). Small areas of riparian vegetation occur in some drainages, approximately 12 miles, throughout the allotment.

Approximately 246 acres of the Copper Creek Grazing Allotment within the Granite-Mesa Butte Pasture overlap with the Pine Mountain Wilderness. This small section is still identified in the Tonto National Forest Land and Resource Management Plan as being within the General Management Area (1F) for the Cave Creek Ranger District.

Interior chaparral: This vegetative community comprises generally the higher elevation areas on the east half of the allotment. Vegetation is characterized by evergreen shrubs, the dominant being juniper (*Juniperous spp.*) and shrub live oak (*Quercus turbinella*). Other common shrubs include catclaw acacia (*Acacia greggi)*, wait-a-minute bush (*Mimosa biuncifera)*, sugar sumac *(Rhus ovata)*, skunkbush sumac (*R. trilobata)*, and algerita (*Berberis trifoliata)*. Upland perennial grasses include side oats grama (*Bouteloua curtipendula)*, curly mesquite (*Hilaria belangeri)*, black grama (*B. eriopoda)*, hairy grama (*B. hirsuta)*, squirreltail (*Elymus elymoides)* and threeawn species (*Aristida spp.).* These species and their distribution is typical for this vegetation type.

Semi-desert grassland: Largely making up the west half of the allotment, this community is dominated by warm season perennial grasses. Predominant species include tobossa (*Pleuraphis mutica),* side oats grama (*B. curtipendula)*, curly mesquite (*H. belangeri)*, black grama (*B.*

eriopoda), hairy grama (*B. hirsuta)*, and threeawn species (*Aristida spp.).* Wild oat (*Avena fatua)* is a non-native annual grass that is found in much of the range to the west. Common shrubs and sub-shrubs species include mesquite (*Prosopis veluntina),* false mesquite (*Calliandra eriophylla)*, globe mallow (*Sphaeralcea ambigua)*, Wright's buckwheat (*Eriogonum wrightii)*, snakeweed (*Gutierrezia spp.)*, and prickly pear catus (*Opuntia engelmannii).* The south end of this community is predominately tobossa grassland, extending from FR 269 (Bloody Basin Road) to the south end of Perry Mesa. These species and their distribution is typical for this vegetation type.

Sonoran desert scrub: Located at the south end and lowest elevation in the allotment, this community is dominated by mesquite (*P. veluntina),* paloverde (*Parkinsonia spp.)* prickly pear cactus (*O. engelmannii),* snakeweed (*G. spp)* and desert senna (*Senna covesii)*. Grasses include curly mesquite (*H. belangeri),* hairy grama (*B. hirsuta)*, and threeawn species (*Aristida spp.).* These species and their distribution is typical for this vegetation type.

Great basin conifer woodland: This community makes up a relatively small part of the allotment at the east boundary, primarily in the Rugged Mesa area, species present in this are juniper (*Juniperous spp.*) emory oak (*Quervus emoryi)*, and alligator juniper (*J. deppeana)*. Grasses include side oats grama (*B. curtipendula)*, hairy grama (*B. hirsuta)*, and squirrel tail (*E. elymoides).* These species and their distribution is typical for this vegetation type.

Riparian: Found in steep drainages and portions of intermittent washes, these areas are characterized by deergrass (*Muhlenbergia rigens)* sedges (*Scripus spp.)* and bermuda grass (*Cynodon dactylon)*. Freemont cottonwood (*Populus fremontii)*, willows (*Salix spp.),* Arizona sycamore (*Platanus wrightii),* and Arizona ash (*Fraxinus velutina)* are typically found here. These species and their distribution is typical for this vegetation type.

Area Burned by the 2017 Brooklyn Fire

The area of Brooklyn Fire overlapped approximately 16,227 acres of the Copper Creek Allotment (approximately 45 percent of the allotment). This burned area included four pastures as well as the Copper Creek Administrative Site.

Table 8: Area of Pastures Burned by the Brooklyn Fire

Pasture	Total Pasture Acres	Acres Burned	Percentage Burned
Perry Mesa	7,146	6,471	91
Brooklyn	7,634	6,574	86
Cornstalk	5,031	2,420	48
Granite Mesa Butte	12,251	681	6

Vegetation burned in the Brooklyn fire consists of mostly desert grassland on the flat mesas of the Perry Mesa pasture and into the western side of the Brooklyn pasture with Juniper grasslands being burned on the eastern portion of the Brooklyn pasture. The fire occurred in the late summer, prior to the monsoon rains, and quickly consumed the dry litter and dormant perennial grasses as well as the abundant annuals occurring in the area. Areas that burned experienced reduced litter and ground cover which should facilitate germination of grass and forbs following the recent summer monsoons and into the winter rains. Recent observation following the monsoon rains show areas of quick greenup and regrowth of vegetation.

Figure 9: Photo of Vegetation Regrowth Taken 15 Days After Fire Start. Photo Taken by Fire Staff near Forest Service Road 14

Monitoring

Monitoring techniques used to assess current conditions on the Copper Creek Allotment are discussed in this section. In summary, rangeland monitoring data indicate that overall range and soil condition and trend on the allotment is rated "Fair" or "Good" with an upward trend. There are two Parker cluster key areas which indicated downward trends, one in Perry Mesa pasture and one in the Granite Mesa- Butte pasture. Of these, key area C6, in the Perry Mesa pasture, scored a "fair condition" rating and indicated a downward trend (Figure 5 in Chapter 1). This downward trend is attributed to a bias of the Park Cluster monitoring protocol in which a high occurrence of a particular species of plant receives a negative rating, even if that is a typically desirable species. In this case,

the species is Tobossa grass (*Pleuraphis mutic)*. Additional monitoring with Robinett Rangeland Resources, LLC showed that this key area appears to be high in its ecological condition and at or near its site potential. The parker cluster key area in Granite Mesa- Butte pasture, C9, scored a poor condition and in a downward trend. Supplemental monitoring showed that this site appears to be in high ecological function condition and "at or near its site potential". There are areas, such as highly shrubby areas, where a site's optimum condition, or site potential, will never represent ideal range conditions. The area represented by key area C9 appears to fit into this category.

Ecological site condition monitoring at key area C1 (north aspect) in the Bobcat pasture showed that it was not near site potential, however, additional monitoring at this location shows that this area is trending upwards. Parker cluster C4, in the Cornstalk pasture, also showed it was not near site potential. At the time of this monitoring, a block of salt had mistakenly been placed near this key area which influenced this reading.

Key Areas

Copper Creek has nine monitoring locations which are commonly referred to as key areas (Figure 5). These key areas are defined as a relatively small portion of a rangeland selected because of its location, use, or grazing value as a monitoring reference point for grazing use (Holechek et al. 2004). Key areas are intended to be within a single ecological site or plant community, responsive to management actions, and indicative of the ecological site or plant community they are intended to represent (Utilization Studies and Residual Measurements, 1999).

Key areas are used to collect implementation monitoring data (long term) and effectiveness monitoring data (short term) over time. Data is collected for plant composition, ground cover, frequency of perennial forage plants, and plant vigor. These factors are rated to provide a summary rating for range and vegetation condition and trend. Existing conditions for range vegetative condition /watershed condition, and long term trend are compared to desired conditions.

Parker Three-Step monitoring sites

Parker Three-Step monitoring sites (Parker Clusters) pace transects were established in key areas on the allotment in the mid-1950s and early 1960s. These sites provide historical data and are designed to measure long term vegetation condition and vegetation trend. Vegetation trend refers to vegetative conditions based on available forage for livestock. Data at these sites were collected at various intervals between 1956 and 2014 (Table 9).

Table 9: Parker Three-Step Cluster Condition and Trend

Pasture	Key Area	Vegetation Rating	Vegetation Trend
Bobcat	C1	Poor	Upward
Cornstalk	C2	Good	Stable
Cornstalk	C3	Fair	Upward
Cornstalk	C4	Fair	Upward
Granite Mesa- Butte	C5	Good	Upward
Perry Mesa	C6	Fair	Downward
Perry Mesa	C7	Fair	Upward
Brooklyn	C8	Good	Stable
Granite Mesa- Butte	C9	Poor	Downward

Monitoring data collected between 2013 and 2014 shows most of the Parker cluster key areas received vegetative ratings of fair or good. Two key areas received poor ratings, and of these one showed an upward trend indicating conditions here may be improving. Trend data were assessed by comparing the most recent vegetation rating to the previous monitoring data at the site. Previous monitoring for most of the Parker clusters was in 1994 and 1995. All of the Parker clusters were last monitored before the Complex fire.

In 2014, Parker Cluster #8 was re-established because a mine was established at its original location. Parker Cluster #9 was unable to be located. A new key area comparable to the original Parker Cluster was established nearby and a pace monitoring transect was utilized here for data collection.

Common Non-Forested Vegetation Sampling Procedures Monitoring Protocol

In 2013, the Cave Creek Ranger District began implementation of a relatively new Forest Service monitoring protocol called Common Non-Forested Vegetation Sampling Procedures monitoring protocol (Vegetation Sampling). The intent of implementing this additional protocol was to collect additional rangeland data to better describe key areas. This protocol combines several monitoring methods from the "Sampling Vegetation Attributes" and "Guide to Rangeland Monitoring and Assessment" to capture information on a variety of attributes including ground cover and vegetative species index/frequency list (ITT 1996a and Smith et al. 2012). Vegetation Sampling was implemented at key areas so legacy data from historic Parker Clusters could be assessed at the same locations. Because the Vegetation Sampling data has been collected a single time, there is insufficient data for analysis. However, these data may be used with future monitoring for better analysis.

Vegetation sampling data was collected at all key areas within the Copper Creek Allotment (Table 10). Initial data collection with this monitoring protocol may help serve as baseline data for future monitoring and grazing management. Currently the region is working on completing Terrestrial Ecosystem Survey data for the Tonto National Forest. The Terrestrial Ecosystem Survey data classifies the Forest into different terrestrial ecosystems and describes the ecological site potential among other things (Neary 2004). When Terrestrial Ecosystem Survey data is finalized, vegetation sampling data may be compared to site potential of the key areas to determine and describe the ecological structure, function, capability, and management opportunities of the area.

Table 10: Vegetation Sampling Ground Cover 2013-2014

Pasture	Key Area	Percent Basal Cover	Percent Bare Soil	Percent Litter	Percent Rock	Percent Gravel
Bobcat	C-1	2	65	6	20	24
Cornstalk	C-2	1	74	21	3	0
Cornstalk	C-3	31	60	6	2	2
Cornstalk	C-4	31	7	44	11	7
Granite Mesa-Butte	C-5	6	68	7	19	1
Perry Mesa	C-6	29	2	12	32	0
Perry Mesa	C-7	9	67	20	3	2
Brooklyn	C-8	8	78	9	5	2
Granite Mesa-Butte	C-9	6	33	31	19	12

To allow better collaboration between the two agencies in evaluating the rangeland resources of the neighboring allotments, Robinett Rangeland Resources, LLC, who was contracted to do the Land Health Evaluation range report on the neighboring Horseshoe allotment, also spent several days monitoring key areas on the Copper Creek Allotment. The objective was to match Copper Creek key areas to a corresponding Natural Resources Conservation Service (NRCS) ecological site concept, as was done on the BLM Horseshoe allotment. The soil and plant communities were evaluated at all key areas and ecological condition /site potential were assessed (Table 11). All areas except two were found to be at or near site potential.

Table 11: Ecological Condition and Site Potential Based on NRCS Ecological Site

Key Area	Ecological Condition	Site Potential
C-1	South aspect-High Functioning	At or near site potential
C-1	North aspect-Moderate Functioning FFFunctioning Functioning	Not near site potential
C-2	High Functioning	At or near site potential
C-3	High Functioning	At or near site potential
C-4	Low to Moderate Functioning	Not near site potential
C-5	High Functioning	At or near site potential
C-6	High Functioning	At or near site potential
C-7	High Functioning	At or near site potential
C-8	Moderate to High Functioning	At or near site potential
C-9	High Functioning	At or near site potential

In the summer of 2005, the Cave Creek Complex Fire (Complex fire) burned 80 percent (28,000 acres) of the allotment, mostly areas east of Forest Road (FR) 677 and FR 14. Both roads were used as control lines during the incident. The Complex fire resulted in reductions in juniper and chaparral through portions of the analysis area, and conversely increased turbinella oak and catclaw in other areas. Much of the burned area within the analysis area has improved over time. The herbaceous and shrub layers have increased and helped reduce erosion and movement of surface materials during rain events, although the perennial portions of Silver Creek entirely lost surface flows until recently due to sedimentation. The Complex fire greatly reduced encroaching juniper within the majority of the analysis area. The chaparral habitat type has not had any treatment since the fire. Areas west of Forest Service Roads 14 and 677 were not burned in the fire. The fire had varying degrees of burn intensity, with many areas retaining burned junipers that remain standing, providing habitat for some wildlife species.

Environmental Consequences

Assumptions and Methodology

Environmental consequences for rangeland resources within this document have direct and indirect effects that occur within the Allotment boundary for the Copper Creek Grazing Allotment, within the Tonto National Forest. Cumulative effects may be larger in scale to include the watersheds within the Allotment boundary and the neighboring Horseshoe Allotment on the BLM in which cattle are run in conjunction with this allotment. Cumulative effects on rangeland resources may also extend to larger ecosystems surrounding this allotment and adjacent allotments that may also be grazed.

Under the *Multiple-Use Sustained Yield Act* and the *National Forest Management Act*, all renewable resources are to be managed in such a way that they are available for future generations. The alternatives are contrasted based on the likelihood of upland vegetation attaining the short and long-term desired conditions described in this analysis document. The likelihood of attaining desired conditions depends largely on the type of management, maintenance of range improvements, permittee effort, and stocking rates. Meeting short-term utilization goals will limit the annual impacts of livestock grazing. Short-term uses, and their effects, are those that occur annually or within the first few years of project implementation. Domestic livestock grazing can be considered a short-term use of a renewable resource. Long-term desired conditions are expected to be achieved through attainment of short-term desired conditions. Conditions will be measured through effectiveness monitoring.

Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. As a renewable resource, forage on rangelands can be sustained if the long-term productivity of the land is maintained. In order to maintain that productivity, rangeland resources are monitored to ensure proper vegetative cover exists to protect soils. As stated in the Forest Plan, our goal is to maintain an effective ground cover of at least 30 percent to be considered adequate soil protection. Effective ground cover may consist of basal cover, rocks, or leaf litter. This threshold is set in order to maintain the productivity of the land and ensure the continued growth of the vegetation on that land for future generations.

General Effects from grazing

Livestock may directly affect vegetation by removing current year's growth, reducing plant vigor and productivity, decreasing or eliminating desirable forage species, and causing loss of, or injury to, individual plants from trampling, particularly near water developments (Holechek 2004). Plant communities may benefit from grazing by increased photosynthesis, increased tillering (production of multiple stems), reduced shading, reduced transpiration loss, and reduction of excess litter accumulation that may physically and chemically inhibit vegetative growth (Holechek *et al*. 1989). Reduction in litter accumulation (fuels) may also reduce wildfire fuel loading, flame length, rate of spread and fire intensity (Diamond *et. al* 2012). Grazing impacts on vegetation are mitigated by timing of use, heard management (yearlings), adjustment of stocking rates, addition of range improvements which increase cattle disbursement, limiting utilization rates, and conformance with other Forest Plan standards and guidelines which improve general environmental conditions.

West Nile Virus

West Nile Virus was brought up as a concern during a public scoping meeting for this project regarding the addition of troughs and standing water sources on the allotment. *Culex* spp. comprise the primary mosquito genus responsible for disease transmission (Zou *et al*. 2006), with *C. tarsalis* representing the primary carrier in Arizona and the western United States (Yavapai County 2015). Vegetation along the edges of small bodies of water typify ideal larval habitat for this species (Zou et al. 2006). Consequently, grazing activities that increase trampling in riparian areas and add to the amount of stagnant water where vegetation can persist could increase habitat for *C. tarsalis* and the likelihood of outbreaks.

This species prefers sites with submerged vegetation on which to oviposit, and warm standing water that promotes rapid larval development, including ephemeral puddles, vegetated pond edges, and surface water held in slow draining formations such as in hummocky areas (hoof prints), and road-side trenches. The larvae mature from seven days to four weeks to become full-fledged mosquitos, depending on temperature and food availability. *C. tarsalis* mosquitos are most active during the first few hours after sunset. (Walker 2009).

Regarding the potential for transmission of the disease, water troughs could provide a relatively minor amount of additional habitat for mosquitos to lay their eggs. Habitat suitable for mosquito reproduction is already present from the waters in stock tanks, troughs, and riparian areas that exist within the allotment. The additional habitat that could be created around the troughs would be from water spilling out of the troughs and maintaining wet spots/puddles on the ground and/or from water left in the troughs after the cattle have been removed. When the cattle are in the pasture, they would be drinking from the troughs and fresh water would be flowing into the troughs through the pipeline, which would make the water unattractive to mosquitos that need standing/still water for their eggs to mature.

Cattle would also be walking around the troughs enough to disturb any wet spots thereby minimizing mosquito reproduction. Overflow or wet areas that settle in hummocky areas around the troughs when the cattle are not in the pasture could also be a breeding source for mosquitoes. In addition, standing/still water left in the troughs after the cattle are removed, along with the growth of algae in the troughs on which mosquitos could lay their eggs, could provide habitat for mosquito reproduction. However, if the environmental design and resource protection measures are followed, such as installing float valves to prevent trough overflows and removing algal growth and other debris, there should be little if any increase in areas where mosquitos could reproduce and therefore little to no additional risk created for the transmission.

Direct and Indirect Effects of Proposed Action

The proposed action consists of five components: authorization, improvements, adaptive management, monitoring, and management practices. The proposed action follows current guidance from Forest Service Handbook 2209.13, Chapter 90 (Grazing Permit Administration; Rangeland Management Decision making).

Grazing Authorization

The Proposed Action has been designed to improve unsatisfactory areas as well as maintain or improve conditions for the remainder of the allotment that are in satisfactory vegetative condition. Herbaceous forage utilization would be set at a conservative utilization level, at approximately 30 to 40 percent of current year's growth on key perennial species, allowing for the physiological requirements of vegetative growth and reproduction, and to ensure progress towards meeting desired conditions identified in the Forest Plan. During periods of prolonged drought, livestock intensity would be no more than 30 percent utilization on key forage species.

This alternative would limit forage utilization to conservative levels (up to 40 percent for grasses, forbs, and shrubs). This is within the range recommended for moderate grazing in semi-desert grass and shrublands. Most rangeland grasses and forbs can have 35 percent to 45 percent of their leaves and stems removed every year and still remain healthy and productive so that plants can photosynthesize and manufacture energy to produce more leaves, stems, and seeds (Holechek 1988). Under this alternative, range improvements would be added which would improve distribution of cattle. With these grazing utilization stipulations and increased cattle distribution, the Proposed Action would maintain or improve upland vegetation productivity over current conditions by maintaining grazing intensity at lower levels than currently exist on the allotment.

The Brooklyn Fire should result in a reduction of shrubs and other woody species which compete with herbaceous species. This direct decrease in competition is likely to increase herbaceous production which would be beneficial to both livestock and wildlife. Much of the area that burned is dominated by Tobosa (*Hilaria mutica*), a grass which reproduces using underground rhizomes. Since its growth structures are located below ground and are undamaged by the fire, full recovery of these Tobosa grasslands should be relatively quick.

Livestock use on the Brooklyn, Perry Mesa and Cornstalk pastures would be rested to allow for vegetative regrowth and seeding out of key species prior to livestock being placed back into these three pastures. This rest will allow for herbaceous species to recover, rebuild their root structure, and provide additional litter cover to protect soils following this fire.

Continued livestock grazing on the Copper Creek Allotment is not expected to impact the wilderness values within the approximately 246 acres of the Pine Mountain Wilderness. The proposed action does include a new water development in the Granite-Mesa Butte Pasture that reduces the distance that cattle would need to travel to water before reaching the wilderness. However, since this development would still be over a mile and a half from the new water source and utilization limits on upland key species are to be monitored, grazing is expected to be light in this area and will continue to be consistent with the wilderness values for the Pine Mountain Wilderness.

Improvements

Addition of proposed range improvements would play a key role in moving current conditions toward desired conditions and help to achieve management objectives set forth in this analysis. Some areas near proposed improvements may experience higher levels of use, but utilization across the allotment would likely decrease because the proposed range improvements would provide additional distribution opportunities for livestock. Improved distribution would also promote fewer overall

disturbances to watershed and soil resources. Utilization around current improvements may also decrease because of the additional water troughs proposed elsewhere in pastures. Construction of range improvements may temporarily affect local vegetation, but effects are expected to be minor.

Fences
Additional fencing for grazing exclosures would have impacts to vegetation resources through the partial clearing of woody vegetation for fence line construction and maintenance, typically six feet on either side of the fence. Additional impacts would occur from livestock and wildlife that may use the fence line as a travel corridor. Livestock grazing and trampling may increase in this area.

Wells and Storage Tanks
The proposed range improvements include four wells. Direct impacts would include disturbance to vegetation around the well site from the well drilling truck. This would be localized to an area approximately ten feet by 15 feet around the well. Sediment from the drilling would be contained in a small depression created next to the well site where approximately 100 square feet of additional vegetation would be impacted by the clearing and leveling needed for the placement of a storage tank.

Pipelines and Troughs
Proposed improvement locations were designed to follow existing roads and areas that have been previously disturbed, minimizing impacts to existing vegetation. Vegetation would be directly impacted in the short-term by the installation of the proposed pipelines and troughs. Direct impacts would include full removal of some vegetation species within the footprint of the project (up to 60 feet across) before or during installation using hand or power tools. Indirect impacts would include trampling or defoliation of established vegetation during installation. Other potential indirect impacts may include the expansion of invasive species into disturbed areas. Pipe would be laid on top of the ground using a horse and pull behind cart to lay pipe on the ground. Pipe would be weaved through and around existing vegetation causing minimal impacts. The above ground pipeline and disturbance from this would be expected to be minimal. Levels of moderately higher use would be expected to occur in areas within one quarter mile from trough locations.

Adaptive Management – Native Fish Introductions
Introduction of native fish species as listed under Alternative A could have varying effects to the livestock grazing operation depending on where introduction locations may be. If the introductions occur in areas where livestock are already excluded, then no additional effects would be expected, as no changes would be made with the introduction of fish.

If fish introductions are proposed in areas where minimal livestock disturbance currently exists, then increased grazing management may be required such as through adding salt or alternative offsite watering sources. This could result in increased vegetation disturbance at those new locations from the concentrating of livestock use.

For those sites that livestock currently use, but it is determined that livestock need to be excluded in order to protect the habitat for the new fish introductions, vegetation is expected to increase within the excluded area, and a slight reduction of available forage for cattle would occur. However,

depending on the site, livestock access to water may be an issue. It is recommended that exclusions should only be proposed for those areas that already have an alternative adequate nearby water supply for livestock. Fencing livestock out of fish habitat typically also removes access to water for cattle, especially in drier years. This could increase concentration of livestock at other water sources or reduce the timing a pasture can be used. Although, outside water may be provided from the excluded area. If this was done by removing water that is providing the fish habitat and then piping it to a trough, this could reduce the water flow at the site for the fish and typically would require a fine mesh screen to keep fish from entering the pipeline. These screens require constant maintenance making this impractical. Water provided from other sources or excluding areas that cattle already typically don't use or already have access to other nearby water sources would not impact the grazing operation.

Management Practices and Mitigation

The Tonto National Forest uses monitoring results to continually modify management in order to achieve specific objectives. Alternative A would provide sufficient flexibility to adapt management to changing circumstances. If monitoring indicates that desired resource conditions are not being achieved, certain management decisions could be used to modify management. Such changes may include annual administrative decisions to adjust the specific number of livestock, specific dates for grazing, class of animal, or pasture rotations. These changes would not exceed limits for timing, intensity, duration, and frequency as needed to achieve management goals and objectives. 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. The flexibility given to resource managers to adjust the timing, intensity, frequency, and duration of livestock grazing in any pasture, at any time will ensure that plants are not used beyond levels that will provide for recovery, improved vigor, and recruitment of desirable species. By implementing the management practices in the proposed action, effects to vegetation are mitigated, resulting in improvement of vegetative conditions in areas of less than satisfactory conditions and maintenance of sites currently in satisfactory conditions.

Grazing management during times of drought would follow the Tonto National Forest/R3 Chapter 90 drought Plan. Drought conditions would be monitored with the Standardized Precipitation Index (SPI)[22]. When the twelve month SPI for this area reaches negative one, Forest Service specialists will look at site specific data on the Copper Creek Allotment. Numerous rain gauges have been installed across this allotment and would be used to monitor site specific precipitation amounts within various areas of the allotment. Utilization strategies during drought could then be adjusted to compensate for decreased plant growth and would allow for residual forage and thermal cover for wildlife. Decreased livestock numbers may be required in order to maintain plant health and vigor across the allotment.

The Proposed Action 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 are needed to modify or construct new

[22]For more information, visit https://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/spi.html

improvements, Alternative A provides the flexibility to consider and review these changed circumstances and provides a range of options for construction or modification of Structural Range improvements in the context of the overall project. The proposed range improvement infrastructure, when implemented, in no particular order or time frame (driven by management objectives), will aid in growing season rest or deferment of pastures and will facilitate livestock distribution throughout the allotment. Typically, even during dry years, reliable water sources and water distribution throughout the allotment are the limiting factors, not forage availability.

Monitoring

The objective of monitoring is to determine if management is being properly implemented and whether actions are effective at achieving or moving toward desired conditions.

While monitoring techniques as described above would be conducted in key areas, these would not be the sole locations for gathering information from grazing allotments to make decisions about timing, intensity, duration, or frequency of livestock grazing in a given grazing season. Overall condition of allotments and such things as distribution patterns or rangeland improvement conditions could be assessed at any given time to help make those decisions. The physical exercise of some monitoring techniques as described in this EA may result in the crushing or disturbance of some individual plants while accessing the monitoring site. However, this disturbance would be extremely localized and minor, being the same as any recreational user accessing that area of the forest. Monitoring would have a beneficial effect to vegetation, allowing management to continuously be adjusted in response to current conditions.

Direct and Indirect Effects of No Grazing

Grazing Authorization

Grazing use levels on the key forage species in all key areas and adjacent areas on the allotment would be light, as wildlife would still graze on the allotment. Wild ungulates such as antelope, mule deer, Coues white-tailed deer, and elk would still impact herbaceous and browse plant species. However, these impacts are expected to be minimal. It is predicted that the physiological growth requirements of the forage plants would be favored in all key areas under this alternative. Therefore, areas on the allotment would likely increase in desirable forage plant densities and litter. Additionally, there would be an increase in plant species composition and improved vigor of forage plants within the allotment. The overall forage production (biomass) would also increase with no livestock grazing by cattle. The overall effect would allow for the quickest recovery in unsatisfactory areas and improve vegetative conditions overall across the allotment. This would also be true for vegetation affected by the use of motor vehicles by the permittee for management of the allotment.

The Brooklyn Fire should result in a reduction of shrubs and other woody species which compete with herbaceous species. This direct decrease in competition is likely to increase herbaceous production which would be beneficial to wildlife. Much of the area that burned is dominated by Tobosa (*Hilaria mutica*), a grass which reproduces using underground rhizomes. Since its growth structures are located below ground and are undamaged by the fire, full recovery of these Tobosa grasslands should be relatively quick.

Under this alternative, upland vegetation would improve the most in short-term productivity, vigor, species composition, and formation of new stems compared to the proposed action. Plants that would benefit most from no grazing are grass and forb species. Current year's leaf growth is important for photosynthesis. It is the most digestible part of the plant and is the portion generally removed by grazing animals. Conversely, production, vigor and species composition may decrease relative to the Proposed Action over time due to the accumulation of old plant material around palatable plants causing them to be undesirable to wildlife and livestock (Holecheck 2008). Under this alternative this allotment could, in the future, be used as a reference area to neighboring allotments with similar vegetation when analyzing the effects of grazing.

Livestock grazing would be removed from the small portion of the Pine Mountain Wilderness near Turret Peak under this alternative. However, livestock grazing would still occur in neighboring pastures on other grazing allotments. No additional effects would be apparent to wilderness values under this alternative. This alternative would move this area towards the goals and objectives outlined in the Forest Plan for the Pine Mountain Wilderness.

Improvements

Existing boundary fences would be assigned to adjacent Tonto National Forest permittees (where applicable). Interior fences and other infrastructure may be removed, as funding or workforce allows, mitigating potential adverse impacts to wildlife and public users. Water developments, important for wildlife may be maintained where feasible using other program funds or volunteers. Often, recreational users take advantage of existing corrals and water developments to care for their horses or mules while using National Forest System trails. Some improvements in the area are also popular to photograph by the public. Additionally, some wildlife species may have grown accustomed to reliable water at water developments, so there may be short-term detrimental impacts to their populations without those water sources.

Management Practices and Mitigation Measures

Management practices and monitoring would still be used under this alternative and would be conducted as described under Alternative B. Monitoring would consist of standard long term vegetation monitoring techniques such as photo points and Parker Three Step cluster monitoring, as well as some short term monitoring such as inspections to ensure no livestock are found on the allotment. Management practices could be used to identify and maintain structural improvements that may be benefiting other resources. Those structural range improvements identified as being useful across the allotment would require maintenance by the Tonto National Forest under this alternative and could be conducted with help from volunteers, partner groups or Arizona Game and Fish Department.

Adaptive Management – Native Fish Introductions

Since no livestock will be authorized on the Copper Creek Allotment under this alternative, no effects are expected on the overall range program from the introduction of native fish species on the Copper Creek Allotment under Alternative B. Some increased vegetation impacts may be seen on a localized level for continued monitoring of these introduction sites. However, this would be

relatively small in scale and would not be above general recreational use. With the removal of livestock, overall vegetation on the allotment would likely improve and provide greater resilience to the landscape to help support the recovery of introduced fish species.

Cumulative Effects

The Cave Creek Ranger District consists of approximately 570,000 acres with livestock grazing currently authorized across 7 of the 11 allotments on the district, including the Copper Creek Allotment. Approximately 330,741 acres of the Cave Creek Ranger District are grazed (minus some pastures and exclosures) 58 percent of the Ranger District. The Allotment is approximately six percent of the acreage in the entire Cave Creek Ranger District (approximately 34,700 acres). All of these acres could potentially be grazed under the proposed action with the exception of a few exclosed areas totaling approximately 900 acres that would further decrease the area affected.

The defined area for the cumulative effects analysis is dominated by public lands managed by both the Bureau of Land Management and the Tonto National Forest and encompasses approximately 458,000 acres. These areas are subject to multiple uses of the area including livestock use, recreation activities, rights of way maintenance, and habitat restoration accomplished by the use of fire and hand treatments. The Copper Creek Allotment is adjacent to two other livestock grazing allotments on the Tonto National Forest. It is also adjacent to the Horseshoe Allotment managed by the Bureau. The two adjacent allotments on the Tonto National Forest, Six Bar and Red Creek grazing allotments, are currently stocked and within some of the same watersheds as the Copper Creek Allotment. Each of these allotments are conservatively stocked and monitored to ensure conservative utilization standards are being met. As a result, cumulative watershed effects for these allotments are anticipated to be minimal considering the size and complexity of the watersheds themselves.

Copper Creek has been active livestock grazing allotment with livestock grazing occurring in some form on the allotment area for over a century. The environmental effects of past grazing practices are reflected in the current description of the affected environment for the allotment. Historic grazing on this allotment also contributed to cumulative effects. Stocking rates were disproportionately high during the first half of the 20th century. Impaired soils and vegetation observed today may be a result of those early impacts that the vegetation and rangeland is still recovering from. Historical overuse by livestock, particularly in the lower elevations and flatter terrain of the allotment has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

OHV use and unauthorized route proliferation have increased dramatically over the past 30 years. Unmanaged OHV use can have an impact on the vegetation resource. Impacts include destruction and loss of vegetation through the creation of unauthorized routes, soil loss and compaction, and the facilitation in the spread of noxious weeds either directly (transport) or indirectly (disturbed soil creates microsites) (Brooks and Lair, 2005). Portions of the cumulative effects area are locally impacted by non-native weed species. The Tonto National Forest is currently in the process of designating a system of roads, motorized trails, and areas for motor vehicle use under the Final Travel Management Rule. When that final decision is signed and a motor vehicle use map is published, cross country travel by the public will no longer be permitted, reducing these impacts to vegetation resources. Until the Tonto National Forest's Travel Management Plan can be

implemented, effects of current management are expected to continue[23] including on the Copper Creek Allotment. Because no or minimal direct and indirect effects are anticipated from either alternative on the Copper Creek Allotment, no significant cumulative effects are expected when added to the effects of travel management.

Climatic changes over the next several years and decades indicate warmer and drier conditions may develop in the southwest. A recent summary of scientific information provided in *Rangelands* (Archer and Predick 2008) notes that these projections would likely affect vegetation and ecosystem processes in the Southwest. With warmer temperatures, current boundaries of southwestern deserts, including the Sonoran desert, will likely expand to the north and east. Nonnative perennial grasses utilize winter rain for growth more effectively than native grasses, which may result increased fire activity in desert ecosystems which are not adapted to fire. Although the potential effects of climate change on southwestern deserts are known, there is currently a lack of long-term monitoring data available to separate the effects of changes in climate from the effects of other drivers (e.g., land use). Management tools and strategies are increasingly important in arid and semi-arid regions in order to respond to fluctuations in precipitation. Management tools and mitigation measures are included in the proposed action that allows grazing management to be modified in response to many factors, including climatic factors, to avoid any significant cumulative effects.

Livestock use has occurred both in the past and currently within the cumulative effects analysis area. Silver Creek has been excluded from livestock use since the 2005 Cave Creek Complex fire and the Copper Creek Allotment, on the eastern end of the cumulative effect area, was closed to livestock use between 2005 and 2012.

The surrounding areas are used by many recreationists for activities such as visiting cultural sites, hunting, mining, OHV riding, hiking, bird watching and many others. In 2014, 80,000 visitors were estimated to have visited the Agua Fria National Monument with trends increasing each year. It is likely that many of these visitors also spend time on the Copper Creek Allotment, as it is adjacent to the Monument and contains many cultural sites that are popular for visitors.

The Tonto National Forest will continue to manage land for multiple uses. Traditional uses including livestock grazing, recreation activities, rights of way maintenance, and habitat restoration will likely continue. Other land management actions that may be implemented within the cumulative effects analysis area include weed treatments, land acquisitions, threatened and endangered species re-introductions, the Special Recreation Permit development, and range/wildlife facilities development (ex. fence installation/removal/redesign and water developments).

Cumulative Effects of Alternative A

Monitoring has demonstrated that current management has resulted in improvements to vegetative condition in the allotment. A flexible management livestock rotational system with a selective rest-rotation strategy, light to conservative grazing intensity, and additional range improvements are not

[23] Effects to vegetation resources across the Tonto National Forest under current management are detailed in the Final Environmental Impact Statement for the Travel Management Plan on the Tonto National Forest and can be found on the forest's website.

expected to result in significant direct or indirect negative effects to vegetation and are likely to maintain or improve the overall vegetative condition of the allotment. If left unchanged (Proposed Action), current grazing practices are not expected to contribute toward any downward trends in resource conditions on the allotment. Reauthorizing grazing for an additional ten years under the Proposed Action is not anticipated to contribute additional adverse impacts to allotment resource conditions as described in Chapter 3. Therefore, effects from this project are not anticipated to have significant cumulative impacts when added to the effects from past, present, and foreseeable future actions.

Cumulative Effects of Alternative B

Under the No Grazing alternative, improvement in resource conditions are expected to be low to moderate over the long-term as vegetative conditions slowly recover from long-term livestock grazing on the allotment. Vegetation (fuels) would likely continue to build up as no livestock would be removing above ground biomass. This may increase the probability of wildfire within the allotment which may have increased negative impacts to vegetation and soil resources. The effects of climate change and drought may impact vegetation condition of the allotment. However, the continued absence of livestock grazing pressure may lessen plant stress, thereby reducing or slowing these effects.

Hydrology, Riparian, and Watershed Resources

Affected Environment

The area within the Copper Creek allotment is relatively flat topographically with some rolling hills in the west and central portions and increasing elevation and slope towards the east. Within the project boundary, less than one mile, a 0.6 mile section of Silver Creek, is considered to have perennial flow characteristics. There are approximately 20 miles of stream length identified as being intermittent, with most these stream segments occurring in Silver, Bishop, and Copper Creeks. Consistent with the southwest, most of the streams within the allotment are characterized as being ephemeral. These ephemeral streams are dominated by upland and xeric riparian vegetation. Although they contain water through much of the year, 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.

The US Army Corp of Engineers (2015) 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.

Western riparian systems are among the rarest habitat types in the Western Hemisphere (Krueper, 1995). In Arizona and New Mexico, these areas occupy less than 0.5 percent of the state's land area, yet 80 percent of all vertebrates use riparian areas. In Arizona 60-75 percent of the resident wildlife species depend on riparian areas to sustain their populations (Arizona Riparian Council, Fact Sheet No.1, 1995).

Riparian can be simply defined as the vegetation or habitats that are associated with the presence of water, whether it is perennial, subsurface, intermittent or ephemeral in nature (Krueper, 1993). These areas are transitional between aquatic and terrestrial areas and have components of both (DeBano and Schmidt, 1989a). Riparian areas have distinctly different vegetative species composition than adjacent areas. The most diverse and robust riparian vegetation occurs in association with perennial and intermittent reaches. However, some transitional ephemeral reaches do support isolated pockets of riparian woody vegetation because of the presence of shallow subsurface water.

Approximately 500 acres of riparian vegetation was identified by regional riparian mapping project (2011) as occurring within the project area. This riparian vegetation was dominated (85 percent) by broadleaf riparian forest units including: Sycamore and Fremont Cottonwood, Fremont Cottonwood-Conifer, and Fremont Cottonwood-Shrub. The Desert Willow and Herbaceous units comprised approximately 14 percent and 1 percent, respectively of the total acreage.

The Brooklyn Fire burned approximately 19,000 acres within the Copper Creek Allotment. Burn severity by soil burn severity class is displayed in (Table 12).

Table 12: Brooklyn Fire Soil Burn Severity within Copper Creek Allotment

Burn Severity Class	Acres	Percent of Burned Area	Percent of Allotment
Unburned	3,447	18	10
Low	15,191	78	42
Moderate	928	5	3

Areas of moderate burn severity were typically confined to swales and in and adjacent to drainages on side slopes where vegetation was denser. Hydrophobic soil conditions were typically present in the upper one centimeter of soil. Areas of low soil burn severity typically had more scattered trees and shrubs than areas of moderate burn severity. Hydrophobic soil conditions occurred in the upper one centimeter of soil in low burn severity areas under trees and shrubs but was not present in the interspaces between shrubs and trees. Some of the litter under trees and shrubs was not completely consumed. Most of the basal cover of grass remained in areas of low burn severity and some resprouting is already evident. Many of the shrub and tree species that burned are quick to re-sprout after fire but were not observed to be re-sprouting at the time of assessment in July 2017.

Field information and research indicate that the greatest effect on the soil and watershed after a fire is the lack of effective ground cover, litter, and vegetation. Erosion and runoff increase with a reduction in cover. This is true in the burned area. Average pre-fire erosion rate was 0.3 tons per

acre. Average post-fire erosion rate is 24 tons per acre. There are five major physical functions vegetation provides to help control erosion during rainfall events:

- Interception of rainfall, which extends time for water to reach the ground surface and absorbs rainfall impact energy.
- Mulching of the ground surface to provide temporary water storage and slow release, slope roughness and energy absorption. Structural support of loose, surface material.
- Reinforcement of the deeper soil by roots, which increases the natural slope stability.
- Maintains conditions necessary for soil microorganisms that provide nutrient recycling and soil structure.
- In areas of moderate fire severity the scorched needles of coniferous trees will provide mulch on the soil surface, aiding in protecting it from direct rainfall impact and minimizing overland flow during a storm event.

Environmental Consequences

Assumptions and Methodology

Several forest and regional geodatabases were used for this analysis, along with permanent photo points, and stream and riparian assessment data. Several photo points and key areas were field visited in November, 2016 to verify that current conditions were consistent with the information being described in this analysis.

Hydrophobic soil conditions as well as reduced effective ground cover contribute to increased runoff and erosion from burned areas, such as those within the Brooklyn Fire burn area. Changes in peak flows—measured in cubic feet per second (cfs)—from the burned area were estimated with a rainfall runoff model (Wildcat5) (Hawkins and Barreto-Munoz, 2016) that assesses watershed runoff from a one one hour thunderstorm based on changed watershed conditions. Increases in peak flows were for watersheds ranging in size from 1.5 to 15.2 square miles that drain the burned area. Post-fire peak flow flow increases from the two year one hour storm ranged from 1.1 to 1.9 times pre-fire peak flows and and averaged 1.6 times pre fire peak flows. Post fire peak flows from the 100 year one hour storm in these watersheds ranged from 1.1 to 1.3 times pre fire peak flows. Pre and post fire peak flows estimated with the Wildcat5 rainfall runoff model are estimated in Table 13 and

Table 14.

Table 13: Brooklyn Fire Pre-Fire Peak Flow Estimates

Pre-Fire Peak Flow Estimates (cfs)						
	Storm Return Period (years)					
Watershed	2	5	10	25	50	100
Lousy Creek	392	990	1,602	2,615	3,524	4,558
Larry Creek	380	976	1,573	2,553	3,432	4,429
North Fork Squaw Creek	382	956	1,543	2,509	3,374	4,355
Tank Creek	437	1,120	1,801	2,924	3,933	5,082
Copper Creek	497	1,273	2,051	3,336	4,491	5,807
Hackberry Wash	165	418	668	1,079	1,446	1,870

Table 14: Brooklyn Fire Post-Fire Peak Flow Estimates (cfs)

Post-Fire Peak Flow Estimates (cfs)						
Watershed	Storm Return Period (years)					
	2	5	10	25	50	100
Lousy Creek	703	1514	2270	3462	4499	5655
Larry Creek	640	1400	2112	3239	4222	5319
North Fork Squaw Creek	725	1525	2261	3413	4423	5567
Tank Creek	756	1634	2457	3763	4903	6177
Copper Creek	631	1502	2348	3721	4940	6317
Hackberry Wash	228	521	800	1247	1648	2105

The relative magnitude of post-fire peak flow increases is displayed in Table 15.

Table 15: Relative magnitude of post fire increase (pre-fire cfs divided by post fire cfs).

Pre-Fire Peak Flow / Post-Fire Peak flow						
Watershed	Storm Return Period (years)					
	2	5	10	25	50	100
Lousy Creek	1.8	1.5	1.4	1.3	1.3	1.2
Larry Creek	1.7	1.4	1.3	1.3	1.2	1.2
North Fork Squaw Creek	1.9	1.6	1.5	1.4	1.3	1.3
Tank Creek	1.7	1.5	1.4	1.3	1.2	1.2
Copper Creek	1.3	1.2	1.1	1.1	1.1	1.1
Hackberry Wash	1.4	1.2	1.2	1.2	1.1	1.1

This table illustrates that the relative magnitude of post fire increases (pre-fire cfs divided by post-fire cfs) are greatest for the more common storm events, such as the 2 year storm. Relative magnitude of increases is much less for the rarer storm events such as the 50 or 100 year storm where the magnitude of the rainfall overwhelms the effect of watershed condition on runoff.

Permanent Photo Points

There are 18 permanent photo points located in riparian areas on the Copper Creek Allotment (Table 16). All photo points have been repeated at least once and most have been repeated several times[24].

Table 16: Photo Points on the Copper Creek Allotment and History of Repeat Photography

Site Name	Number of Photo Points	Years Established
Silver Creek	2	1995-2015
Bishop Creek	8	1993-2015
Copper Creek	8	1994-2015

Stream Channel Classification and Condition Assessment

Historic condition assessments have been completed on three streams within the allotment; Silver Creek, Bishop Creek, and Copper Creek. Stream reaches were classified according to the Rosgen (1996) system which is described below. Assessment ratings were completed using a condition assessment developed on the Tonto National Forest (Mason and Johnson 1999). The condition assessment is based on stream channel stability which is defined as: the ability of a stream to carry

[24] Photo point photos are stored on the Friends of the Tonto website http://www.friendsofthetonto.org/photo-point.html

the water and sediment of its watershed while maintaining its dimension, pattern, and profile, without aggrading or degrading, over time and in the present climate (Rosgen 1996). The condition rating classes are stable, impaired (slightly or severely), or unstable. Parameters used to assess stability include depositional pattern, stream bank vegetative cover (Thompson et al. 1998), stream channel width to depth ratio, channel stability rating (Pfankuch 1975), and bank erosion hazard index (Rosgen 1996).

Watershed Condition

The Watershed Condition Framework was used to evaluate watershed scale existing conditions and cumulative effects in this report. A watershed's condition class integrates conditions of many indicators within a watershed, and therefore provides an ideal mechanism for interpreting the cumulative effect of a multitude of management actions on soil and hydrologic function (USDA, 2011). Watershed Condition Classification is the process of describing watershed condition in terms of discrete categories (or classes) that reflect the level of watershed health or integrity. The Forest Service Manual (FSM) uses three classes to describe watershed condition (USDA Forest Service 2004, FSM 2521.1).

- Class 1 watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential.
- Class 2 watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential.
- Class 3 watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential.

The FSM classification defines watershed condition in terms of "geomorphic, hydrologic and biotic integrity" relative to "potential natural condition." Within this context, integrity relates to functionality. The three watershed condition classes as related to the degree or level of watershed functionality are (USDA Forest Service, 2011, FS-978):

- Class 1 = Functioning Properly
- Class 2 = Functioning at Risk
- Class 3 = Impaired Function.

The Watershed Condition Classification system used to derive the three classes is based on 12 indicators that directly or indirectly affect soil and hydrologic functions and associated riparian and aquatic ecosystems. In 2010, Watershed Condition Classification was completed across the Tonto National Forest at the subwatershed level (6th Level Hydrologic Unit Code or HUC).

General Effects to Hydrology, Riparian, and Watershed Resources from Grazing

Riparian areas have ecological importance beyond the small percentage of land area they occupy. This percent area is smaller in the arid southwestern United States than in the country as a whole, but their ecological importance is even more critical in the Southwest. 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). As long-term drought conditions

persist, surface water resources are anticipated to decrease. Thus, areas with riparian vegetation are likely to see more stress. Wildlife and cattle tend to congregate in many riparian areas because they favor riparian forage, water availability, shade in warm months, and relatively flat topography.

Excessive grazing, trampling and trailing impacts can destabilize and break down streambanks, 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). In addition, stream channels and riparian areas can also be affected indirectly by watershed condition and 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).

Direct and Indirect Effects of Proposed Action

Grazing Authorization

One of the most important factors influencing riparian conditions is utilization (Mosley *et al*. 1999; Clary and Kruse 2003). Monitoring of upland vegetative conditions as well as riparian species will be a critical component of the proposed action. Continued heavy to extreme use of woody species can limit the plant's ability to regenerate (Winward 2000). Research has shown that heavy to extreme use by grazing animals every year is detrimental to plant health, while light to moderate use maintains overall plant health (Thorne *et al*. 2005).

As discussed in the description of the proposed action, grazing intensity will be measured using forage utilization. Forage utilization will be managed at a level corresponding to light to conservative grazing intensity in order to provide for grazed plant recovery, increases in herbage production, and retention of herbaceous litter to protect soils. Conservative use equates to 30 to 40 percent on herbaceous species and up to 50 percent use on browse. Consistent patterns of utilization in excess of 40 percent on key species in key areas will be used as a basis to modify management practices or take administrative actions necessary to reduce utilization in subsequent grazing seasons. Light to conservative use levels, in addition to mitigation measures such as not trailing livestock through riparian areas, nor placing salt and/or mineral supplements within stream or riparian corridors will ensure direct and indirect effects to riparian areas and stream channels will be minimal. Project defined desired conditions can be achieved if the implementation and effectiveness monitoring is completed as outlined in the monitoring section and the management practices and mitigation measures strictly adhered to.

Silver Creek exits the allotment into the Agua Fria National Monument where it eventually enters an impaired reach of the Agua Fria River (from Sycamore Creek to Bishop Creek). This reach is

impaired for the designated use of full body contact with respect to *E. coli* exceedances. Livestock grazing is a potential source of *E. coli* contamination. However, it is unlikely that past and future grazing activities associated with this allotment, including those within the proposed action, are going to be a contributing factor to this impairment. Silver Creek enters the Agua Fria River near the furthest downstream portion of this impaired reach. Bishop Creek and tributary Copper Creek enter the Agua Fria where no impairments have been identified downstream. Where Silver Creek exits the allotment boundary is at least five stream miles upstream from the confluence with the Agua Fria River. Given the distance of the allotment upstream from the Agua Fria and the strict adherence to management practices and mitigation measures in the proposed action such as salting/supplement locations up out the drainages, this alternative is not expected to contribute to the aforementioned impairment, nor cause any additional impairments.

The relatively quick burning nature of the Brooklyn Fire and low amount of moderate and high soil burn severity does not present a major risk to watershed integrity, such as long-term soil productivity or hydrologic function. The burned area emergency rehabilitation (BAER) team members observed that soil and fine root structure was largely preserved, litter not completely consumed, and re-sprouting already occurring throughout the burned area. Soil-hydrologic function within the burned area should recover within two to three years.

Establishment of vegetative cover is critical in reducing erosion rates, maintaining site productivity and minimizing detrimental effects to overall watershed condition. One of the treatment recommendations in both the hydrology and soils specialists' reports from the Brooklyn Fire BAER assessment was that the burned area be rested from grazing for at least one growing season. This will permit root reserves to be replenished, would improve effective ground cover from both canopy and litter accumulation, and reduce compaction from soil trampling.

Range Improvements and Management Practices

Adding fencing, constructing livestock handling facilities, protection of springs, and developing additional watering sources, will be beneficial to facilitate better livestock distribution and reduce undesirable effects to channel stability and riparian vegetation. As stated by Clary and Kruse (2003) on page 252 of the book, Riparian Areas of the Southwestern United States Hydrology, Ecology and Management, "Encouraging livestock away from riparian areas is, in many cases, a key management activity. Development of off-stream water sources is often the easiest way to do this." Strict adherence to the proposed management practices and mitigation measures are expected to minimize any potential negative direct or indirect effects to riparian and watershed resources from these activities.

If infrastructure is added or other management actions are taken to exclude livestock from riparian areas or springs as a result of native fish introductions, these effects would only be further minimized. Construction or maintenance activities associated with range improvements are expected to have a minor and temporary effect from potential addition of sediment to streams. Additionally, as part of allotment management activities, the grazing permittee may be permitted to travel cross country in a motorized vehicle. This is expected to have minimal effect on riparian areas and streams if travel directly through stream and riparian corridors is avoided and existing stream crossings are utilized.

Direct and Indirect Effects of No Grazing

The direct and indirect effects of this alternative should result in reaching stream and riparian desired conditions at the fastest rate. Potential for recovery and rate of recovery will vary by key reach. Where there is potential for recovery of riparian vegetation, eliminating the direct and indirect effects of livestock grazing should allow the most rapid rates of recovery. Where riparian vegetation is meeting desired conditions, this alternative will provide the most protection for maintaining those conditions.

Cumulative Effects

Cumulative effects analysis at the watershed scale was completed using the Watershed Condition Framework. Watershed Condition scores are based on twelve indicators composed of attributes related to watershed processes. This analysis will qualitatively describe the potential changes of the indicators relevant to this project in relation to: 1) the effects of past, present and reasonable foreseeable activities within the watershed; and 2) the effects that are expected with implementation of the alternatives associated with the proposed action. Reasonably foreseeable activities include those that are anticipated to occur now and ten years into the future. Superimposed on the exiting condition and reasonably foreseeable activities, are the effects with respect to full implementation the proposed action.

As previously discussed, all of the affected sixth code watershed are in “functional at risk” condition with the exception of Bishop Creek, which currently rated as impaired. The indicators that were rated as being in poor condition included: riparian/wetland, water quality, aquatic habitat, roads and trails, and soil condition. In addition to the legacy effects of historic over-grazing, many of these indicators were impacted by the Cave Creek Complex Fire in 2005. The effects of excess runoff and erosion in the uplands after the fire caused channel scouring in stream headwaters and excess deposition downstream, lower gradient sections of streams. Based on the field collected data and field visits, the riparian/wetland, water quality, and soils indicators are improving since the watershed condition ratings were originally completed. These indicators also appear to be stable or improving in the other watersheds as well. Because no or minimal direct and indirect effects are anticipated from grazing authorization on the Copper Creek Allotment, no significant cumulative effects are expected when added to the effects on these resources.

On November 9, 2005, the Forest Service published travel management regulations, referred to as the Final Travel Management Rule, governing off-highway vehicles (OHVs) and other motor vehicles on national forests and grasslands. This final rule was developed in response to the substantial increase in use of OHVs on National Forest lands and related damage to forest resources caused by unmanaged OHV use over the past 20 to 30 years. Under this final rule, the Tonto National Forest will issue a final decision which will designate a system of roads and motorized trails. Once routes are designated, maps will be available to the public and modified as needed to reflect any changes. Once that map is publically available, motorized travel will be prohibited off designated roads and trails, eliminating cross-country travel on the forest. Enforcement of the Travel Management Rule will be essential to assure compliance and prevent resource damage. Successful implementation of the Travel Management Rule should accelerate recovery of upland and riparian areas where these areas are currently being impacted by cross country travel. The Travel

Management Rule should have a positive effect on the roads and trails watershed condition indicator. Until the Tonto National Forest's Travel Management Plan can be implemented, effects of current management are expected to continue[25] including on the Copper Creek Allotment. Because no or minimal direct and indirect effects are anticipated from grazing authorization on the Copper Creek Allotment, no significant cumulative effects are expected when added to the effects of travel management.

Two other grazing allotments within the affected 6th code watersheds of interest are the Horseshoe Allotment and the Six Bar Allotment. The Six Bar Allotment, which is within the Tonto National Forest is located within a large proportion of Squaw Creek (49 percent) and to a smaller extent (6.5 percent) the Bishop Creek watersheds. The effects of the management of this allotment on the Rangeland Vegetation Condition indicators and other indicators for these watersheds have already been incorporated into the existing Watershed Condition rating. The Rangeland Vegetation indicator conditions for Squaw Creek and Bishop Creek watersheds, were rated as "Fair" and "Good", respectively. The Proposed Action for this project has been designed to improve unsatisfactory areas as well as maintain or improve conditions for the remainder of the allotment that are in satisfactory vegetative condition. Therefore with respect to this project, the rangeland vegetation and riparian/wetland vegetation indicators for the affected watersheds should either be maintained or improved.

Since the Coordinated Resource Management Plan was implemented in 1998, the Copper Creek and Horseshoe Allotments have been run as a single operation. The Forest Service, Bureau of Land Management, and permittees are partners in the implementation of the grazing plans. The adjacent Horseshoe Allotment is located on BLM managed lands and overlaps Tank Creek (58 percent), Silver Creek (31 percent), Lousy-Canyon Agua Fria River (26 percent), and Bishop Creek (20 percent) watersheds. Although the Horseshoe Allotment is not within the Forest Boundary, and therefore was not considered during the Watershed Condition rating process, it is expected that watershed condition indicators will be consistent across the boundary.

In summary, because Watershed Condition Framework indicator scores are maintained or improved with the multitude of past, present, and reasonably foreseeable actions (including the proposed action) Watershed Condition Classes will be maintained or improved. Therefore, no adverse watershed cumulative effects are expected with either alternative.

Soil Resources

Affected Environment

Soils in the higher eastern portions of the allotment area and in the western portion grasslands, adjacent to the Agua Fria National Monument, have developed in basalt parent material. In the center

[25] Effects to water resources across the Tonto National Forest under current management are detailed in the Final Environmental Impact Statement for the Travel Management Plan on the Tonto National Forest and can be found on the forest's website.

of the allotment the soils in a strip trending north to south have developed from granitic sources exposed as result from erosion of the basalt.

Soils Inventories and Surveys

The soils of the allotment were originally mapped and described in the North Tonto National Forest Terrestrial Ecosystem Survey Report (Forest Service 1985). The soil data for the allotment are currently being updated to current standards in the Terrestrial Ecosystem Unit Inventory, which is ongoing for the Tonto National Forest (USDA 2014). This inventory is currently in draft status.

Soil Condition

Soil quality assessment and monitoring (soil condition) is used to determine watershed condition and long-term soil productivity[26]. Soil condition monitoring is completed during the current mapping process. It is an evaluation of soil quality based on an interpretation of factors which affect vital soil functions. These functions include the ability of the soil to hold and release water (hydrologic function), the ability of the soil to resist erosion and degradation (soil stability), and the ability of the soil to accept, hold and release nutrients (nutrient cycling).

Soils are evaluated and assigned a soil condition category, (satisfactory, impaired, or unsatisfactory), which is a reflection of soil function. These categories are defined as:

- **Satisfactory** – The soil indicators (hydrologic function, soil stability, and nutrient cycling) signify that soil function is being sustained and the soil is functioning properly and normally. The ability of the soil to maintain resource values and sustain outputs is high.
- **Impaired** – The soil 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.

Soil condition data were collected at five locations on the Copper Creek Allotment in 2009 (Robertson *et al.* 2014) and are displayed in Table 17. In 2009, 40 percent of the sites were in satisfactory condition and 60 percent were in impaired condition. Another field review of the allotment was conducted in February 2015. Soil condition was assessed at six of the key areas visited. In April 2015, soil condition assessments were completed at six additional representative locations on the allotment (Table 17 and Figure 10). In 2015, soil condition was satisfactory at ten of the twelve sites, or approximately 83 percent. The sites in satisfactory condition were stable, had good soil structure, and had a good cover of perennial grass. The sites at C4 and S1 were in impaired condition. The impaired ratings were a result of lack of soil stability and a reduction in nutrient cycling.

[26] More information can be found at Forest Service Handbook 2509.18-99-1

Table 17: Soil Condition Ratings

Location	Year	Pasture	TEUI Unit	Condition
C1	2015	Bobcat	435	Satisfactory
S6	2015	Bobcat	432	Satisfactory
S1	2015	Brooklyn	435	Impaired
S2	2015	Brooklyn	381	Satisfactory
S5	2015	Brooklyn	426	Satisfactory
C2	2015	Cornstalk	429	Satisfactory
C3	2015	Cornstalk	429	Satisfactory
C4	2015	Cornstalk	380	Impaired
T1	2009	Cornstalk	450	Satisfactory
T2	2009	Cornstalk	424	Impaired
T4	2009	Granite-Mesa	429	Impaired
T5	2009	Granite-Mesa	432	Impaired
S3	2015	Granite-Mesa	468	Satisfactory
S4	2015	Granite-Mesa	424	Satisfactory
C6	2015	Perry Mesa	380	Satisfactory
C7	2015	Perry Mesa	380	Satisfactory
T3	2009	Perry Mesa	380	Satisfactory

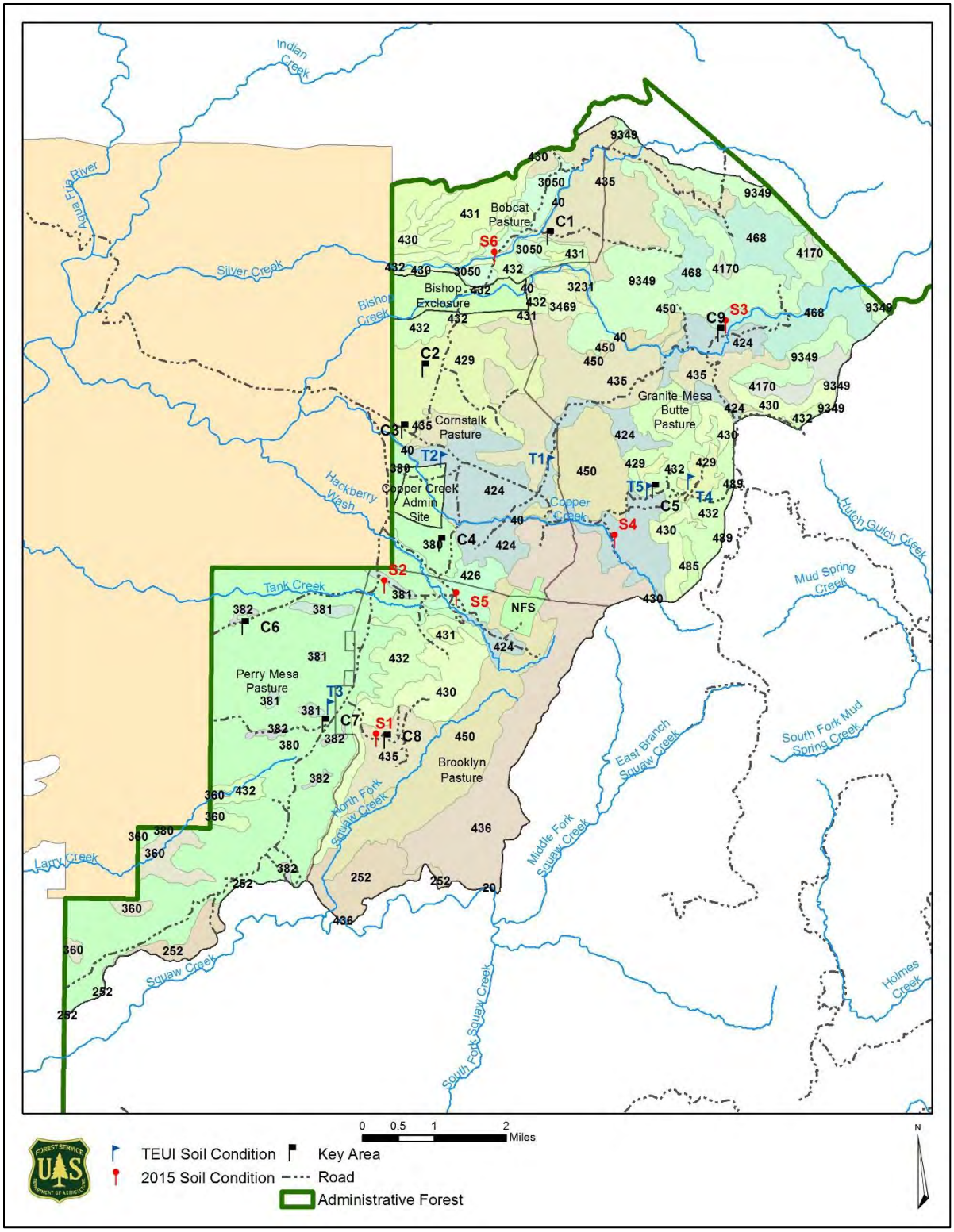

Figure 10: Copper Creek Soil Condition Monitoring Locations

Slope

Topographical features on the Copper Creek Allotment range from nearly level alluvial fans to rugged steep slopes (Table 18). Slopes of up to 40 percent are considered suitable for grazing, as cattle tend to congregate in flatter areas. Areas with greater than 40 percent slope are often not used by cattle.

Table 18: Net Acres by Pasture and Percent Slope

Allotment Pastures by Percent Slope	Acres	Percent Slope Per Allotment Pasture
Bobcat Pasture	**2,857**	**8**
0-10 Percent Slope	884	3
10-40 Percent Slope	1680	5
More than 40 Percent Slope	293	1
Brooklyn Pasture	**7,631**	**22**
0-10 Percent Slope	1637	5
10-40 Percent Slope	3,875	11
More than 40 Percent Slope	2,119	6
Cornstalk Pasture	**5,029**	**14**
0-10 Percent Slope	3,005	9
10-40 Percent Slope	1,781	5
More than 40 Percent Slope	243	1
Granite-Mesa Butte Pasture	**12,247**	**35**
0-10 Percent Slope	2,199	6
10-40 Percent Slope	7,600	22
More than 40 Percent Slope	2,448	7
Perry Mesa Pasture	**7,141**	**20**
0-10 Percent Slope	5,789	17
10-40 Percent Slope	974	3
More than 40 Percent Slope	378	1
Total	**34,905**	**100**

Environmental Effects

The criteria used to evaluate alternatives will be based on the likelihood of moving toward or attaining desired conditions for soil resources in management direction including the Tonto National Forest Plan. The alternatives are contrasted based on the likelihood of upland vegetation and soils attaining the short and long-term desired conditions described.

Assumptions and Methodology

Soil condition is an evaluation of soil quality based on an interpretation of factors which effect vital soil functions. These functions are: The ability of the soil to hold and release water (hydrologic function), the ability of the soil to resist erosion and degradation (soil stability), and the ability of the soil to accept, hold and release nutrients (nutrient cycling)[27]. Soils are evaluated and assigned a soil

[27] The rationale and procedure for monitoring soil quality is located Forest Service Handbook 2509.18 supplement of the Forest Service Manual.

condition category which is a reflection of the status of soil function. The soil quality monitoring procedure is intended to update and supplement Hydrology Note 14, June 1981 and Terrestrial Ecosystem Survey Handbook Chapter 8 (both USDA Forest Service, Southwestern Region) as a method to evaluate soil and watershed condition in the Southwestern Region. Hydrology Note 14 et.al. is the method specified in the Tonto National Forest Land Management Plan for evaluating watershed condition. This method, based on the Universal Soil Loss Equation (USLE) erosion model, tended to over-estimate the amount of unsatisfactory soils on steep slopes and under-estimate the amount of unsatisfactory soils on flatter surfaces. The new procedure for assessing soil condition examines more parameters and gives a more refined evaluation of soil condition.

Incomplete or Unavailable Information

Not all soil conditions and their associated delineations were field inspected and validated due to their inaccessible locations and are based on somewhat limited on-site data. Field validating every delineation for purposes of collecting on-site specific information would not be practical. Some of the soil condition classes are based on theoretical approaches and methods generally accepted in the scientific community. Consequently, the soil condition classes should be used as a coarse-filter technique to assign gross range condition classes per vegetation type.

General Effects from Grazing and Range Improvements

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 plant 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).

Slope is one factor which can predict where cattle may congregate. Cattle tend to concentrate on flatter areas, especially if they are fairly open. Holechek reports that cattle tend to use ten to 30 percent slopes thirty percent less often than zero to ten 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.

Cattle indirectly impact soils by removing vegetation resulting in a loss of protective cover including litter. The 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. The 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.

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 generally have extremely small, localized direct impacts to soils. Building fences and developing waters will 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.

Direct and Indirect Effects of Proposed Action

The proposed action consists of five components: authorization, improvements, monitoring, adaptive management, and management practices. The proposed action follows current guidance from Forest Service Handbook 2209.13, Chapter 90 (Grazing Permit Administration; Rangeland Management Decision making).

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 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 or on gentler slopes, areas most likely to be used by livestock. These areas are likely to continue to receive a substantial amount of use. However, if the allowable use guidelines that are prescribed in the proposed action are not exceeded, (conservative use of 30 percent to 40 percent 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. 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.

Biological (cryptogamic) crusts (biological crusts) play an important role in some ecosystems, especially Sonoran Deserts, and to a somewhat lesser extent, other ecosystems in the analysis area. Biological crusts bind and protect soil from both water and wind erosion. Grazing can have detrimental effects on the amount of biological crusts that are retained (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 (Forest Service 2001). Grazing may slow or prevent the recovery of biological crusts. Since the proposed action proposes light to moderate stocking in early-to mid-wet season, this alternative is anticipated to have a minimal effect on biological crusts on the Copper Creek Allotment.

The effects of range improvements (fence construction, tank construction or improvement, etc.) would be a minor, localized, short-term disturbance to soils. Range improvements can have slight, localized, short-term impacts to soils during construction. The same effects would be expected if fencing is proposed to exclude cattle from an area where native fish would be introduced. Building new fences and developing waters, as mentioned in the proposed action, would have extremely small, localized direct impacts to soils. Building fences and developing waters will 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.

Repeated tracking by motor vehicles can directly impact soil by removing the protective vegetation layer to bare soil and loosening soil aggregates through tire churning, rutting and soil displacement thus exposing the soil to accelerated erosion resulting in loss of soil productivity. The impacts are most pronounced during periods when the soil is wet. Motor vehicle use indirectly causes accelerated erosion and sediment transport to connected streams following storm events. Repeated motor vehicle travel on soils with moderate or high erosion risk is most likely to cause accelerated erosion, runoff and sediment delivery into connected stream courses, posing a risk to long-term soil productivity. On soils with slight erosion risk, the direct impact of motorized vehicle activity is lower but could cause a loss of soil productivity when vegetative ground cover is removed, soil is compacted, or rutting occurs. Under this alternative, the grazing permittee may be authorized to travel cross country in a motor vehicle for purposes of managing the allotment. This use, if authorized, could occur in any part of the allotment outside of a designated wilderness area. However, this use would occur on a very limited basis, dispersed in time and space, and areas of high erosion risk and traveling when the soil is wet can be avoided. As such, risks to soils from this activity would be expected to be minor and short-term.

Direct and Indirect Effects of No Grazing

As previously discussed, soil condition was satisfactory at ten of the twelve sites, or approximately 83 percent of the Copper Creek Allotment in 2015. The sites in satisfactory condition were stable, had good soil structure, and had a good cover of perennial grass. The sites at C4 and S1 were in impaired condition. The impaired ratings were a result of lack of soil stability and a reduction in nutrient cycling.

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 occur with complete absence of 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 the soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, complete absence of grazing may facilitate faster recovery in some areas. This alternative is likely to lead to the fastest overall improvement, however even with complete rest of the allotment, it may take more than ten years for some areas with impaired and unsatisfactory soil condition to improve to a better condition class.

This alternative would completely avoid any detrimental effects from grazing on the amount of biological crusts (Beymer, 1992). This alternative is most likely to increase the cover of biological crusts and their ecological benefits of binding and protecting soil from both water and wind erosion.

The effects of removing improvements would be a minor, localized, short-term disturbance to soils. Since grazing would not occur on the Copper Creek Allotment under this alternative, the grazing

permittee would not need to travel cross country in a motorized vehicle for the purpose of managing the allotment. As such, no effects to soils would be expected from this activity.

Effects of not grazing/browsing may allow localized increases in nonnative herbaceous plants that would have otherwise been reduced by grazing in certain areas.

General 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. However, in April 2015, soil condition assessments were completed at six additional representative locations on the allotment. Soil condition was satisfactory at ten of the twelve sites, or approximately 83 percent showing soils are improving from past management actions. The sites in satisfactory condition were stable, had good soil structure, and had a good cover of perennial grass. Two sites were in impaired condition. The impaired ratings were a result of lack of soil stability and a reduction in nutrient cycling.

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 motor vehicle travel can negatively impact soils and vegetation through direct impacts on soils and removal or degradation of herbaceous or woody vegetation. Until the Tonto National Forest's Travel Management Plan can be implemented, effects of current management are expected to continue[28] including on the Copper Creek Allotment. Because no or minimal direct and indirect effects to soils are anticipated from grazing authorization on the Copper Creek Allotment, no significant cumulative effects are expected when added to the effects of travel management.

This allotment has had several large fires (greater than 300 acres) in the last ten years with the most significant being the Cave Creek Complex of 2005. Regarding soils and vegetation, some areas are still recovering, and still show some adverse effects from fire that are visible on the landscape. This type of fire is expected to occur in the future, as well. Although some adverse effects to soils are noted on this allotment, soil condition continues to improve since the 2005 fire. 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). Other activities and management actions that have occurred in the past or are presently occurring in the analysis area are as follows. Effects from all past and present activities are reflected in the existing condition.

- Mining
- Introduction of non-native invasive plants

[28] Effects to soil resources across the Tonto National Forest under current management are detailed in the Final Environmental Impact Statement for the Travel Management Plan on the Tonto National Forest and can be found on the forest's website.

- Wildfire
- Recreational camping
- Introduction and spread of noxious weeds
- Unauthorized livestock from adjacent allotments and other lands

Cumulative Effects from Proposed Action

The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions as listed above, are likely to result in attainment of desired conditions for soils and vegetation but at a slower rate than for Alternative B. The soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, heavy recreation use in certain areas, heavy off-road vehicle use in certain areas, mining, and wildfires. In some high use areas, no improvement is expected. Grazing can affect recovery of certain species within chaparral communities impacted by fire. 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. Implementing the proposed action is not anticipated to have significant effects to soils and vegetation when combined with overlapping effects from past, present, and reasonably foreseeable actions.

Cumulative Effects from No Grazing

The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions as listed above, will generally be beneficial to soils and vegetation and provide the best potential for attaining the desired conditions more quickly than Alternative A. Removing grazing from the Copper Creek Allotment would allow impaired and unsatisfactory soils, often affected by compaction, to recover. The soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, heavy recreation use in certain areas, mining and wildfires. Areas impacted by fires are more likely to recover under this alternative. Grazing can affect the recovery of certain species within chaparral communities impacted by fire. No grazing would benefit these communities. Even with continuous rest, the rate of recovery is expected to be slow for most areas. Soils and vegetation in some areas of the allotment are still recovering from the 2005 Cave Creek Complex Fire. This type of fire is expected to occur in the future as well. However, under the right conditions, the lack of grazing can create the right fuel bed to allow management to allow lightning fires to burn across the landscape in a more natural pattern in the upper elevation vegetative types. Climate change presents additional considerations. Warming and drying of the climate could increase the risk of wildfire especially in fire-dependent ecosystems.

Recreation Resources

The Copper Creek Allotment is located on the Cave Creek Ranger District of the Tonto National Forest, and is bordered by the Agua Fria National Monument to the west, the Prescott National Forest to the north, and the Pine Mountain Wilderness to the northeast.

Affected Environment

Recreationists visit the Cave Creek Ranger District for a wide variety of recreation opportunities including horseback riding, wildlife viewing, dispersed camping, fishing, hunting, target shooting, off-highway vehicle (OHV) use, and scenic driving. Natural features that add value to the recreation setting include spectacular views, springs, creeks, and rare wildlife.

Forest Road 269, also known as the Great Western Trail, runs through the middle of the allotment, providing thousands of people with recreational access to the Forest. This road runs west-east from the Agua Fria National Monument to Tangle Creek just outside the allotment, and is the main access to other Forest Roads and hunting areas within the allotment.

Dispersed Recreation

The Copper Creek Allotment consists primarily of general forest areas used for dispersed recreation. This consists of horseback riding, wildlife viewing, dispersed camping, fishing, hunting, target shooting, OHV use, and scenic driving.

Horseback riders have low to moderate impact on the environment, and due to the allotment's location, horses are trailered out to the forest. Riders commonly use Forest Roads and washes for their routes and horse droppings may be left behind. Wildlife observers and scenic drivers have minimal impact on the environment as they tend to stay close to roads, if not completely remaining in their vehicles and on Forest Roads.

Recreationists primarily use this area for OHV activities, with moderate to high levels of use occurring in the cooler months. With the increasing OHV community and limited signing on the ground, user-created routes are slowly accumulating. Some of these roads were created by cutting fences to get to an area previously closed to OHV traffic. The higher levels of OHV use in the cooler months have also caused sections of forest roads to be widened to accommodate two-way traffic. These user-made additions have increased the surface area of compacted dirt roads, which is negatively affecting soils and drainage.

The Copper Creek Allotment is commonly used for dispersed camping. Many groups and families enjoy this area for dispersed camping because it is a one to two hour drive away from major cities and lacks the crowds associated with other busy recreation areas. There are multiple locations within the allotment that are regularly used for camping and can be identified by compacted soils in a small area just off a main road, damaged or trimmed vegetation, fire rings, litter, and buried human waste. These sites are used regularly and are rarely able to recover from human occupancy. There are no developed recreation areas within the Copper Creek Allotment.

Hunting is another common use on the Copper Creek Allotment. Hunters return to the area seasonally and may camp in areas that have not been previously disturbed and are farther away from roads. They may leave small areas with trampled vegetation, buried human waste, and in the rare case of big game recovery, vehicle tire marks. Hunting laws are regulated by the Arizona Game and Fish Department.

Forest visitors also use lands within the Copper Creek Allotment for target shooting. While many visitors are responsible target shooters, others are not and may leave behind trash, targets, and damaged vegetation. Target shooting use in this area is low, but can be easily identified by damaged signs, empty shells on the ground, and small piles of broken plastic or glass.

There are currently no Outfitters/Guides permitted within the Copper Creek Allotment on the Tonto National Forest. There are 13 Outfitters/Guides that operate within Management Area 1F, but none of those permit holders are authorized to use trails within the allotment. This area has also been absent of recreation events and other permitted activities for at least the past 5 years.

Every year during the extremely dry season (approximately May through July), fire restrictions go into effect on the Tonto National Forest, limiting the use of target shooting, campfires, and other activities involving fire or sparks. Despite these restrictions, small (less than five acres) wildland fires are commonly found and managed in dispersed recreation areas throughout the summer season.

Pine Mountain Wilderness

The northeastern section of the Copper Creek Allotment overlaps a 66 acre section of the Pine Mountain Wilderness. This segment encapsulates Turret Peak, which is a visual feature for the area, although no recreation opportunities exist as it is not accessible by motorized or non-motorized travel.

Environmental Consequences

Direct and Indirect Effects of Proposed Action

Grazing Authorization

Alternative A proposes to authorize livestock grazing in the Copper Creek Allotment using a flexible livestock rotational system. The presence of cattle in the area may affect individual Forest users. Recreationists may take photos of cattle because it creates a pleasant scene, while others will be disrupted by the presence of cattle in the area and forgo a photo worthy opportunity. Cattle can be unwelcome and unpredictable at times, and this may detract users from camping in a favorite dispersed location knowing cattle may be grazing in their camping site. Recreationists may be visually impacted by grazing cattle near them, but only temporarily as the herds will move regularly and are on a rotational schedule.

Cattle in the Copper Creek Allotment may encourage recreationists to be more responsible in the natural environment. Viewing cattle grazing near a populated recreation area may prevent users from leaving litter on the ground, shooting in unsafe areas, and wandering off designated roads and trails. However, there may be a few recreationists that find an interest in the cattle, and attempt to antagonize the cattle when the rancher is not present. OHV users could observe permitted off-road travel by the permittee and could be encouraged to follow their tracks and ride cross country.

Range Improvements

Alternative A also includes the installation of additional water tanks, troughs, pipeline, corrals, and fencing throughout the allotment. The installation of stock tanks and watering troughs may be useful

for horseback and hunting recreationists. However, the addition of pipeline and fencing often becomes a challenge for target shooters to shoot at, while OHV users may damage it in an attempt to enter unauthorized areas. Fencing and pipelines installed and maintained with this alternative will not close off designated roads and trails or otherwise restrict access to the Forest by recreationists. Step-overs, walkthroughs, or gates will be placed where fencing crosses designated trails.

Adaptive Management: Native Fish Introductions

Alternative A also includes the potential for native fish introductions to water sources and streams within the allotment using an adaptive management approach. Reintroduction of fish in these water sources or streams in the allotment should not impact recreationists in the area, and may go unnoticed to the user unless it is advertised or made known. However, fishing in these areas is unpredictable as it is an activity that is not popular in this particular area. There may be a few recreationists that have an interest in the streams and water sources in the area and may attempt to catch one or more of these reintroduced fish. If the National Fish Coordination Team finds a suitable location within the Copper Creek Allotment for native fish introduction, the federal-state partnership and the Tonto National Forest will work to take all reasonable and prudent measures to protect listed species habitats for recovery.

Cumulative Effects

Effects of livestock grazing within the Copper Creek Allotment would be minimal to visitors and would not limit recreation opportunities and therefore would not contribute to cumulative effects to recreation. There would be no cumulative effects to recreational opportunities under this proposed action. The visual modification percentage captured within the Tonto National Forest Land Management Plan, Management Area 1F designates 51 percent as maximum modification and captures grazing reauthorization such as that proposed under Alternative A. The recreation classification is accurate in its percentages for roaded natural and semi-primitive motorized on the allotment. Therefore, the reauthorization of grazing on the Copper Creek Allotment has been accounted for in the Forest Plan and will not contribute further effects to visual quality objectives

Direct and Indirect Effects of No Grazing

Under this alternative, livestock grazing would be eliminated from the Forest Service administered lands within the Copper Creek Allotment. The existing grazing permit would be cancelled, following guidance in 36 CFR 222.4 and FSM 2231.62. Based on current use, this alternative should not affect recreational use on the Cave Creek Ranger District. The removal of livestock grazing may go unnoticed to the recreation user, and may even be beneficial to recreationists in the area. The benefits of not having livestock grazing in the area may prevent conflicts associated with scenic values, access, and personal perspectives. Recreationists may take photos of cattle because it creates a pleasant scene, while others will be disrupted by the presence of cattle in the area and forgo a photo worthy opportunity.

The removal of livestock grazing will open access opportunities and allow recreationists to truly enjoy National Forest lands by not having the perceived notion to stay out of fenced in areas for grazing cattle. Cattle can be unwelcome and unpredictable at times, and this may detract users from camping in a favorite dispersed location knowing cattle may be grazing in their camping site. The removal of livestock grazing can prevent these personal values from hindering ones visit to the

forest. With the removal of cattle from the allotment, OHV users would not observe any permitted off-road travel by the permittee and would therefore not be encouraged to follow their tracks and ride cross country.

Cumulative Effects

Since there would be minimal direct and indirect effects from Alternative B, there would be no cumulative effects to recreation. There would be no cumulative effects to recreation opportunities or visual classification under the current use.

Fire and Fuels

Historically, fire has played a significant role in the ecology of the Southwest. A high occurrence of lightning throughout the region supports frequent wildfire ignitions during the period from late spring through summer. Native Americans were known to have used fire for hunting, brush clearing and other purposes. The advent of European settlement during the late 19th century brought livestock grazing and other land management activities which significantly modified the existing vegetation. The ability for fire to spread and affect large areas across the landscape was significantly reduced. In addition, aggressive fire suppression policies adopted by state and federal land management agencies virtually eliminated the role of fire in natural ecological processes. In many cases, the ecosystems that exist today are very different from those where fire was once an integral part of the landscape (Allen 1996).

Affected Environment

Vegetative communities found within the Copper Creek Grazing Allotment include Sonoran Desert Scrub, Semi Desert Grassland, Interior Chaparral, and Pinyon-Juniper Chaparral. The natural fire regimes for each of these vegetative communities range from frequent, low severity to long-interval, high severity, stand replacement fires. This is measured in natural fire regime (NFR), fire interval (FI) in years, and the current fire regime condition class (FRCC) (Table 19). The Cave Creek Complex Fire (Complex Fire) of 2005 fire burned nearly 80 percent (28,000 acres) of the allotment. The Brooklyn Fire, in 2017, burned approximately 45 percent (16,277 acres) of the allotment, overlapping many of the same acres burned in the Cave Creek Complex Fire (Figure 3 in Chapter 1).

Table 19: Existing FRCC for Vegetative Communities on the Copper Creek Grazing Allotment

Vegetation Type	NFR	FI (years)	Current FRCC
Desert	V - Infrequent interval, Any Severity	Greater than 200	3 (High departure)
Semi desert Grassland	II - Frequent, stand replacement	10	2 (Moderate departure)
Interior Chaparral	IV - Less frequent, stand replacement	45	1 (Low departure)
Pinyon-juniper	III - Frequent, mixed severity.	31	1 (Low departure)

Sonoran Desert scrub

This vegetation type is the least predominate in the Copper Allotment. It generally occurs below 3,500 feet elevation and is historically resistant to large fires. This vegetation type falls into fire

regime group V, characterized by infrequent fires. Fire size and severity is highly variable due to the low productivity of the vegetation and resulting low fine fuel levels (Brooks and Chambers 2011). This vegetation type has, however, been altered with the invasion of red brome (*Bromus rubens*). This grass has greatly contributed to the amount of fine fuels. High rainfall years result in increases in nonnative annual grass biomass (fine fuels) and can result in large fires (Rogers and Vint 1987; Schmid and Rogers 1988). This area also has high recreation use, and the majority of fires started in this vegetative type are human caused (Alford *et al*. 2005), which contributes to more fires than historically present. Livestock grazing has been shown to reduce these fine fuels (Hann *et al*. 2003). Grazing currently takes place on this allotment. This allotment has had several large fires (greater than 300 acres) in the last ten years with the most significant being the Complex Fire. The majority of this vegetative type is considered to be in FRCC 3 due to the change in vegetative types and its more frequent fire intervals than has historically occurred.

Semi desert grassland

This vegetation type is typically found in the foothills where the Sonoran Desert transitions to mountain landforms. This vegetation type falls into fire regime group II, characterized by frequent (zero to 35 years) stand replacement fires. The mean fire interval is about eight years with a high variation due to drought, which reduces fire frequency and moist periods that increase fire frequency. Grazing of the grassy fuels by livestock may also influence fire mosaic patterns in this vegetation type (Hann *et al*. 2003). This vegetation type is currently in FRCC 1 and 2 and moving towards FRCC 2 and 3 as the fire interval increases.

Interior chaparral

This vegetation type is classified as fire regime IV, having a moderately long (35 to 100 years) fire return interval, characterized by intense burning that generally replaces the stand 90 percent of the time. Chaparral stands tend to become more flammable with age, mainly due to the amount of dead woody material that accumulates in the individual plants as they mature. The majority of the chaparral component in the allotment was burned in the Complex Fire and has returned to a normal fire interval, where periodic stand replacement fires are the norm, and been reset to FRCC 1.

Pinyon-juniper Chaparral

This vegetation type typically occurs in the transition between the chaparral and the Ponderosa pine mixed-conifer communities. These woodlands are classified as fire regime III, with a 35 to 100 year return interval and mixed severity fires (Hann *et al*. 2003). A fire often moves into the pinyon-juniper chaparral from adjacent fuel types (pine, chaparral). However, the ability for that fire to continue spreading is often dependent on the availability of understory grasses. A large portion of this vegetative type was affected by the Complex Fire, and has been reset to FRCC1.

Reference condition characteristics have been identified and descriptions developed for each of the vegetation types represented on the allotment (Table 20). These reference conditions are an estimate of the historical mix of vegetative successional classes and fire frequency and severity across the landscape. In simple terms, they represent an ongoing process, and how the different vegetative groups responded and evolved before natural fire cycles were disrupted. Over time, restoring fire to these ecosystems will shift areas currently classified as FRCC 3 (high departure from natural

conditions) to FRCC 1 and 2 (low to moderate departure), while serving to maintain those areas already in FRCC 1. Reference conditions are the baseline for determining departure from the natural or historical range (i.e., condition class).

Table 20: Reference Condition Characteristics for Copper Creek Allotment Vegetation Types.

Vegetation Type	Early Seral % of Landscape	Mid-Seral Closed %	Mid Seral Open %	Late Seral Open %	Late Seral Closed %	Fire Frequency (FI)	Dominant Fire Regime	Replace. Fire %[29]
Desert	5	20	75	0	0	500	V	0.001
Pinyon-Juniper	20	10	20	40	10	31	III	41
Interior Chaparral	20	45	5	5	25	45	IV	90
Desert Grassland	5	25	67	2	1	10	II	99

Environmental Consequences

Assumptions and Methodology

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 combined with the severity of the fire, the amount of vegetative replacement) and its effects on the dominant over story vegetation. The five natural fire regimes are as follows:

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

[29] Replacement fire percent refers to the total percentage of all fires that result in stand replacement.

limited to) fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, and introduced insects and disease (Schmidt *et al*. 2002).

The following three fire regime condition classes[30] are based on deviation from the central tendency. 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.

- FRCC 1 represents ecosystems with low (less than 33 percent) departure from a defined reference period;
- FRCC 2 indicates ecosystems with moderate (33 to 66 percent) departure; and
- FRCC 3 indicates ecosystems with high (greater than 66 percent) departure from reference conditions.

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.

Direct and Indirect Effects of Proposed Action

Grazing Authorization

Grazing has been shown to be an effective method to control the growth of fine fuels such as grasses and forbs, which contribute to fire spread after these fuels have cured. Additionally, livestock movement tramples the fine fuel, which creates a more compact fuel bed reducing its flammability and ability to spread.

Because of impacts fuels have on fire characteristics, moderate levels of grazing likely increase the efficiency of fire suppression activities. Red brome is a cool season annual, which grows during the wet winter months and has a short window of palatability for livestock. However, by timing livestock to graze in pastures with high density of this and other grasses and forbs, livestock could reduce the amount of biomass during the growing season and in turn reduce the amount of cured fuels during fire season. Livestock also create trails, which can be used as fire breaks in lighter fuels. The management of cattle after fires is also important to allow a site to recover properly. The amount of rest is ultimately determined by the severity of the fire and the response of the plants during this recovery period. This determination will be made following the guidelines stated in Chapter 2 of this Environmental Analysis.

[30] Based on Hann and Bunnell 2001; Hardy *et al*. 2001; Schmidt *et al.* 2002.

Range Improvements

Range improvements such as fencing have a neutral effect on the fire and fuels within the proposed project area. Materials such as metal fence posts are advantageous because they require less maintenance during a prescribed burn or wildfire. In a wildfire situation, fire resources often cut fences to gain access or to move livestock; however, fences are easily repaired.

Water development is almost always advantageous to fire and fuels. Developed wells and stock tanks allow fire resources to use these developments to help suppress any unwanted fire. Water developments also tend to have greater use by livestock, which provides more fuel reduction and trails that break up fuel continuity in an area.

Adaptive Management: Native Fish Introductions

Fish introductions within the proposed project area are not likely to affect fire or fuels. Future projects, such as prescribed burns, may require additional input or analysis from specialists in regards to these species that have been introduced. Additional mitigation may be required for future projects involving these species; however, this will be addressed during the planning phase of any future projects.

Monitoring

Monitoring in the proposed project area is not likely to affect fire or fuels. Access into an area by vehicle or animal will create a road of trail that will break up the fuel continuity on the landscape. This creates a barrier to the spread of fire, and lessens the effect of fire on the landscape.

Management Practices and Mitigation

Management practices such as pasture rotations can have a negative effect on fire and fuels within the proposed project area. If the district proposes any prescribed fire within the proposed planning area it might be necessary to “rest” a pasture. This will allow fine fuels such as perennial grasses to grow so there is a continuous fuel bed available for burning. The more continuous fuel bed will allow fire managers to have more fire across the landscape. Greater fine fuel loads can be advantageous for fire managers during prescribed burns to allow greater coverage across the landscape.

This will also increase fire intensity for fire to carry through the project area more completely, thus promoting the cycling of nutrients and promoting new growth of vegetation. Wildfires that are managed for resource objectives may also require Forest Service Managers and Permittees to work together to use fire as a tool while allowing the permittee to efficiently manage their livestock. This coordination will occur during wildfire and prescribed fire events, however discussions of these management objectives will likely occur well before wildfires or prescribed fires happen.

Direct and Indirect Effects of No Grazing

In general, where grazing is not permitted, loading of fine fuels, annual, and perennial grasses and shrubs increase. This has a different effect in the desert vegetation types (scrub and grassland), as compared to the upper elevation vegetation types (chaparral and pinyon juniper).

In the desert vegetation types, no livestock grazing would allow fine fuels to buildup and create a continuous fuel bed. This can negatively impact the Sonoran Desert by allowing fire to spread across larger areas at a higher severity than was traditionally present. Depending on locale, Mediterranean grass (*Schismus* spp.), buffelgrass (*Pennisetum ciliare*), fountain grass (*P. setaceum*), and red brome cause the most concern (Brooks and Pyke 2001). These species increase the biomass and continuity of fine fuels by their presence. These types of grasses were not historically present, and fires in the desert typically were confined to small continuous patches of brush and trees, but generally not able to carry through large areas of the desert. This creates a situation where firefighters must utilize aggressive firefighting tactics to keep fires small in size.

Lack of grazing in the upper elevation brush and timber habitats allows for the fine fuels to grow as well. However, these habitat types are adapted to a more frequent fire interval and the fuel loading allows for fire to carry through them, thus promoting the cycling of nutrients and promoting new growth of vegetation.

Under the no grazing alternative, removal of fences in the project area will not likely affect the fire or fuels within the project area. Removal of any improvements, such as fences will make prescribed fires or managing wildfires for resource objectives easier, because mitigation or protection of improvements will not be necessary because they will no longer be on the landscape within the proposed project area.

Cumulative Effects of Proposed Action

Brooks and Pyke (2001) identified livestock grazing as one of a number of land use practices that can influence the interaction between invasive non-native plants and altered fire regimes in the Sonoran Desert. Past disturbances caused by fire and grazing have contributed to an increase of non-native species of plants in the majority of this allotment. Going forward, grazing can contribute (as long as timing and duration are proper) to a reduction in fuels growth and accumulation, thus reducing fire behavior and fire severity.

Recreational uses, including OHVs and dispersed camping, can have the unintended consequence of accidental fire ignitions which can also change the vegetation makeup of the allotment. With active grazing, the severity of these accidental ignitions would decrease as fine fuels would be lessened.

With lack of fine fuels to promote fire in the upper elevation vegetative types, the brush and trees tend to fill in the space that was once covered in grasses. This creates a situation in which fire will burn in only the most extreme conditions causing larger more catastrophic results. This creates a need to use prescribed fire to mimic the historic patterns of fire across the landscape.

Future projects within or adjacent to the proposed project area may require close coordination with permittees and Forest Service managers. Wildfires that are managed for resource objectives and prescribed fires may require Forest Service managers and permittees to work together to use fire as a tool to allow fire to play it's natural role in this fire dependent ecosystem, while allowing the permittee to efficiently manage their livestock. This coordination will occur during wildfire and prescribed fire events, however discussions of these management objectives will likely occur well before wildfires or prescribed fires happen.

Cumulative Effects of No Grazing

In the event that grazing is eliminated from the landscape in the allotment area, the amount of fine fuels (grasses) should increase. The effects of greater fuel loadings on fire behavior is faster burning fires with higher intensities. Burning conditions in this scenario tend to have more negative fire effects on soils and vegetation. This would most likely have an effect on fire management decisions to be able to effectively suppress undesirable fire in the area, but also on soil, wildlife, and watershed conditions. This area has already had a very large scale fire in the last decade, the Complex Fire. Several drainages still show negative effects that are visible on the landscape. This type of fire is expected to occur in the future as well.

Recreational uses, including OHVs and dispersed camping, can have the unintended consequence of accidental fire ignitions which can also change the vegetation makeup of the allotment. Without active grazing, the severity of these accidental ignitions and larger fires would likely increase. In contrast, under the right wind and humidity conditions, the lack of grazing can create the right fuel bed to allow management to allow lightning fires to burn across the landscape in a more natural pattern in the upper elevation vegetative types.

Wildlife Resources

The Forest plan provides general wildlife resource goals and includes providing for species diversity in the ecosystem, maintaining or improving wildlife and fish populations through improvement of habitat, ensuring that fish and wildlife habitats are managed to maintain viable populations of existing species, preventing adverse modification of critical habitat for threatened and endangered species, and managing to improve threatened, endangered, and sensitive species with a goal of increasing population levels that would remove them from the lists.

Threatened and Endangered Wildlife, Plants, and Fish

Affected Environment

Within the project area there are currently no listed species under the *Endangered Species Act of 1973*. However, *Section 7* of this act directs Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats (16 U.S.C. 1536 et sq.). At this time, the Agua Fria sub-basin is the system furthest downstream in the Gila River basin that currently supports or is historically known to have supported Gila chub (*Gila intermedia*). This sub-basin sustains or recently sustained four remnant Gila chub populations, including an extant population in Silver Creek. Silver Creek is also designated Critical Habitat for this species.

Gila chub were once known to occur within pools in the approximate 3.1 miles of Silver Creek that lies within the Bobcat pasture on the Copper Creek Allotment. Several years following the Complex Fire, and the subsequent inundation of sediment, the upper reach of Silver Creek (on the Copper Creek Allotment) no longer maintained surface flows to support the species. No fish have been observed in this upper reach (upstream from Bureau of Land Management (the Bureau) boundary fence on the Horseshoe Allotment) since that time. Following the Complex Fire and the listing of

Gila chub with critical habitat designation, livestock use was excluded from the Bobcat pasture. The species currently occurs in Silver Creek downstream of the forest boundary on Bureau administered lands. Arizona Game and Fish Department, U.S. Fish and Wildlife Service, and Forest Service fisheries biologists believe that once perennial or intermittent surface flow returns to the upper reaches of the creek, Gila chub will move upstream to occupy that habitat. A field visit to Silver Creek on December 12, 2014 revealed some improvement in Silver Creek with some surface flow present although insufficient to support Gila chub. Silver Creek was again visited on July 15, 2015; no surface flow was present from Forest Road 677 downstream to Forest boundary.

Subsurface water is sufficient as is evidenced by the presence of woody and herbaceous vegetation throughout the creek, as well as providing enough water to support obligate woody species recruitment.

Gila Chub Critical Habitat

On November 2, 2005, the U.S. Fish and Wildlife Service designated 160.3 miles (258.1 km) of stream reaches, within National Forest System lands in the southwestern region, as critical habitat. Critical habitat vital for the conservation of Gila chub includes: Cienegas, headwaters, spring fed streams, perennial streams, and spring-fed ponds.

Critical habitat includes the stream channels within the identified stream reaches and areas within these reaches potentially inundated during high flow events. Critical habitat also includes the area of bankfull width plus 300 feet on either side of the banks. The bankfull width is the width of the stream or river at bankfull discharge, i.e., the flow at which water begins to leave the channel and move into the floodplain (Rosgen 1996). Bankfull discharge, while a function of the size of the stream, is a fairly consistent feature related to the formation, maintenance, and dimensions of the stream channel (Rosgen 1996). Bankfull width was chosen because bankfull discharge and width are quantifiable measures as are required to accurately classify a stream channel and make sound decisions about management of the stream and its watershed. This 300-foot width defines the lateral extent of each area of critical habitat that contains sufficient primary constituent elements to provide for one or more of the life history functions of the Gila chub.

Critical habitat is organized into seven areas or river units; Silver Creek is within Area 7 – Agua Fria River. Based on the current knowledge of the life history, biology, and ecology of the species and the requirements of the habitat to sustain the essential life history functions of the species, the U.S. Fish and Wildlife Service (2005) determined that the Gila chub's primary constituent elements are:

1. Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies all found in headwaters, springs, and cienegas, generally of smaller tributaries;
2. Water temperatures for spawning ranging from 17 to 24 degrees Celsius (62.6 to 75.2 degrees Fahrenheit), and seasonally appropriate temperatures for all life stages (varying from approximately 10 to 30 degrees Celsius (50 to 86 degrees Fahrenheit));
3. Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH (ranging from 6.5 to 9.5), dissolved oxygen (ranging from 3.0 to 10.0) and conductivity (100 to 1000 mmhos);

4. Food base consisting of invertebrates (e.g. aquatic and terrestrial insects) and aquatic plants (e.g. diatoms and filamentous green algae);
5. Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, a high degree of streambank stability, and a healthy, intact riparian vegetation community;
6. Habitat devoid of nonnative aquatic species detrimental to Gila chub or habitat in which detrimental nonnatives are kept at a level that allows Gila chub to continue to survive and reproduce; and
7. Streams that maintain a natural flow pattern including periodic flooding.

Current conditions within designated Critical Habitat for Gila chub in the action area (the stretch of Silver Creek that occurs on the forest within the Bobcat pasture on the Copper Creek Allotment) does not support most of the primary constituent elements due to heavy sedimentation and damage to the riparian zone from the Cave Creek Complex Fire. Re-establishment of the riparian and upland vegetation and a large stream flow event are needed to remove sediment that has filled in pool habitats.

Environmental Consequences

Direct and Indirect Effects

Livestock grazing has been excluded in the Bobcat pasture since 2005, following the Complex Fire and the listing of Gila chub with critical habitat. Livestock grazing can indirectly impact watershed condition and fish through the removal of upland vegetation and soil compaction both of which can increase runoff, thereby increasing sediment load and decreasing water quality. Recent visits to this allotment suggest that current range condition is in stable to improving condition, and soil condition was rated as satisfactory. Though grazing may slow the recovery of watershed conditions, under conservative use and improved livestock distribution through additional water sources, range and soil conditions should not degrade, but rather remain stable or improve over time. Therefore, indirect effects resulting from upland livestock grazing to Gila chub are not likely to reach the level where take would occur, thus these indirect effects are insignificant or discountable.

Livestock grazing can directly or indirectly affect the first five of the seven primary constituent elements listed above. The proposed action includes the flexibility to install fencing where necessary for resource protection. At this time, water is not present within this critical habitat area, and the primary constituent elements are not sufficient to allow Gila chub to survive whether or not cattle are present. If it is determined that an exclosure fence becomes necessary in the future to ensure that those primary constituent elements associated with vegetation condition and diversity, bank stabilization, and water quality are protected and maintained (primary constituent elements 1, 2, 4, 5), then the proposed action would allow such a fence to be built. And lastly, improved livestock distribution and conservative utilization levels should reduce runoff thereby decreasing the amount of sediment entering the system (primary constituent element 3).

Effects to Gila Chub and its Habitat for Proposed Action

Based on the following criteria taken directly from the 2015 *Framework for Streamlining Grazing Consultations* (Forest Service 2015):

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 threatened, endangered, or proposed 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 as measured through quantitative or qualitative measures such as watershed health and condition, use levels, or sedimentation in critical habitat.

It is the determination of the Forest Fisheries Biologist that the proposed action on the Copper Creek allotment, may affect, but is not likely to adversely affect Gila chub. This was based on the following:

- Although habitat within Silver Creek does not currently support this species, prior to the 2005 Cave Creek Complex fire, this system was intermittent with reliable pool habitats throughout. This system is functioning properly, and is expected to return to pre-fire conditions once the system is able to move the existing sedimentation through.
- The proposed action includes the addition of two new water sources in the uplands which will facilitate improved livestock distribution throughout the Bobcat pasture.
- The adherence to the proposed conservative utilization guidelines (30 to 40 percent) will ensure residual vegetation remains in the uplands to reduce runoff, maintain or improve soil condition and watershed health.

All of the following criteria (Forest Service 2015) are used to determine the effects the proposed livestock grazing and management activities may have on the primary constituent elements of the critical habitats previously described:

1. Direct effects to primary constituent elements of critical habitat will be avoided.
2. Indirect effects to primary constituent elements of critical habitat which result from upland grazing are determined to be insignificant or discountable as measured through quantitative or qualitative measures such as watershed health and condition, use levels, or sedimentation in critical habitat.

It is the determination of the Forest Fisheries Biologist that the proposed action on the Copper Creek allotment, may affect, but is not likely to adversely affect Gila chub critical habitat based on the following:

- The proposed action may exclude livestock grazing from critical habitat within Silver Creek if water returns to the creek (primary constituent elements 1, 2, 4, and 5).
- Improved livestock distribution and conservative utilization levels should reduce runoff thereby decreasing the amount of sediment entering the system (primary constituent element 3).

Effects to Gila Chub and its Critical Habitat from the No Grazing Alternative

This alternative would result in a "No Effect" determination for Gila chub in Silver Creek. Furthermore, none of the primary constituent elements associated with Gila chub critical habitat would be affected by livestock, as no livestock grazing or livestock management activities would occur within or near this species respective habitats. This alternative would promote improved riparian habitat, water quality, aquatic habitat, and upland conditions. Although other factors such as;

flooding regime, drought, and recreational impacts play a role in the quality of the habitat for species on the allotment, it is anticipated that removal of grazing from these areas would result in greater improvement of upland and riparian areas to that of the other alternatives. General habitat conditions for sensitive species would also improve with discontinuation of livestock grazing.

Implementation of the No Grazing Alternative may begin to reverse some of the impacts resulting from past overgrazing practices on allotment.

Forest Service Sensitive Wildlife, Plants, and Fish

Sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: (a) significant current or predicted downward trends in population numbers or density; or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.[31]"

The most current and available data on species, available habitat, survey history, biologists knowledge and experience, the most recent Regional Forester's Sensitive Species List[32] (2013), the Tonto National Forest sensitive species list (2015), and a review of the Arizona Game and Fish Department Heritage Data Management System and HabiMap were used to determine if any sensitive species, or their habitats may be affected by the proposed action. Currently there are two sensitive species within the allotment: Sonoran Desert Tortoise (*Gopherus morafkai*); and Lowland Leopard Frog (*Lithobates yavapaiensis*).

Sonoran Desert Tortoise

Affected Environment

The distribution of the Sonoran desert tortoise covers the broadest range of latitude, climate, habitats, and biotic regions of any North American tortoise. The tortoise ranges from northern Sinaloa north to southern Nevada and southwestern Utah, and from south central California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act: the threatened Mojave population occurs north and west of the Colorado River, and the candidate Sonoran population occurs south and east of the Colorado River.

Sonoran Desert tortoises are herbivores, with their diet largely consisting of various annual and perennial grasses, forbs, and succulents. Numerous other items such as various trees, shrubs, and woody vines are also eaten.

Densities of desert tortoise populations vary dramatically from 15 to 150 individuals per square mile across the 18 plots that are regularly surveyed in Arizona. These surveys also indicate that populations are mostly stable or increasing; 17 populations were stable or increasing, while only one population decreased dramatically (Arizona Game and Fish Department, 2010).

[31] Forest Service Manual 2670.5(19)
[32] All of the Region 3 sensitive species were considered and analyzed for this project and are available in the Biological Evaluation in the project record.

The desert tortoise occurs primarily on rocky slopes and bajadas of Mojave desert-scrub and Arizona Upland and Lower Colorado River Valley subdivisions of Sonoran desert scrub. They most often occur in paloverde-mixed cacti associations, but have been documented in semi-desert grassland, interior chaparral, oak woodland, ponderosa pine-dominated coniferous forests, and thorn-scrub habitats.

Adequate shelter is one of the most important habitat features of tortoises in the Sonoran desert (Averill-Murray *et al*. 2002). Tortoises escape extreme temperatures in shelters, which stay cooler in the summer and warmer in winter than outside temperatures. Tortoises require loose soil in which to excavate (usually shallow) burrows below rocks and boulders, but they may also use rock crevices which they may or may not be able to modify. Tortoises occasionally burrow under vegetation, less often dig soil burrows on more or less open slopes, and also use caliche caves in incised wash banks. They will also rest directly under live or dead vegetation without constructing a burrow.

There are no site specific occurrence records of desert tortoise within the action area. However, habitat does exist within their preferred Sonoran desert scrub habitat in the southern portion of the Perry Mesa pasture and southwestern most portion of the Brooklyn pasture. As previously mentioned, this species may also occasionally be found in semi-desert grassland communities, however to a lesser extent.

Environmental Consequences

Direct and Indirect Effects of Proposed Action

In May 2015 a multiagency cooperative effort developed a *Candidate Conservation Agreement (Conservation Agreement) for the Sonoran Desert Tortoise*. The CCA was created to provide effective conservation of this previously listed candidate species (2009 through 2015) in Arizona.

Primary threats to desert tortoise populations in Arizona are habitat destruction, fragmentation, and degradation. Causes of these threats include, but are not limited to: human-constructed barriers to movement, invasive nonnative plant establishment, off-highway vehicle use, livestock grazing, and altered fire regimes. Low to moderate severity fire moved through Sonoran desert habitat in the southwestern portion of the Brooklyn Fire. Although there are no reported observations of Sonoran desert tortoise in this area, there is potential for this species to occur. If present, individuals may have been negatively impacted directly by the fire. According to the Conservation Agreement, livestock grazing is not currently thought to affect desert tortoise populations in Arizona, given that there is little overlap in the habitat shared with livestock, and livestock management practices such as; managing for conservative use, balancing stocking levels with range capacity, and livestock distribution practices (salting, water) allow for improvement in overall ecosystem health.

Although desert tortoise prefer rocky, boulder-covered hills and mountains, they also inhabit desert washes and canyon bottoms where their forage areas may overlap with areas used by livestock. Therefore, the potential exists for seasonal competition for forage between tortoises and livestock. Additionally, livestock may directly impact desert tortoise through trampling individuals or burrows; however these incidents would be considered rare (Carrier 1996; Grover 1995; Schmid 1988).

The proposed utilization levels, management practices (rotational grazing, rest), monitoring, mitigation measures, and conservation measures are intended to minimize any direct or indirect effects to individual desert tortoise and their habitat.

The proposed action includes numerous mitigation and conservation measures to remove or minimize direct or indirect effects of livestock grazing on desert tortoise. Conservative utilization levels throughout the allotment, where habitat overlap may occur, will ensure adequate residual forage remains to support desert tortoise. Therefore, the proposed action on the Copper Creek allotment, may affect individual Sonoran desert tortoise, but will not result in a trend toward federal listing or loss of viability.

Direct and Indirect Effects of No Grazing

Low to moderate severity fire moved through Sonoran desert habitat in the southwestern portion of the Brooklyn Fire. Although there are no reported observations of Sonoran desert tortoise in this area, there is potential for this species to occur. If present, individuals may have been negatively impacted directly by the fire. Upland herbaceous and shrub density would be expected to increase at a faster rate under this alternative. Additionally, in areas where tortoise and livestock habitat overlap, there would be no competition for forage resources. Direct effects to tortoise through trampling of individuals or tortoise burrows would be removed.

Lowland Leopard Frog

Affected Environment

The historical geographic range of lowland leopard frogs included areas mostly below the Mogollon Rim from northwestern to southeastern Arizona, southwestern New Mexico, along the lower Colorado River, the Coachella Valley of southern California, and Sonora, Mexico. The current geographic range of lowland leopard frogs has contracted substantially, as the species is considered extirpated from the lower Colorado River and the Coachella Valley (Arizona Game and Fish Department, 2006a).

Lowland leopard frogs are habitat generalists that inhabit various natural and man-made aquatic systems. The species is mostly restricted to permanent waters with aquatic and herbaceous vegetation, but it sometimes also inhabits semi-permanent aquatic systems, where it survives by retreating into mud cracks and other protective features when surface waters are absent (Arizona Game and Fish Department, 2006a). The frogs breed primarily from January through April, and then again in late summer or early fall, with eggs deposited on submerged vegetation, bedrock, or gravel. The larvae are herbivorous, while the adults eat arthropods and other invertebrates. Adults appear to live up to 3 years (Jennings 1987).

Lowland leopard frogs have been recorded in multiple locations on the allotment including; Hutch tank, Copper Spring, and Silver Creek (Heritage Data Management System 2013; HabiMap). This species likely occurs within other unsurveyed riparian habitat on the allotment.

Environmental Consequences

The primary threats to lowland leopard frogs are habitat alteration and fragmentation, decline of perennial water sources, water pollution, grazing, and the introduction of various fish, crayfish, and frogs (mainly bullfrogs) (Arizona Game and Fish Department, 2006a). Populations on the Tonto National Forest are also susceptible to climatic events such as severe floods and droughts.

Direct and Indirect Effects of Proposed Action

The effects of livestock grazing on vegetative structure and species composition in riparian areas could be detrimental to amphibian and reptile habitat within these areas. However, aquatic and riparian habitat for reptiles and amphibians will be managed indirectly if watershed, riparian, and water quality objectives are being met in the analysis area. With conservative use, riparian conditions are expected to improve. Improving upland soil and watershed conditions may reduce the chance for sedimentation into streams and suitable habitat for these riparian dependent species.

Known lowland leopard frog habitat on the Copper Creek Allotment was not affected by the Brooklyn fire. Riparian habitat is somewhat resistant to fire due to high moisture content, humidity, and the presence of water.

The existing exclosures on Copper and Bishop Creeks would remove any direct effects of livestock grazing on lowland leopard frogs. Furthermore, conservative riparian utilization guidelines are expected to maintain or improve leopard frog habitat over the term of the permit. The proposed action would require that all new and existing spring developments be fenced to exclude livestock; thereby protecting riparian habitat. Therefore, direct effects within areas proposed for exclusion would be the same as would be expected with the ‘no grazing’ alternative. Individuals which occur within riparian habitats not excluded from livestock may be directly affected and/or reproductive efforts and egg masses laid during the winter breeding season may experience some direct mortality through trampling; however these impacts are expected to be minimal.

Implementing the proposed grazing strategy may impact individuals, but is not likely to result in a trend toward federal listing or loss of viability for the species.

Direct and Indirect Effects of No Grazing

With the removal of livestock grazing, there would be no direct effects to lowland leopard frogs or their habitat. Known lowland leopard frog habitat on the Copper Creek Allotment was not affected by the Brooklyn fire. Riparian habitat is somewhat resistant to fire due to high moisture content, humidity, and the presence of water. However, this alternative would provide the most rapid rate of improvement in upland vegetation and soil condition, thereby increasing infiltration and reducing runoff and sedimentation improving water quality for this species.

General Wildlife, Rare Plants, Management Indicator Species, and Migratory Birds

Affected Environment

Fuels projects in the analysis area were completed in grasslands and chaparral. Fuels treatment objectives in the grassland included reduction of encroaching juniper in order to maintain grassland and reduce potential conversion to a juniper dominated system. In 2005, the Cave Creek Complex fire (Complex fire) greatly reduced encroaching juniper within the majority of the analysis area. Much of the chaparral habitat type has not been treated since the Complex fire and has resulted in much of the habitat becoming stagnant and decadent.

Availability of forage, and ground and canopy cover, are essential to sustaining wildlife populations, as is the availability of water. Wildlife not only use “live water” (perennial or intermittent streams), but depend on developed waters (dirt tanks, troughs), especially during times of drought.

General Wildlife

The various vegetation types support a variety of game and non-game species. Wildlife species that occur on the allotment include but are not limited to pronghorn, elk, desert mule deer, Coues white-tail deer, mountain lion, black bear, javelina, coyote, gray fox, bobcat, raccoon, desert cottontail, various rodents, various bats, common black hawk, zone-tailed hawk, red-tailed hawk, turkey vulture, Gambel's quail, various neotropical migratory birds, western diamondback rattlesnake, speckled rattlesnake, gopher snake, black-necked garter snake, common king snake, striped whipsnake, Sonoran mud turtle, collared lizard, desert spiny lizard, and dove.

The allotment provides habitat for the only population of pronghorn on the Tonto National Forest, primarily due to desert grassland habitat in the Perry Mesa area. Approximately 50 percent of the allotment is comprised of desert grassland, dominated by tobosa. Pronghorn have no Forest Service special status designation, although management of the habitat and species are key considerations in management of the area. Pronghorn and associated habitat management in the action area has been successful for many years, and provides hunting opportunities for rifle and archery hunters. In 2015, the Arizona Game and Fish Department authorized 13 rifle buck pronghorn tags and 10 archery antelope tags in Game Management Unit 21, which includes the analysis area (Arizona Game and Fish Department, 2015).

Rare Plants

Although there haven’t been any formal surveys for rare plants completed within the action area, there may be a number of rare local or regionally endemic plants found within the action area. The grazing strategy and management, authorized utilization levels, and proposed range improvements were developed in order to provide for maintaining or improving upland and riparian conditions as well as soil conditions; all of which would benefit rare plant species. Prior to the installation of any of the proposed range developments (i.e. fencing, water developments), a site specific survey would be conducted to determine if any rare plants are within the immediate area. If discovered, a biologist would determine if the species would be directly impacted by the project, or indirectly through

increased livestock use within an area. If determined that the effect would negatively affect a species, the proposed improvement location or design may be modified to mitigate deleterious effects.

Management Indicator Species and Migratory Birds

Management indicator species (indicator species) were selected during the Tonto National Forest planning process to adequately monitor implementation of project actions on wildlife habitat and species diversity. These indicator species reflect general habitat conditions or habitat components that are of value to these and other species with similar habitat needs. Habitats for a large number of the Forest indicator species occur on the Copper Creek Allotment. Because most indicator species are not rare species and the allotment contains a wide variety of vegetation types, it is assumed that at least some individuals of each indicator species are present on the allotment. The nine indicator species that were selected for this allotment were done so based on the premise that livestock grazing and management can have an effect on habitat components (ground cover, species diversity, etc.) that can impact Forest-wide habitat and population trends. Those indicator species listed in Table 21, have been fully analyzed and these analyses are available in the Management Indicator Species Report in the project record. In summary, the proposed grazing strategy, utilization levels, and improvements will not alter Forest-wide habitat or population trends for any the species analyzed. Additionally, this report details species not selected for analysis and the reason for their exclusion.

Table 21: Management Indicator Species

Habitat Type/MIS	Indicator of:
Pinyon/Juniper	
Ash throated flycatcher	Ground Cover
Chaparral	
Rufous-sided (spotted) towhee	Shrub density
Black-chinned sparrow	Shrub diversity
Desert Grassland	
Horned lark	Vegetation aspect
Savannah sparrow	Grass species diversity
Desert Scrub	
Black-throated sparrow	Shrub diversity
Brown (canyon) Towhee	Ground cover
Riparian (low and high elevation)	
Bell's vireo	Well-developed understory
Aquatics	
Macroinvertebrates	Water quality/fisheries

Executive Order 13186, January 10, 2001, directs federal agencies to support migratory bird conservation and to "ensure environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern". Important Bird Areas are sites that provide essential habitat for one or more species of bird, including sites for breeding, wintering, and/or migrating birds. Approximately one mile of Silver Creek, from the Forest boundary east, is included in the Agua Fria National Monument Riparian Corridors Important Bird Area.

Special Status Species are those given status by agencies responsible for managing plants, wildlife, and their associated habitat because of declines in the species' population or habitat. Birds are given

provisions under the *Migratory Bird Treaty Act*. An analysis in compliance with this act was completed and is available in the project record.

Conservative upland and riparian utilization standards, riparian exclosure fencing, permitted numbers balanced with production, rotational grazing, and adaptive management should allow for an improvement in watershed and overall habitat condition. This improvement should result in continued upward trend in 21 of the migratory bird species with habitat respondent to changes in grazing management.

Environmental Consequences

The alternatives are contrasted based on the likelihood of riparian vegetation, and stream channels in the key reaches, attaining the short and long-term desired conditions described in the hydrology/riparian sections. Species that require riparian and aquatic environments would respond to changes in riparian and aquatic habitats. Similarly, each alternative, and its effects on wildlife species, will be evaluated based on the attainment of short and long-term goals, described in the Chapter 1. Watershed effects from upland and riparian areas would have either positive or negative impacts to aquatic and terrestrial wildlife species. Short-term desired conditions limit the annual impacts of livestock grazing. Long-term desired condition is measured through effectiveness monitoring. Although upland livestock use levels, and associated upland wildlife habitat are important to wildlife; riparian and aquatic habitat condition is of higher value due to limited habitat availability and the importance of that habitat species[33].

Direct and Indirect Effects of Proposed Action

General Wildlife

Congregation of livestock (herding, stock tank areas, trailering, loading/unloading, maintenance of livestock facilities, branding) may contribute to effects to wildlife or associated habitat. Effects may include removal of vegetation, dust accumulation, noise, avoidance areas, soil compaction, and watershed effects. Impacts may vary depending upon circumstances. For the most part, effects associated with congregation of livestock are primarily within the uplands.

Implementation of the riparian utilization guidelines are intended to maintain or increase existing riparian vegetation. If riparian area utilization guidelines are followed and cattle are moved when use guidelines are met, the negative, direct effects of grazing will be minimized, and riparian area and stream channel condition should be maintained or improved. This mitigation measure should be effective for all of the key reaches in grazed pastures. Recruitment of woody and herbaceous riparian species, including deergrass, is expected. Additionally, fencing off new and existing spring developments should improve spring resource habitat. Over time, structural and age class diversity in these riparian areas would continue to improve under this alternative, although to a lesser degree than under Alternative B. Other selected key riparian reaches are also expected to improve through adherence to the stated utilization guidelines.

[33] General effects of livestock grazing on wildlife can be found in the Wildlife Resources Specialist Report in the project record.

The Copper Creek Allotment provides habitat for the only population of pronghorn on the Tonto National Forest, primarily due to the desert grasslands on Perry Mesa. Southwestern desert grasslands are fire adapted communities which have a fire return frequency of zero to 35 years, with a 12 year mean interval. The 2005 Cave Creek Complex fire was the last fire to burn through this habitat until the recent Brooklyn Fire (2017). The Brooklyn Fire burned through mostly grassland habitat, most of which was classified as moderate to low severity. Additionally, these fine fuels carried the fire quickly which protected soils from becoming hydrophobic and burn throughout this habitat type in a mosaic pattern allowing remaining vegetation to serve as a seed bank.

Unburned desert grassland habitat north of the Brooklyn fire will provide forage for this species until the grass, predominately tobosa, returns. However, a study conducted on grasslands on the Appleton-Whittell Research Ranch in southeastern Arizona indicated that mule deer and pronghorn both used burned areas more frequently than neighboring unburned areas (Bock, 1988).

Overall, it is expected that watershed and soil conditions across the allotment would continue to improve under this alternative, although improvement would be slower than the 'No Grazing' alternative. Over time, upland habitat capability for game species such as deer, pronghorn, and quail may slowly improve due to an increase in herbaceous vigor and density in the openings as a result of conservative use under this alternative. Small game and non-game species numbers would generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity, although at slower rates than Alternative B.

Management Indicator Species and Migratory Birds

Continued exclusion of riparian habitat within Copper and Bishop Creeks, the addition of the proposed water developments, and adherence to riparian utilization guidelines are expected to improve habitat conditions for riparian (Bell's vireo) and aquatic species (macroinvertebrates). If determined to be necessary, the proposed action also includes the possible addition of a fence to exclude livestock access to Silver Creek to benefit Gila chub and its critical habitat. If implemented, riparian habitat within this section of the Agua Fria National Monument Riparian Areas Important Bird Area, would likely improve at a rate similar to Alternative B.

With an improvement in soils and vegetation, upland wildlife habitat is expected to improve over time, although at a slower rate and to a lesser degree than Alternative B.

Species that are indicators of chaparral vegetation type (rufous-sided towhee/black-chinned sparrow), and desert scrub species (black-throated sparrow, brown towhee) would likely experience a smaller habitat gain under this alternative than under the 'No Grazing' alternative. Management indicator species for desert grassland and Sonoran desert scrub; Savannah sparrow and black-throated sparrow respectively, may experience some temporary habitat displacement as a result of the Brooklyn Fire. Similar surrounding unburned habitat outside of the burn perimeter, as well as unburned habitat within, can provide nesting and foraging habitat until the affected vegetation recovers. Additionally, habitat for species indicative of good ground cover, such as the ash throated flycatcher, will likely improve, however at a slower rate than under Alternative B.

Direct and Indirect Effects of No Grazing

The most rapid rates of riparian recovery, from past grazing impacts, normally occur with complete protection from grazing (Clary and Kruse 2003). Riparian areas are generally regarded as having high inherent potential for recovery from disturbance (Milchunas 2006). The potential for recovery is highly variable, dependent on biotic and abiotic factors, including flow regime, channel gradient, dominant channel substrate, past disturbance history, watershed area, and cover and diversity of riparian vegetation (Kindschy 1987).

General Wildlife

With discontinuation of grazing, wildlife habitat conditions would likely improve. Improvements in the aquatic and riparian habitat would likely occur more rapidly, as compared to the other alternative. Riparian areas would continue to recover from past grazing. Recruitment of woody and herbaceous riparian species, including deergrass, would increase. It is expected that, over time, structural and age class diversity in riparian areas would improve resulting in increased potential for riparian dependent wildlife species to occur on the allotment.

With the exclusion of livestock grazing, it is expected that there would be an increase in upland herbaceous and shrub density, cover, and diversity benefitting wildlife species. Overall watershed, and soil conditions across the allotment would continue to improve. Upland habitat for game species such as deer and javelina would generally increase in vigor and density. Unburned desert grassland habitat north of the Brooklyn Fire area will provide forage for this species until the grass, predominately tobosa, returns. However, a study conducted on grasslands on the Appleton-Whittell Research Ranch in southeastern Arizona indicated that mule deer and pronghorn both used burned areas more frequently than neighboring unburned areas (Bock, 1988). Small game and nongame species would 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 the grazing alternative.

One effect of this alternative to wildlife would be the removal or lack of maintenance of water developments. Developments such as dirt stock tanks, developed springs, and troughs that provide water to livestock also provide water to wildlife. Livestock permittees are responsible for developing watering facilities and their maintenance. Under the no grazing alternative, these improvements would likely fall into disrepair. In areas without alternate water sources (i.e. seeps, springs), wildlife may rely on these developed waters for survival. Their removal would result in changes in wildlife abundance and distribution.

Management Indicator Species and Migratory Birds

Habitat conditions for all management indicator species would be expected to improve with cessation of livestock grazing on the allotment. With an improvement in soil and vegetation condition, increases in high-quality wildlife habitat would likely occur, over time, in all life zones. Improvements to terrestrial habitat are as described under the general wildlife discussion above. The elimination of livestock from perennial and intermittent streams should result in overall improvements in water quality. As compared to the grazing alternative, in locations not proposed for exclusion of livestock, an improvement in water quality and aquatic conditions would be anticipated with the elimination of bank trampling and trailing from livestock in riparian areas. An increase in

riparian understory density and improvement in vertical structure would benefit Bell's vireo. Management indicator species for desert grassland and Sonoran desert scrub; Savannah sparrow and black-throated sparrow respectively, may experience some temporary habitat displacement as a result of the Brooklyn Fire. Similar surrounding unburned habitat outside of the burn perimeter, as well as unburned habitat within, can provide nesting and foraging habitat until the affected vegetation recovers.

This alternative would provide for the greatest improvement in habitat and population trends for migratory birds found throughout the allotment.

Cumulative Effects Common to Both Alternatives

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

Cumulative effects to watershed condition class and cumulative effects to special status species (sensitive, management indicator species, etc.) are closely associated with each other. The Proposed Action for this project has been designed to improve unsatisfactory areas as well as maintain or improve conditions for the remainder of the allotment that are in satisfactory vegetative condition. Therefore with respect to this project, the rangeland vegetation and riparian/wetland vegetation indicators for the affected watersheds should either be maintained or improved, thereby improving wildlife habitat conditions.

The Copper Creek Allotment is bounded to the west by the Horseshoe Allotment (Bureau land), to the east and southeast by the Red Creek and Six Bar Allotments respectively, and to the north by the Prescott National Forest. The Red Creek and Six Bar Allotments are conservatively stocked and monitored to ensure conservative utilization standards are being met. As a result, cumulative watershed effects for these allotments are anticipated to be minimal in contrast to the size and complexity of the watersheds themselves.

Cumulative effects within the project area include off-highway vehicle use, target shooting, hiking, hunting, camping, bird watching, mining, equestrian use, fire, and grazing on neighboring allotments.

Motorized and nonmotorized recreation, and illegal cross country travel, negatively impact wildlife resources and or habitat through removal, destruction or degradation of upland and riparian herbaceous/woody vegetation and aquatic emergent vegetation. Increased sedimentation and turbidity in aquatic habitat where roads intersect creeks may impact aquatic species. 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, impacts to wildlife would still exist, but at reduced levels.

Unauthorized cross country travel also has negative effects to wildlife and habitat through proliferation of user created 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 unauthorized, cross country, motorized travel.

Maintenance of roads and trails may also have a temporary negative effect on wildlife. Workers, heavy equipment, and noise may lead to wildlife avoidance during maintenance activities. On the Copper Creek Allotment, road maintenance effects to wildlife are expected to be minimal due to the infrequent maintenance cycle (annual) of Forest Road 269, which is the only maintained road on the allotment.

Air traffic in the analysis area varies greatly depending on proximity to Phoenix and associated flight paths. Non-commercial flights occur regularly within the analysis area and have presented challenges over wilderness areas due to low flying aircraft. Commercial flights in the area are generally high elevation on the approach to Phoenix or other airports in the area. Arizona Game and Fish Department conducts game surveys by air on a regular basis and would continue to do so in order to determine wildlife population status and trends in accordance with existing compliance requirements.

Recreational shooting also has negative impacts on wildlife as a result of noise and the presence of people. Trash and debris shooters often leave behind may pose hazards to wildlife and actually attract other shooters, due to available target material. Hunting may have negative impacts on wildlife including: high concentrations of hunters, illegal off-road travel, littering, increased presence of people/vehicles, and poaching.

In general, the presence of people and associated noise and disturbance of habitat in dispersed areas and on non-motorized trails has 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 yearlong recreation use occurs. Additionally, the Cave Creek Ranger District occasionally receives Tribal requests for agave stalk collection to be used for ceremonial purposes. Typically, these requests are for less than ten stalks.

Climate change has the potential for additional impacts. According to the Climate Assessment for the Southwest report for December 2016, the area containing the Copper Creek Allotment would be classified as being abnormally dry. 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 U.S. (Garfin et al. 2013). New modeling efforts for the North American monsoons indicate that 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-October) (Cook and Seager 2013).

Wildfire and suppression activities can 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.

Management practices and mitigation measures have been included in the Proposed Action to minimize any negative effects of reauthorizing grazing on the Copper Creek Allotment to wildlife, aquatic species, and rare plants. By following these practices, no or negligible effects are anticipated. Therefore, no significant effects are expected when added to the effects discussed in this section.

Heritage Resources

This report discloses the effects of proposed activities to heritage resources within the boundaries of the Copper Creek Allotment. Heritage resources are a combination of archaeological, historic, and traditional cultural resources, including contemporary Tribal uses of natural, archaeological, and historic resources.

Affected Environment

The Copper Creek Allotment, and the federal lands adjacent to it, are 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. Additionally, the allotment contains many historic sites reflecting the use and occupation by Apache and Yavapai hunters, gatherers, and farmers, Anglo ranchers, stockmen, miners and prospectors, Basque and other Iberian and Latin American sheepherders, and the current land managing agency, USDA Forest Service.

History of the Allotment Area

Thousands of years ago, nomadic hunters and gatherers during what is called the Archaic Period first ventured up onto the mesa top. There were not many of them and they stayed near the natural water sources in the canyons. The most substantial evidence of their passing is a distinctive style of rock art seen in a few places on the mesa and occasional surface artifacts such as projectile points. The first permanent settlers were Hohokam colonists related to the prehistoric inhabitants of the Salt River Valley. Some founded settlements in the Rosalie Mine and Brooklyn Basin areas, beginning about 750 AD. Others began using the mesa top after about 1000 AD, exploiting the abundance of agave. These early sites are characterized by pithouse architecture, which generally leaves nothing visible on the surface but concentrations of artifacts. (Wood 1999)

After about 1150 AD, some of these settlements were abandoned while others continued to be occupied. It was probably about this time that these people began building above-ground masonry structures and transforming the mesa top for agriculture. Drastic changes began about 1280 AD with the influx of refugees from other parts of central Arizona who had been displaced by the Great Drought of 1275 to 1300AD.

After 1280 AD and continuing to the middle of the 14th century, the population grew very rapidly and many new settlements were built while existing ones greatly expanded. This time period/culture is referred to by archaeologists as the Salado Culture. During this time, the major stone masonry ruins that are located within the project area were built, and the agricultural exploitation of the mesa reached its maximum extent. Rainfall harvesting fields of check dams and contour terraces covered much if not most of the mesa top. It is this period of occupation – 1280 to 1400 AD – that is best reflected in the surface archaeology and landscape of the allotment. Most of these sites are

agricultural – check dams and terraces in fields covering hundreds of acres. Scattered among these fields are hundreds of roasting pits and detached single room structures usually called "fieldhouses." Rock art, mostly in the form of petroglyphs pecked into cliff and boulder faces, is also abundant throughout the area. However, the most prominent archaeological features are the massive full height stone masonry ruins that can run anywhere from about 40 to over 100 rooms. There are three clusters of these ruins located on the Copper Creek allotment. Archaeologists believe that these settlement clusters probably operated as a single community for defense and social and economic organization, and that the widespread development of agricultural fields in many different localities on the mesa represents a sophisticated adaptation to the vagaries of local climatic and rainfall patterns. At its height, Copper Creek Allotment and the surrounding area was home to as many as 3000 to 5000 people. Nevertheless, it was abandoned prehistorically sometime around 1400 AD. The descendants of these people can be found today among the Hopi and O'odham tribes of northern and southern Arizona. (Wood *et. al* 1989)

After the prehistoric inhabitants left, the area lay empty until the late 17th, 18th, or early 19th century, when it was temporarily re-occupied by the Apache and Yavapai. Their archaeological remains are extremely ephemeral compared to the massive stone ruins of the Salado period. Very early on in the history of the Tonto National Forest area it was recognized that its primary commodity was not lumber, copper, wool, or beef, but water.

The Tonto National Forest was created in 1905 to protect the Salt River Watershed (Effland and Macnider 1991). The creation of the national forest to protect the watershed and provide water to Phoenix and Mesa were critical elements in the political process that gave statehood to Arizona (Salt River Project 2011). It was at this time that ranching, running sheep, and mining for copper were the predominant uses of the Copper Creek allotment, and each of those activities has left an archaeological record of its own.

These activities resulted in the first great push for infrastructure development in Forest Service history. Ironically, it took a massive economic depression in the country to provide the forest with the labor, equipment, and money to install the roads and recreation facilities. The Works Progress Administration (WPA) and the Civilian Conservation Corps were the largest of the public works programs created by the federal government to provide jobs during the Great Depression of the 1930s (Collins 1999). These two programs were responsible for the construction of modern recreation and Forest Service administrative facilities, and hundreds of miles of roads and trails connecting them (Otis *et. al* 1986; Merrill 1981). These programs also attempted to protect the watershed of the reservoirs by slowing erosion. Thousands of check dams and other erosion control features were built to slow the widespread erosion on the Tonto caused by overgrazing.

The beginning of World War II brought an end to the public works programs and the surge in facility construction (Otis *et. al* 1986). Forest development came to a near standstill during the war. Post-war prosperity created another wave of population growth in Arizona and the Phoenix area in particular. As Phoenix and its surrounding communities grew, the pressures on the recreational facilities on the Tonto National Forest began to reach a critical point. New highways throughout the state made it easy for people to enjoy the forests in numbers never before seen. As a result, the Depression-era facilities were being overwhelmed.

The early 1960s saw a new boom of recreation and administrative site development. Throughout the Tonto, new camping and picnicking sites were built. Improved forest roads gave visitors access to parts of the national forest that had been difficult to reach.

Archeological Sites

The allotment covers approximately 36,261 acres. For reasons that will be explained in this report, cultural resource inventory surveys in the Copper Creek project area focus on a) those areas in which standard range activities are most likely to have the potential to affect archaeological sites, and b) those areas where new range improvements are planned and expected to be implemented within the next two years. Approximately 1.9 percent (688.7 acres) of the project area has been completely surveyed to date for ground-disturbing activities. Previously conducted archaeological surveys have been undertaken both for compliance purposes (e.g. electrical transmission lines, grazing improvements) and for research by various academic institutions (Prescott College, Southern Illinois University, Museum of Northern Arizona, Arizona State University).

To date, one hundred and twenty-one (121) archaeological sites have been identified in the Copper Creek Allotment. Seventy-eight (78) sites are present within the Heritage GIS layer; forty –three (43) sites were found only on the hard-copy records. Of these sites, ninety-eight (98) contain evidence for prehistoric occupation, eight (8) contain evidence for historic period occupation, and three (3) contain evidence for both occupation types. The remaining twelve (12) sites are of unknown cultural or temporal affiliation. At least five of the prehistoric sites appear to be pithouses (individual and village). The remainder of the prehistoric sites located in the project area appear to consist of either the large architectural ruins, petroglyphs, or agricultural features. These sites contain material spanning a large time period, and most likely saw repeated use throughout their occupation. The historic record on the Copper Creek Allotment is also quite extensive. As many as six mines and their associated camps are located on the allotment. A historic road (Forest Road 677), a fort, a historic residence, and an administrative site associated with the Civilian Conservation Corps have also been identified.

Twenty-three (23) of 121 known archaeological sites are already listed on the National Register of Historic Places (National Register). Fifty-three (53) archaeological sites are considered National Register -eligible, one has been assessed as not eligible for the National Register, and forty-four (44) have not been evaluated against National Register significance criteria. Summary information on the archaeological sites, as well as maps showing the locations of the cultural resources, will be presented in an upcoming survey report. The Tonto National Forest Heritage Inventory Forms (on file with the Tonto National Forest) provide more detailed descriptions of each of the archaeological sites.

Perry Mesa Archeological District

Many of the prehistoric sites already listed on the National Register are most likely associated with the Perry Mesa Archeological District. Perry Mesa, the larger landform on which the allotment is located, was initially listed as an archeological district in 1975 (totally approximately 1,920 acres). An expansion of this district to approximately 48,000 acres was nominated and accepted by the Keeper of the National Register in 1996. While most of the district is managed by the Bureau of

Land Management (the Bureau), the archeological district does include approximately 11,500 acres administered by the Forest Service. At least 450 prehistoric sites are known to exist within National Register district boundaries, and it is likely that the district contains many more sites that have yet to be recorded. All these sites are attributed to the Salado culture, and meet National Register significance criteria as found in *36 CFR 60.6*: "Criterion D: That have yielded, or the potential to yield, information that is important to prehistory or history".

Environmental Effects

Legal and Regulatory Compliance

While numerous federal laws and executive orders are in place that address historic preservation and tribal consultation on federal lands, the National Historic Preservation Act (Preservation Act) of 1966, as amended, provides the legal framework for heritage resource management on this project. Preservation Act Section 106 directs all Federal agencies to take into account the effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the Preservation Act. Advisory Council on Historic Preservation regulations at 36 CFR 800 implement Preservation Act Section 106, and these regulations contain the definitions utilized to determine the potential effect, if any, any given undertaking will have on cultural resources. The Area of Potential Effect for a given project is defined as "… the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties… The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." (*36 CFR 800.16(d)*). An Effect to a cultural resource is defined as "…alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." (*36 CFR 800.16(i)*). An Adverse Effect is found "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."[36 CFR 800.5(a)(1); see subsection (a)(2)]. Effects to cultural resources may be either direct or indirect.

Forest Service Manual 2360 and Forest Service Handbooks 1509 and 2309 are the documents through which the Washington Office outlines implementation of *36 CFR 800*, providing the foundation for agency policy and procedures. 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, Forest Service Manual 2364.02 lists as the first three objectives for the protection and stewardship of Heritage resources:

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

In tandem with the guidance from the Washington Office, the Forest Service Southwest Region (Region 3) has generated regional amendments Region 3 Forest Service Manual 2360 and Region 3 Forest Service Handbook 2309. Region 3 Forest Service Manual 2360 addresses the infrastructure, policies, and procedures used for cultural resource management in this region. Region 3 Forest Service Handbook 2309 contains the standards and guidelines for cultural resource management in the region.

In accordance with *36 CFR 800.14(b)(2)*, federal agencies have the option to pursue "Program Programmatic Agreements", which allow the agency to create a Section 106 process that differs from the standard review process and that will apply to all undertakings under a particular program. These agreements are typically used by agencies with programs that have undertakings with similar or repetitive effects on historic properties, such as grazing authorizations, in order to avoid the need for a separate Section 106 review for each project. Long-term consultation with the State Historic Preservation Officer and Region 3 policy has resulted in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities between the USDA Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation*, signed 12/24/03 (R3PA). This agreement, specifically, Appendix H, *Standard Consultation Protocol for Rangeland Management* developed pursuant to Stipulation IV.A of the Programmatic Agreement, is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

In accordance with Appendix H, standard Section 106 process will be implemented on all range improvement and ground-disturbing management practices that are planned and have been identified at the time of the *National Environmental Policy Act* analysis. In addition to the acreage identified for improvements, analysis of impacts to Heritage resources from cattle grazing will also be undertaken. Field surveys should be conducted in areas where there are known or potential impacts to heritage resources or specific areas of concern in order to identify and assess site conditions.

"In making the decision on the level of survey to be conducted, the Forest Archaeologist will consider the following and document the decision in the heritage resource report:

A. grazing history
B. proposed changes in grazing management practices
C. known incidents of or high potential for damage to sites
D. presence of grazing-sensitive sites
E. presence of areas where cattle congregate
F. amount of the allotment previously surveyed for cultural resources
G. site density
H. information provided by employees, permittees, or other users" (Appendix H, II, B.2)

Once inventory has been completed, and archaeological sites have been identified, the Forest may draw from, but is not limited to, the following mitigation measures to ensure that effects to cultural resources are avoided or minimized:

1. 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;
2. Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties;
3. Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing;
4. Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing;
5. Periodic monitoring to assess site condition and to ensure that protection measures are effective;
6. Other mitigation measures involving data recovery, for example, may be developed and implemented in consultation with the SHPO as the need arises; and
7. The appropriate Tribes will be consulted if the mitigation is invasive or it affects a TCP or other property of concern for them.

Also in accordance with Appendix H, monitoring will be conducted as part of the day-to-day activities of the professional cultural resource specialists 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. The archaeologists will use these opportunities to observe and report on grazing activities, the 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. (Appendix H, II, D)

The 1985 Forest Plan and its Amendments 21 (May 3, 1995) and 29 (July 31, 2017) establishes the following standards and guidelines (under Decision Unit 3) that is applicable throughout the Forest regarding the management and protection of prehistoric and historic archaeological sites and other historic properties:

> The Forest will comply with *National Historic Preservation Act (NHPA)* and with *Executive Order (EO) 11593,* and will undertake active management which recognizes Heritage (cultural) resources as equal in importance to other multiple uses. Heritage resources will be managed in coordination with the State Historic Preservation Officer (SHPO) in accordance with the R3PA regarding cultural property protection and responsibilities….
>
> During the conduct of undertakings, 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. Exceptions may occur in specific cases where consultation with the SHPO indicates that the best use of the resource is data recovery and interpretation…

In general, this requires that any surface disturbing project can be subject to the evaluation, consultation, and clearance approval process required by the Region 3 Programmatic Agreement, which typically requires archaeological survey of proposed construction and disturbance activities, e.g. for range improvements. Specifically for the Copper Creek area, this would include the

evaluation of potential impacts from grazing systems, as well as the construction and maintenance of range improvements. Amendment 21 goes on to add that interpretive opportunities for Heritage (archaeological and historic) resources should be pursued as a high priority when opportunities arise. Other management direction, specifically applied toward the protection of archaeological and historic resources from looting or vandalism is found in the *Archaeological Resources Protection Act*.

Regarding the Copper Creek Allotment area specifically, the Plan adds the following management prescription:

> Develop and document feasibility study/EAs for interpretive development of the Squaw Creek Ruin and Perry Mesa Prehistoric Archaeological Sites. Carry out development plan from site surveys through design and contract preparation. Complete excavation, stabilization, and actual construction (including preparation of display materials and publications) according to schedules identified in the development plan.

Management of this aspect of the Heritage resource was not expressly addressed in the 1985 Forest Plan. Until revision of the Plan is completed, direction in this area is provided by the Region 3 Programmatic Agreement, the *Native American Graves Protection and Repatriation Act*, and a variety of laws, Executive Orders, Memorandums, and case law, including *Archaeological Resources Protection Act*, the *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*, *EO 13007 Accommodations of Sacred Sites*, and *EO 12898 Environmental Justice* as directed by the Forest Service Manual and Handbook.

The proposed action (Alternative A) proposes various activities in the five pastures located in the Copper Creek Allotment. The proposed action would also authorize the construction and maintenance of future as yet unidentified range improvements that may become necessary for allotment management. The No Grazing Alternative (Alternative B) proposes that no grazing management activities take place within the project area. The Determination of Effect presented in this report takes into consideration the effect of the activities proposed in Alternative A on the archaeological sites, since not grazing within the allotment will not affect historic properties. The spatial boundary used to evaluate direct and indirect effects of the project was the allotment boundary, since no cultural resources outside of this area will be affected by proposed project activities.

Assumptions and Methodology (data limitations and data inaccuracies)

Physical accessibility to archaeological records of the Forest is inconsistent; most archaeological sites and surveys recorded prior to 2012 have been digitized into GIS. Hard-copy site and survey records appear to have been kept up to date through approximately 2015. Both hard-copy records and digital records were compared in order to determine data gaps; however, anything not captured in either format will be absent from the literature review. The methodology used for literature review followed current professional standards.

Cultural resource surveys conducted for this project will follow methodology identified in the Region 3 Programmatic Agreement. Range improvements that are proposed to be installed within the first two years of the project were evaluated[34]. Improvements proposed to be installed after the first two years of this project, or improvements that may become necessary in the future but have not yet been identified may require additional surveys and evaluation by the Forest Archeologist before they can be installed.

To determine survey needs for new improvements in GIS, point features (assumed by the archaeologist to be tanks and springs) were buffered at 50 meters; line features (assumed to be pipelines and fences) were buffered at 20 meters. Acreage to be surveyed for new improvements is 345.47 acres. To determine survey needs under Region 3 Programmatic Agreement Appendix H, stream corridors (having the highest potential for prehistoric cultural resources) were buffered at 100 meters. Gates and other locations having the highest potential for cattle congregation were identified off of the topographic map and buffered at 100 meters. The two areas of highest potential were then cross-referenced and then compared to archeological site layers to determine locations of known or potential impacts to cultural resources. Survey acreage needed under the Region 3 Programmatic Agreement is 506.53 acres. Total acres to be surveyed for the 2016 Copper Creek Allotment project is 852 acres.

Direct and Indirect Effects for the Proposed Action

With respect to the Copper Creek Allotment project, direct effects are those that will occur during project implementation. The potential for adverse impacts of grazing activities on significant cultural resources relates directly to the level of range developments (i.e. water tanks, pipelines, etc.), number and density of livestock within an allotment, length of grazing periods, and other ground disturbing activities existing and proposed within the project area, including access to range developments. While there is no common agreement among archaeologists as to how extensive the effects are, there is no disagreement that livestock grazing has the potential to adversely impact significant cultural resources through trampling, obliteration, and displacement (Horne and McFarland 1993; Osborn and Hartley n.d.; Osborn *et. al* 1987; Shea and Klench 1993; Todd et. al 2000; and Willingham 1994). Sites located within the vicinity of livestock congregation areas, such as near water tanks, salt licks, gates, along fence lines or other livestock trials, suffer the most damage. The severity of grazing impacts on cultural resources increases proportionally with the number and duration of livestock congregation. Livestock grazing requires the construction and maintenance of range improvements, including water tanks, pipelines, fences, and access roads. The installation and maintenance of range improvements typically require new ground disturbance. Projects requiring new ground disturbance, by definition, have the potential to adversely affect significant cultural resources.

[34] More detailed information on the type and location of these improvements can be found in Chapter 2.

In general, the direct effects on the cultural resources of the various activities that are proposed for this project are expected to be as follows:

1. In those project areas where no historic properties (archaeological sites meeting National Register criteria) are present, proposed project activities have No Potential to Affect cultural resources.
2. In those project areas in which ground disturbing activities would be carried out as listed above, where historic and/or unevaluated properties are present, and where Site Avoidance is feasible and is implemented, the proposed project activities are expected to have No Effect on cultural resources.
3. Where archaeological sites occur where site avoidance is not feasible, the Forest may use any of the mitigation measures described above and develop a mitigation plan that will result in a finding of No Adverse Effect on historic properties.
4. Where archaeological sites that are located within the identified boundaries of the Perry Mesa Archeological District, where proposed activities would have an adverse effect, the Forest will use any of the mitigation measures described above and develop a mitigation plan that will result in a finding of No Adverse Effect on historic properties.

Increased site vulnerability is expected to be the principal indirect effect to historic properties resulting from proposed activities. With application of appropriate mitigation, it is not expected that the proposed project activities will increase visitor use in those areas in which archaeological sites are located. Therefore, it is not expected that implementation of the proposed activities will have indirect effects on the historic properties.

Archeological sites located within the project area will continue to be affected by natural processes (i.e. erosion). Since recreation activities would continue to take place within the project area, the extent and scope of adverse effects of these activities to archaeological sites will remain unknown. However, opportunities for interpretative development and/or stabilization may be identified.

No Grazing Alternative

The No Grazing Alternative (Alternative B) would mean no grazing management would occur on the allotment. Should this alternative be chosen as a result of this analysis, then no grazing management activities take place within the project area. However, existing range improvements may need to be removed.

If this alternative is selected, additional cultural resource surveys may be needed to address the ground disturbance that would result from the removal of range improvements (i.e. fences, tanks, and pipelines). Such projects have the potential to adversely affect significant cultural resources.

Archeological sites located within the project area will continue to be affected by natural processes (i.e. erosion). Since recreation activities would continue to take place within the project area, the extent and scope of adverse effects of these activities to archaeological sites will remain unknown. Opportunities for interpretative development and/or stabilization will also remain unidentified.

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 allotments. Given the non-renewable 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. Provided that appropriate mitigation measures are implemented, it is not expected that any of the proposed project activities will result in additional adverse effects to the cultural resources referenced in this report. It is expected that there will be no change in the condition of the cultural resources over the existing condition.

Contemporary Indian Uses

This report discloses the effects of proposed activities to contemporary tribal use within the boundaries of the Copper Creek Allotment. Contemporary tribal use of natural, archaeological, historic and modern resources typically fall under the larger category of Heritage Resources, which includes archaeological, historic, and traditional cultural resources. The spatial boundary used to evaluate direct and indirect consequences of the project was the allotment boundary, since none of the archaeological sites, sacred sites, or traditional use areas outside of this boundary will be affected by proposed project activities. The allotment covers approximately 36,261 acres.

For reasons that will be explained below, the focus on this report will be on a) those areas in which standard range activities are most likely to have the potential to affect archaeological sites, sacred sites, and traditional use areas, and b) those areas where new range improvements are planned and expected to be implemented within the next two years.

Affected Environment

The Tonto National Forest (Forest) contains 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 or clan histories. For centuries prior to its establishment in 1905, the Forest was part of a large area in central Arizona that was occupied by the Apache and Yavapai peoples. Some of these tribes continued to live on Forest land well into the 20th century. The Forest also retains significance through affiliation into prehistory for the O'odham, Hopi, and Zuni people.

Significant Tribal places, whether sacred sites, 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. These places 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 archeological and historic sites, they are irreplaceable and individually unique. 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.

To date, one hundred and twenty-one (121) archaeological sites have been identified in the Copper Creek Allotment. Other potential locations used by Tribal members to conduct traditional activities such as plant collection and religious rites are known on the Forest, but no specific locations were identified during scoping that are within the Area of Potential Effect (APE) for this analysis. It must be remembered that Tribal consultation regarding the location and management of sacred places and traditional use areas is an ongoing process not specifically tied to any one proposal, alternative, or timeline. The Forest will always consider modification of its decisions in light of any new information received from the Tribes. Further analysis of conflicts and impacts would be phased in as more information becomes available, recognizing that information regarding the location and use of sacred places, sites, and traditional use areas is confidential and often well-guarded by the Tribes. It is not always appropriate to identify such places or discuss their uses or significance in public documents such as this environmental analysis. As a result, the Forest will continue to work with the Tribes to address these issues as they are identified. Protection and preservation of identified traditional use areas, sacred places and sites, and traditional cultural properties of all kinds remain a principle goal.

An important consideration in the fulfillment of the Forest Service mission is the trust relationship the Forest Service has with Tribes and the potential impact Forest Service policy, program, and project decisions may have on them. The Tonto National Forest 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, and to collect firewood. Cattle can compete with tribal resource availability. Excessive grazing can affect the regeneration of important subsistence species such as Emery oak and Arizona barberry. Cows eat the young saplings of Emery Oak, preventing them from maturing. The majority of Emery Oak stands on the Forest are over 40 years old due to low survival of smaller saplings which could impact the availability of these resources to Tribal members in the future.

Environmental Effects

Legal and Regulatory Compliance

The Tribal consultation process for the Tonto National Forest is guided through a variety of laws, Executive Orders, Memorandums, and case law. Some of those laws include the *National Historic Preservation Act* and subsequent amendments, *Archaeological Resources Protection Act*, *American Indian Religious Freedom Act*, *National Environmental Policy Act*, the *Native American Graves Protection and Repatriation Act*, and the *National Forest Management Act*.

Depending on the specific location of an undertaking, the Forest routinely consults with between nine and thirteen Tribes regarding proposed projects and management policies. These Tribes are Apache (San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, the Mescalero 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 the Zuni, and Yavapai (Yavapai-Prescott Tribe, Fort McDowell Yavapai Nation, and Yavapai-Apache Nation (previously mentioned)). Consultation with these Tribes is ongoing.

In accordance with the *National Historic Preservation Act* and its regulations 36 CFR 800, federal agencies have the option to pursue "Program Programmatic Agreements", which allow the agency to create streamline processes that differ from the standard review process and that will apply to all undertakings under a particular program. Long-term consultation with the Arizona State Historic Preservation Office (SHPO) and Region 3 policy has resulted in the First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities between the USDA 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 (R3PA). This agreement, specifically, Stipulation III. Tribal Consultation, outlines the 'standard operating procedure' for consulting "with Indian tribes that attach traditional religious and cultural significance to historic properties that may be affected by FS undertakings".

Once cultural resource inventory and tribal consultation have been completed, the Region 3 Programmatic Agreement allows the Forest to draw from, but does not limit options to, the following protective measures to ensure that effects to cultural resources, sacred sites, and traditional use areas are avoided or minimized:

- 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 known historic properties, sacred sites, and areas of traditional use.
- Relocation of existing range improvements and salting locations sufficient to ensure the protection of the locations being impacted by concentrated grazing.
- Fencing or exclosure of livestock from individual sensitive locations or areas containing multiple sensitive historic properties, sacred sites, or traditional use areas 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 the SHPO and Tribes as the need arises.

The 1985 Forest Plan and its Amendment 21 (May 3, 1995) establishes the following standards and guidelines (under Decision Unit 3) that is applicable throughout the Forest regarding the management and protection of prehistoric and historic archaeological sites and other historic properties:

The Forest will comply with National Historic Preservation Act (NHPA) and with Executive Order (EO) 11593, and will undertake active management which recognizes Heritage (cultural) resources as equal in importance to other multiple uses. Heritage resources will be managed in coordination

with the State Historic Preservation Officer (SHPO) in accordance with the R3PA regarding cultural property protection and responsibilities.

During the conduct of undertakings, 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. Exceptions may occur in specific cases where consultation with the SHPO indicates that the best use of the resource is data recovery and interpretation…

Thus, the Forest Plan directs that the protection of historic properties, sacred sites, and traditional use areas is best accomplished through avoidance.

Assumptions and Methodology

As noted above, significant Tribal places, whether sacred sites, 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. Tribal members are often hesitate to share this information, for fear of both resource damage and increased visitor use. Tribal members do not share this information freely, and will do so only under strict confidentiality. As a result, Forest staff know of only a few such places. Locations that are known either through oral history or on the ground (i.e. archaeological sites) are the most easy to identify, thus making them the easiest location type to protect. Cultural resource surveys conducted for this project will follow methodology identified in the Region 3 Programmatic Agreement.

Direct and Indirect Effects of the Proposed Action

Direct effects to traditional cultural properties, sacred sites and tribal use areas can be generally defined as anything that results in the 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). The potential for adverse impacts from grazing activities on these areas relates directly to the level of range developments (i.e. water tanks, pipelines, etc.), number and density of livestock within an allotment, length of grazing periods, and other ground disturbing activities existing and proposed within the project area, including access to range developments. While there is no common agreement among archaeologists as to how extensive the effects are, there is no disagreement that livestock grazing has the potential to adversely impact significant cultural resources, sacred sites, and traditional use areas through trampling, obliteration, and displacement (Horne and McFarland 1993; Osborn and Hartley n.d.; Osborn *et. al* 1987; Shea and Klench 1993; Todd *et. al* 2000; and Willingham 1994).

Sacred sites and traditional use areas located within the vicinity of livestock congregation areas, such as near water tanks, salt licks, gates, along fence lines or other livestock trials, suffer the most damage. The severity of grazing impacts increases proportionally with the number and duration of livestock congregation. Livestock grazing requires the construction and maintenance of range improvements, including water tanks, pipelines, fences, and access roads. The installation and maintenance of range improvements typically require new ground disturbance. Projects requiring new ground disturbance, by definition, have the potential to adversely affect these locations. Conversely, range improvements, such as fences which could be constructed to keep cattle from

accessing areas of sensitive Tribal resources, such as stands of Emory oak saplings, may also benefit these resources.

In general, the direct effects on sacred sites and tribal use areas of the various activities that are proposed for this project are expected to be as follows:

- In those project areas where no historic properties (archaeological sites meeting the National Register of Historic Places criteria), sacred sites, or traditional use areas are present, proposed project activities have No Potential to Affect historic properties.
- In those project areas in which ground disturbing activities would be carried out as listed above, where historic and/or unevaluated properties, sacred sites, or traditional use areas are present, and where Site Avoidance is feasible and is implemented, the proposed project activities are expected to have No Effect on historic properties.
- Where archaeological sites, sacred sites, or traditional use areas occur where site avoidance is not feasible, the Forest may use any of the mitigation measures described above and develop a mitigation plan that will result in a finding of No Adverse Effect on historic properties.

Indirect impacts can include modern trash contamination and the introduction of noise and light pollution from vehicles and camping. The presence of people and activities that may be seen as degrading to either the sacred nature of a place or to the experience of conducting traditional activities there could be considered an indirect impact. Impacts can also take the form of conflicts with other recreational or economic uses that affect the ability of traditional practitioners to access these areas. With application of appropriate mitigation, it is not expected that the proposed project activities will increase visitor use in those areas in which archaeological sites are located. Therefore, it is not expected that implementation of the proposed activities will have indirect effects on historic properties, sacred sites, or areas of traditional use.

Direct and Indirect Effects of No Grazing

Should the No Grazing Alternative be chosen, additional cultural resource surveys and tribal consultation may be needed to address the ground disturbance that would result from the removal of range improvements (i.e. fences, tanks, and pipelines). Such projects have the potential to adversely affect sacred sites and areas of traditional use.

Areas of Tribal use, to include archeological sites, located within the project area will continue to be affected by natural processes (i.e. erosion). Since recreation activities are already taking place within the project area, and would be anticipated to continue at current levels, the extent and scope of adverse effects of these activities to areas of tribal use will remain unknown. Opportunities for interpretative development and/or stabilization will also remain unidentified.

Cumulative Effects

Since site condition assessments for heritage resources and tribal use areas are not available for any time prior to the introduction of European livestock species to the Southwest, some level of impact is assumed to have contributed to the current condition of all of these locations on the allotments. Given the non-renewable nature of areas of tribal use, any portion of a given location, either damaged or removed, diminishes its cultural value permanently. Therefore, all effects to tribal use

areas are considered cumulative. Provided that appropriate mitigation measures are implemented, it is not expected that any of the proposed project activities will result in additional adverse effects to the tribal use areas referenced in this report. It is expected that there will be no change in the condition of the tribal use areas over the existing condition.

Finding of No Significant Impact

The Cave Creek District Ranger, the responsible official for this project, is responsible for evaluating the effects of the project relative to the definition of significance established by the CEQ Regulations (*40 CFR 1508.13*). This Final Environmental Assessment for Copper Creek Allotment Grazing Analysis (Final EA), including any incorporated reports and comment response report in the project record, have been reviewed and considered by the responsible official in determining that the proposed action (Alternative A) will not have a significant effect on the quality of the human environment. As a result, no environmental impact statement will be prepared. The rationale for this finding is as follows, organized by sub-section of the CEQ definition of significance cited above.

Context

For the proposed action and the no grazing alternative, the context of the environmental effects is based on the environmental analysis in this Final EA. In terms of scale and scope of grazing authorization for the Copper Creek Allotment, the allotment is approximately six percent of the acreage in the entire Cave Creek Ranger District (approximately 34,700 acres). All of these acres could potentially be grazed under the proposed action with the exception of a few exclosed areas totaling approximately 900 acres that would further decrease the area affected. Under the no action alternative, the entire allotment would be removed from grazing (approximately 34,700 acres).

The Cave Creek Ranger District consists of approximately 570,000 acres with livestock grazing currently authorized across 7 of the 11 allotments on the district, including the Copper Creek Allotment. Approximately 330,741 acres of the Cave Creek Ranger District are grazed (minus some pastures and exclosures) 58 percent of the Ranger District.

As discussed in Alternative A, the proposed action would authorize up to 500 head of cattle yearlong and up to 250 yearlings from January 1st through May 15th or approximately 6,788 total animal unit months (AUMs). This maximum number would represent approximately 4 percent of the total number authorized on the forest. In 2016, there were 1,632 head of cattle authorized on the Cave Creek Ranger District or approximately 16,427 AUMs. In 2016, there were 17,139 head of cattle authorized on the Tonto National Forest or approximately 181,305 AUMs.

Intensity

Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis, Chapter 3 of this Final EA, and the references in the project record. The effects of authorizing grazing within the Copper Creek Allotment have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits. This finding of no significant impact

is based on the context of the project and intensity of effects using the ten factors identified in *40 CFR 1508.27(b)*.

1. **Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.**

   Both beneficial and adverse effects were analyzed in chapter 3, summarized here:

   Under the Proposed Action, range improvements would be added which would improve distribution of cattle. With the stated grazing utilization stipulations and increased cattle distribution, the Proposed Action would maintain or improve upland vegetation productivity over current conditions by maintaining grazing intensity at lower levels than currently exist on the allotment. Flexibility given to resource managers to adjust the timing, intensity, frequency, and duration of livestock grazing in any pasture, at any time will ensure that plants are not used beyond levels that will provide for recovery, improved vigor, and recruitment of desirable species. Light to conservative use levels, in addition to mitigation measures such as not trailing livestock through riparian areas, nor placing salt and/or mineral supplements within stream or riparian corridors will ensure effects to riparian areas and stream channels will be minimal. In addition, vegetation on the allotment will likely increase in desirable forage plant densities and litter. Additionally, there will be an increase in plant species composition and improved vigor of forage plants within the allotment. The overall forage production (biomass) will also increase. Based on this, soil condition will be maintained, and possibly improve. In terms of fire suppression and fuel loading, grazing will assist in controlling the growth of fine fuels such as grasses and forbs, which contribute to fire spread after these fuels have dried out.

   For forest visitors looking for a “natural” recreational experience, the presence of livestock and range improvements may have an adverse effect. However, the presence of livestock may also encourage more responsible use of the area by other recreationalists. Adverse effects to heritage resources or contemporary Indian uses may happen if there is increased trampling from localized concentration or in uses that are above previous or existing levels. Cattle can also compete with tribal resource availability. Excessive grazing can affect the regeneration of important subsistence species such as Emery oak and Arizona barberry. Cows eat the young saplings of Emery Oak, preventing them from maturing. The majority of Emery Oak stands on the Forest are over 40 years old due to low survival of smaller saplings which could impact the availability of these resources to Tribal members in the future.

   Finally, the decision is not biased by the beneficial effects of the Proposed Action.

2. **The degree to which the proposed action affects public health or safety.**

   As part of Chapter 3, water quality was considered as part of the hydrology, riparian, and watershed analysis. Given the distance of the allotment upstream from the impaired reach of the Agua Fria River (from Sycamore Creek to Bishop Creek) and the strict adherence to management practices and mitigation measures in the proposed action such as salting/supplement locations up out of the drainages, the proposed action is not expected to

contribute to *E. coli* impairment, nor cause any additional impairments. The proposed action will not affect water quality based on current assessment data, which was either inconclusive or found that impairment was due to factors outside of grazing authorization, such as effects from the Cave Creek Complex Fire.

Additionally, West Nile Virus was considered as part of the Range analysis. The analysis found that if the environmental design and resource protection measures are followed, such as installing float valves to prevent trough overflows and removing algal growth and other debris, there should be little, if any, increase in areas where mosquitos could reproduce and therefore little to no additional risk created for the transmission of West Nile Virus and no significant effects on public health and safety.

3. **Unique characteristics of the geographic area such as the proximity to historical or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.**

As detailed in the heritage resources section of Chapter 3, the Copper Creek Allotment, and the federal lands adjacent to it, are 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. Additionally, the allotment contains many historic sites reflecting the use and occupation by Apache and Yavapai hunters, gatherers, and farmers, Anglo ranchers, stockmen, miners and prospectors, Basque and other Iberian and Latin American sheepherders, and the current land managing agency, USDA Forest Service.

To date, one hundred and twenty-one (121) archaeological sites have been identified in the Copper Creek Allotment. Of these sites, ninety-eight (98) contain evidence for prehistoric occupation, eight (8) contain evidence for historic period occupation, and three (3) contain evidence for both occupation types. The remaining twelve (12) sites are of unknown cultural or temporal affiliation. At least five of the prehistoric sites appear to be pithouses (individual and village). The remainder of the prehistoric sites located in the project area appear to consist of either the large architectural ruins, petroglyphs, or agricultural features. These sites contain material spanning a large time period, and most likely saw repeated use throughout their occupation. The historic record on the Copper Creek Allotment is also quite extensive. As many as six mines and their associated camps are located on the allotment. A historic road (Forest Road 677), a fort, a historic residence, and an administrative site associated with the Civilian Conservation Corps have also been identified.

Many of the prehistoric sites already listed on the National Register are most likely associated with the Perry Mesa Archeological District. Perry Mesa, the larger landform on which the allotment is located, was initially listed as an archeological district in 1975 (totally approximately 1,920 acres). An expansion of this district to approximately 48,000 acres was nominated and accepted by the Keeper of the National Register in 1996. While most of the district is managed by the Bureau of Land Management (the Bureau), the archeological district does include approximately 11,500 acres administered by the Forest Service. At least 450

prehistoric sites are known to exist within National Register district boundaries, and it is likely that the district contains many more sites that have yet to be recorded.

The Tonto National Forest recognizes that several area Tribes have cultural ties to and knowledge about lands now managed by the Forest Service, including on the Copper Creek Allotment. 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, and to collect firewood.

4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.**

There is no known scientific controversy over the effects associated with grazing authorization. Management actions such as those discussed in Chapter 2 for the Proposed Action are implemented in other areas throughout the Tonto National Forest and on many other national forests across the United States. Furthermore, the effects have been analyzed in compliance with *40 CFR 40 1500.1* and *36 CFR 220.7* in Chapter 3 and the Proposed Action includes monitoring, management practices, and mitigation measures to address issues raised both externally and internally throughout the NEPA process. The analysis in this Final EA represents the judgement and expertise of resource management professionals who have applied their knowledge to similar projects and resources in the past. The management practices proposed are commonly-used resource management practices described in agency directives, prescribed in the Forest Plan, and used by other land management agencies. The intensity of grazing and management practices proposed are consistent with the best scientific information currently available and current Forest Service direction. While some members of the public are opposed to livestock grazing on public lands and others view the Forest Service as too restrictive in its management, this action is not highly controversial within the context of the *National Environmental Policy Act*.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.**

The Tonto National Forest staff has considerable experience with the types of activities associated with grazing authorization. The effects analysis in Chapter 3 shows the effects are not uncertain, and do not involve unique or unknown risk. Effects of this action will be similar to the effects of past similar actions. The interdisciplinary team that conducted the analysis used current literature (see References section in this document), field data, and extensive on the ground knowledge from project partners. Based on these findings, there are no unique or unusual characteristics about the area not previously encountered that would constitute an unknown risk upon the human environment.

6. **The degree to which the action may establish precedent for future actions with significant effects or represents a decision in principle about a future consideration.**

   The decision to authorize grazing on the Copper Creek Allotment as detailed in the description of the Proposed Action in Chapter 2 does not establish a precedent for future actions with significant effects. Future actions will be evaluated through an environmental analyses process, in compliance with *40 CFR 1500-1508* and *36 CFR 220*. Future range projects, including the project to authorize grazing on the Bureau of Land Management's neighboring Horseshoe Allotment, will be evaluated individually as to environmental effects and project feasibility. Furthermore, as detailed in Chapter 3, this project is consistent with the Tonto National Forest Plan of 1985, as amended.

7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.**

   The cumulative effects are disclosed for each resource area in Chapter 3 of this Final EA. These effects evaluated the combined effects of the project with past, present and reasonable foreseeable future actions. Based on the information contained in this Final EA and the information identified during public review of the EA, there are no cumulatively significant impacts.

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.**

   The proposed action, as detailed in Chapter 2, will have no significant adverse effect on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places. As detailed in the Heritage Resources section and the Contemporary Indian Uses section in Chapter 3 of this Final EA, mitigation of impacts to heritage resources is best accomplished by avoidance of these properties by the placement and construction of all range improvements. It can also be achieved by minimizing opportunities for the localized concentration of animals, improving distribution across the allotment and across each pasture, and by reducing the intensity of grazing for the allotment as a whole.

   In instances where proposed improvements will involve any potential for ground disturbance, such as stock tanks and other water developments, a 100 percent archaeological survey will be conducted for areas which have no previous survey coverage, or have outdated surveys, which do not conform to current standards. 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 only of those that have been formally determined to be not eligible in consultation with the State Historical Preservation Office (SHPO).

Archeological clearance must be approved with all necessary consultation with SHPO and the potentially interested Tribes prior to issuing any decision regarding the construction, modification, or removal of all improvements. This approach, based on long-term consultation with SHPO and on U.S. Forest Service Region 3 policy as embodied in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities* between the USDA 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, and specifically, Appendix H, the *Standard Consultation Protocol for Rangeland Management* developed pursuant to Stipulation IV.A of the *Programmatic Agreement* is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.**

The action will not adversely affect any endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species act of 1973, as amended. Within the project area there are currently no listed species under the Endangered Species Act of 1973. However, Section 7 directs Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats (16 U.S.C. 1536 et sq.). At this time, the Agua Fria sub-basin is the system furthest downstream in the Gila River basin that currently supports or is historically known to have supported Gila chub (*Gila intermedia*). This sub-basin sustains or recently sustained four remnant Gila chub populations, including an extant population in Silver Creek. Silver Creek is also designated Critical Habitat for this species.

Current conditions within designated Critical Habitat for Gila chub in the action area (the stretch of Silver Creek that occurs on the forest within the Bobcat pasture on the Copper Creek Allotment) does not support most of the primary constituent elements due to heavy sedimentation and damage to the riparian zone from the fire. Re-establishment of the riparian and upland vegetation and a large stream flow event are needed to remove sediment that has filled in pool habitats.

At this time, since water is not present within this critical habitat area, the primary constituent elements are not sufficient to allow Gila chub to survive whether or not cattle are present. If it is determined that an exclosure fence becomes necessary in the future to ensure that those primary constituent elements associated with vegetation condition and diversity, bank stabilization, and water quality are protected and maintained, then the proposed action would allow such a fence to be built. Since Gila chub are not currently present on the allotment and the primary constituent elements necessary for fish survival are also not present, the consultation process with the U.S. Fish and Wildlife Service was discontinued and is not necessary at this time. However, this determination was made in coordination with U.S. Fish and Wildlife Service.

There are no site specific occurrence records of desert tortoise within the action area. However, habitat does exist within their preferred Sonoran desert scrub habitat in the southern portion of the Perry Mesa pasture and southwestern most portion of the Brooklyn pasture. The proposed action includes numerous mitigation and conservation measures to remove or minimize direct or indirect effects of livestock grazing on desert tortoise. Conservative utilization levels throughout the allotment, where habitat overlap may occur, will ensure adequate residual forage remains to support desert tortoise. Therefore, the proposed action on the Copper Creek allotment, may affect individual Sonoran desert tortoise, but will not result in a trend toward federal listing or loss of viability.

10. **Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.**

    The Proposed Action will not violate Federal, State, and local laws or requirements for the protection of the environment. It is fully consistent with the Tonto National Forest Plan of 1985, *National Forest Management Act, Clean Water Act, Endangered Species Act, National Environmental Policy Act,* along with all other laws and requirements for the protection of the environment that the Tonto National Forest and the Forest Service must comply.

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Appendix A – Calculation of Animal Unit Months

Animal Unit Months (AUMs) is used to calculate forage consumption for livestock where a 1,000 pound cow is one Animal Unit (AU). Yearlings, which consume less than a full sized cow, would be considered 0.7 animal units and a nursing cow with a calf, which consumes more forage than a cow, that is not nursing is calculated at 1.32 animal units. An animal unit is then calculated by the number of months the animal is on the ground to give us Animal Unit Months.

The permitted number that could be authorized based on the 1997 Decision Notice and resulting 1998 Coordinated Resource Management Plan for the Copper Creek Allotment was 500 head of cattle yearlong with a calf heard of 375 to 950. If we assume that the 500 head are all nursing cows (so 1.32 Animal Units for twelve months) and calculate the 950 head as being yearlings on the allotment for four and a half months, then the maximum AUMs that could possibly be authorized under this current direction would be 10,912 AUMs.

Below is a graph with the authorized use (actual animals paid for to graze on the allotment) that has occurred on the Copper Creek Allotment from 1997 through 2016 based on grazing year.

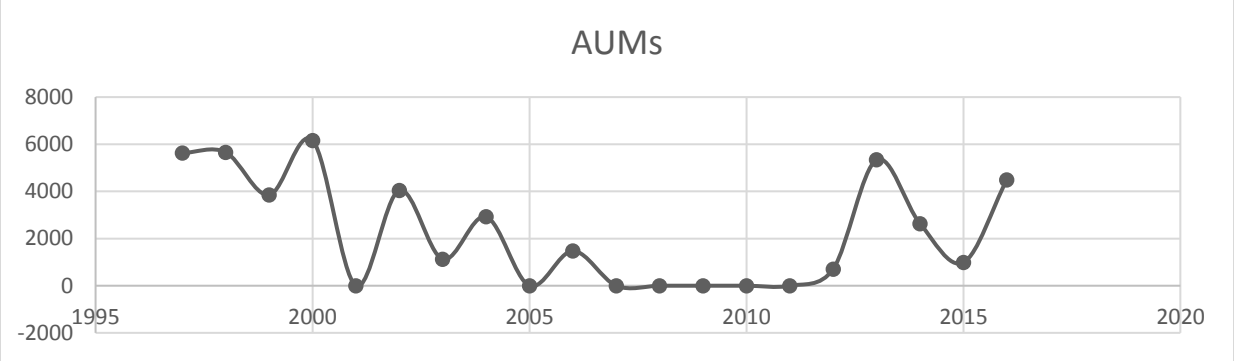

Figure 11: Authorized Grazing History for the Copper Creek Allotment from 1997 through 2016

**The number of AUMs listed for 2016 in this graph is different than that listed in Table 1 on page 14 of the Environmental Assessment due to this graph including the AUMs using the AU factor of 1.32 (Cow with calf) rather than just the adult cattle (AU of one) in the calendar year of 2016. 285 head as*

Under the Proposed Action in this Environmental Assessment the range of permitted AUMs that could be authorized would be between 2400 and 6787 AUMs with adult cattle calculated at one animal unit or 3168 AUMs and 8,707 AUMs if the calculation was completed with all nursing cows (1.32 AU conversion Factor). Under Alternative B, no AUMs would be authorized on the Copper Creek Allotment.