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Environmental Assessment

Tonto Basin, Walnut, 7/K Grazing Allotments

Tonto Basin Ranger District, Tonto National Forest

Gila County, Arizona

For Information Contact: Eric Hoskins
28079 N. Arizona Highway 188, Roosevelt, AZ 85545
(928) 467-32360 or ehoskins@fs.fed.us

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CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

The Tonto National Forest has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment (EA) discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Tonto Basin Ranger District Office in Roosevelt, Arizona (District); those documents have been summarized in this Environmental Assessment.

Allotment Description and Location

This analysis covers three allotments; Tonto Basin, Walnut and 7/K, totaling approximately 147,944 acres that are located in Gila County, Arizona and encircle Punkin Center, Arizona. The allotments range in elevation from 2,150 feet at Roosevelt Lake to 7,100 feet in elevation in the Mazatzal mountain range (Figure 1). These allotments fall within Management Area 5G, 5D, 6F and 6J as described in the 1985 Tonto National Forest Land Management Plan (Forest Plan).

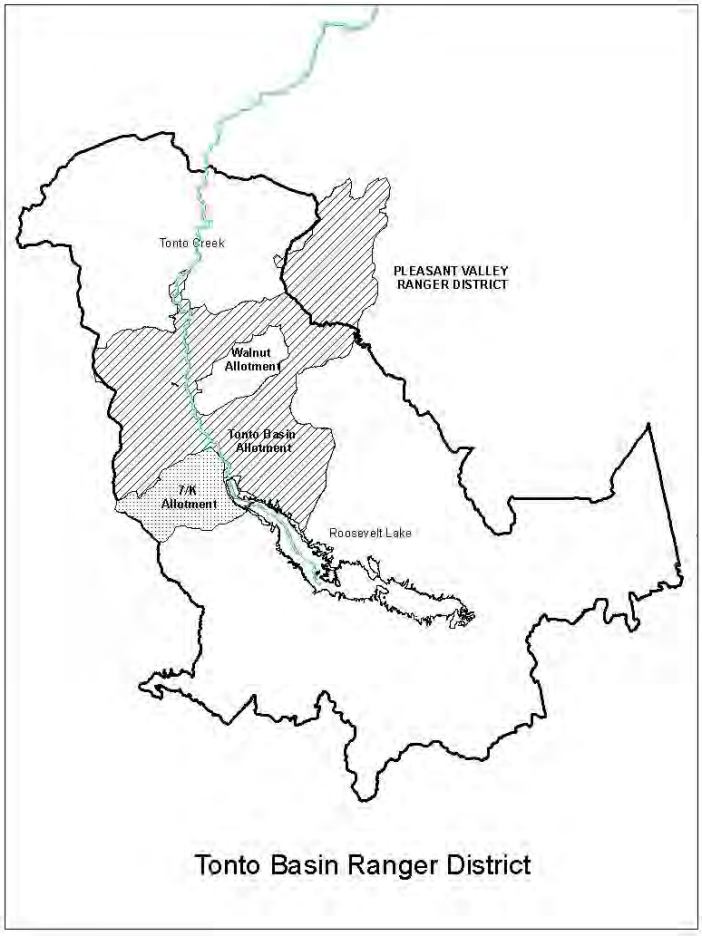

Figure 1- Project Area (Tonto Basin, Walnut, and 7/K Allotments)

Project Area Grazing History

Grazing on Tonto Basin, 7/K and Walnut allotments has a long and complicated history. Settlement of the area began in the mid-1800s. By the 1890s, a variety of livestock including sheep, cattle, horses and hogs were heavily stocked in the area and significant impacts to resources were occurring (Croxen 1926). Tonto Basin and Walnut Allotments were part of a large community allotment that included present-day Del Shay Allotment (fenced out mid-1930s). This community allotment was stocked by multiple ranching operations yearlong with little active management. Today, there are five distinct permits on the former community allotment: Del Shay, Tonto Basin (Northwest), Tonto Basin (Southeast), and Walnut. Del Shay Allotment will not be included in this assessment.

In the late 1980s and early 1990s the Central Arizona Project began work on raising the dam height for the Roosevelt Lake Dam; work associated with raising the level of the dam is commonly referred to as Plan 6. Under Plan 6 and in preparation of Roosevelt Dam being raised, which in turn would raise lake levels, the Forest Service and Bureau of Reclamation entered into an agreement for an accelerated range management re-evaluation to adjust allotment boundaries and move existing improvements or install new improvements based on the new expected lake level. It was during this time period that the previous Environmental Assessments were conducted on these allotments.

Decision Notices issued based on the Environmental Assessments for these allotments implemented rest rotation grazing systems across the three allotments in four separate herds with each herd entering any given pasture for a period of time between one and five months. After being grazed, each pasture would be rested for at least one full growing season. In addition numerous structural range improvements were authorized including water developments, and construction of pasture fences in order to implement the rest rotation grazing system and to allow for proper distribution of cattle across the allotments while reducing concentrated use around water sources.

In 1989 it was recommended by the U.S. Fish and Wildlife Service (USFWS) to the Bureau of Reclamation to fund construction and monitoring of the Tonto Creek Riparian Unit. This amendment to the Fish and Wildlife Coordination Act Report between the Bureau of Reclamation and the USFWS officially created the Tonto Creek Riparian Unit. The unit would address concerns for wildlife habitat lost when Roosevelt Dam was raised by Bureau of Reclamation (Ganada 2001). The unit is approximately 9,227 acres in size and is located around Tonto Creek between the northeast and southwest portions of the Tonto Basin Allotment (Figure 2).

The primary method of improving riparian habitat was expected to occur as a result of the change in livestock grazing management. Limited grazing was initially authorized within this Tonto Creek Riparian Unit during winter periods (mid-January to March); however, by the late 1990s, grazing was restricted due to concerns for threatened, endangered, and sensitive species within the unit (Ganada 2001). As a result, considerable inventory and monitoring of stream channel conditions and riparian vegetation was conducted during this period. Trends

in stream channel geomorphology and watershed conditions have been reported in (Hydro Science, 1996). Riparian photo point monitoring conducted along Tonto Creek has shown a significant increase in vegetation and cover since the mid-1990s.

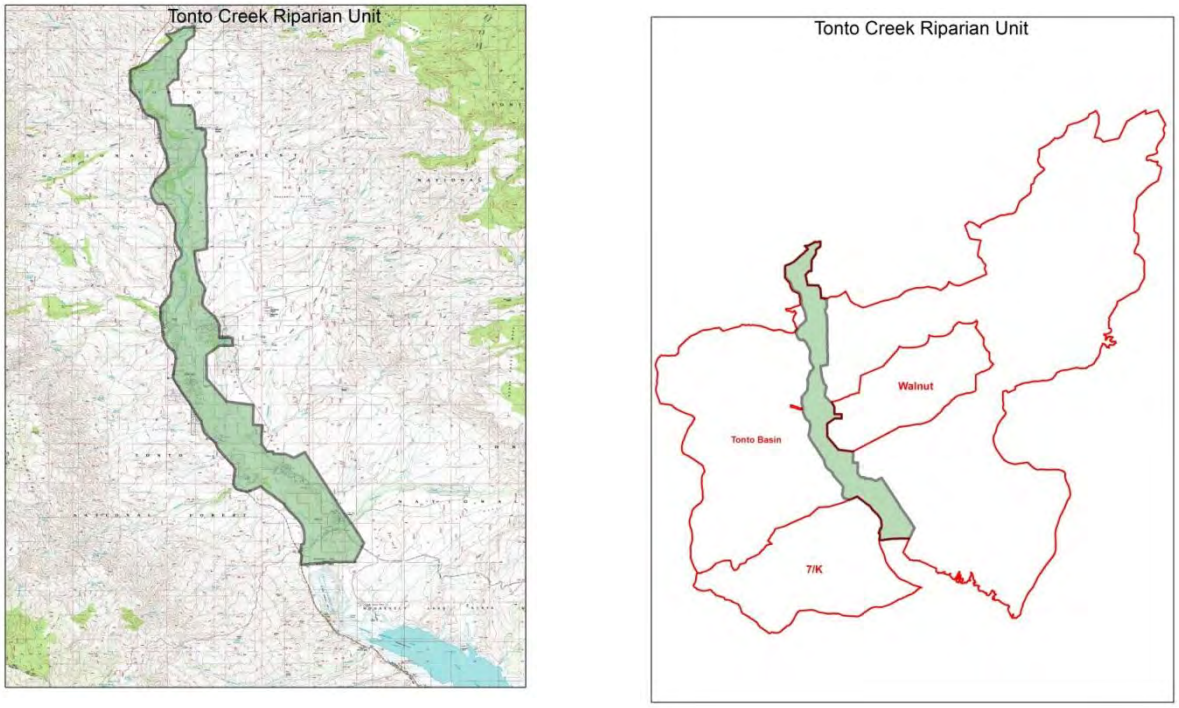

Figure 2 – Tonto Creek Riparian Unit (TRCU)

Tonto Basin Allotment

The Tonto Basin Allotment is approximately 118,552 acres and is divided into two separate management areas that are run under two distinct permits with a different herd of livestock and separate rotations on each permit; however, the Northeast portion was never physically fenced off from the Southwest portion of the Tonto Basin Allotment. The boundary between the two portions of the Tonto Basin Allotment is defined by mostly natural boundaries consisting of steep rugged terrain that has been effective at keeping the cattle separate when combined with herding and a drift fence but is recognized as needing a more permanent physical barrier if livestock numbers were to increase to what is currently permitted.

In 1994, an Environmental Assessment for this allotment was conducted and a Decision Notice with a Finding of No Significant Impact (FONSI) statement was signed on August 4th 1995. Consultation with the U.S. Fish and Wildlife Service at first concurred with the Forest Service's determination of No Effect on T&E species however the Southwestern Willow Flycatcher was listed in 1995 and had been identified as having occupied nesting habitat within the allotment in the Tonto Creek Riparian Unit (TRCU) in 1993.

As a result, the new determination on the decision for the Tonto Basin Allotment may have resulted in a possible jeopardy call for the flycatcher. In response to this, the Forest Service modified the decision and agreed to incorporate reasonable and prudent alternatives in consultation with the US Fish and Wildlife Service to achieve a non-jeopardy opinion on the

Southwestern Willow Flycatcher and a new Biological Opinion was issued from the USFWS on December 1st 1995.

Based on the Environmental Assessment (EA) and within the scope of the Biological Opinion from the USFWS, two separate Allotment Management Plans (AMPs) were signed for each section of the Tonto Basin Allotment, one on October 22, 1996 for the Northwest and the other on July 23, 1996 for the Southeast. This AMP authorized a deferred rest rotation grazing strategy and would officially separate the two Tonto Basin Allotments once all of the improvements were constructed. However, to date the dividing allotment boundary fence has not yet been built to physically separate the allotment into two parts. They are currently separated by other pasture fences. Some of the improvements outlined in the AMP for this allotment, including fences that would define some of the pastures, have yet to be built and other improvements have been destroyed by forest fires in the area.

Figure 3 shows the Tonto Basin allotment and pasture boundaries in the 1996 AMP.

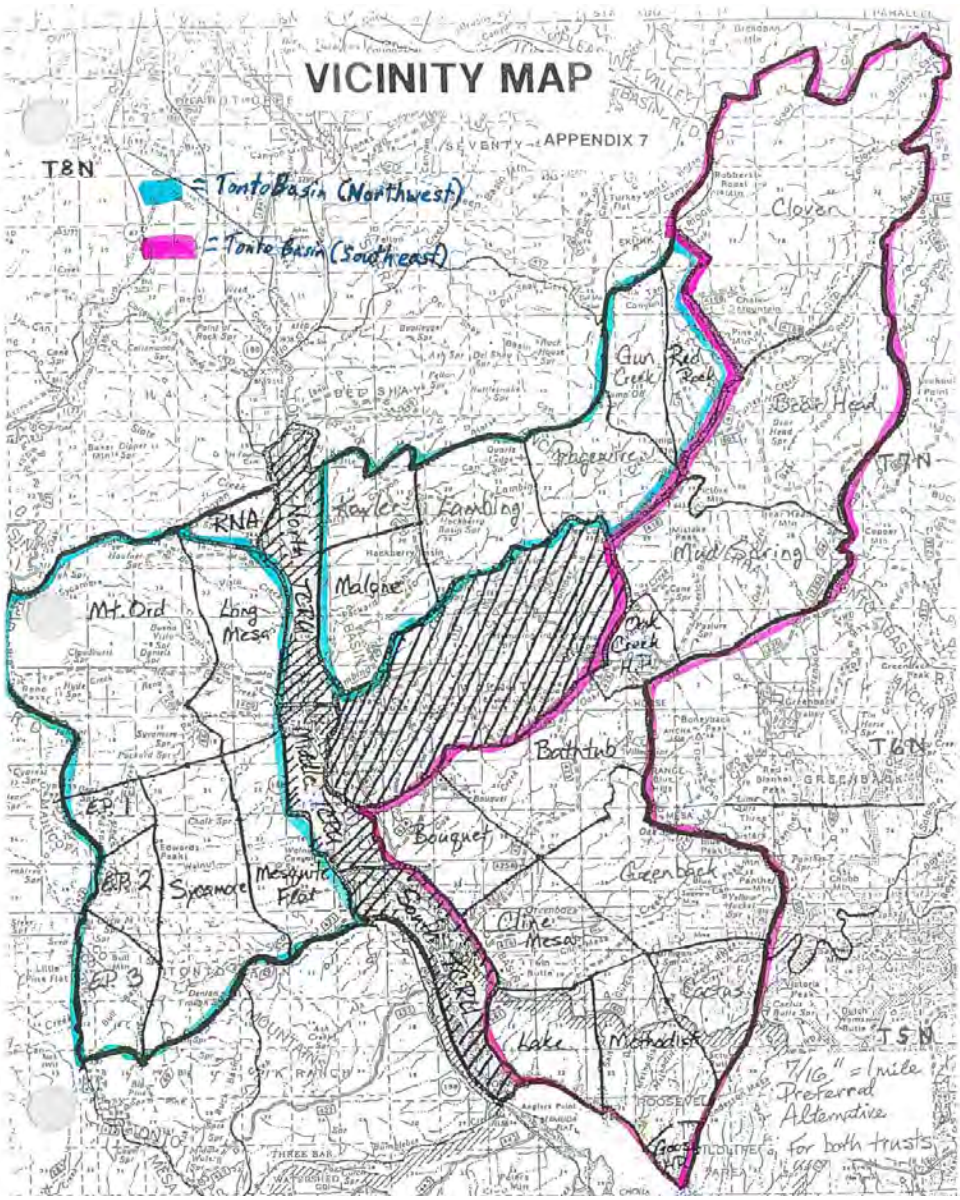

Figure 3 - Current Allotment boundaries for the Tonto Basin Allotment

Tonto Basin Allotment (Northwest)
The Northwest section of the Tonto Basin Allotment ranges from just south of Horse Canyon on the northern side to upper Lambing Creek on the eastern side, just north of FR 71 on the southern side and Edwards Park on the western side.

The 1996 AMP for this northwest part described a grazing system that included three separate grazing units: Page wire, Quartz Ledge and Edwards Park. According to the AMP, the Pagewire Unit was to have 3 pastures, each grazed for 6 months and rested for 6, 12, or 18 months. The length of rest was to vary for each pasture each year. The Quartz Ledge Unit was to contain 3 pastures each grazed for 6 months, with 12 months of rest. The Edwards Park Unit was to have of 3 pastures, each grazed for 6 months, with 12 months of rest. Grazing treatments were to change through the year and by season.

This management was to be implemented and managed through the yearly annual operating procedures as improvements were constructed. Although some of these projects were implemented others have not been completed or were destroyed by wildfires. Currently, the Quartz Ledge Unit and Edwards Park Unit have full rotations but the page wire unit is lacking pasture fences.

Under this Allotment Management Plan for the northwest section of the Tonto Basin Allotment, permitted numbers were approved for up to 568 cattle yearlong and 422 yearlings from January 1st until May 31st. This number of cattle for the Northwest portion of the Tonto Basin allotment was split between two permits one for 435 cows yearlong and 325 yearlings from January 1st through May 31st and another for 133 cattle yearlong and 97 yearlings from January 1st through May 31st.

In 2001 both permits were reduced by approximately 50 percent for noncompliance with the terms and conditions of the term grazing permit. One permit was reduced to 217 Cows and 162 yearlings and the other was reduced to 66 cattle and 48 yearlings. In 2002 all of the cattle were removed from the allotment as a result of the severe drought conditions that the Forest experienced. It wasn't until 2004 that cattle were restocked on the allotment, although significantly below permitted numbers, authorized cattle numbers have slowly been building through natural increase and have been managed on a rest rotation schedule based on resource conditions with typically shorter grazing periods than outlined in the previous AMP and similar or longer rest periods for each pasture.

In 2014, through an MOU with the permittee, the two permits for the Northwest section of the allotment were combined into a single permit keeping the combined permitted numbers the same. Current authorized numbers for this combined permit on the Northwest section of the Tonto Basin Allotment in 2015 was for 86 cattle and 4 bulls year long, with 20 yearlings from January 1 through May 31. The cattle are managed using a deferred rest-rotation grazing strategy.

Figure 4 shows the pastures and improvements as outlined in the 1995 Environmental Assessment and Decision Notice for the Northwest half of the Tonto Basin Allotment.

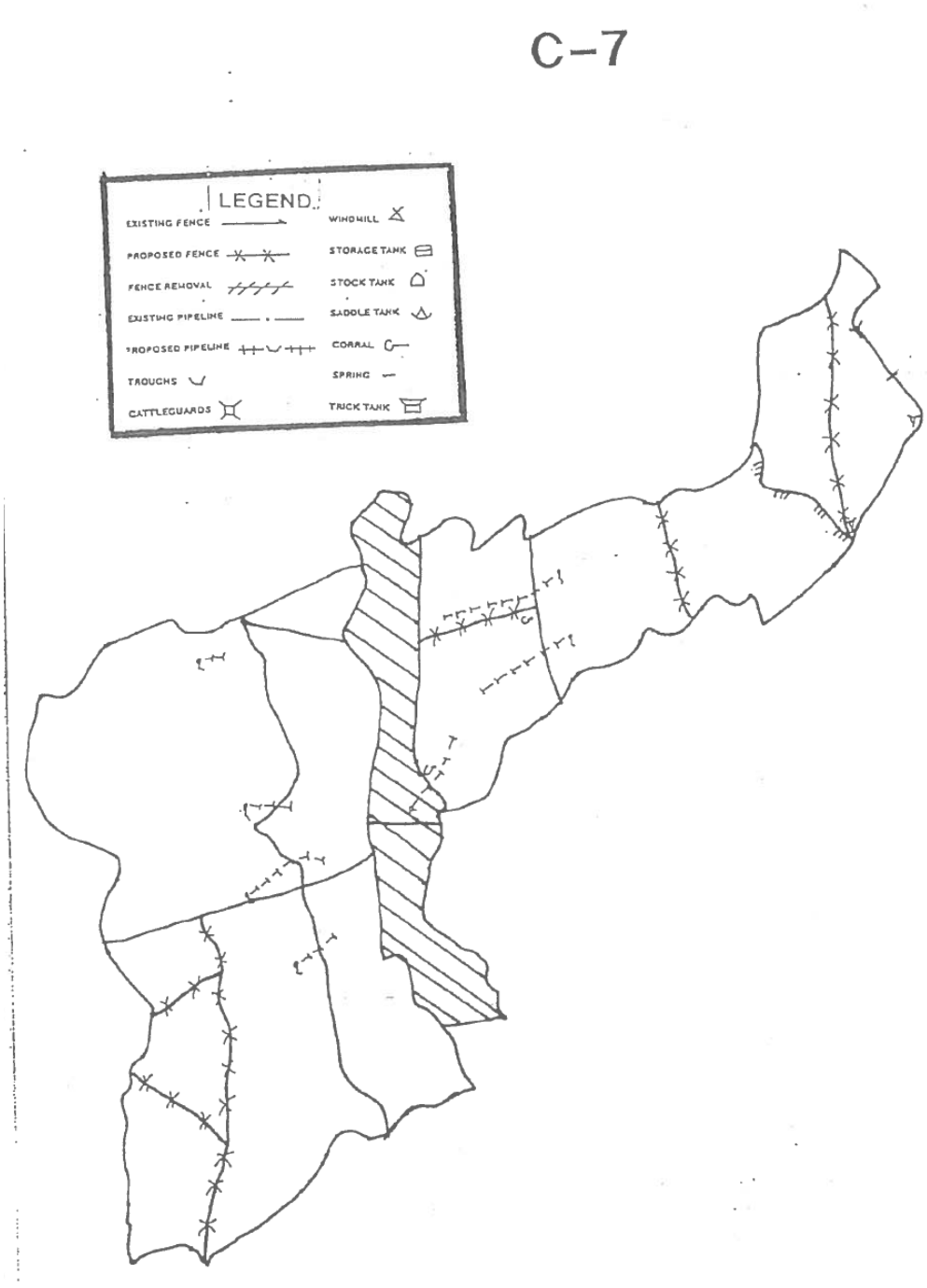

Figure 4 – Northwest section of the Tonto Basin Allotment
Figure 5 shows the authorized and permitted numbers of livestock since 1997 for the Northwest section of the Tonto Basin Allotment.

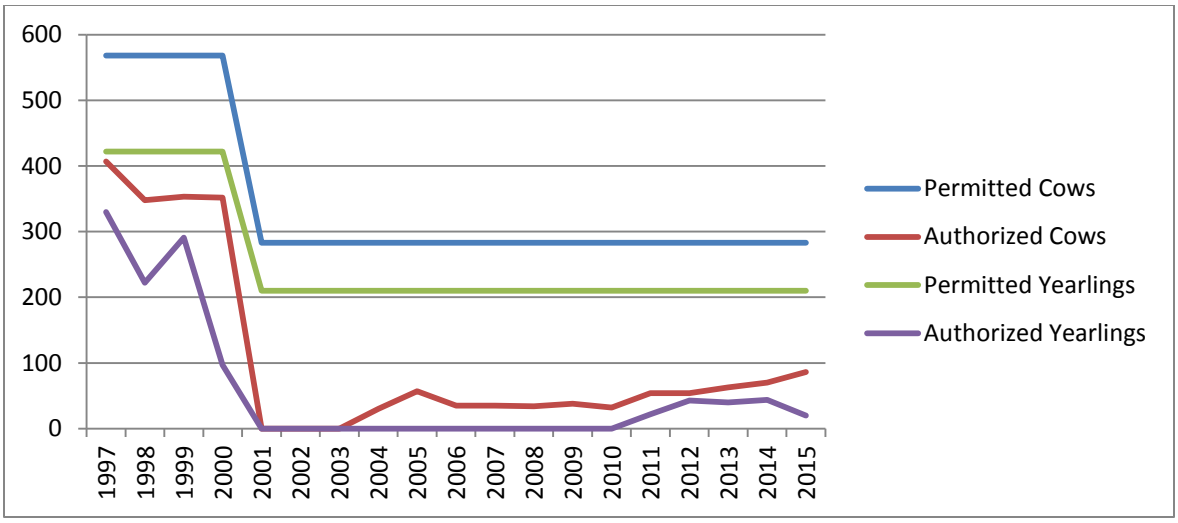

Figure 5 – Permitted and authorized cattle numbers, Tonto Basin Allotment (Northwest)

Tonto Basin Allotment (Southeast)

The Southeastern section of the Tonto Basin Allotment ranges from Brady and Buzzard Roost Canyons on the north, across Chalk and Bearhead Mountain east of FR 71, along Oak Creek to lower Greenback Creek, and down to Roosevelt Reservoir and Tonto Creek on the south and west end.

In 1996 an Allotment Management Plan for the Northwest section of the Tonto Basin Allotment was approved with permitted numbers of up to 533 cattle yearlong and 386 yearlings from January 1st until May 31st. The permit however was reduced by approximately 50 percent for noncompliance of the terms and conditions within the Term Grazing Permit to 266 cattle year long and 193 yearlings from January 1 through May 31.

In 2002 the Forest experienced severe drought conditions and all of the cattle were removed from the allotment. In 2004 a limited number of cattle were returned to the allotment and although significantly below permitted numbers, authorized cattle numbers have slowly been increasing through natural increase. Current permitted numbers are for 266 cattle year long and 193 yearlings from January 1 through May 31. While current authorized numbers for the Southeastern permit are 137 cattle year long and 75 yearlings from January 1 through May 31. Livestock on the southeast section of the Tonto Basin Allotment are managed using a deferred rest-rotation grazing strategy.

Figure 6 shows the pastures and improvements as outlined in the 1995 Environmental Assessment and Decision Notice for the Southeast section of the Tonto Basin Allotment.

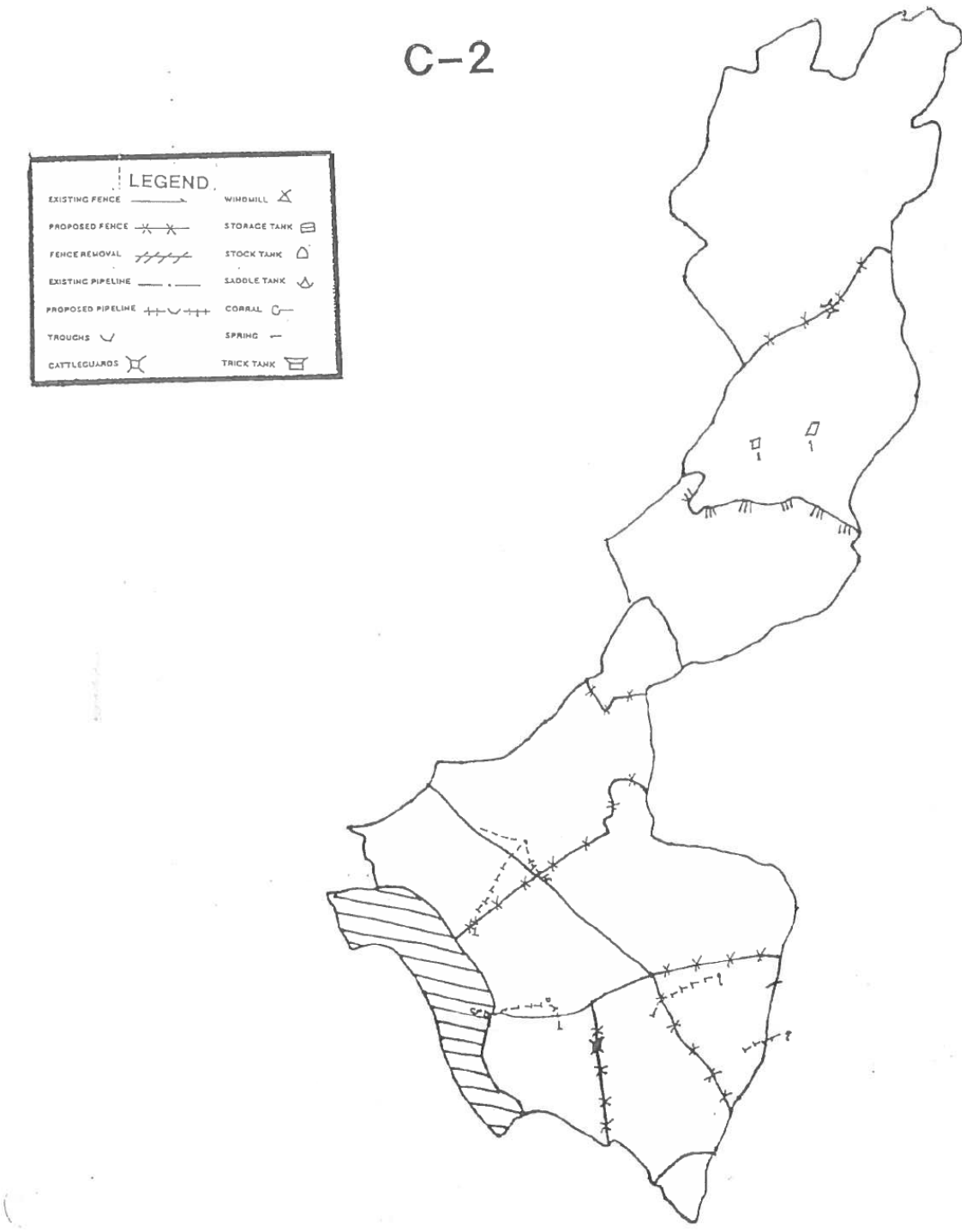

Figure 6 – Pastures and Structural Range improvements on the Southeast section of the Tonto Basin Allotment.

Authorized and permitted numbers of livestock since 2001 is listed in Figure 7.

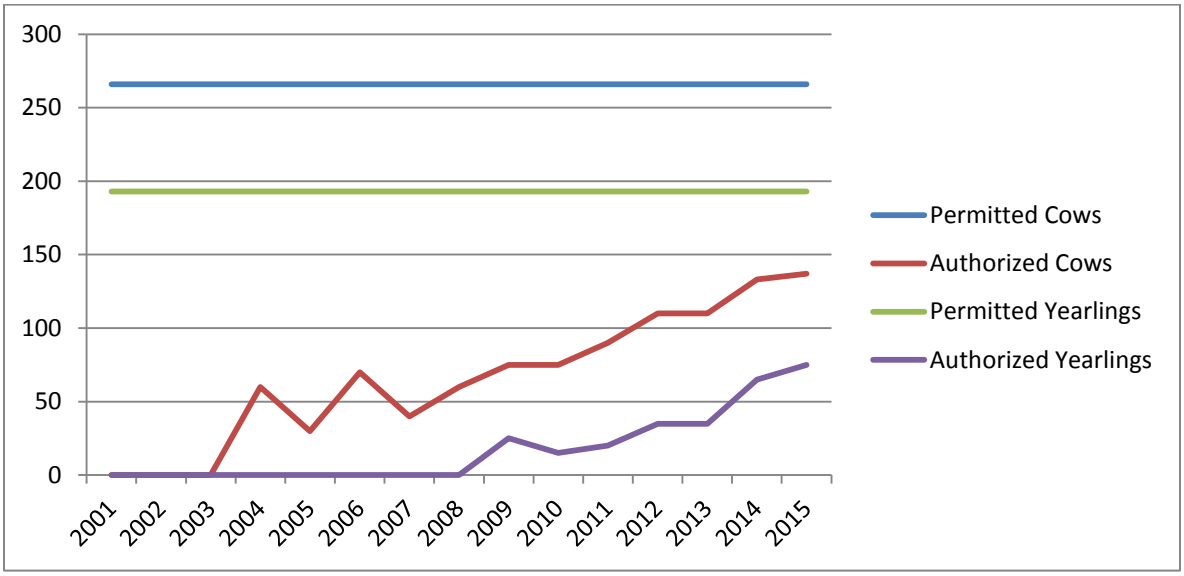

Figure 7 - Permitted and Authorized Numbers, Tonto Basin Allotment (Southeast)

7/K Allotment

The 7/K allotment is approximately 17,615 acres in size and is adjacent to Sycamore Creek on the north, the top of the Mazatzal Mountains on the west, Bumblebee Creek on the south, and Tonto Creek on the east. In 1973 an allotment assessment estimated the grazing capacity on the 7/K allotment to be approximately 3204 AUMs which is 659 AUMs above the current obligation of 2545 AUMs.

In 1992, an Environmental Assessment for this allotment was conducted with a Finding of No Significant Impacts and Decision Notice being signed on November 25th 1992. The Decision Notice following the 1992 EA implemented a modified Santa Rita grazing system[1] that rotates cattle through five pastures. The decision also authorized a number of range improvements to be constructed due to the lack of water within the allotment. Some of these improvements were implemented; however, others have yet to be constructed due to the Lone and Edge Complex Fires which substantially affected large portions of this allotment as well as concerns over drought and endangered species located near the allotment.

In 1999 livestock were voluntarily removed due to concerns with wildlife species management around Roosevelt Lake. Cattle were re-stocked in 2008; the current permit authorizes 150 cattle year long and 119 yearlings from January 1 through May 31. Currently there are, 135 cows, 10 bulls, 100 yearlings, and 5 stock horses authorized to graze on the allotment.
Figure 8 shows the 7/K pastures and structural range improvements that were approved in the 1992 Environmental Assessment and resulting Decision Notice.

[1] A type of rest-deferred grazing management system, that rests pastures from between 6 and 12 month out of the year and grazes them on a rotational basis for three or four months out of the year.

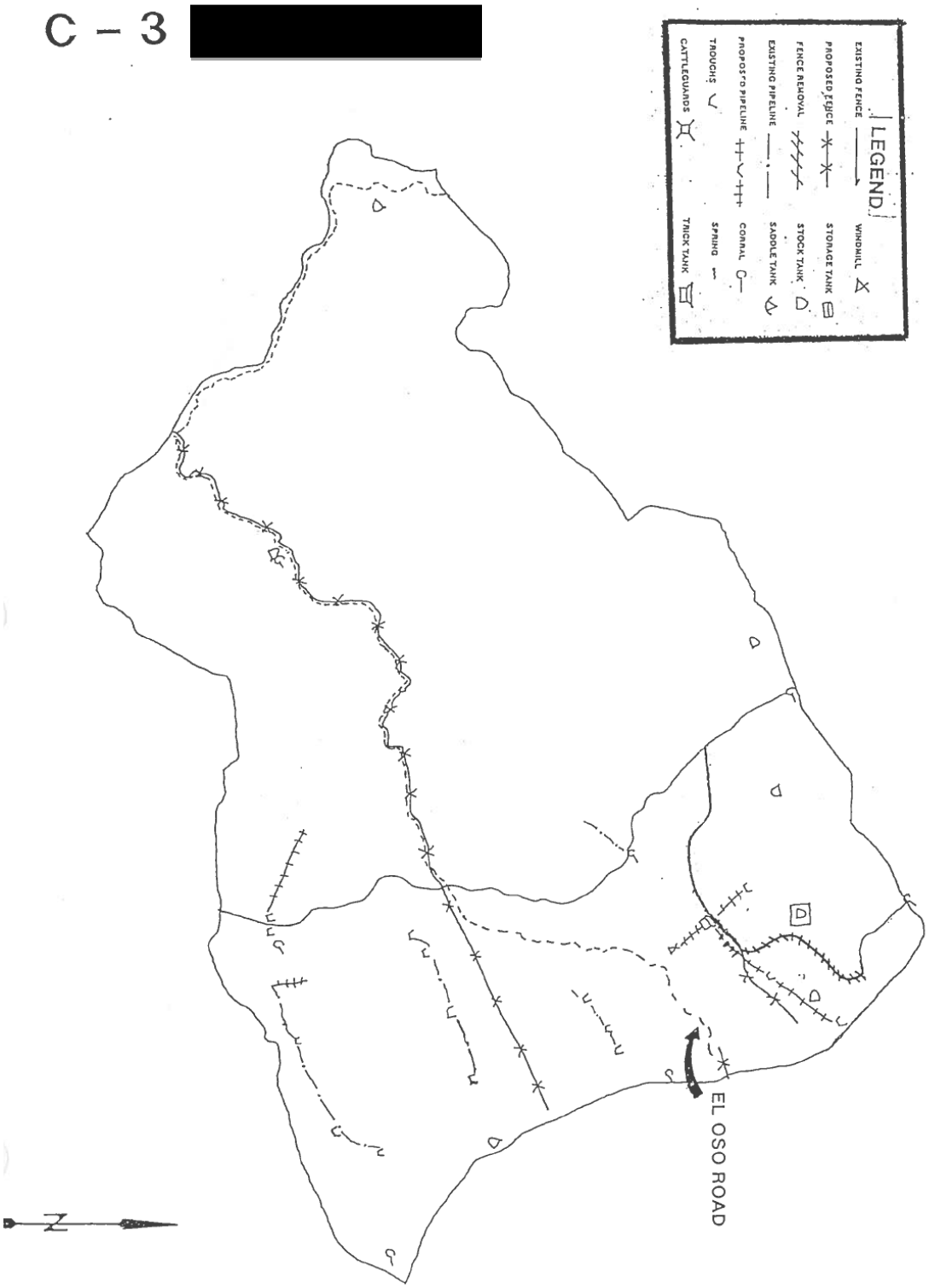

Figure 8 – 7/K structural range improvements

Figure 9 shows the authorized and permitted numbers of livestock since 1997.

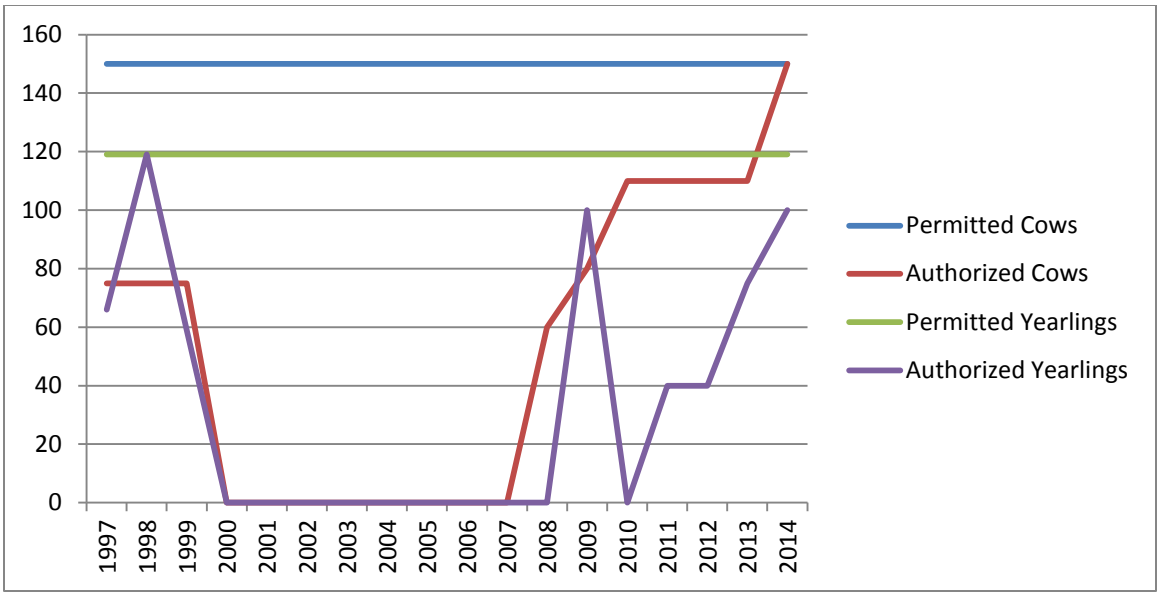

Figure 9 - Permitted and Authorized numbers for the 7/K Allotment

Walnut Allotment

The Walnut allotment is approximately 11,777 acres in size and borders FR 71 on the north, encompasses Walnut Spring and runs along a ridgeline above Oak Creek to the east, and borders FR 423 (Ewing Trail) on the west.

The Walnut Allotment was originally part of the larger community allotment; however, since the mid-1960s fewer than 200 adult cattle were grazed on what would be the Walnut Allotment each year, with fewer than 150 yearlings carried over. Then in 1972 the Walnut Allotment was officially fenced out of the Tonto Basin community allotment.

In 1988 a Production and Utilization Study was completed on this allotment estimating an average carrying capacity of 2,791 AUMs which is 575 AUMs above the permitted numbers at that time of 150 Cattle yearlong (1800 AUMs) and 119 yearlings from 01/01 – 05/31 (416 AUMs).

In 1992 an Environmental Assessment for this allotment was last completed with a Finding of No Significant Impacts and Decision Notice being signed on September 8th 1992. This decision implemented a modified Santa Rita grazing system and authorized the construction of associated structural range improvement projects.

In 2002 the Forest experienced severe drought conditions and it was decided to take off all of the cattle from the Allotment. All of the cattle were not removed so permitted numbers were reduced by approximately 50 percent for noncompliance. Cattle were re-stocked on the allotment in 2009 with the reduced permitted numbers of 75 cattle year long and 60 yearlings from January 1 through May 31. There are currently, 51 cows and 4 bulls, authorized to graze yearlong and 40 yearlings, authorized to graze from January 1st to May 31st.

Figure 10 shows the pastures and structural range improvements authorized in the 1992 Environmental Assessment and resulting Decision Notice for the Walnut Allotment.

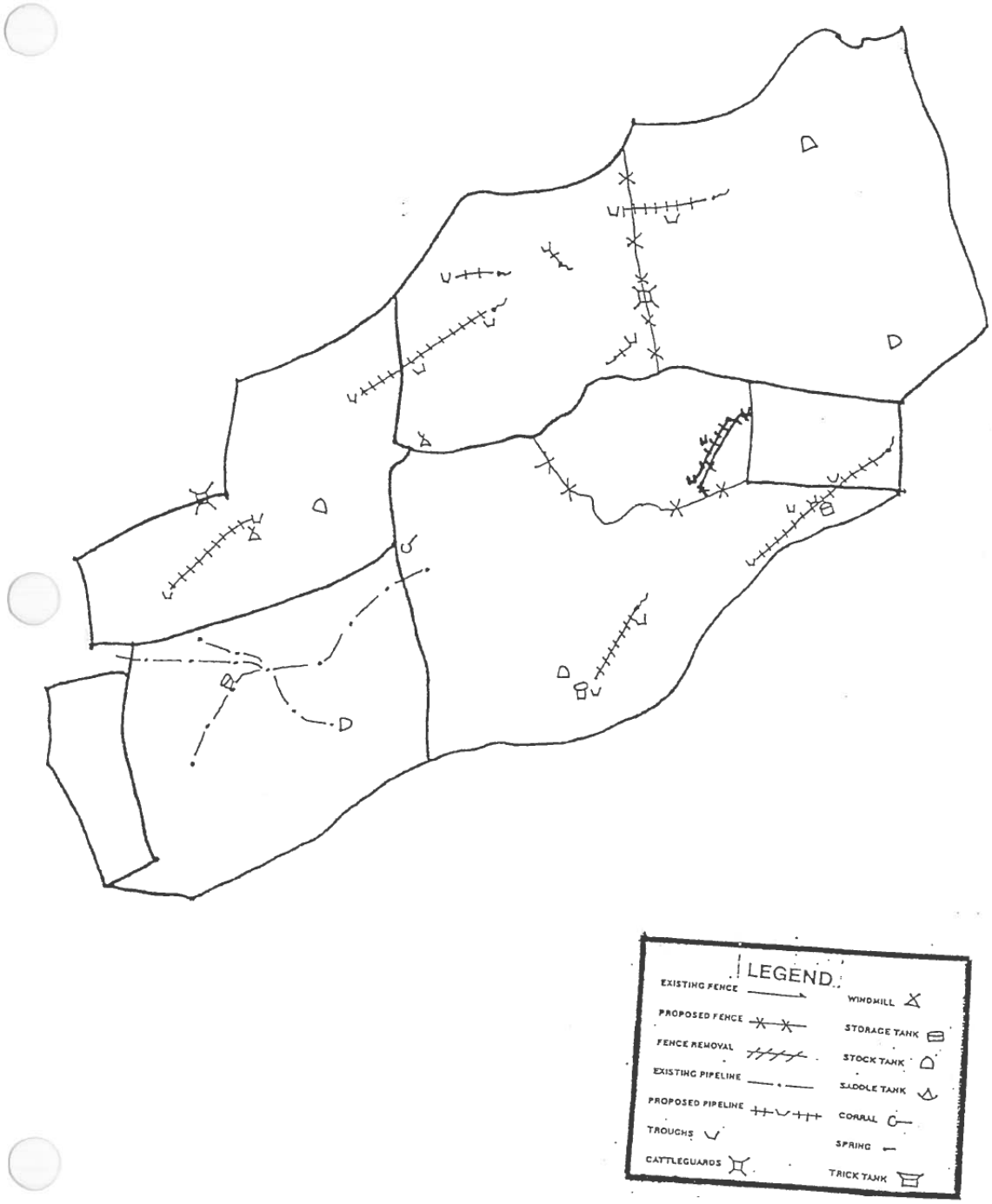

Figure 10 – Structural range improvements on the Walnut Allotment

Figure 11 shows authorized and permitted numbers of livestock since 1992.

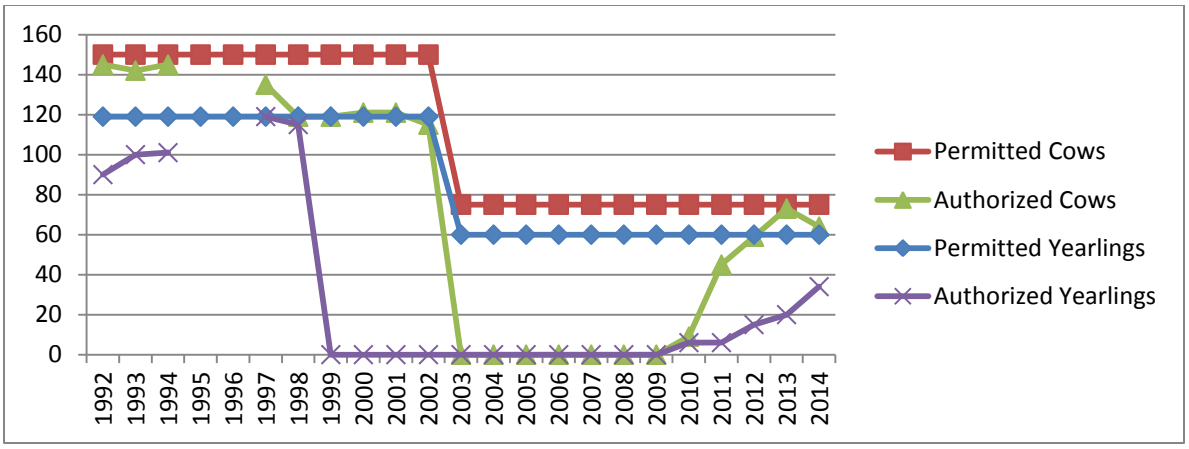

Figure 11 - Permitted and Authorized cattle on the Walnut Allotment

Existing Condition

Existing conditions in this section are limited to those resources that would be affected by grazing and do not represent the existing condition for all resources present within the Tonto Basin, Walnut and 7/K Allotments. This section will only address the existing conditions for range, vegetation, soils, watersheds, riparian areas and wildlife.

Existing upland and riparian conditions on the allotment have been measured utilizing the best available scientific information and most current data available, collected through standard agency procedures. Key areas are upland monitoring sites that are defined as a relatively small portion of the range selected because of its location, use, or grazing value as a monitoring reference point for grazing use. It is assumed that key areas if properly selected will reflect the overall acceptability of current grazing management over the range (Holechek et al. 2004). These key areas are utilized to collect implementation and effectiveness monitoring data such as plant composition, frequency of perennial plants, species vigor as well as soil and watershed condition as described in "Utilization Studies and Residual Measurements" (ITT 1999) that are representative across the allotment. A key area should be a representative sample of a large stratum, such as a pasture, grazing allotment, wildlife habitat area, herd management area, watershed area, etc., depending on the management objectives being addressed by the study.

Unlike key areas which are upland monitoring sites, key reaches are riparian monitoring sites that measure riparian vegetation attributes that are described in ITT (1999) and Burton (2011) or the most current acceptable method. Key reaches are used as indicator areas that are able to reflect what is happening within riparian areas as a result of on-the-ground management actions. Proper selection of key reaches requires appropriate stratification.

Each allotment contains multiple key areas and key reaches that are monitored to establish existing conditions on the allotments in order to determine if those conditions are moving towards the desired conditions as described in the Tonto National Forest Land and Resource Management Plan. While monitoring techniques as described above would be conducted in key areas and key reaches, these are not 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 are assessed at any given time to help make those decisions.

Range and Vegetation Condition

Lands on Tonto Basin, 7/K, and Walnut Allotments have been evaluated and determined to be suitable for grazing through Forest land management planning consistent with Regional direction. In order to manage vegetation and rangelands that have been determined to be suitable for grazing in compliance with laws, regulation and policy that emphasis sustainable use of this resource as well as ensuring resources are moving towards desired conditions as outlined in the Tonto National Forest Land and Resource Management Plan, information is gathered on vegetation specifically looking at palatable species that may be consumed by livestock as well as several other indicators that is associated with rangeland health. By looking at these indicators and knowing the palatable species of cattle within each pasture, key plant species are identified to be monitored at key areas. These areas are located approximately ¼ to ½ mile away from water in an area that is easily accessible to livestock but not along a trail or fence line. Monitoring key plant species at these key areas, provide us the best opportunity to observer changes occurring to vegetation within each pasture in order to make appropriate management changes.

One of the factors included in surveying a site, is the composition of three classes of plant species: decreasers, increasers, and invaders, which aids in assessing whether a particular site is in an early or late stage of succession. Decreasers are plants preferred by livestock, which decrease in abundance if an area is overgrazed. These decreasers are then replaced by other plants that initially increase in abundance. If grazing pressure continues, increasers are then replaced by invaders. Therefore, successional stage could be determined by what proportion of the vegetation, measured by percent composition, were decreasers, increasers, or invaders; the greater the proportion of decreasers, the better the condition of the area, while the greater the proportion of increasers or invaders, the poorer the condition (Dyksterhuis, 1951, National Research Council, 1994).

In the 1950s and 1960s Parker Three-Step monitoring transects (Cluster (C)) and pace transects (PT)) were established in key areas on the allotments. This monitoring method was to provide information on range condition to be used for management planning and decision making. The goal of establishing these monitoring sites was to re-read the transects on a ten year basis to determine an overall vegetation trend; however information based on these locations were not re analyzed until 2009.

In 1994 an interagency Team consisting of representatives from the Forest Service, Bureau of Reclamation, Arizona Game and Fish Dept., Arizona Cattlegrowers, Arizona State University and the University of Arizona Extension Service helped in creating this rangeland monitoring plan designed and implemented to determine response of management to eleven allotments bordering Roosevelt Lake and Tonto Creek as a result of the adjustment to the offset of land lost due to the increased lake level as a result of “Plan 6” which increased the dam height at Roosevelt Lake. This monitoring technique implemented a basic line intercept monitoring plan to capture canopy cover and diversity on woody species as well as a ground cover monitoring technique using a one square foot hoop.

In 2009 using points on maps and the photographs from the original Parker Three-Step Monitoring sites, an effort was made by the district to find and read these monitoring transects. Only a few stakes associated with the monitoring technique could be found. With such long time periods between monitoring of the sites, trend could not be determined based on recent grazing management as outlined in each allotment's AMP. Only general observations could be made based on these locations. These general observations show that across the Tonto Basin District, within the Sonoran and Semi-Desert grasslands, there appears to be a transition from open areas with more perennial grass at lower elevations to perennial grasses moving up in elevation and more annual grasses in the lower elevations, with overall increase in shrubs resulting in greater canopy cover in both the Sonoran desert and semi-desert grasslands.

In 2014 locations for the Plan Six monitoring sites where identified and the photographs for these sites were retaken, data collection at some of these sites occurred in 2015 with continuing efforts ongoing. Based on the repeat photography and initial data collection, each key area has been evaluated for vegetation composition and ground cover. The method of data collection used in the Plan 6 key areas gives only limited reliable data including qualitative observations from the photographs and general quantitative data in the form of plant composition and some canopy and ground cover information; however due the limited sample size for each key area, the data gathered from this technique is probably not statistically accurate enough to make management decisions based on this information alone.

Additional information about monitoring techniques is located in Chapter 2 under Inventory and Monitoring Techniques. The data along with photographs from each key area is located at the Tonto Basin Ranger District and summarized in the Range Report.

Soil Condition

No systematic soil condition inventory has been conducted. The soil condition data presented in this report should be viewed as an approximation. Areas with less than satisfactory soil condition are a result of past wildfires and past and current management practices. Various field inspections have determined that generally the flatter Sonoran Desert soils tend to be in unsatisfactory condition largely due to compaction and a lack of ground cover. Some of the semi-desert grassland soils appear to have problems with erosion and lack of ground cover. Generally these are in impaired condition and occur on soils derived from granite. Data collected for TEUI have noted rills and gullies on granitic soils. Soils in chaparral, pinyon-juniper, and ponderosa pine communities generally have sufficient ground cover to control erosion. Accelerated soil loss occurred in many areas burned by the 1996 Lone Fire. These areas have generally recovered and are stable. Some chaparral areas were burned in 2005 by the Edge Complex or Three Fires. Many of these areas which suffered accelerated soil erosion have begun to stabilize but may still be experiencing excessive erosion in some places. The vegetation has re-sprouted in these areas but litter cover may not have reached pre-burn conditions. Streams within much of the burned area were impacted by post-fire flooding and have not fully recovered.

Microbiotic crusts are communities of organisms living on soil surfaces and are commonly found in semiarid and arid environments. Crusts play an important ecological role in the environment including increasing soil stability, reducing erosion, fixing atmospheric nitrogen, and contributing nutrients to plants. In deserts, well-developed biological soil crusts can inhibit germination of exotic plant species. Biological crusts are currently sparse on Sonoran Desert portions of these allotments.

Watersheds and Riparian Condition

Riparian areas and springs on these allotments have been relied upon as a primary source of livestock water for many years, causing stream channels and adjacent riparian areas to receive concentrated grazing pressure. Existing conditions of watersheds, stream channels and riparian areas have been affected by many factors, both natural and human caused. Natural disturbances such as drought, fire, and flooding have likely been exacerbated by human activities. Based on a long history of grazing in Tonto Basin and associated changes in upland and riparian vegetation, it seems likely that prior to the 1870s there were more miles of perennial stream reaches and acres of riparian vegetation than currently exist (Croxen 1926; Haskett 1935; Hendrickson and Minkley 1984; Heffernan 2008).

There are at least 192 miles of named and/ or riparian stream channels and at least as many unnamed drainages across these allotments. Of this, 53.1 miles are currently supporting riparian vegetation. Dominant riparian species include sycamore (*Platanus wrightii*), cottonwood (*Populus fremonti*i), red willow (*Salix laevigata*), Goodding's willow (*Salix gooddingii*), desert willow (*Chilopsis linearis*), ash (*Fraxinus velutina*), cattail (*Typha spp.*), seep willow (*Baccharis salicifolia*), sedges (*Carex spp.*), rushes (*Juncus spp.*), deergrass (*Muhlenbergia rigens*), water cress (*Nasturtium officinale*), and monkey flower (*Mimulus spp.*). Non-native species include Bermuda grass (*Cynodon dactylon*) and salt cedar (*Tamarix spp.*). Upper Lambing Creek supports a population of broadleaf lupine (*Lupinus latifolius leucanthus*).

Some of the stream channels assessed in the project area are in impaired or unstable condition (Mason and Johnson 1999) in a large part due to lack of riparian vegetation. These streams are less able to resist the erosive forces of flood waters, even during smaller events of lower water velocities (Janicke 2000). When large flood events with high water velocities occur, the channels experience severe erosion and/or aggradation causing heavy loss of riparian vegetation. Across the project area there are 42 riparian photo monitoring points, in 2014 the non-profit group "Friends of the Tonto" began helping the Tonto National Forest with this repeat photography making the locations and photos public on their website http://www.friendsofthetonto.org/photopoint-map.html.

Desired Conditions

Desired Conditions for the Tonto Basin, Walnut and 7/K Allotment are based on Forest Plan guidance, policy in Forest Service Handbooks and Manuals as well as best available science as it relates to site-specific conditions of the allotments. Desired Conditions by resource are described in greater detail in chapter 3 for range/vegetation, soils, watersheds/riparian areas and wildlife.

Range and Vegetation

The desired condition for rangelands on the Tonto Basin, Walnut and 7/K allotments is to manage for maintenance or improvement of preferred herbaceous and browse species for cattle and native ungulates, as well as maintenance or improvement in canopy and basal cover for soil protection. In desert scrub communities this would include browse species such as jojoba and range ratany. In semi-desert grasslands, management would strive for maintenance or an increase in "decreaser" and "increaser" herbaceous species such as sideoats grama, curly mesquite, and three-awn.

Soils

Forest resource managers desire to have all soils in satisfactory condition as described in FSM 2509.18-99 however this is a long-term goal. Complete recovery of all soils is unlikely to occur within ten years. Rates of recovery would differ depending on several factors such as magnitude of past soil loss, inherent soil properties, current vegetative ground cover, and type of ecosystem. Desired condition for soils can be summarized as follows:

- Maintain or improve soils currently in satisfactory condition
- Improve soils in impaired condition so they are attaining or moving towards satisfactory condition
- Improve soils in unsatisfactory condition so they are attaining or moving towards impaired or satisfactory condition
- Increase the amount of microbiotic crust on Sonoran Desert soils

Hydrology/Riparian

Desired conditions for key reaches include both short-term and long-term timeframes. The most important short-term desired conditions are:

- Maintain residual herbaceous vegetation along the greenline or streambank whenever precipitation is expected
- Re-introduce riparian vegetation if native riparian species are absent
- Minimize the annual impacts to seedling and sapling riparian woody species
- Limit physical impacts to alterable streambanks and greenlines

The most important long-term desired conditions are:

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

Wildlife

General wildlife resource goals for the Tonto National Forest are outlined on page 20 of the Forest Plan and include providing for species diversity, maintaining viable populations of existing species, improving habitat for selected species, and managing to increase population levels of threatened and endangered species.

Differences between Existing and Desired Conditions

Soils

Impaired soils exist within the project area, it is the desired condition to have all soils in satisfactory conditions as described in FSH 2509.18-99-1; however, this is a long-term goal. Complete recovery of all soils is unlikely to occur within 10 years. Rates of recovery will differ depending on several factors such as magnitude of past soil loss, inherent soil properties, current vegetative ground cover, and type of ecosystem.

7/K Allotment

- Maintain or improve the approximately 60 percent of soils currently in **satisfactory condition**.
- Improve the approximately 25 percent of soils that are in **impaired soil condition** so that they are reaching or moving towards **satisfactory condition.**
- Improve the approximately 15 percent of soils that are in **unsatisfactory soil condition** so that they are reaching or moving toward at least **impaired condition.**

Tonto Basin Allotment

- Maintain or improve the soil currently in **satisfactory condition**.
- Improve approximately 25 percent of the allotment in **impaired soil condition** so that the soils are reaching or moving towards **satisfactory condition.**
- Improve approximately 25 percent of the allotment in **unsatisfactory soil condition** so that the soils are reaching or moving toward at least **impaired condition.**
- Increase the amount of microbiotic crust in the Sonoran Desert

Walnut Allotment

- Maintain or improve the soil currently in **satisfactory condition**.
- Improve approximately 24 percent of the allotment in **impaired soil condition** so that the soils are reaching or moving towards **satisfactory condition.**
- Improve approximately 34 percent of the allotment in **unsatisfactory soil condition** so that the soils are reaching or moving toward at least **impaired condition.**
- Increase the amount of microbiotic crust in the Sonoran Desert.

Watershed and Riparian

Twenty-four riparian areas on Tonto Basin Allotment, identified below, have potential to improve within a relatively short time period (10 years), and have been identified as key reaches for this analysis. Key reaches, similar to upland key areas (ITT 1999), are stream channels/ springs/ riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key species. Key reaches are synonymous

with designated monitoring areas (DMA's) defined by Burton et al. 2011) as the location where monitoring occurs.

Figure 17: Key reaches, Tonto Basin Allotment

Pasture	Streams
Clover/Bearhead	Clover Spring, Rock Creek, Bear Head Canyon, Lambing Creek, Maverick Basin, Upper Mud Spring, Gun Creek, Juniper Canyon
Lambing	Lambing Creek
Methodist/Bathtub	Oak Creek and Oak Creek Spring, Methodist Creek, Greenback Creek
Bouquet/Cline	Greenback Creek
Mt. Ord	Sycamore Canyon & tribs, Park Creek, Reno Creek
Sycamore	Walnut Canyon, Sycamore Creek
Long Mesa	Park Creek, Reno Creek
Mesquite Flat	Walnut Canyon

Four riparian areas on 7/K Allotment, shown below, have potential to improve within a relatively short time period (10 years), and have been identified as key reaches.

Figure 18: Key reaches, 7/K Allotment

Pasture	Streams
Buck Basin	Ash Creek, South Fork Sycamore Creek
Mountain	Bumblebee Creek
Ash Creek	Bumblebee Creek

Six riparian areas on Walnut Allotment, identified below, have potential to improve within a relatively short time period (10 years), and have been identified as key reaches.

Figure 19: Key reaches, Walnut Allotment

Pasture	Streams
Juniper I	Juniper Canyon
Juniper II	Juniper Canyon, Hymn Book Spring
Holding	Walnut Creek
Edward Spring	Walnut Creek, Edwards Spring

Purpose and Need for Action

The purpose of and need for this proposed action is for authorization of livestock grazing in a manner that maintains and/or moves toward Forest Plan objectives and 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 (Forest Plan) Continued domestic livestock grazing is consistent

with goals, objectives, standards and guidelines of the Forest Plan for lands occurring within Management Areas 5G, 5D, 6F, and 6J. (Forest Plan).

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)*

There is a need to develop a new livestock management plan that will maintain or continue to move toward desired conditions.

Summary of Proposed Action

The Tonto Basin Ranger District, Tonto National Forest, proposes to reauthorize domestic livestock grazing by cattle on the Tonto Basin, Walnut and 7/K Allotments using a rotational grazing system. The proposed action would authorize stocking rates and range improvement projects as described in Chapter 2.

Management Direction

Tonto National Forest Plan identifies goals and objectives for range, wildlife, riparian, soils, and water programs on the Forest as described under Desired Conditions for each resource. The Multiple Use Sustained Yield Act states that management of the National Forests must provide "sustained yields in perpetuity without impairment of the productivity of the land" (FSM 2550.1 Authority 1).

FSM 2550.3 policy states "Manage forest and rangelands in a manner that will improve soil productivity".

FSM 2521.03 objectives state "Manage terrestrial ecosystems and NFS watershed to protect soil productivity and hydrologic function. Implement soil and water conservation measures with management activities to maintain satisfactory or optimum watershed conditions."

Decision Framework

The Tonto Basin District Ranger is the official responsible for decisions regarding management of these allotments. As a result of this analysis, the District Ranger will issue a decision notice that includes a determination of significance of environmental effects and whether an environmental impact statement (EIS) will be prepared. If the District Ranger determines there are no significant issues warranting an EIS, the decision will be documented in a Decision Notice. Implementation of a decision would continue to authorize livestock grazing through issuance of new term grazing permits. Allotment management plans and annual operating instructions would include any management actions, design features, mitigation measures, and monitoring requirements necessary to implement the decision. These documents would also describe permitted numbers of animals, season of use, allowable utilization standards, and terms for grazing permits.

Project History

On November 4th 2008 a project initiation letter was sent out identifying the need for further analysis on the Tonto Basin, Walnut, and 7/K Allotments. On February 9th 2009 a scoping letter was sent out to the public for comments on the proposed action. Based on these comments and internal meetings, the Interdisciplinary Team put together for this project, further developed the proposed action and created alternatives. A draft Environmental Assessment (EA) disclosing the alternatives and the effects of each alternative was released for public comment on August 9th, 2012. Based on the information received from the public comments, additional information was added to the draft EA. A draft Biological Assessment based on the proposed action was sent to the US Fish and Wildlife Service on March 20th 2013. Through informal and then formal consultation, design features were added to the Draft EA. A Biological Opinion was received from US Fish and Wildlife Service on July 24th 2014.

On August 5th 2014 a draft decision was issued on the Tonto Basin, Walnut and 7/K Grazing Allotment Environmental Assessment for the 45 day objection period. Two objections were received on this Draft Decision and after a Regional Review of the EA and the Draft Decision, it was determined that a revision of the EA needed to be completed in order to disclose potential site specific effects of the actions for each alternative as well as clearly analyze and describe the actions that may be taken under the adaptive management strategy described in the EA. This document is a revision of the Draft EA for the Tonto Basin, Walnut and 7/K Grazing Allotment Environmental Assessment as in accordance with recommendations from the Regional Review Team and based on objections received from the draft decision document. The structure of the document has also been slightly rearranged for clarity and ease of reading.

Public Involvement

Forest Service range personnel met with all permittees for these allotments in 2008 and again in 2011 and 2012 to develop and refine proposed actions for each allotment. All permittees were invited to join interdisciplinary team members collecting data in 2008 and 2009. The proposal was listed in the Schedule of Proposed Actions on May 2, 2011. The proposal was provided to the public and other agencies for comment during scoping May 2 through June 3, 2011. Using comments from the public, local permittees, other federal and state agencies, Forest specialists, and tribal liaisons (see *Issues* section), the interdisciplinary team developed a list of issues to address. Forest range, soils, and wildlife personnel along with the District Ranger held a field trip for permittees in July 2012 to discuss soil conditions in Sonoran desert pastures, and met with permittees following the field trip to discuss soil and wildlife concerns and management implications. A draft Environmental Assessment was provided to permittees and the public for comment in August 2012. On August 5th 2014 a draft decision was released to the public for objections, based on the two objections received additional information is being included in this revised draft EA.

Issues

The Forest Service separated issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the

proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

The Forest Service identified grazing impacts to riparian areas as an effect of implementing the proposed action of reauthorizing livestock grazing on the three allotments during review of comments received from the public. Livestock use of streams and springs will be addressed through design features described in Chapter 2 of this document. Additionally, public and internal concerns for desert soil, vegetation conditions and proximity to Threatened and Endangered Species were identified as being effected and were addressed through modification of the proposed action as well as development of an alternative to the proposed action.

CHAPTER 2: ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares alternatives considered for the project. This section also presents alternatives in comparative form, sharply defining differences between each alternative and providing a clear basis for choice among options by the decision maker and public. Some information used to compare alternatives is based upon design of the alternative and some information is based upon environmental, social and economic effects of implementing each alternative.

Alternatives

Alternative 1

No Action/ No Grazing

Forest Service Policy (Forest Service Handbook 2209.13) requires the Forest Service to identify no grazing as the no-action alternative. Under the No Action alternative, term grazing permits for these allotments would be cancelled following guidance in *36 CFR 222.4* and *FSM 2231.62*. Maintenance of Adjacent Allotment Boundary Fences would be transferred to adjacent permittees where applicable. The agency, would determine whether to maintain existing improvements for wildlife or recreational benefit and whether any improvements should be removed from the allotments for safety or aesthetic purposes. Removal of designated range improvements would occur over a number of years using a combination of volunteers, agency staff and through coordinating partnerships.

Alternative 2

Proposed Action

Authorization
The Tonto Basin Ranger District, Tonto National Forest, proposes to reauthorize livestock grazing on the Tonto Basin, Walnut and 7/K Allotments.

Grazing for these allotments will be authorized under a managed rotational grazing system that rotates cattle though a number of pastures within each allotment. As cattle are moved from one pasture to the next, all cattle will be removed from the previous pasture within one week on either side of the move date and the pasture will be allowed to have complete rest until the following year or until such a time that the pasture has sufficiently recovered to allow cattle back into the pasture.

Yearly authorized numbers of cattle would be within the permitted numbers and could fluctuate depending on monitoring, precipitation or other resource concerns. Specific dates for grazing and yearly pasture rotations would be authorized on an annual basis through the issuance of Annual Operating Instructions (AOI). The rotation and timing of use for each pasture will be within the design features common to alternatives two and three. Additionally, adaptive management changes may occur during the grazing season to protect resources as outlined in the adaptive management section. Initial/minimum stocking rates will be for the number of cattle currently authorized. Annual authorized livestock numbers may be adjusted from initial stocking levels. A stock and monitor approach, consistent with regional Forest Service direction *R3 Supplement to FSH 2209.13 chapter 90,* will be used to establish grazing capacity over the long term (five to ten years). Actual permitted levels of grazing will be determined annually by the Tonto Basin District Ranger with the permittee based on the results of monitoring and successful implementation of management practices.

Permitted numbers to be authorized under this Alternative are outlined in Figure 20. Proposed permitted numbers compared to previously permitted numbers and how some allotments were affected by a 50 percent non-compliance issue is outlined in Figure 21.

Allotment	Type	Number	Dates Authorized
Tonto Basin (Northwest)	Cow/Bull	342	Yearlong
	Yearling	262	January 1st – May 31st
Tonto Basin (Southeast)	Cow/Bull	266	Yearlong
	Yearling	193	January 1st – May 31st
Walnut	Cow/Bull	150	Yearlong
	Yearling	119	January 1st – May 31st
7/K	Cow/Bull	150	Yearlong
	Yearling	119	January 1st – May 31st

Figure 20 - Proposed Permitted numbers under the proposed Alternative

Allotment	Prior to Non-Compliance and authorized through previous NEPA	Current	Proposed
Tonto Basin (Northwest)	568 Cow/Bull 422 Yearlings	283 Cow/Bull 210 Yearlings	342 Cow/Bull 262 Yearlings
Tonto Basin (Southeast)	533 Cow/Bulls 386 yearlings	266 Cow/Bull 193 Yearlings	266 Cow/Bull 193 Yearlings
Walnut	150 Cow/Bulls 119 Yearlings	75 Cow/Bull 60 Yearlings	150 Cow/Bull 119 Yearlings
7/K	150 Cow/Bull 119 Yearlings	150 Cow/Bull 119 Yearlings	150 Cow/Bull 119 Yearlings

Figure 21 - Changes in Permitted Cattle Numbers as compared to Proposed Permitted numbers

Allotment Specific Action

Tonto Creek Riparian Unit (TRCU)

Under this Alternative the TCRU will be considered a riparian exclosure (no livestock grazing) and will be removed entirely from the grazing allotments within the project area (Figure 2).

Tonto Basin Allotment (Northwest): Under this alternative, permitted numbers would be up to 342 cows/bulls yearlong (managed rotational grazing) and 262 yearlings from 1/1 through 5/31.

All improvements that are currently on the allotment will be maintained to Forest Service standards and those improvements that were previously authorized in the 1996 AMP but either have yet to be constructed, such as the boundary fence that will physically divide the southeast portion of the allotment from the northwestern portion of the Allotment, or were burned due to the Lone and Edge fires will also be authorized for construction or reconstruction.

The boundary fence to separate the northwest section of the Tonto Basin Allotment from the southeast section of the Tonto Basin Allotment would be located as previously agreed to both permittees and authorized in 1996. This fence will begin in the vicinity of Oak Creek Pasture and run up into natural barriers below Picture Mountain. Most of the division is expected to be accomplished using natural boundaries where topographic feature prevent cattle from crossing. There is reliable water on both sides of the proposed fence. Location of this fence is displayed approximately on the map in Figure 22. An accurate survey would be completed prior to construction, considering topography, archaeology, and natural resource concerns on-site.

Once existing and previously authorized improvements are brought up to Forest Service Standards, the following additional improvements may be authorized following field surveys for archaeological sites;

- A small unnamed spring in the vicinity of Punkin Center transfer station may be developed. The district will visit this spring with hydrologists to determine its viability for development. This spring development would alleviate grazing pressure on the northern end of the Long Mesa Pasture and increase accessibility of forage that is currently limited in the south end of the pasture, due to the distance that cattle need to travel from existing water sources.
- Existing pipelines from Daniels Spring and Packard Spring will be extended to new troughs; locations of pipelines are displayed approximately in Figure 22. These additional troughs will provide water to cattle where portions of the allotment are currently not accessed due to the topography and distance to existing water sources.
- Edwards Park and upper west portions of the allotment south of Mt. Ord is to be held in reserve, used as necessary when other resource conditions warrant its use.
- A new corral will be constructed near the transfer station outside Punkin Center (water lot an existing dirt tank). Location of the corral is displayed approximately on the map in Figure 22. This corral will provide a place where cattle can be gathered, inspected and trucked to other parts of the allotment. Currently there isn't a sufficient facility nearby to move livestock from this area, to other portions of the Allotment.

Construction of all improvements and ground disturbing activities will require archeological clearance from the forest archeologist to ensure protection of heritage sites. Accurate surveys would be completed prior to construction, considering topography, archaeology, and natural resource concerns on-site. Existing water developments and pasture fences would continue to be maintained. Those new structural range improvements listed above have been identified as necessary to improve livestock management and flexibility in meeting resource desired conditions. As conditions change and livestock numbers are brought back up to permitted levels the need for additional structural range improvements may be identified. If additional new projects are deemed necessary during the life of this decision, those projects would be analyzed appropriately.

Tonto Basin Allotment (Southeast): Under this alternative permitted numbers would be 266 cows/bulls yearlong and 193 yearlings from 1/1 through 5/31. Livestock will be managed on a rotational grazing strategy to move livestock through pastures and provide periodic rest. Due to resource concerns and the possibility of cattle bogging down, cattle will not be authorized to graze in the Lake pasture when Roosevelt Lake levels are below 45 percent. Due to the proximity of this pasture to potential and suitable flycatcher habitat, cattle would also be restricted from using this pasture between May 15th and August 15th (the southwestern willow flycatcher breeding season) if:

- the lake remains below 60 percent
- flycatcher habitat develops in the areas around Indian Point and
- territories are found during surveys at this location.

Currently Clover/Bearhead Pasture is not being used as part of the regular rotation. It has not been economically feasible consider moving cattle between pastures located below Picture Mountain and Clover /Bearhead Pasture. Historic trails disappeared during years of nonuse resulting from drought conditions, and road maintenance makes trucking livestock a costly proposition. Therefore under this alternative a separate herd of approximately 20 cattle, for

six months each year, will graze Clover/ Bearhead Pasture while the rest of the herd rotates through the remaining pastures. Cattle would water at a limited number of stock tanks and at springs and in creeks in the Clover/ Bearhead Pasture.

All improvements that are currently on the allotment will be maintained to Forest Service standards. Those improvements that were previously authorized in the 1996 AMP but have yet to be constructed will also be authorized for construction or reconstruction.

Once existing and previously authorized improvements are brought up to Forest Service Standards, the following additional improvements may be authorized following field surveys for archaeological sites;

- A fence will be constructed on the north side of Greenback Creek to separate Methodist and Bathtub pastures and to exclude Greenback Creek above private inholdings. Location of this fence is displayed approximately on the map in Figure 22 (Greenback Pasture). Currently cattle are limited in this area due to resource concerns with livestock use in greenback creek. Construction of this improvement would be required in order to run full permitted numbers.
- As funding becomes available, a steel pipe rail fence will be constructed around Clover Springs to protect the spring and meadow area below the spring from elk and livestock impacts. A trough will be provided outside of the spring exclosure with an overflow into the adjacent Dirt Stock Tank.
- Two troughs will be added to a pipeline in Cline Mesa Pasture near Twin Buttes to increase cattle distribution
- In order to increase cattle distribution and access to available forage, one trough will be added to an existing pipeline along the fence between Bouquet and Bathtub pastures and another trough will be added in Bathtub pasture to existing infrastructure in Maverick Basin.

Construction of all improvements and ground disturbing activities will require archeological clearance from the forest archeologist to ensure protection of heritage sites. Accurate surveys would be completed prior to construction, considering topography, archaeology, and natural resource concerns on-site. Existing water developments and pasture fences would continue to be maintained. Those new structural range improvements listed above have been identified as necessary to improve livestock management and flexibility in meeting resource desired conditions. As conditions change and livestock numbers are brought back up to permitted levels, the need for additional structural range improvements may be identified. If additional new projects are deemed necessary during the life of this decision, those projects would be analyzed appropriately.

7/K Allotment: Current management for 7/K is meeting Forest objectives but does not contain adaptive management options. Under Alternative 2, the agency proposes to keep elements of the current management plan for this allotment while adding the adaptive management framework.

Proposed permitted numbers are 150 cows/bulls yearlong using managed rotational grazing to provide periodic rest and 119 yearlings from January 1 through May 31.

Existing water lines and developments as previously authorized in the 1992 EA and the associated AMP will be repaired and replaced as well as fences that were not sufficiently maintained during a period of nonuse resulting from drought conditions, previous fires and wildlife habitat concerns. In addition to the existing structural improvements that were authorized in 1992, a new corral is proposed for construction in Red Hills Pasture (Figure 23).

Construction of all improvements and ground disturbing activities will require archeological clearance from the forest archeologist to ensure protection of heritage sites. Accurate surveys would be completed prior to construction, considering topography, archaeology, and natural resource concerns on-site. Existing water developments and pasture fences would continue to be maintained. Those new structural range improvements listed above have been identified as necessary to improve livestock management and flexibility in meeting resource desired conditions. As conditions change the need for additional structural range improvements may be identified. If additional new projects are deemed necessary during the life of this decision, those projects would be analyzed appropriately.

Walnut Allotment: Under this alternative permitted numbers would be 150 cows/bulls yearlong using a managed rotational grazing system to provide periodic rest, with 119 yearlings as carryover from 1/1 through 5/31. This permitted number would be the same as authorized in the 1992 EA and previous permits prior to an approximate 50 percent reduction in 2002 due to non-compliance on the permittee's term grazing permit at that time. This permitted number is also within the capacity as previous determined in Production Utilization Surveys completed on this Allotment (U.S. Forest Service 1988).

All improvements that are currently on the allotment or were authorized in the 1995 AMP will be maintained to Forest Service standards. New projects are described as follows and approximately displayed in Figure 24;

- Edwards Spring Pasture Division Fence - A fence will be constructed to split the Edwards Spring Pasture. This division fence was first analyzed and approved in the 1992 EA for this allotment however the fence was never constructed. This structural improvement should allow for greater flexibility in managing cattle while in the Edwards Spring Pasture.
- Edwards Spring Pipeline Extension - A pipeline and trough will be added to the existing development at Edwards Spring to provide water to lower portions of the allotment. A previous improvement authorized in the 1992 EA and associated AMP near Peirce Basin lacked sufficient water to fill the storage tank associated with the improvement and to provide reliable water for livestock. This improvement would extend from Edwards Spring down to Pierce Basin and fill the existing stock tank and water trough previously constructed.
- Artesian Well Storage Addition - Additional storage will be added to the existing development at an artesian well to supplement water in the Cottonwood Pasture. This will increase the reliability of having water provided by this system.
- Grapevine Water system Pipeline Extension - An existing pipeline from Grapevine Spring will be extended, tying into an existing line and trough below Hymn Book Spring, which no longer produces enough water.

- Lann Corral Pipeline Project – A pipeline will be run from a well on private property down an existing fence line to a corral in Lann Pasture. This will provide cattle access to water while they are being worked and sorted at these corrals.

Construction of all improvements and ground disturbing activities will require archeological clearance from the forest archeologist to ensure protection of heritage sites. Accurate surveys would be completed prior to construction, considering topography, archaeology, and natural resource concerns on-site. Existing water developments and pasture fences would continue to be maintained. Those new structural range improvements listed above have been identified as necessary to improve livestock management and flexibility in meeting resource desired conditions. As conditions change and livestock numbers are brought back up to permitted levels, the need for additional structural range improvements may be identified. If additional new projects are deemed necessary during the life of this decision, those projects would be analyzed appropriately.

Adaptive Management Tools for the Tonto Basin, Walnut and 7/K Allotments

If monitoring indicates that desired resource conditions outlined in Chapter 3 are not being achieved, in the desired time frame or areas for these allotments, there are tools, or administrative actions that would be used to modify management. Such changes may include annual administrative actions to adjust the specific number of livestock and/or animal unit months (AUMs), specific dates for grazing, class of animal, or pasture rotations. These changes will not go beyond what would be authorized under a decision to implement this alternative.

Necessary changes would be implemented through Annual Operating Instructions (AOI), which will adjust use to be consistent with current productivity and resource conditions. The AOI will also include design features, 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 that may 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.

If monitoring or general inspections identify one of the conditions listed above, there are several types of administrative actions that may take place within the allotment. These actions would comply with the Forest Plan and mitigations detailed later in this section. Actions that may be taken in order to address management concerns and ensure that the allotment is moving towards desired conditions as outlined in this document include:

- Extending or shortening the amount of time cattle are authorized in a pasture based on utilization levels for upland and riparian vegetation;
- Assessing the readiness of a pasture, including plant vigor, production, recovery and life stage (such as seed set or dormancy) and changing the timing of use for that pasture within the yearly grazing rotation for the season.
- Resting a pasture for one or more growing seasons
- 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 salting and mineral blocks to aid in distribution, especially away from critical areas such as riparian areas
- Herding livestock
- 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

If monitoring indicates desired conditions are not being met, the range 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 actions under an adaptive management strategy
- Generate documentation necessary in the AOI and/or permit and allotment files for the action to be implemented
- As necessary, conduct additional site specific monitoring and surveying to determine if the change in management using these adaptive management actions is moving resources towards desired conditions.

Additional Improvements

In addition to livestock management changes in timing, intensity and frequency, structural range improvement projects may be completed across the allotments as specific needs are identified and funding is available. Adding fencing, constructing livestock handling

facilities, protecting springs, and developing additional watering sources may be beneficial to livestock management, facilitate better livestock distribution, reduce undesirable effects to riparian vegetation and wildlife habitat, or otherwise improve the rangeland resource in order to meet desired conditions. All new structures would have appropriate clearances prior to implementation. The types of improvements that could be constructed include:

- Additional pasture division fencing;
- Holding trap development;
- Development of drift fences
- Construction of livestock handling facilities;
- Reconstruction of existing spring developments
- Livestock exclosures both upland and riparian, or around springs where existing livestock waters currently could provide access for cattle.
- Development of additional saddle or road tanks;
- Development of additional pipelines, storage tanks and troughs
- Development of additional trick tanks and water catchments.

Traps, holding pastures and livestock handling facilities may be constructed if needed in the future in association with many of these pastures, depending on logistical needs. For the purpose of this analysis it is important to make a distinction between these features and to identify the expected management in each.

- A **trap** is defined as an enclosure of less than ten acres, with a water source for livestock, where cattle may be gathered and left for a short period of time. Animals left in such an enclosure for more than 12 hours may be fed certified weed free hay. Utilization within a trap is assumed to be 100 percent.
- A **holding pasture** is defined as a small pasture greater than ten acres in size, with a water source for livestock, where cattle may be gathered and left for short periods of time, where natural vegetation is sufficient for their nutritional requirements. Utilization within a holding pasture will be more uniform and higher than in regular pastures due to the proximity to water and the small size of the pasture. Utilization within a holding pasture may not exceed 50 percent, measured at the end of the growing season.

All improvements will be constructed to USFS standards (FSH, "Range Improvement Standards", William D. Durst, 1972) and inspected for approval by Forest Service personnel, with appropriate permit modifications. Many improvements on FS allotments are now accomplished using grant money from Arizona Game & Fish Department and the Natural Resource and Conservation Service cost share programs such as the Environmental Quality Incentive Program, which may carry additional specifications and design criteria on a site specific basis.

Existing range improvement infrastructure should be brought up to agency standard prior to installing any new developments. An exception to this may be granted if a particular existing

improvement is determined, because of location, competing uses, livestock needs, or type, to be beyond its useful life. Such improvements would then be removed from the forest and the permittees list of maintenance responsibilities outlined in part three of the Term Grazing Permit. Allotment administration would determine whether identified structural improvements are necessary or need to be modified or removed.

Additional resource protection measures when installing structural range improvements that will be followed include:

- New watering sites will not be developed within 300 ft. of perennial streams
- All existing 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 300 feet away from riparian areas; or
- New fencing would be constructed using a "wildlife friendly" design which includes; upper three strands barbed wire, top wire not to exceed 42 inches and lowest strand smooth wire set at 16 inches above ground to allow wildlife to safely pass under.

As conditions change or the need arises for additional range improvement infrastructure, projects would be authorized following required clearances on a site specific basis (ie archeological or MRDG in Wilderness).

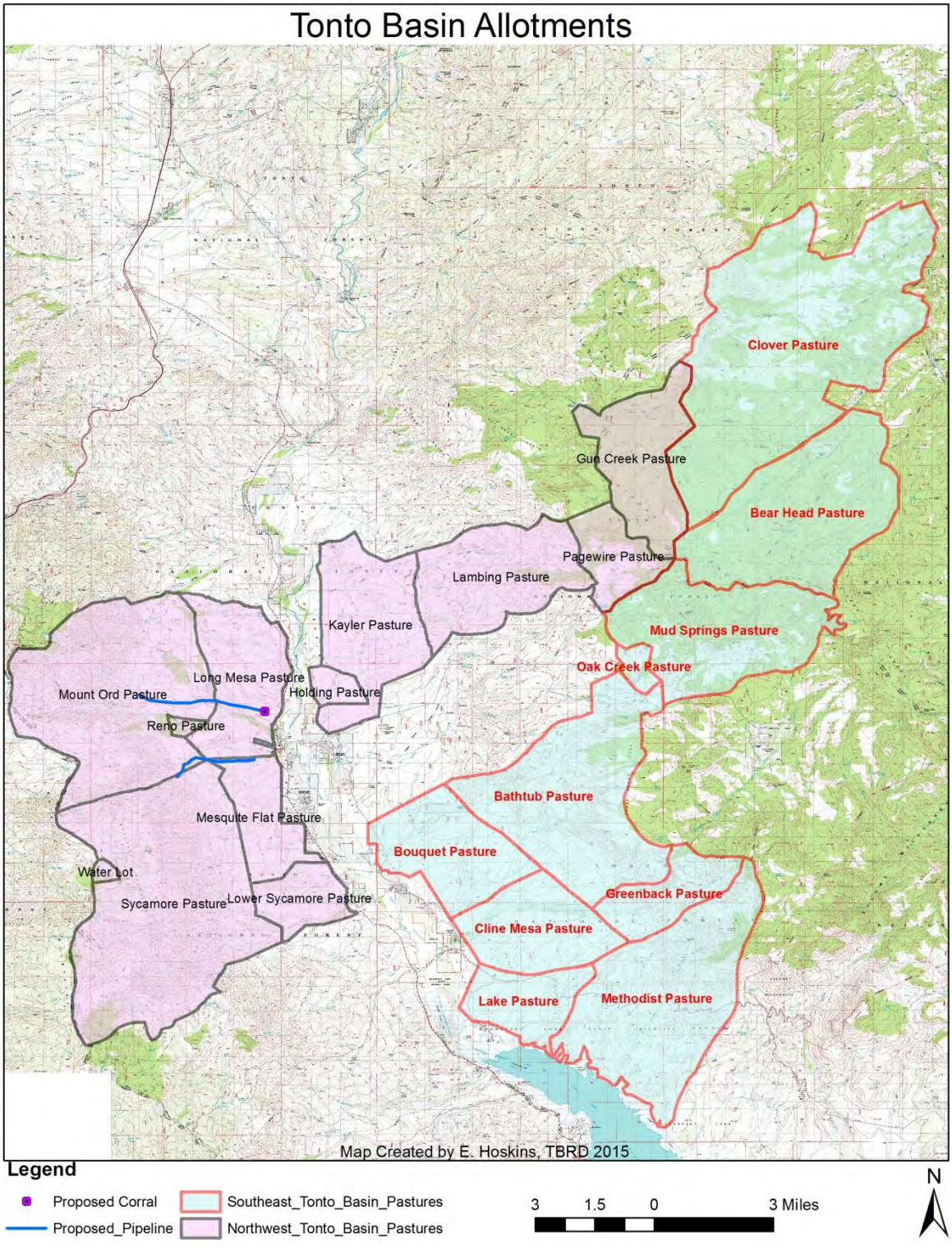

Figure 22. Tonto Basin Allotment Proposed Action- Map

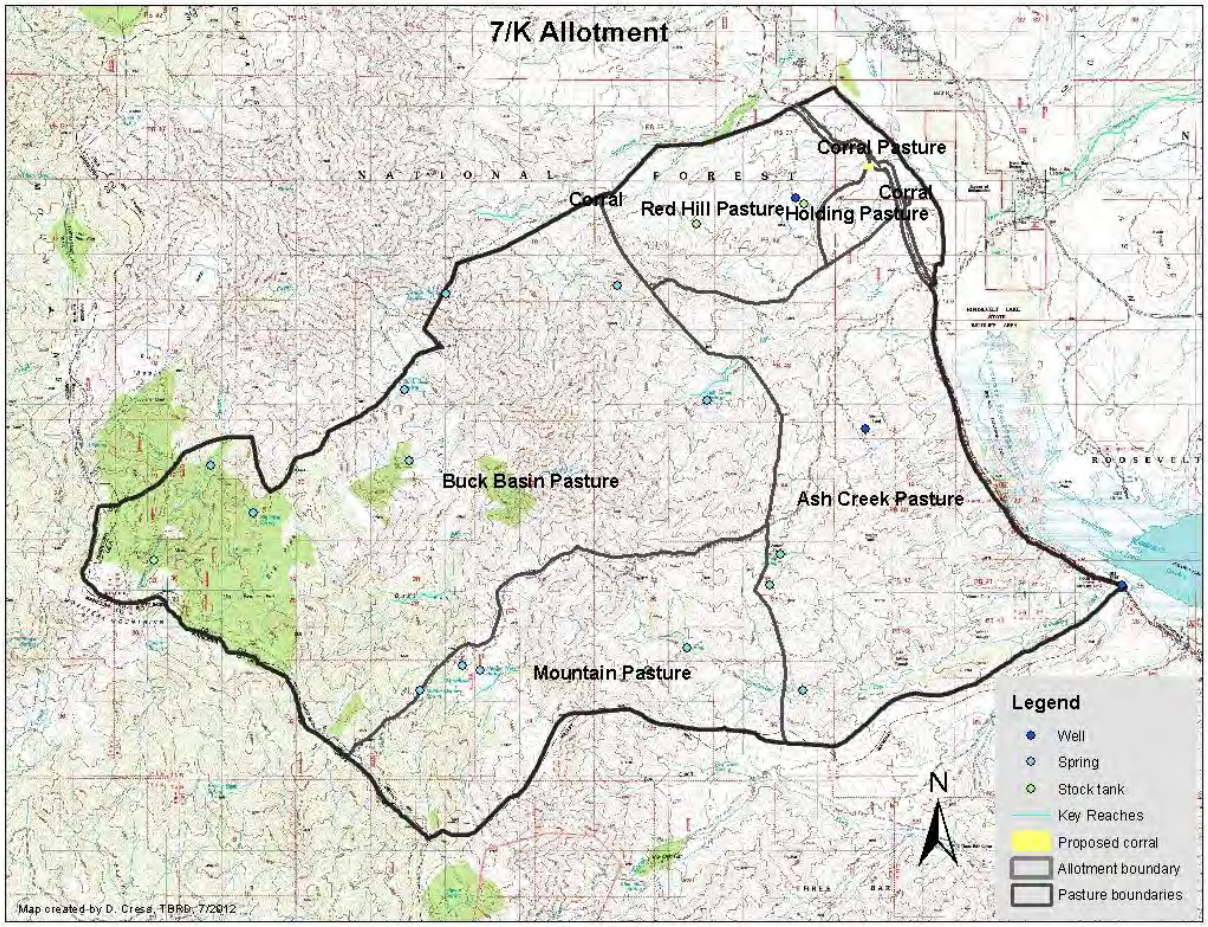

Figure 23. 7/K Proposed Action- Map

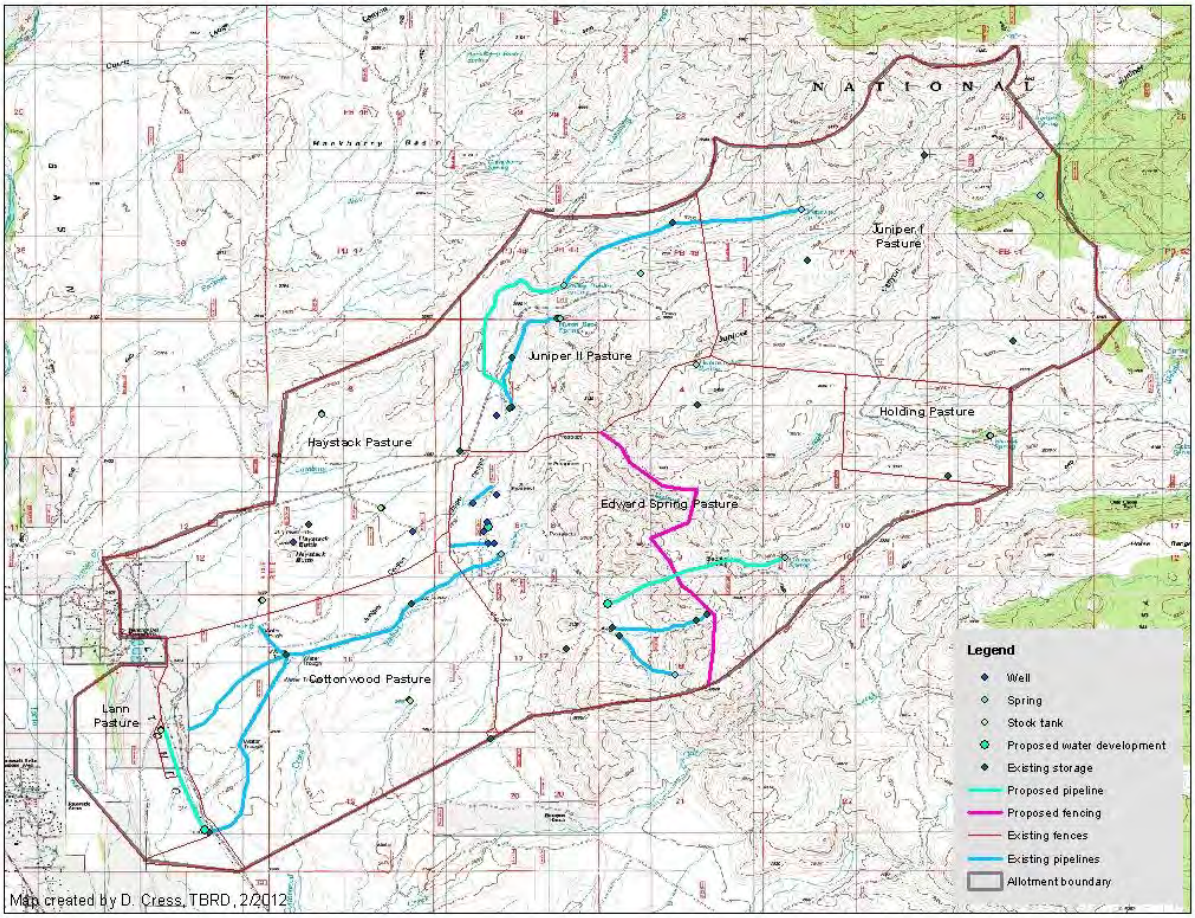

Figure 24. Walnut Proposed Action- Existing and Proposed Range Improvements - Map

Alternative 3

Modified Proposed Action

Public comments received in response to the initial scoping letter and ID Team specialist input identified impaired soils and Sonoran Desert vegetation conditions as an issue on the Tonto Basin and Walnut Allotments. Specifically, soils in Kayler Pasture, Malone Holding Pasture, Haystack Pasture, Cottonwood Pasture, Bouquet Pasture, and Cline Mesa Pasture (Figures 25 and 26) are of concern. Additional public comments from the previous draft document released to the public on August 9th, 2012 also identified proximity to T&E species as a concern. Pastures that are adjacent to the TRCU and Critical Habitat within Tonto Creek were of specific concern.

This alternative proposes to place some of the pastures adjacent to the TRCU including Haystack, Cottonwood, Bouquet and Cline Mesa Pastures in nonuse for five years to monitor soil and vegetation conditions. Under this Alternative, use of the pastures Kayler and Malone Holding pastures could be limited to only having authorized use of grazing, in years when annual forb and grass production is abundant. Use of these two pastures would only be authorized outside of the Flycatcher Breading Season which runs from May 1st to August 31st. Data collected in 2005 in Malone Holding Pasture indicated the site is capable of producing more than 300 lbs. per acre dry weight in palatable annual forbs and grasses when precipitation and temperature is favorable. During years with abundant annual forb production, livestock select for annual forage leaving perennial plants generally ungrazed. Limiting use of annual forbs and grasses to 50 percent of current year's production would leave half of annual forb and grass production as litter to help improve overall soil conditions.

The Southeastern Portion of the Tonto Basin Allotment would be required to incorporate the Clover/Bearhead Pastures into regular rotation planning, instead of deferring use as has been done the past several years, to compensate for loss of grazing access in other pastures. This alternative would also implement the adaptive management tools described in Alternative 2 and design features outlined in design features common to alternatives 2 and 3.

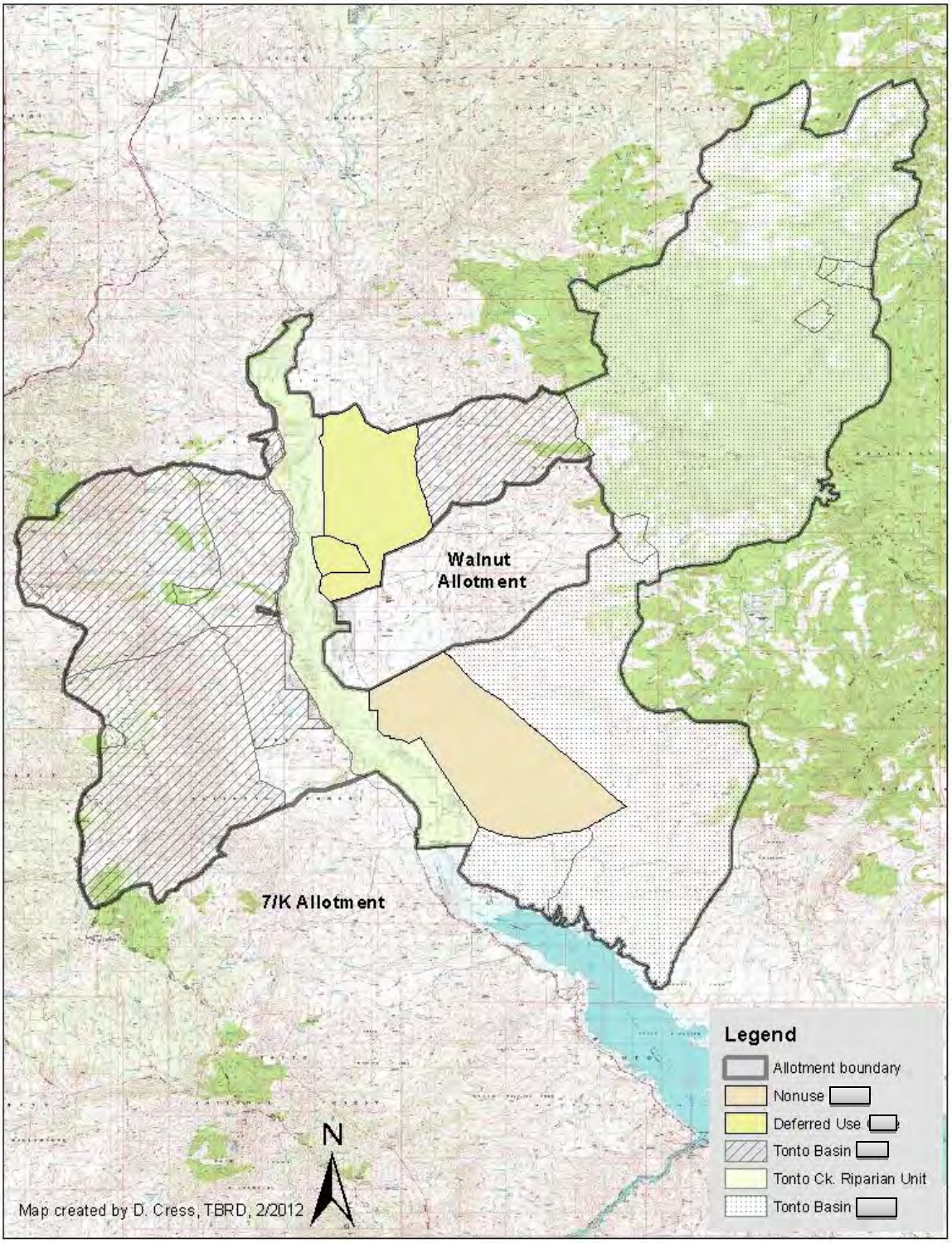

Figure 25. Tonto Basin Allotment- Alternative 3

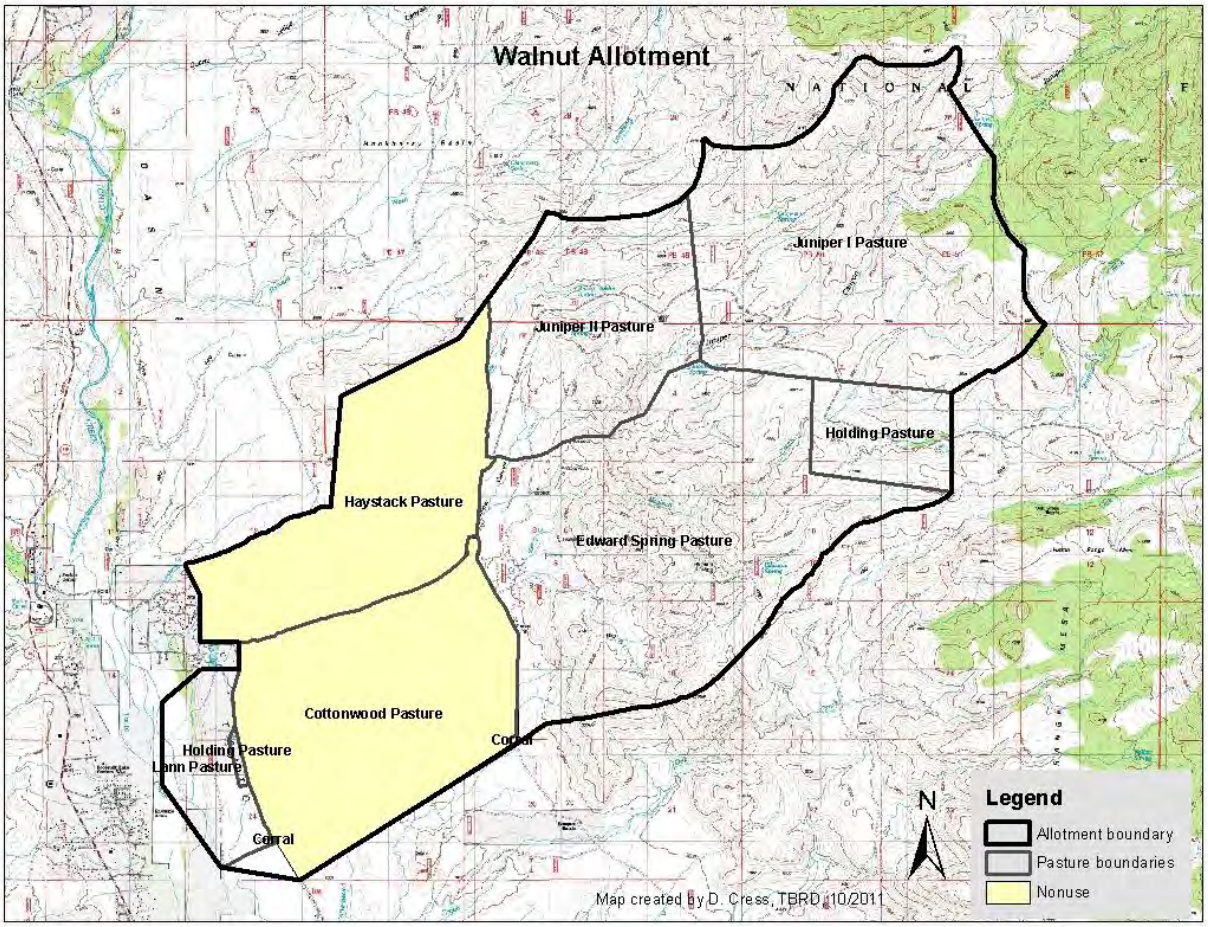

Figure 26. Walnut Allotment- Alternative 3

Design Features Common to Alternatives 2 and 3

Upland Vegetation Monitoring

Forage utilization would be managed at a level corresponding with light to conservative utilization (30-40 percent on perennial grasses). Use of browse species and annuals would be limited to not more than 50 percent of current annual growth in order to provide for grazed plant recovery, increases in herbage production and retention of herbaceous litter to protect soils (implementation monitoring). In Sonoran desert pastures, grazing intensity rather than utilization would be monitored. Light intensity use as defined by Holechek et al. (2004) differs from light to conservative utilization in that it looks at impacts to soils and vegetation at a landscape level rather than solely at utilization of perennial plants. Light intensity use reflects use of only choice plants and areas with no use of poor forage plants. Range should appear practically undisturbed away from water developments. Implementation monitoring would be conducted by qualified Forest Service personnel on a yearly basis at the end of each growing season and, when possible, at the end of each pasture rotation, while effectiveness

monitoring would be conducted at a minimum of once every ten years to determine if management is moving towards desired conditions.

In order to address concerns over livestock impacts to Sonoran Desert soils and permittee concerns over lack of site specific data of grazed compared to non-grazed areas, long term paired macroplots (grazed and ungrazed) have been proposed and may be constructed. Biological soil crusts, litter content, soil stability, and vegetation composition could be recorded and monitored over time. These long term plots should provide reference data for future analysis.

Drought conditions should be monitored as needed and decisions regarding continued grazing would be made in compliance with FSH 2209.13, Chapter 10 and with Tonto National Forest Rangeland Drought Policy (Appendix F). If catastrophic events such as fire or extreme drought occur, temporary adjustments to stocking rates could occur to allow for recovery of natural resources without additional grazing pressure.

Term grazing permits would provide for yearlong, managed rotational grazing which would provide periodic rest to pastures under the proposed action. If proper use in management units is reached before the end of a grazing year or season, livestock may have to be removed to avoid exceeding utilization guidelines. Better distribution of livestock avoids concentrating effects and provides the best opportunity for livestock to remain on allotments for entire grazing seasons.

Riparian Vegetation Monitoring

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

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

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

Wildlife Design Features and Monitoring

Southwestern Willow Flycatcher Conservation Measures:

1. No grazing will occur within habitat used by breeding flycatchers or designated critical habitat.
    a. Tonto Basin Ranger District has continued to prohibit grazing on lower Tonto Creek to help alleviate the broader negative impacts from historical upland overuse and promote dynamic developing habitat.
2. Due to the proximity of Lake Pasture (Tonto Basin Allotment) and Ash Creek Pasture (7/K Allotment) to breeding flycatcher habitat, these pastures will be seasonally restricted if the lake levels drops below 60 percent of full pool, flycatcher habitat develops in the areas around Indian Point, and flycatcher territories are found during surveys. Seasonal restrictions will prevent cattle from entering these pastures from May 15 through August 15 to protect the critical incubation period and reduce risk of parasitism by brown-headed cowbirds.
3. Due to the proximity of Lann Pasture (Walnut Allotment) to occupied breeding flycatcher habitat, seasonal restrictions will be implemented in this pasture from May 15 to August 15.
4. In the following pastures adjacent to the TCRU, water will be shut off within 1 mile of occupied flycatcher breeding habitat to keep cattle from concentrating in areas in proximity to Tonto Creek and flycatcher nesting areas to reduce the risk of cowbird parasitism during the flycatcher nesting period (May 15 to August 15). The pastures are Bouquet/Cline Mesa, Holding, Kayler, Long Mesa, and Mesquite on Tonto Basin Allotment, and Red Hill on 7/K Allotment.
5. Habitat will be considered occupied if flycatchers are detected in any of the previous three years of presence/absence surveys conducted by the District Biologist.
6. The TCRU, which runs through portions of the Walnut and Tonto Basin Allotments and includes areas where flycatchers nest, is fenced from cattle grazing year-round. Fences are, and will continue to be, monitored by the permittees and Forest Service District staff. When cattle are seen trespassing, permittees will be notified and cattle will be removed from the TCRU.
7. Upland ranges and riparian areas are grazed at conservative levels.
8. TNF biologist will conduct willow flycatcher surveys annually if and when suitable habitat is present.

Mexican Spotted Owl Conservation Measures:

1. The TNF will not conduct activities that could result in disturbance to owls within 0.25 mile of protected activity centers (PACs) during the Mexican spotted owl breeding season (March 1 to August 31).
    a. Only non-motorized entry for livestock herding activities will be used during the owl breeding season.
2. Mexican spotted owl recovery plan guidelines will be applied in PACs and critical habitat.
3. The TNF will maintain residual stubble height and limit utilization to conservative use of annual growth on key forage species (between 20 and 30 percent within Mexican spotted owl habitat).

Additional consultation on the proposed action will be completed by submitting a Biological Assessment to US Fish and Wildlife Service. Conservation measures for threatened, endangered, and sensitive species as provided through a letter of concurrence from US Fish and Wildlife Service will be incorporated into any action alternative selected for this analysis. Desired conditions and existing mitigation for wildlife on these allotments is discussed in Chapter 3.

Recreation Design Features

Maintenance and construction of structural range improvements as well as livestock management activities, may require off road designated route travel to effectively manage livestock on these allotments. Authorization for off road travel will be described under the term grazing permit. Permittees would continue to access their allotments the majority of the time on existing roads and trails as designated by Tonto National Forest maps to avoid creating illegal ATV trails.

Heritage Design Features

New rangeland improvements not currently analyzed in this decision would be assessed for need on a case by case basis. Any range improvement which would disturb soil would require an archaeological clearance by the Forest Archaeologist or a certified para-archaeologist. New improvements not anticipated by this decision would also require a separate analysis to comply with NEPA regulations. Salting, watering, or supplemental feeding would not be permitted where cultural sites or resources exist.

Mitigation of impacts to heritage resources for all alternatives would be accomplished by avoiding these properties through placement and construction of all range improvements. Minimizing localized concentration of animals, improving livestock distribution across allotments, and reducing intensity of grazing would also minimize surface disturbance to heritage resources. Where proposed improvements would involve ground disturbance, 100 percent archaeological survey would be conducted. Other, more specific mitigation requirements may be identified as each improvement is developed and a heritage inventory is made of their areas of potential effect. Such protective measures are developed in accordance with goals of the project taking into account site vulnerability as well as 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.

Archaeological clearance must be approved with all necessary consultation with SHPO and potentially interested Tribes prior to issuing any decision regarding the construction, modification, or removal of all improvements. This approach is based on long-term consultation with SHPO and Region 3 policy as embodied in *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, and specifically, Appendix H, *Standard Consultation Protocol for Rangeland Management* (Protocol) developed pursuant to Stipulation IV.A of the *Programmatic Agreement* is considered to be "standard operating procedure" for treating potential grazing impacts to heritage resources on Tonto NF.

Protection measures identified under the Protocol include:

9. Archaeological surveys 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.
10. Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties.

11. Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing.
12. Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing.
13. Periodic monitoring to assess site condition and to ensure that protection measures are effective.
14. 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 it affects a TCP or other property of concern for them.

Other specific protection measures may need to be developed on a case by case basis.

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

Inventory and Monitoring Techniques

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. There are two types of monitoring that occur would occur with all alternatives, implementation monitoring and effectiveness monitoring. Both are crucial to determine when and if adaptive management changes should be made and the cause and effect between management actions and progress towards desired future conditions. (R3 2209.13 Chapter 90 section 95).

Implementation Monitoring:

The purpose of implementation monitoring is to determine if grazing meets conservative use guidelines in upland and riparian settings. Implementation monitoring would occur at any time during the grazing year and include such things as inspection reports, forage utilization measurements, livestock counts and range improvement inspections. Utilization measurements in uplands and riparian areas would be made following methods found in "Utilization Studies and Residual Measurements" (ITT 1999), "Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands" (Smith et al. 2005), and in reference to current scientific papers which are applicable to management of vegetation types in the project area. Data could include browse utilization measurements, perennial grass stubble height measurements, photo points, or height/weight relationships for certain perennial grass species.

Information would be collected through routine pasture inspections, end of season utilization monitoring, and cooperative 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 as outlined in chapter 1.

Monitoring information from cooperative monitoring would be considered and includes dry weight ranks, distance to closest perennial plants, and palatable forage production information. Consistent patterns of utilization meeting or exceeding conservative use guidelines (up to 40 percent) on key species in key upland areas or meeting Forest guidelines for riparian areas would be used as a basis to modify management practices or take administrative actions such as reducing authorized and permitted numbers in order to reduce utilization in subsequent grazing seasons.

Key areas are described in "Utilization Studies and Residual Measurements" (ITT 1999) 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 a representative sample of a large stratum, such as a pasture, grazing allotment, wildlife habitat area, herd management area, watershed area, etc., depending on the management objectives being addressed by the study. Proper selection of key areas requires appropriate stratification.

Riparian vegetation available in key reaches would be monitored using riparian utilization measurements (implementation monitoring) following the ITT (1999) and Burton (2011) or the most current acceptable method.

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.

Effectiveness Monitoring:

The purpose of effectiveness monitoring is to track condition and trend of upland and riparian vegetation, soil, and watersheds. Monitoring of upland Key areas would follow one of the three monitoring procedures listed below, those described in "Utilization Studies and Residual Measurements"(ITT 1999) and Region 3 Rangeland Analysis and Training Guide (FSH 2209.21) or future monitoring techniques developed that are scientifically sound and provide the needed information as outlined in this EA.

Data from this type of monitoring is 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. Two types of effectiveness monitoring have occurred within the project area, Parker Three-Step Cluster Monitoring and CAP Plan 6 Rangeland Monitoring as described below. The third type of monitoring described, CNVS is the most recent monitoring protocol developed to be used by both rangeland managers and fire managers. To date this method is believed to provide the best information given the relative time to collect information. This monitoring technique has not yet been used within the action area however

this monitoring technique is starting to be implemented on allotments and shows promising results in respect to time needed and amount of data collected for vegetation attributes.

Parker Three-Step Cluster Monitoring:

Permanent transect monitoring plots were established in the 1950s and 1960s that were the start of determining trend data through vegetation composition, point cover and plant vigor. These Parker Three-Step Cluster monitoring sites provide long term historic information about past vegetative communities and species compositions, when completing the initial data collection for this project in 2009 an attempt was made to relocate these original monitoring sites. Unfortunately many of the stakes used to make these permanent monitoring sites had either been disturbed, pulled out of the ground or simply could not be relocated. Those that were identified showed a remarkably stable vegetative community that doesn't appear to change very much over time as shown by the two photos on the Tonto Basin Allotment at Cluster 5 Transect 1 from 1966 and 2009. The exact same mesquite plants are present in both photos taken 43 years apart. Given that more recent information on vegetation communities and monitoring data exists in this area (Plan 6 Monitoring), the monitoring data collected from these sites using the Parker Three-Step Method was not included in this assessment but will be maintained at the District Office.

Tonto Basin Allotment C5-T1 1966

Tonto Basin Allotment C5-T1 2009

CAP Plan 6 Rangeland Monitoring Protocol:

An interagency Team consisting of representatives from the Forest Service, Bureau of Reclamation, Arizona Game and Fish Dept., Arizona Cattlegrowers, Arizona State University and the University of Arizona Extension Service helped in creating this rangeland monitoring plan designed and implemented to determine response of management to eleven allotments bordering Roosevelt Lake and Tonto Creek as a result of the adjustment to the offset of land lost due to the increased lake level as a result of "Plan 6" which increased the dam height at Roosevelt Lake. This monitoring technique implemented a basic line intercept monitoring plan to capture canopy cover and diversity on woody species as well as ground

cover monitoring technique using a one square foot hoop. This monitoring plan was signed and implemented in 1992 with additional data and photos taken in 1997. In 2014 and 2015 these monitoring plots were relocated using a GPS and then the photos were retaken, collection of data at these sites across the district is currently ongoing at this time.

Plan 6 Monitoring Plot #1492, 2014

Plan 6 Monitoring Plot #1492, 1997

Common Non-Forested Vegetation Sampling Protocol (CNVSP):

This protocol combines various methods of monitoring along a pace transect and is used in conjunction with computer tablets that run the VGS software to improve the speed at which the data is collected and can be analyzed. This monitoring method can be designed to collect ground cover, frequency of rooted and canopy within a $1/10^{th}$ meter quadrat, fetch and Dry-Weight-Rank. Additionally this monitoring method provides data that can be used in the PHYGROW vegetation model and the Burning Risk Advisory Support System making data collected useful to both rangeland and fire land managers. (USDA Southwestern Region 2012).

Riparian Monitoring:

Effectiveness monitoring in riparian areas would use cross sections as described in Harrelson, et al. (1994), riparian photo points, or the most current methods. Key stream reaches would be monitored for changes in riparian vegetation and stream channel geomorphology condition and trend at five to ten year intervals (effectiveness monitoring) using protocols described in "Utilization Studies and Residual Measurements" (ITT 1999), Burton (2011), and Harrelson, et al. (1994), photo point monitoring, or the most current acceptable method.

In October of 2014 the National Riparian Monitoring Team provided training on the Tonto National Forest to test the Multiple Indicator Monitoring Method on the flashy systems of the southwest desert. Further information is being developed at the regional office at this time but early indications are that this system of monitoring would work and could be implemented at Key Reaches of Riparian Areas within the project area (Burton et al. 2011).

Alternatives Considered but Eliminated from Further Analysis

Current Management
Maintaining current management of the Tonto Basin, Walnut and 7/K allotments does not meet Forest objectives as described under the desired conditions in chapter 2 of this document. Previous Environmental Assessment and Allotment Management Plans are outdated and do not contain language specific to adaptive management policy as described in the purpose and need statement, nor do they contain updated language associated with recent Biological Opinions and management direction that was implemented to ensure management of cattle stay within compliance of the Endangered Species Act. Areas with impaired soils have been identified and may need to be addressed through updated management to comply with Forest Plan direction.

Comparison of Alternatives

Ability to Meet Purpose and Need	**Alternative 1) No Action**	**Alternative 2) Proposed Action**	**Alternative 3) Modified Proposed Action**
Consistent with Forest Service Policy to make forage from lands suitable for grazing available to qualified livestock operators (FSM 2201).	This action is not consistent with this policy.	This action is consistent with this policy.	This action is consistent with this policy.
Meets the Rescission Act	Yes	Yes	Yes
Implementation of Forest Service Policy as described in FSH 2209.13, Chapter 90 (Adaptive Management).	This action does not implement Adaptive management policy.	This action does implement adaptive management policy.	This action does implement adaptive management policy.
Ability to Address Issues	**Alternative 1) No Action**	**Alternative 2) Proposed Action**	**Alternative 3) Modified Proposed Action**
Impacts to Riparian Areas	This alternative meets the intent of the Forest Plan and should move Riparian areas towards desired conditions in the shortest amount of time.	This alternative meets the intent of the Forest Plan and should move Riparian areas towards desired conditions although not quite as quickly as in	This alternative meets the intent of the Forest Plan and should move Riparian areas towards desired conditions. Desired riparian conditions should be

		Alternative 1.	achieved faster in those pastures that don't receive grazing.
Unsatisfactory Soil Conditions	This alternative meets the intent of the Forest Plan and should move soils towards desired conditions in the shortest amount of time where that is feasible, however this is not expected to occur within the timeframe and life of this decision.	This alternative meets the intent of the Forest Plan and should move soils towards desired conditions. Some soils such as those on relatively flat and gentle slopes and closer than a ¼ mile to water may not improve under this alternative.	This alternative meets the intent of the Forest Plan and should move soils towards desired conditions similar to Alternative 2. Those pastures that do not receive grazing pressure would improve as discussed under Alternative 1.
T&E Species	Given that riparian conditions will continue to improve with no grazing, and TES are riparian centric, except for MSO, TES habitat will improve and move towards desired conditions and delisting with this alternative	The TCRU is still protected from livestock grazing and will allow for continued habitat improvement in Tonto Creek. TES will benefit from this but will move towards desired conditions slower than Alternative 1 because of indirect effects from livestock grazing.	Similar to Alternative 2, but might improve faster given more rest in Sonoran Desert Pastures.
Comparison of Effects by Resource			
Vegetation	This action could result in improved vegetation health and vigor with vegetation moving towards desired conditions.	This action should maintain current condition.	This action should maintain current condition. Sonoran Desert pastures may improve at a slightly quicker rate.
Soils	This action may improve soils across the project area.	This action should maintain current condition.	This action should improve Sonoran Desert Soils and maintain current soil conditions on the rest of the project area.
Hydrology	This Action provides the most rapid	This Action is likely to result in attainment of	This Action is likely to result in attainment of

	improvement in watershed condition.	desired conditions for many riparian areas at a slower rate than for Alternative 1.	desired conditions for many riparian areas at a slower rate than for Alternative 1. For Sonoran Desert Pasture, effects would be the same as for Alternative 1 for the first five years and the same as Alternative 2 after five years, if grazing resumes.
Wildlife	Habitat conditions should improve and move towards desired conditions.	Habitat improvement likely to be slower to move towards desired conditions or simply maintain conditions under this alternative, compared to Alternative 1.	Most habitat improvement would be similar to that described in Alternative 2. Sonoran Desert Pastures would improve habitat as described for Alternative 1.
Fire and Fuels	May increase fire occurrence in Sonoran Desert Pastures	Use of adaptive management may help increase fine fuels in preparation of planned ignitions.	Use of adaptive management may help increase fine fuels in preparation of planned ignitions. Sonoran Desert Pastures may have an increased chance of occurrence.
Heritage	Effects to heritage resources by livestock grazing would be eliminated through this alternative.	Mitigation measures is anticipated to maintain current effects to heritage resources	Mitigation measures are anticipated to maintain current effects to heritage resources. Effects to heritage resources by livestock grazing would be eliminated for Sonoran Desert Pastures.
Recreation	Conflicts between recreational users and livestock would be eliminated. Structural Improvements used by livestock and	This action should maintain current recreational opportunities.	This action should maintain current recreational opportunities.

	recreationists would decrease resulting in opportunity loss for some recreational activities.		
Air and Water Quality	There would be no effects to air and water quality by livestock grazing under this alternative.	This action should maintain current conditions.	This action should maintain current conditions.
Climate	Eliminating grazing pressure on vegetation may also have a slight benefit for carbon sequestration.	This action should maintain current conditions.	This action should maintain current conditions.
Socioeconomics	Permittee as well as Tonto Basin and Gila County could be affected due to the amount of money made by permittees and how much is spent in the local economy. Removal of livestock from allotments could result in some loss of culture and lifestyles tied to ranching. The local perception of the Forest Service could have both positive and negative effects.	Continuation of ranching operations in a sustainable manner would provide for continuation of culture and lifestyle tied to ranching in this area. Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel decreased trust and increased negative attitude towards the Forest Service.	Some economic hardship may result to the permittees, other effects are similar to those described in Alternative 2.

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

This section summarizes physical, biological, social and economic environments of the affected project area and potential changes to those environments due to implementation of the alternatives. It also presents a scientific and analytical basis for comparison of alternatives presented in the chart above. Complete reports for these topics can be found in the project record for this analysis.

Existing Conditions

Rangeland and Vegetation

Annually authorized stocking rates for livestock on any given allotment is dependent on the amount of palatable forage produced which in turn is dependent on yearly precipitation. Forage production can vary widely from year to year therefore estimating annual stocking rates for the allotment involves multiple resource considerations, including current vegetation, precipitation and soil conditions. While there are capacity recommendations based on percent utilization for grass-dominated ecosystems (Holechek 1988), little research has been completed to evaluate palatable shrubs, a key food source for cattle on grazing lands in the desert southwest. Cattle will browse new growth, flowers, and beans on jojoba, mesquite, palo verde, catclaw acacia, and mimosa as well as new growth on other desert shrubs to a lesser degree. Cattle also browse new growth on turbinella oak, mountain mahogany, deer brush, skunkbush sumac, and other chaparral species. Annual forbs and grasses can be clipped and weighed to provide an estimate of pounds per acre of production, but this number will fluctuate widely from year to year depending on precipitation and temperature. Smaller sub-shrubs also provide important forage and are not well researched to evaluate how much they contribute to capacity for grazing animals.

McLeod (1997) points out the following: "An implicit feature of all definitions is the assumption that the system will approach or reach equilibrium, if given enough time. While this may be true for slightly variable environments, it is certainly invalid for highly variable environments where plants and herbivores rarely, if ever, reach equilibrium." Therefore, when determining yearly authorized numbers within the permitted numbers for Tonto Basin, 7/K, and Walnut Allotments in this analysis, agency personnel consider past livestock numbers, slopes greater than 40 percent where only incidental grazing is likely to occur, current and desired future resource conditions including soil condition and vegetation trend, water availability, utilization measurements and other resource needs such as wildlife and recreation, and past monitoring results.

Tonto Basin Allotment

The Tonto Basin Allotment is located north of Roosevelt Lake on the Tonto Basin Ranger District and parts of the Pleasant Valley Ranger District of the Tonto National Forest. It occupies 118,552 acres (Tonto NF Geographical Information System {GIS data}). The Tonto Basin Allotment occurs in Management Areas 6J, 6F, 5G, and 5D of the Tonto National Forest Plan (USDA 1985, as amended). Vegetation on the Tonto Basin Allotment ranges from pinyon/ juniper savannahs with Ponderosa pine stringers at the highest elevations in the Sierra Ancha Mountains to Sonoran desert vegetation near Tonto Creek and Roosevelt Reservoir. Much of the steeper slopes consist of dense chaparral vegetation. Riparian vegetation is confined to short reaches along creeks and around springs.

Dominant perennial grass species include blue grama (*Bouteloua gracilis*), side oats grama (*Bouteloua curtipendula*), wolftail (*Lycurus phleoides*), and bull muhly (*Muhlenbergia emersleyi*) at higher elevations in the Sierra Ancha and Mazatzal Mountains, curly mesquite (*Hilaria belangeri*), black grama (*Bouteloua eriopoda*), three awn (*Aristida spp.*), vine

mesquite (*Panicum obtusum*), and hairy grama (*Bouteloua hirsuta*) at middle elevations, and fluffgrass (*Tridens pulchella*) and three awn at lower elevations. Perennial grasses are sparse at the lowest elevations and often confined to slopes and areas greater than ¼ mile from water developments at the middle elevations. Ridge tops and gentler areas are often dominated by annual vegetation such as red sprangletop (*Leptochloa filiformis*), ragweed (*Ambrosia spp.*), and red brome (*Bromus rubens*).

The lowest elevations of the Tonto Basin Allotment are dominated by cholla (*Opuntia spp*), mesquite (*Prosopis velutina*), and creosote (*Larrea tridentata*). Mesquite, catclaw acacia (*Acacia gregii*), and prickly pear (*Opuntia spp.*) are common shrubs in the semi-desert grasslands found at the middle elevations of the allotment. Jojoba (*Simmondsia chinensis*) is present on slopes but less common than other shrubs. Juniper (*Juniperus spp.*) is common at middle and higher elevations on the allotment. Die-back of this tree from drought stress can be observed on many north-facing slopes, particularly on the northern end of the allotment.

The right-of-way along Highway 188 contains numerous invasive weeds which is beginning to spread onto the allotments in the project area. Arizona Department of Transportation chemically treats invasive weeds in the highway right-of-way but existing populations have been persistent over the last few years. Invasive weed populations can also be found adjacent to Roosevelt Lake, spreading up drainages (Appendix D). Livestock are one vector of movement of invasive plants; however even in the absence of livestock grazing weeds would continue to spread through human dispersal, wildlife dispersal, and wind and water dispersal. On the Tonto Basin Allotments, Malta star thistle is the most common invasive plant, occurring in nine pastures. Recent completion and implementation of a Forest Weeds Environmental Assessment should mitigate the spread of these noxious weeds.

Tonto Basin Allotment (Northwest)

Range and Vegetation - Fences and water lines on the west side of Highway 188 were burned in the 2005 Edge Complex fire and most of them have been replaced or repaired at this time using funds appropriated following the burned area emergency response (BAER) team's evaluation. Water developments across the allotment are in various conditions ranging from fully functional to nonfunctional. Dirt tanks on the east side of Highway 188 generally hold water when storm runoff is sufficient but provide an unreliable water source.

Water developments in the vicinity of Reno Creek are nonfunctional and cattle are using Reno Creek as their source of water when using pastures in that portion of the allotment. Cattle also use Sycamore Creek as a primary source of water for the southwestern end of the allotment. A dirt stock tank near upper Lambing Creek is unreliable and cattle water in the creek. A population of broadleaf lupine (*Lupinus latifolius* ssp. *leucanthus*), a Forest sensitive species, is located in upper Lambing Creek and receives grazing pressure during late spring and early summer livestock use when it occurs.

Water developments below Quartz Ledge Spring are functional but cattle use the spring and associated channel to water as well. An old water development exists in the channel near the

spring but is in disrepair. Allotment and pasture fences on the east side of Highway 188 are generally repaired and functional. Gates are frequently left open by hunters and recreational users which creates livestock distribution issues.

Tonto Basin Allotment (Southeast)

Range and Vegetation - Fences on the allotment are generally functional. Water developments are in various conditions ranging from functional to nonfunctional. Dirt tanks on the allotment generally hold water when storm runoff is sufficient but provide an unreliable water source.

When livestock use the southern portion of the allotment they rely primarily on natural water sources including Roosevelt Lake and Methodist Creek. A pipeline and trough system developed from Journigan Spring is nonfunctional and there are no plans to repair the system because the spring is unreliable. Livestock do not currently use the pasture containing a portion of Greenback Creek but if they were grazed in the future, cattle would rely on water in the creek.

A short pipeline and trough at Oaker Spring is fully functional. It is in close proximity to Oak Creek and cattle also use Oak Creek as a source of water for this portion of the pasture. Above this, cattle water in Maverick Creek and at Mud Spring in upper Greenback Creek. Large dirt tanks exist in the northeastern portion of the allotment but cattle also have access to natural water at Clover Spring and in Gun Creek. This portion of the allotment has not received livestock use for several years.

7/K Allotment

Fences and water developments on this allotment were burned in the 1996 Lone Fire. Other fires, including a portion of the Edge Complex Fire, burned across the allotment after the Lone Fire and damaged range improvements. Most of the fencing has been replaced and is in good condition, the exception being portions of the western allotment boundary fence. Water developments are currently being repaired but livestock rely primarily on natural water in Bumblebee Creek, Ash Creek, and various unnamed springs across the allotment. A water development associated with Ash Spring is functional but is located adjacent to lower Ash Creek so cattle also water in Ash Creek. Reliable developed water is lacking in the northern portion of the allotment and eastern portion of the allotment east of Highway 188. 7/K is divided between Gun Creek-Tonto Creek and Tonto Creek- Theodore Roosevelt Lake 5th code watersheds. On 7/K Allotment, all stream channels evaluated in the field are in impaired condition (Mason and Johnson 1999).

The allotment is more or less evenly divided among Sonoran Desert scrub at lower elevations, semi-desert shrubland/grassland at mid-elevations, and chaparral at higher elevations. Most of the easily accessible lower elevation Sonoran Desert flats have been heavily impacted by domestic livestock grazing and are in relatively poor condition. Areas with less than satisfactory soil condition are a result of past wildfires and past and current

management practices. Various field inspections have determined that generally the flatter Sonoran Desert soils tend to be in unsatisfactory condition largely due to compaction and a lack of ground cover. Some of the semi-desert grassland soils appear to have problems with erosion and lack of ground cover. Generally these are in impaired condition and occur on soils derived from granite. Data collected for TEUI have noted rills and gullies on granitic soils.

The steeper desert areas tend to be in better condition with a better diversity of vegetation but those areas that occur on granite tend to be erosive. Nearly all of the shrubland/grassland occurs on granite which tends to favor shrubs over grasses. False mesquite and Wright buckwheat are common. The dominant grasses are three awns and fluff grass. The grasslands are sensitive to erosion and currently show signs of rill erosion. Nearly all of the chaparral occurs on moderately steep to steep granite slopes and nearly all burned in the 1996 Lone Fire and about half burned in the 2005 Three and Edge Complex Fires. Vegetative ground cover (plant basal area plus litter) has completely recovered in areas burned only by the Lone Fire. In those area burned in 2005, ground cover may still be less than the unburned areas. The chaparral on granite tends to be highly erosive when ground cover is removed. Except for some areas burned in 2005, ground cover is sufficient to retard erosion. The chaparral generally has a good composition of desirable browse shrubs such as mountain mahogany, Wright silktassel, and desert cenaothus.

Lone, Three, and Edge Complex Fires

The 1996 Lone Fire (12,275 acres) and the 2005 Three (4,502 acres) and Edge Complex (5,999 acres) Fires covered about 90 percent of the allotment. Most of the area burned by the Three Fire and part of the areas burned in the Edge Complex had been burned previously by the Lone Fire. A high percentage of the Lone Fire experienced low burn severity. Only about 20 percent had moderate severity. Most of the moderate severity burn occurred in chaparral and semi-desert grassland vegetation. Photo points established in 1996 to monitor post-fire recovery (K. Nelson; Tonto National Forest Files) revealed sheet, rill and some shallow gully erosion in the years following the fire. By 1999, photos showed a significant recovery of vegetation, especially in chaparral. Data collected in 2009 showed nearly complete recovery of chaparral burned in the Lone Fire. About 40 percent of the Three Fire had moderate burn severity. Most of the rest of the fire experienced low burn severity. Nearly all of the moderate severity burn occurred in chaparral and semi-desert grassland vegetation. Terrestrial Ecological Unit Inventory (TEUI) documentation taken following the Three Fire showed areas of significant erosion in chaparral in the year following the fire. Most of the Edge Complex Fire experienced low burn severity with only about 5 percent of the area burned within the allotment experiencing moderate to high burn severity. Burn severity by pasture is listed in Figure 13.

Figure 13 – Burn Severity (Acres)

Fire	Pasture	Unburned & Underburned	Low	Moderate	High	Total Burned	Total Pasture
Lone (1996)	Ash Creek	0	2,657	0	0	2,657	4,722
Lone (1996)	Buck Basin	316	4,271	1,971	0	6,558	7,816
Lone (1996)	Mountain	1,198	1,635	227	0	3,060	3,062
Lone (1996)	Red Hill	0	0	0	0	0	1,463
Lone (1996)	Corral/Holding	0	0	0	0	0	469

Lone Fire (1996)	**Total**	**1,514**	**8,563**	**2,198**	**0**	**12,275**	**17,532**
Three (2005)	**Ash Creek**	**193**	**1,195**	**70**	**0**	**1,458**	**4,722**
Three (2005)	**Buck Basin**	**54**	**413**	**236**	**0**	**703**	**7,816**
Three (2005)	**Mountain**	**65**	**636**	**1,447**	**192**	**2,341**	**3,062**
Three (2005)	**Red Hill**	**0**	**0**	**0**	**0**	**0**	**1,463**
Three (2005)	**Corral/Holding**	**0**	**0**	**0**	**0**	**0**	**469**
Three Fire (2005)	**Total**	**312**	**2,244**	**1,753**	**192**	**4,502**	**17,532**
Edge Complex (2005)	**Ash Creek**	**1,408**	**412**	**0**	**0**	**1,820**	**4,722**
Edge Complex (2005)	**Buck Basin**	**619**	**1,574**	**305**	**3**	**2,501**	**7,816**
Edge Complex (2005)	**Mountain**	**0**	**0**	**0**	**0**	**0**	**3,062**
Edge Complex (2005)	**Red Hill**	**602**	**855**	**4**	**0**	**1461**	**1,463**
Edge Complex (2005)	**Corral/Holding**	**203**	**0**	**0**	**0**	**203**	**469**
Edge Complex (2005)	**Total**	**2,832**	**2,841**	**309**	**3**	**5,985**	**17,532**

Vegetation

Vegetation on the 7/K Allotment ranges from chaparral with Ponderosa pine stringers at the highest elevations in the Mazatzal Mountains to Sonoran desert at the lowest elevations near Tonto Creek. The allotment is dominated by steep, decomposed granite slopes and shrubby vegetation. Riparian vegetation is confined to short reaches along creeks and around springs.

Perennial grasses are a minor component at all elevations and include fluffgrass, three awn, and lovegrass (*Eragrostis* spp.). Dominant shrubs at the higher elevations include turbinella oak (*Quercus turbinella*), Manzanita (*Arctostaphylos pungens*), mountain mahogany (*Cercocarpus montanus*), and buckbrush (*Ceanothus* spp). Dominant shrubs at lower elevations include mesquite, prickly pear, jojoba, and catclaw acacia. Important half shrubs and forbs that are palatable to livestock include shrubby buckwheat (*Eriogonum wrightii*), globe-mallow (*Sphaeralcea* spp.), false-mesquite (*Calliandra eriophylla*), deerweed (*Porophyllum* spp.), and wire-lettuce (*Stephanomeria* spp).

The vegetative types listed in Figure 14 and 15 and the vegetation map were developed from a combination of the Mid Scale Existing Vegetation project developed for Forest Plan revision (USDA Forest Service, 2007), the in-progress TEUI survey covering the northern 3/4 of the allotment, and aerial photo interpretation. The Mid Scale Existing Vegetation project uses an *existing vegetation* classification system to develop *dominance types* based on the most abundant components of the uppermost canopy layer of the plant community. The Mid Scale map (see project record) has an accuracy of about 60 percent for the groupings of dominants types found on the 7/K Allotment. Much of the inaccuracy is the result of confusion at ecotones where similar types grade together. The final map represents a grouping of similar vegetation types. See: USDA Forest Service, Southwestern Region, 2006. Dominance Type Key v4.2 USFS Southwestern Region – Existing Vegetation Type Classification for an explanation of Mid Scale Domiance Types.

Figure 14. Summary of Vegetation Types

Vegetation Groups	Domianance Types	Acres
Sonoran Desert Scrub (LSM, 2)	AMDE4. LATR, SEDX_2, SICH_2, PAMI5, PRVE_2	6,918
Semi-Desert Grassland Shrub (LSM, 3)	CAER, MIACB, PRVE_3, SEDX_3, SICH_3, BOUTE	5,243

Pinyon-Juniper Woodlands (LSM, 4)	JUDE2, JUCO11, PIMOF, TEIX_4	284
Chaparral (LSM, 4)	ARPU5, ARPU5_QUTUT2, CEMO2_QUTUT2, QUAR_QUEM, QUTU2, SEDX_4, SEMX_4, JUDE2_QUERC	5,003
Ponderosa Pine Forests (LSM, 5)	PIPO, PIPO_QUERC, TEIX_5	167
Total		**17,615**

Figure 15. Description of Dominance Types

Dominance Types	Explanation
AMDE4	Triangle Bursage
LATR	Creosote Bush
SEDX_2	Sonoran Desert Mixed Evergreen and Deciduous Shrub
SICH_2	Jojoba (Life Zone 2)
PAMI5	Littleleaf Paloverde
PRVE_2	Velvet Mesquite (Life Zone 2)
CAER	False Mesquite
MIACB	Catclaw Mimosa
PRVE_3	Velvet Mesquite (Life Zone 3)
SEDX_3	Semi-Desert Mixed Evergreen and Deciduous Shrub
SICH_3	Jojoba (Life Zone 3)
BOUTE	Grama Species
JUDE2	Alligator Juniper
JUCO11	Redberry Juniper
PIMOF	Arizona Pinyon
TEIX_4	Shade Intolerant Evergreen Tree Species Mix
ARPU5	Pointleaf Manzanita
ARPU5_QUTUT2	Pointleaf Manzanita_Turbinella Oak
CEMO2_QUTUT2	Mountain Mahogany_Turbinella Oak
QUAR_QUEM	Arizona White Oak_Emory Oak
QUTU2	Turbinella Oak
SEDX_4	Semi-Arid Evergreen and Deciduous Shrub Mixed
SEMX_4	Semi-Arid Evergreen Shrub Mixed
JUDE2_QUERC	Alligator Juniper_Oak Species
PIPO	Ponderosa Pine
PIPO_QUERC	Ponderosa Pine_Oak Species
TEIX_5	Evergreen/Shade Intolerant Tree Mix

Figure 16. Vegetation by Pasture – Seven/K Allotment

Pasture	Sonoran Desert	Semi-Desert Shrubland	Chaparral	PJ Woodland	Ponderosa Pine	Total
Ash Creek	3,717	955	27	26	0	4,725
Buck Basin	1,191	2,703	3,505	255	167	7,820
Mountain	31	1,568	1,464	1	0	3,064
Red Hill	1,440	14	7	3	0	1,464
Corral/Holding	467	3	0	0	0	470
Excluded (Highway	73	0	0	0	0	73
Grand Total	6,918	5,243	5,002	284	167	17,616

Walnut Allotment

The Walnut Allotment is comprised of semi-desert grasslands and Sonoran desert vegetation. A few junipers occur at the higher elevations with a strong perennial grass understory, including side-oats grama, black grama, hairy grama, bush muhly (*Muhlenbergia porter*), three awn, curly mesquite, and cane beardgrass (*Bothriochloa* spp.). Mesquite, catclaw

acacia, whitethorn acacia (*Acacia constricta*), and prickly pear also occur at the higher elevations.

The Sonoran desert elevations of this allotment are dominated by cholla (*Cylindropuntia* spp.) on flatter sites and mixed shrubs with saguaro on slopes. Steeper slopes are dominated by many of the semi-desert grassland species as the Sonoran desert transitions rapidly to a semi-desert grassland type.

Some of the Range improvements on this allotment had fallen into disrepair during the approximately 9 years that the allotment was not stocked, fences fell into disrepair during that time and livestock from the neighboring Tonto Basin allotment were repeatedly found on the Walnut Allotment. Since 2009 as livestock have been re-authorized on the allotment many of these improvements have been repaired.

The allotment boundary fence has been repaired and interior fencing and water developments are being repaired. Lower-elevation pipelines are watered by developed artesian wells which are reliable when functioning. Stock tanks across the allotment need to be cleaned and repaired and will provide water dependent upon localized storms.

Soils

No systematic soil condition inventory has been conducted. The soil condition data presented in this report should be viewed as an approximation. Areas with less than satisfactory soil condition are a result of past wildfires and past and current management practices. Various field inspections have determined that generally the flatter Sonoran Desert soils tend to be in unsatisfactory condition largely due to compaction and a lack of ground cover. Some of the semi-desert grassland soils appear to have problems with erosion and lack of ground cover. Generally these are in impaired condition and occur on soils derived from granite. Data collected for TEUI have noted rills and gullies on granitic soils. Soils in chaparral, pinyon-juniper, and ponderosa pine communities generally have sufficient ground cover to control erosion. Accelerated soil loss occurred in many areas burned by the 1996 Lone Fire. These areas have generally recovered and are stable. Some chaparral areas were burned in 2005 by the Edge Complex or Three Fires. Many of these areas which suffered accelerated soil erosion have begun to stabilize but may still be experiencing excessive erosion in some places. The vegetation has re-sprouted in these areas but litter cover may not have reached pre-burn conditions. Streams within much of the burned area were impacted by post-fire flooding and have not fully recovered.

Microbiotic crusts are communities of organisms living on soil surfaces and are commonly found in semiarid and arid environments. Crusts play an important ecological role in the environment including increasing soil stability, reducing erosion, fixing atmospheric nitrogen, and contributing nutrients to plants. In deserts, well-developed biological soil crusts can inhibit germination of exotic plant species. Biological crusts are currently sparse on Sonoran Desert portions of these allotments.

Tonto Basin Allotment

About 80 percent is composed of nearly level to moderately steep slopes ranging from 0 to 40 percent. Elevations range from 2,150 feet near Roosevelt Lake to about 7,100 feet on Mt. Ord. Mean annual precipitation on the allotment ranges from 15 to 25 inches.

Satisfactory soil condition class generally occurs in the higher elevations under chaparral, pinyon-juniper woodlands, or ponderosa pine and also on steeper slopes at lower elevations. Generally, these soils have not been heavily impacted or they have high effective vegetative ground cover. Plant species density and diversity are high.

Impaired soils tend to occur on moderately steep slopes in grasslands and deserts where impacts have been moderate and in a few areas burned by recent fires. Current soils erosion may be excessive.

Unsatisfactory soils tend to occur on the flat Sonoran Desert portion of the allotment but also occur on some of the more accessible semi-desert grassland soils. The unsatisfactory soils have high amounts of surface compaction, poor soil porosity and poor root distribution resulting in moderate to high amounts of sheet and rill, and some gully erosion. There is very poor diversity, density, and composition of perennial grasses, forbs, and half-shrubs with little litter cover.

Satisfactory soils cover about 47 percent of Tonto Basin allotment. These are generally found on steeper slopes, areas that are rocky, soils with chaparral, pinyon-juniper, or timbered overstories with abundant litter. Satisfactory/ impaired soils cover about 6 percent of the allotment. Soils in this class cannot be cartographically delineated. Within this category, satisfactory soils tend to be in areas of dense chaparral while impaired soils occur in more open areas. Impaired soils cover about 20 percent of the allotment. Most of these soils occur on slopes ranging from 10-40 percent or on rocky flats. These soils have slight to moderate soil compaction and have lost part of the original "A" horizon through moderate sheet and rill erosion. Unsatisfactory soils comprise about 26 percent of the allotment. A large portion of these soils occur in Sonoran Desert and semi-desert grassland close to Tonto Creek, where historic settlement impacts were the highest. Nearly all occur on flats and low hills with slopes less than 40 percent. Moderate to high sheet, rill and gully erosion occurs and is most conspicuous on granitic soils. About one percent of soils are unsatisfactory/ impaired. Soils in this class cannot be cartographically delineated. Within this category, unsatisfactory soils tend to be in flat, open areas while impaired soils are seen on hills and in areas with denser vegetation.

Field observations indicated that 0 to 10 percent slopes had high historic impacts. Ten to 30 percent slopes had mostly moderate to high historic impacts except rocky areas, where impacts were low. Most slopes steeper than 30 percent had low historic impacts. Areas with less than satisfactory soil conditions are a result of past management practices. Recent data collected from Terrestrial Ecosystem Surveys (TES), pasture inspections, and Parker 3-step transects show a great deal of impaired and unsatisfactory soils in the lower elevation desert pastures east of Punkin Center. These soils tend to be compacted.

The allotment is located north of Roosevelt Lake within the Central Highlands or Transition Zone Physiographic Province (Chronic, 1983). The vegetation is extremely variable but is dominated by Sonoran Desert scrub, semi-arid grasslands, chaparral, pinyon-juniper woodlands, and ponderosa pine forests. Small areas of riparian vegetation occur in drainages. Topographical features range from nearly level valley and elevated plains to very steep mountains and escarpments. About 80 percent of the allotment is composed of nearly level to moderately steep slopes ranging from 0 to 40 percent. Table 4 contains slope data by pasture. Elevations range from about 2,150 feet near Roosevelt Lake to about 7,100 feet near Mount Ord. Mean annual precipitation on the allotment, based on Terrestrial Ecosystems gradient analysis, ranges from approximately 15 inches at the lower elevations to 25 inches at the higher elevations (Terrestrial Ecosystems Survey Handbook {TESH}). The slope map displays slope classes by pasture.

Table 1: Percent slope for Tonto Basin Allotment

Pasture Name - Slope	0-10%	10-30%	30-60%	60%+	Total
Bathtub Area	1,157	2,778	1,774	138	5,847
Bearhead Area	6,676	15,369	5,649	403	28,097
Bouquet/Cline Mesa Pasture	6,881	936	0	0	7,817
Cactus Area	90	985	1,668	158	2,900
Greenback Area	1,533	1,820	2,350	491	6,193
Holding Pasture	600	554	257	0	1411
Kayler Pasture	3,496	1,222	162	0	4,880
Lake Pasture	1,497	752	111	0	2,360
Lambing Pasture	326	2,819	1,689	176	5,010
Long Mesa Pasture	1,877	1,872	309	0	4,058
Mesquite Flat Pasture	846	1,413	93	0	2,352
Methodist Area	1,802	2,381	489	0	4,672
Mount Ord Pasture	1,333	3,571	3,842	1,494	10,240
Mud Springs Area	493	3,213	3,467	1,021	8,194
No Grazing	1,117	1,197	223	3	2,540
Oak Creek Pasture	62	289	106	0	457
Sycamore Pasture	524	4,847	6,064	1,625	13,060
Tonto Creek Riparian Unit	7,356	817	47	0	8,220
Water Lot	123	36	1	0	160
Grand Total	37,789	46,871	28,301	5,509	118,468

7/K Allotment

The **satisfactory soil condition class** generally occurs in the higher elevations under chaparral, pinyon-juniper woodlands, or ponderosa pine and also on steeper slopes at lower elevations. Generally, these soils have not been heavily impacted or they have high effective vegetative ground cover. Plant species' density and diversity are high. About 60 percent of the soils on the allotment are estimated to be in satisfactory condition.

The **impaired soils** tend to occur on moderately steep slopes in grasslands and deserts where impacts have been moderate and in a few areas burned by recent fires. Current soils erosion may be excessive. It is estimated that about 25 percent of the allotment contains impaired soils.

The **unsatisfactory soils** tend to occur on the flat Sonoran Desert portion of the allotment but also occur on some of the more accessible semi-desert grassland soils. The unsatisfactory soils have high amounts of surface compaction, poor soil porosity and poor root distribution resulting in moderate to high amounts of sheet and rill, and some gully erosion. There is very poor diversity, density, and composition of perennial grasses, forbs, and half-shrubs with little litter cover. It is estimated that about 15 percent of the allotment contains unsatisfactory soils.

About 70 percent of the allotment is composed of nearly level to moderately steep slopes ranging from 0 to 40 percent. Elevations range from about 2150 to 6200 feet. Mean annual precipitation ranges from approximately 13 inches at lower elevations to 24 inches at the highest elevations (Terrestrial Ecosystems Survey Handbook {TESH}).
Cluster 2- photo comparison appears to show an increase in the size of rills and gullies in this area. Soils are naturally erosive on the allotment and recent fires may have played a role.

Percent slope for 7/K Allotment

Pasture	0-15%	15-40%	40-80%	80 %+	Total
Ash Creek Pasture	1,523	2,508	686	5	4,722
Buck Basin Pasture	1,228	3,384	2,907	297	7,816
Corral/Holding Pastures	329	121	17	2	469
Mountain Pasture	552	1,683	791	36	3,062
Red Hill Pasture	745	536	179	4	1,463
Allotment Total	4,378	8,234	4,583	348	17,533
Percent by Slope Class	25%	47%	26%	2%	100%

Walnut Allotment

about 85 percent of the allotment is composed of nearly level to moderately steep slopes ranging from 0 to 40 percent. Elevations range from about 2300 feet near Tonto Creek to about 4700 feet in the northeast corner of the allotment. Mean annual precipitation on the allotment ranges from 15 to 20 inches.

Satisfactory soil condition class covers 4,922 acres (42 percent). Twenty-four percent of soils (2,825 acres) are predominantly in impaired soil condition. The unsatisfactory soil condition class makes up 4,029 acres (34 percent). Most of the unsatisfactory soils occur in flat Sonoran Desert east of Punkin Center in Haystack and Cottonwood Pastures. An estimated 60 percent of Sonoran Desert soils are in unsatisfactory condition. These areas make up the bulk of unsatisfactory soils on the allotment. Pastures with high percentages of unsatisfactory soils include Haystack and Cottonwood. About 40 percent of the allotment is covered by

semi-desert grasslands. Semi-desert grasslands, especially slopes and areas far from water, have mostly satisfactory soils while some heavily used areas have impaired soils.

It was observed in the field that 0 to 10 percent slopes had high historic impacts. 10 to 30 percent slopes had mostly moderate to high historic impacts except rocky areas, where impacts were low. Most slopes steeper than 30 percent had low impacts. Areas with less than satisfactory soil conditions are a result of past management practices. Recent data collected from TES surveys and inspections show a great deal of impaired and unsatisfactory soils in the lower elevation desert pastures east of Punkin Center. These soils tend to be compacted.

Table 3: Percent slope for Walnut Allotment

Pasture	0-15%	15-40%	40-80%	80%+	Total
Corral	3	-	-	-	3
Cottonwood	1,902	84	4	-	1,990
Edward Spring	888	1,369	791	46	3,093
Haystack	1,349	194	46	0	1,588
Holding	163	280	23	-	466
Juniper I	698	1,566	544	17	2,825
Juniper II	539	630	194	15	1,378
Lann	391	28	13	0	432
Total	5,933	4,151	1,614	78	11,776

The allotment is underlain by a variety of geologic types. Sedimentary rocks and old semi-consolidated valley fill deposits cover about 70 percent of the allotment, granite covers 25 percent, and diabase about 5 percent. All soils within the allotment are in the Low Sun Mild (LSM) TES climatic gradient (Terrestrial Ecosystem Survey Handbook). The desert soils (LSM, 2) are dominated by Torrifluvents (recent alluvium) along the major drainages; poorly developed Torriorthents on steep slopes; well developed Haplargids on non calcareous flats and hills; and Calciargids and Haplocalcids on calcareous hills and flats. The calcareous soils are normally associated with creosote bush (*Larrea tridentata tridentata*). In the semi-arid grassland zone (LSM, 3), well developed Aridic Haplustalfs dominate ranging from medium to fine texture. In the pinyon-juniper woodlands (LSM, 4), well developed Typic Haplustalfs and dark Typic Argiustolls are common while fine textured Vertic Argiustolls often occur on flats. In areas of chaparral (LSM, 4), Typic Haplustalfs are common, but shallow, poorly developed Lithic Ustorthens often occur on steep slopes.

Watershed and Riparian

Riparian: Riparian areas and springs on these allotments have been relied upon as a primary source of livestock water for many years, causing stream channels and adjacent riparian areas to receive concentrated grazing pressure. Existing conditions of watersheds, stream channels and riparian areas have been affected by many factors, both natural and human caused. Natural disturbances such as drought, fire, and flooding have likely been exacerbated by

human activities. Based on a long history of grazing in Tonto Basin and associated changes in upland and riparian vegetation, it seems likely that prior to the 1870s there were more miles of perennial stream reaches and acres of riparian vegetation than currently exist (Croxen 1926; Haskett 1935; Hendrickson and Minkley 1984; Heffernan 2008).

There are at least 192 miles of named and/ or riparian stream channels and at least as many unnamed drainages across these allotments. Of this, 53.1 miles are currently supporting riparian vegetation. Dominant riparian species include sycamore (*Platanus wrightii*), cottonwood (*Populus fremonti*i), red willow (*Salix laevigata*), Goodding's willow (*Salix gooddingii*), desert willow (*Chilopsis linearis*), ash (*Fraxinus velutina*), cattail (*Typha spp.*), seep willow (*Baccharis salicifolia*), sedges (*Carex spp.*), rushes (*Juncus spp.*), deergrass (*Muhlenbergia rigens*), water cress (*Nasturtium officinale*), and monkey flower (*Mimulus spp.*). Non-native species include Bermuda grass (*Cynodon dactylon*) and salt cedar (*Tamarix spp.*). Upper Lambing Creek supports a population of broadleaf lupine (*Lupinus latifolius leucanthus*).

Some of the stream channels assessed in the project area are in impaired or unstable condition (Mason and Johnson 1999) in a large part due to lack of riparian vegetation. These streams are less able to resist the erosive forces of flood waters, even during smaller events of lower water velocities (Janicke 2000). When large flood events with high water velocities occur, the channels experience severe erosion and/or aggradation causing heavy loss of riparian vegetation.

Watershed Condition Assessment: In 2010, a national effort was completed by the Forest Service to assess the condition of all 6th code watersheds on National Forest System (NFS) 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 Functioning, Functioning at risk, and Impaired and was assessed a point value based on its condition. Each 6th code watershed was given an overall rating of Functioning, Functioning at risk, or Impaired based on the indicator scores. The results of the assessment for the 6th code watersheds in the project area are listed in Figure 27 (Potyondy and Geier, 2011). Condition descriptions in the figure correlate with the condition ratings as follows: Good – Functioning, Fair – Functioning at Risk, Poor – Impaired).

Allotment	HUC12 Number	HUC12 Name	Huc12 acres	HUC12 acres within	% HUC12 within Allotment	Watershed Condition
7/K	150601050409	Ash Creek-Tonto Creek	13919	7145	51.3%	FR
	150601050503	Bumblebee Creek-Tonto Creek	14022	6412	45.7%	FR
	150601050407	Sycamore Creek	11885	3730	31.4%	FR
Tonto	150601050409	Ash Creek-Tonto Creek	13919	6117	43.9%	FR

Basin						
	150601050503	Bumblebee Creek-Tonto Creek	17966	5970	33.2%	FR
	150601050101	Buzzard Roost Canyon	14022	1941	13.8%	FR
	150601050404	Cottonwood Creek	10655	4122	38.7%	FR
	150601050408	Greenback Creek	21874	10332	47.2%	FR
	150601050401	Gun Creek	36695	9512	25.9%	F
	150601050406	Lambing Creek-Tonto Creek	33398	28842	86.4%	I
	150601050502	Methodist Creek	6382	5593	87.6%	FR
	150601050105	Middle Spring Creek	16624	1736	10.4%	FR
	150601050405	Oak Creek	10596	8021	75.7%	FR
	150601050403	Packard Wash-Tonto Creek	23721	11817	49.8%	FR
	150601050102	Rock Creek	16318	14178	86.9%	FR
	150601050407	Sycamore Creek	11885	8020	67.5%	FR
Walnut	150601050404	Cottonwood Creek	10655	6533	61.3%	FR
	150601050406	Lambing Creek-Tonto Creek	33398	4187	12.5%	I
	150601050405	Oak Creek	10596	1049	9.9%	FR

Figure 27 - **[1]Watershed Area within Each Allotment**

[2]Disregarded watersheds with less than 5% of watershed area within allotments

[3]F= Functioning

[4]FR= Functioning at Risk

[5]I= Impaired

Tonto Basin Allotment

The majority of the allotment lies within the Gun Creek-Tonto Creek 5th code watershed. Major tributaries to Tonto Creek originating along the steep front of the Mazatzals and flowing through the flat mesas above Tonto Creek include Haufer Wash, Buena Vista Creek, Sycamore Canyon, Reno Creek, Park Creek, Walnut Canyon, and Sycamore Creek. Tributaries of Tonto Creek draining the west slope of the Sierra Anchas, within the project area, include Gun Creek, Horse Canyon, Quartz Ledge Canyon, Packard Wash, Lambing Creek, Juniper Canyon, Walnut Creek, Oak Creek, and Greenback Creek.

There are approximately 146 miles of named streams on the USGS 1:24,000 topographic quadrangles within the Tonto Basin Allotment. There appear to be at least as many miles of unnamed streams delineated as blue lines on the USGS topographic quadrangles. These unnamed streams are the ephemeral and intermittent tributaries to the named streams. These channels are primarily headwater channels dominated by upland vegetation or ephemeral washes. They provide important functions relating to water quantity, water quality, the flood regime, hydrological connectivity, riparian vegetation, and wildlife habitat (Meyer et al. 2003, Levick et al. 2007) within the watershed.

Presently, of the 146 miles of named stream channels on the Tonto Basin Allotment, there are approximately 52 miles of stream channels that support riparian vegetation. Based on the 2210 Forest Service reports, this extent of riparian vegetation has been reduced from historic conditions. The potential to restore and increase the acreage of riparian vegetation is unknown, but likely. Most of the stream channels evaluated in the field are in unstable or impaired condition (table A6). Riparian areas and springs have been relied upon as the primary source of livestock water for many years causing stream channels and adjacent riparian areas to receive concentrated grazing pressure.

Permanent photopoints - There are 20 permanent photopoints (Figure 12) located in riparian areas on the Tonto Basin Allotment. In general, the photopoints on Tonto Creek show an increase in cover and size of vegetation. Photopoints on the tributaries are discussed in this report. The ones on Oak Creek were just established in 2009.

Figure 12. Photopoints on the Tonto Basin Allotment.

Stream Name	Number of Photopoints
Tonto Creek	6
Reno Creek	5
Park Creek	2
Greenback Creek	1
Sycamore Creek	1
Oak Creek	5

7/K Allotment

The 7/K Allotment is located on the Tonto Basin District on the west side of Tonto Creek on the north end of Roosevelt Lake. It encompasses about 17,542 acres. The entire allotment lies within the Tonto Creek watershed with the northern quarter in the Gun Creek-Tonto Creek 5th code watershed and the southern three quarters in the Tonto Creek-Theodore Roosevelt Lake 5th code watershed. Main tributaries to Tonto Creek within the allotment include Sycamore Creek, Ash Creek, and Bumblebee Creek.

There are approximately 25 miles of named streams on the USGS 1:24,000 topographic quadrangles and unnamed streams with riparian vegetation on the National Wetland Inventory (NWI) maps within the 7/K Allotment. There appear to be at least as many miles of unnamed streams delineated as blue lines on the USGS topographic quadrangles. These unnamed streams are the ephemeral and intermittent tributaries to the named streams. These channels are primarily headwater channels dominated by upland vegetation or ephemeral washes. They provide important functions relating to water quantity, water quality, the flood regime, hydrological connectivity, riparian vegetation and wildlife habitat within the watershed (Meyer et al. 2003, Levick et al. 2007).

Presently, of the 25 miles of named stream channels on the 7/K Allotment, there are approximately 9.6 miles of stream channels that support riparian vegetation. Based on the 2210 Forest Service reports, this extent of riparian vegetation has been reduced from historic conditions. The potential to restore and increase the acreage of riparian vegetation is unknown, but likely. All of the stream channels evaluated in the field are in impaired condition (Mason and Johnson 1999). Riparian areas and springs have been relied upon as

the primary source of livestock water for many years causing stream channels and adjacent riparian areas to receive concentrated grazing pressure. Over three quarters of the allotment were burned in the Lone Fire in 1996. Then in 2005 the Edge Complex Fire burned the north quarter of the allotment.

Eight permanent photopoints have been established on the 7/K Allotment (table A5). The one on Ash Creek is near FR 3310. It was established in 1996 and repeated in 2005 and 2009. No change in the stream channel or vegetation is apparent. The two on South Fork Sycamore Creek were established on Big Pine Flat in 1998 after the Lone Fire and repeated in 2001. One shows a widening of the stream channel. The other shows no apparent change. The five on Bumblebee Creek were established in 2001 and have not been repeated.

Table A5. List of photo points on the 7/K Allotment

Stream Name	Number of Photo points
Ash Creek	1
South Fork Sycamore Creek	2
Bumblebee Creek	5

Photo point photos and other photos taken during field visits are available on the Forest Service network "O" drive.

Walnut Allotment

The Walnut Allotment on the Tonto Basin Ranger District was carved out of and is completely surrounded by the Tonto Basin Allotment. The allotment extends from the Sierra Ancha Mountains on the east to Tonto Creek on the west and encompasses about 11,776 acres. The entire allotment lies within the Gun Creek-Tonto Creek 5th code watershed. Tributaries to Tonto Creek that flow through the allotment include Lambing Creek, Juniper Canyon, Cottonwood Creek, and Walnut Creek.

There are approximately 19 miles of named streams on the USGS 1:24,000 topographic quadrangles within the Walnut Allotment. There appear to be at least as many miles of unnamed streams delineated as blue lines on the USGS topographic quadrangles. These unnamed streams are the ephemeral and intermittent tributaries to the named streams. These channels are primarily headwater channels dominated by upland vegetation or ephemeral washes. They provide important functions relating to water quantity, water quality, the flood regime, hydrological connectivity, riparian vegetation and wildlife habitat (Meyer et al. 2003, Levick et al. 2007) within the watershed.

Presently, of the 19 miles of named stream channels on the Walnut Allotment, there are approximately 7.7 miles of stream channels that support riparian vegetation. Based on the 2210 Forest Service reports, this extent of riparian vegetation has been reduced from historic conditions. The potential to restore and increase the acreage of riparian vegetation is unknown, but likely. Most of the stream channels evaluated in the field are in impaired or unstable condition (Mason and Johnson 1999) (table A7). Riparian areas and springs have been relied upon as the primary source of livestock water for many years causing stream channels and adjacent riparian areas to receive concentrated grazing pressure. Juniper

Canyon and Walnut Creek also received unauthorized use from Tonto Basin Allotment cattle for several years. The Walnut Allotment was put in nonuse from 2003 to 2009, but continued to have unauthorized use from Tonto Basin Allotment cattle.

In September 2010, an intense monsoon storm hit the Walnut Creek area (Tonto Basin Ranger District personnel). The Punkin Center gauge recorded 3.92 inches of rain for the month, the average is 1.38 (WRCC 2011). This storm had tremendous impacts on Walnut Creek and the surrounding area.

Given the initial condition of the stream channels and the magnitude of two rainfall/flooding events at such close intervals, some of the streams within the project area have lost riparian vegetation, downcut, eroded, and experienced excessive deposition (aggraded).

A total of 11 permanent photopoints have been established on Walnut Spring and Walnut Creek downstream from the spring on the Walnut Allotment. All but one were established in 1996 or 1997 and repeated in several subsequent years. A new one was established at Walnut Spring in 2009. All photos show a dramatic increase in riparian vegetation cover and diversity, and some show a decrease in the channel width due to trapping of sediment by the vegetation.

Wildlife

Presence of wildlife is dependent on quality of existing habitat. Current drought conditions have stressed vegetation and wildlife populations in the area. Game species present include: black bear, elk, javelina, mountain lion, white-tailed deer, mule deer, coyote, gray fox, bobcat, raccoon, Gambel's quail, rabbits, and doves. Game population numbers are highly dependent on rainfall and available water. Nongame species include a variety of birds, mammals, reptiles, and amphibians. Several Special Status species (federally endangered or threatened) occur and several sensitive species may occur. A list of these species as well as Management Indicator Species can be found in Appendix B.

Neotropical Migratory Birds and Important Bird Areas: 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". No designated Important Bird Areas occur within the action area.

Riparian areas serve as corridors for migration of birds within and through the Tonto National Forest. Although relatively small watersheds, migratory birds use the riparian areas for habitat needs while migrating to different latitudes depending on the time of year. Upland riparian vegetation associated with water along these drainages provides a diversity of habitats that support shorebirds, waterfowl and neo-tropical birds.

Information in soils and riparian specialists' reports and district allotment files indicates this area has been heavily impacted by livestock in the past. Riparian areas are lacking variable age structure components that would improve wildlife usage of the area. Flatter topography is lacking sufficient perennial grasses that would provide forage and cover for wildlife.

Threatened, Endangered, and Candidate Species

Southwestern willow flycatcher (Endangered with Critical Habitat):
The southwestern willow flycatcher inhabits dense riparian habitats of Tonto Creek, near Roosevelt Lake, within the Tonto Creek Riparian Unit. The Roosevelt Lake flycatcher population has a large number of nesting territories, covers an extensive habitat area, and is essential to the recovery of the species. Flycatchers migrate from as far as Costa Rica to nest at Roosevelt Lake. Substantial research and monitoring of flycatchers at Roosevelt Lake, was conducted from 1996 to 2006 and detailed information can be obtained from reports by the AGFD, the USGS, and NAU.

There are 50+ known southwestern willow flycatcher breeding areas on the allotments. Other riparian areas on the allotments are unlikely to develop into flycatcher habitat because of their small size. Cattle management activities on this allotment have the potential to affect riparian habitat within the allotment and the watershed.

Conservation Measures:
Southwestern willow flycatcher (Endangered with Critical Habitat):

1. No grazing will occur within habitat used by breeding flycatchers or designated critical habitat.
    a. Tonto Basin Ranger District has continued to prohibit grazing on lower Tonto Creek to help alleviate the broader negative impacts from historical upland overuse and promote dynamic developing habitat.
2. Due to the proximity of Lake Pasture (Tonto Basin Allotment) and Ash Creek Pasture (7/K Allotment) to breeding flycatcher habitat, these pastures will be seasonally restricted if the lake levels drops below 60 percent of full pool, flycatcher habitat develops in the areas around Indian Point, and flycatcher territories are found during surveys. Seasonal restrictions will prevent cattle from entering these pastures from May 15 through August 15 to protect the critical incubation period and reduce risk of parasitism by brown-headed cowbirds.
3. Due to the proximity of Lann Pasture (Walnut Allotment) to occupied breeding flycatcher habitat, seasonal restrictions will be implemented in this pasture from May 15 to August 15.
4. In the following pastures adjacent to the TCRU, water will be shut off within 1 mile of occupied flycatcher breeding habitat to keep cattle from concentrating in areas in proximity to Tonto Creek and flycatcher nesting areas to reduce the risk of cowbird parasitism during the flycatcher nesting period (May 15 to August 15). The pastures are Bouquet/Cline Mesa, Holding, Kayler, Long Mesa, and Mesquite on Tonto Basin Allotment, and Red Hill on 7/K Allotment.
5. Habitat will be considered occupied if flycatchers are detected in any of the previous three years of presence/absence surveys conducted by the District Biologist.
6. The TCRU, which runs through portions of the Walnut and Tonto Basin Allotments and includes areas where flycatchers nest, is fenced from cattle grazing year-round. Fences are, and will continue to be, monitored by the permittees and Forest Service District staff. When cattle are seen trespassing, permittees will be notified and cattle will be removed from the TCRU.
15. Upland ranges and riparian areas are grazed at conservative levels.
16. TNF biologist will conduct willow flycatcher surveys annually if and when suitable habitat is present.

Mexican Spotted Owl (Threatened with Critical Habitat):
The MSO Inhabits pine-oak/riparian habitat within these allotments. Currently there are four Protected Activity Centers within the project area. Three of these PACs were affected by past fires and the amount of habitat left after these fires is limited.

Conservation Measures:
Mexican Spotted Owl (Threatened with Critical Habitat):

1. The TNF will not conduct activities that could result in disturbance to owls within 0.25 mile of protected activity centers (PACs) during the Mexican spotted owl breeding season (March 1 to August 31).
    a. Only non-motorized entry for livestock herding activities will be used during the owl breeding season.
2. Mexican spotted owl recovery plan guidelines will be applied in PACs and critical habitat.
3. The TNF will maintain residual stubble height and limit utilization to conservative use of annual growth on key forage species (between 20 and 30 percent within Mexican spotted owl habitat).

Two recovery criteria must be met before the Mexican spotted owl can be delisted:

1. *Owl occupancy rates must show a stable or increasing trend after 10 years of monitoring*.
2. *Indicators of habitat conditions (key habitat variables) are stable or improving for 10 years in roosting and nesting habitat*

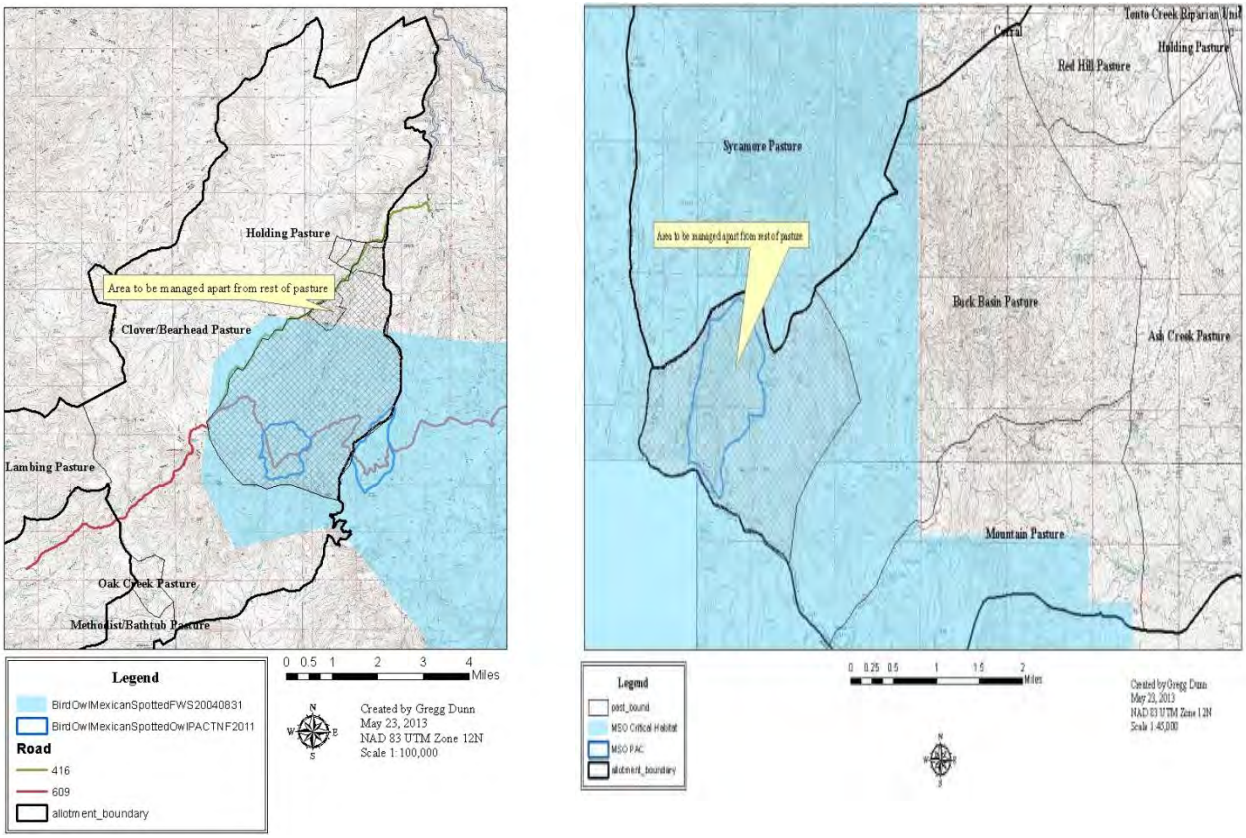

Figure 36 - Mexican Spotted Owl Management Areas on the Tonto Basin and 7/K Allotments.

Yellow-billed Cuckoo (Proposed threatened with critical habitat):

Currently, cuckoos breed in disjunct riparian habitats in the west. They winter in South America to Peru, Bolivia and Argentina. In Arizona, it is an uncommon to fairly common breeder in riparian habitats, below the Mogollon Rim in the Colorado and Gila River drainages. These cuckoos feed entirely on large insects including grasshoppers, cicadas, katydids, and caterpillars. Occasionally berries and fruit may be taken. They typically nest on a horizontal branch 6-25 feet off the ground, mostly in willow or other dense deciduous vegetation close to water. Yellow-billed cuckoos are not parasitic. They require a minimum of 25 acres of broadleaf forest at least 100 m wide (Gaines 1974) and at least 2.5 acres of dense nesting habitat per pair (Laymon and Halterman 1989). In Arizona, pairs are usually distributed every 0.5 miles in large blocks of contiguous habitat.

There has been a drastic reduction in the breeding range of Western yellow-billed cuckoos within the past 60 years due to riparian habitat alteration or destruction (Laymon and Halterman 1987). Habitat loss is the primary reason for declines of this species; causes of habitat loss include historic overgrazing.

Northern Mexican Garter snake (Proposed threatened with critical habitat):
These snakes are semi-aquatic, and activities that negatively affect stream morphology and the snakes' prey will also negatively affect these snakes. Both species of garter snakes require permanent water, dense streamside vegetation and soft-rayed fish. In particular, the narrow-headed garter snake also requires a rocky stream bottom (Holycross et al. 2006). Non-native fish, crayfish and bullfrogs prey upon and out-compete northern Mexican garter snakes, thus leading to a decline in the species (USFWS 2008). NatureServe (2008) also lists the introduction of non-natives and the loss of habitat as major threats to narrow-headed garter snakes. Brennen and Holycross (2006) also suggest that grazing and wildfires may affect narrow-headed garter snakes via erosion of stream banks, loss of aquatic vegetation, and increasing sedimentation, which covers rocky foraging sites. The northern Mexican garter snake is listed as threatened throughout Mexico and is believed extirpated from New Mexico and has declined in Arizona (USFWS 2008). NatureServe (2008) states that the United States' populations of narrow-headed garter snakes appear moderately threatened. In light of recent declines, the USFWS (2008) recently issued a news release stating it would revisit whether the northern Mexican garter snake warrants protection under the ESA.

Surveys conducted in 2005 and 2006 in Arizona by the AGFD found 16 Mexican garter snakes between Gisela and "The Box" on Tonto Creek (Holycross et al. 2006). One narrow-headed garter snake was located in Tonto Creek just above the confluence of Gun Creek (Holycross et al. 2006). A population of narrow-headed garter snakes was documented in 1988 at the Gun Creek confluence with Tonto Creek (Holycross et al. 2006). There is a historical voucher for a northern Mexican garter snake near Tonto Creek, north of Punkin Center from 1995 (Holycross et al. 2006). Sustaining habitat for these species is important not only to these populations themselves, but as a possible source for extirpated populations in other drainages (NatureServe 2008).

Headwater Chub (Sensitive, Candidate for Listing):
Headwater chubs occupy middle to headwater reaches of medium-sized streams of the Gila River basin at elevations of 925 to 2,000 m (3,035 to 6,651 ft). Headwater chubs are usually

found in large pools and are usually associated with cover such as undercut banks, large pools, or deep places created by obstructions like trees or rocks. Typical adult microhabitat consists of deep, near shore pools adjacent to swifter riffles and runs.

Migratory Birds

Executive order 13186, of 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." No designated Important Bird Areas occur within the action area. There is an overwintering designated area along the southern end of the Tonto Basin allotment. This area is closed to use from November 15 – February 15 for overwintering geese.

Tonto Creek and its tributaries serve as corridors for migration of birds within and through the Tonto National Forest. Although relatively small watersheds, migratory birds use the riparian areas for habitat needs while migrating to different latitudes depending on the time of year. Historically, perennial and intermittent channels in these allotments most likely supported higher cover of riparian vegetation, broader floodplains, stable channels, and more extensive perennial water than currently observed (Mason and Grove 2009). Therefore, riparian areas in these allotments most likely do not provide as much habitat for migratory birds as they did in the past.

Bald and Golden Eagle Act

(Desert) Bald Eagle, Sonoran desert population (*Haliaeetus leucocephalus*);

ESA recovered and Bald and Golden Eagle Act protected species): Nationally, the USFWS issued a final rule to delist the bald eagle July 9, 2007. However, on March 6, 2008, the U.S. District Court for the District of Arizona ordered the Service to: 1) conduct a status review of the bald eagle population of the Sonoran Desert region of the American Southwest (desert bald eagle) to determine whether recognizing this population as a discrete population segment (DPS) is warranted, and if so, whether listing the DPS as threatened or endangered pursuant to the ESA is warranted; and 2) issue a 12-month finding on whether recognizing the desert bald eagle population as a DPS is warranted, and if so, whether listing the DPS as threatened or endangered is warranted. The court ordered the Service to issue this finding by December 5, 2008.

Condition of the watershed and understory affect the prey base of the bald eagle. The stream channels and riparian areas report describes streams as having been rated as impaired or unstable, and personal observation in addition to the soils and vegetation report show understory conditions as sparse. Both of these factors negatively affect the populations of prey available to the bald eagle. Threats to the bald eagle include degradation of winter roosts, disturbance at nests, loss of perches (especially snags), and loss of riparian aquatic habitats essential to foraging and nesting. Threats to bald eagles are primarily riparian habitat loss (on the Tonto, mature cottonwoods) due to scouring floods, livestock grazing, and other human disturbances (USFWS 2006).

An eagle pair nests in a cottonwood snag on the north shore of Tonto Creek in the far northwestern arm of Roosevelt Lake. They have nested in other trees in the vicinity and had

more than one nest in the current nesting tree. Two chicks hatched in 2008 but did not survive because the limb of the active nest fell into the water (McCarty et al. 2008). February 27, 2009, this pair was actively nesting in the same snag in an alternate nest. As of March 13, 2009, the nest had three eaglets. An eagle pair nests at the Sheep Nest is in Tonto Creek just north of the town of Tonto Basin. On April 16, 2009, AGFD biologists surveying the area documented that the entire nesting tree had fallen over, most likely during a recent windstorm. The nest had two eaglets in it, and both survived because they were old enough (close to 10 weeks) to fly.

Golden Eagle (*Aquila chrysaetos*; Bald and Golden Eagle Act protected species):
The following information is from Kochert et al. (2002). This is most common in the West near open spaces that provide hunting habitat and often near cliffs that supply nesting sites. Southern pairs tend to be year-round residents where they breed. Although capable of killing large prey (e.g., livestock) golden eagles primarily prey on smaller mammals such as rabbits and ground squirrels. Most begin establishing a nesting territory at around age four. An eagle tends to stay where is first establishes a territory that is about 7-12 square miles from conspecifics. A territory may contain many nests, which a pair maintains and repairs during courtship. The nesting season can extend to more than six months from the time eggs are laid until young gain independence. Threats to eagles include intentional and accidental trapping, shooting, poisoning, and electrocution. Urbanization, agricultural development, and wildfires are also threats. The species persists, but some U.S. nesting populations may be declining.

Use on in the Tonto NF is unclear, but is probably higher than records suggest. HDMS observations exist in the Tonto Basin (East) Allotment. AGFD Eagle nest watchers in 2009 observing the Tonto bald eagle nest documented attacks on an immature golden eagle by the bald eagle pair (personal communication, K. O'Brien, May 6, 2009) and a golden eagle flying from the south over Roosevelt Lake at Indian Point (personal communication, K. O'Brien, May 6, 2009). Tonto Basin RD biologists have also documented two dead golden eagles within the last year; one in Pinto Creek between near Bell's Ranch and FS Road 242, and one near Greenback Creek north of the Conway Ranch. The cause of death of the former eagle is unclear, and the latter died from lead poisoning.

Game Species (Harvest Emphasis)
Specific management objectives for big game species are identified in the Tonto Resource Land Management Plan (USDA Forest Service 2002) and Arizona's Game and Fish Department's (AGFD) Wildlife 2012 Strategic Plan (Strategic Plan, AGFD 2007). The purpose of the Game Management Subprogram of the Strategic Plan is to "protect, restore and manage game populations and their habitats, to maintain the natural diversity of Arizona, and to provide wildlife-oriented recreation opportunities for all present and future generations." "Game" includes big game, small game, fur-bearing animals, predatory animals, upland game birds and migratory game birds.

Tonto Basin, Walnut, and 7/K allotments support habitat for big and small game species. Big game species present within the allotment include: black bear, elk, javelina, mountain lion, white-tailed deer, mule deer, and desert bighorn sheep. Small game species present on the allotment include tree squirrel, cottontail rabbits, and some waterfowl (occasionally using

dirt stock tanks). Small game population numbers are highly dependent on rainfall and available water. Upland game birds on the allotments include Gambel's quail, mourning dove and white-winged dove. Most game species have showed declines in numbers over a ten year period (personal communication Sayer 2012).

Current conditions observed on the allotments suggest that ground cover in Sonoran desert flats lacks desired ground cover (Ambos 2009); therefore, this habitat type may not provide adequate forage, browse, and cover for some game species.

Desired Conditions

Range and Vegetation

According to the Forest Plan, the Tonto NF should manage vegetation types such as; chaparral, semi-desert grasslands, and desert scrub to meet the needs of both game and non-game species (p. 113 – 14). More specific to range management, the desired condition is to manage for maintenance or improvement of preferred herbaceous and browse species for cattle and native ungulates, as well as maintenance or improvement in canopy and basal cover for soil protection. In desert scrub communities this would include browse species such as jojoba and range ratany. In semi-desert grasslands, management would strive for maintenance or an increase in "decreaser" and "increaser" herbaceous species such as sideoats grama, curly mesquite, and three-awn.

Tonto National Forest Plan

- Provide for grazing of domestic livestock (p19).
- Bring permitted grazing use in balance with forage allocated for use by domestic livestock (p 24).
- Improve watershed condition, range forage improvement, wildlife habitat improvement and visual quality enhancement (p 22).
- Maintain a minimum of 30 percent effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas. Where less than 30 percent exists, it will be the management goal to obtain a minimum of 30 percent effective ground cover (p 40-1)
- Identify key ungulate forage monitoring areas. These key areas will normally be ¼ mile from water, located on productive soils on level to intermediate slopes and be readily accessible to grazing. Size of the key forage monitoring areas should be 20 to 500 acres. Within key forage monitoring areas, select appropriate key species to monitor average allowable use (p 43)
- Achieve utilization in the riparian areas that will not exceed 20 percent of the current annual growth by volume of woody species, at least 80 percent of the potential riparian overstory crown coverage and at least 50 percent of the cottonwood willow and mixed broadleaf acres in Structural Type I by 2030 (p 41)
- Rehabilitate at least 80 percent of the potential shrub cover in riparian areas through the use of appropriate grazing systems and methods (p 41)

- Provide wildlife access and escape on all livestock and wildlife water developments (p 42)
- Manage vegetation to achieve satisfactory or better watershed conditions
- Management activities within the desert zone must fully recognize the limitation this unique ecosystem has to the impacts of man's uses and activities.
- Emphasize improvement of soil productivity, air and water quality
- Enhance riparian ecosystems by improved management
- Coordinate with range to achieve utilization in the riparian areas that will not exceed 20 percent of current annual growth by volume of woody species
- Coordinate with range to achieve at least 80 percent of the potential riparian overstory crown coverage
- Coordinate with range to achieve at least 50 percent of the cottonwood-willow and mixed broadleaf acres in structural Type I (tall trees with well-developed understory) by 2030

These allotments fall within management areas 5G, 5D, 6F, and 6J of the Forest Plan. Management emphasis for these areas is on wildlife habitat improvement, livestock forage production, and dispersed recreation. Objectives are to improve livestock forage production and wildlife habitat diversity, as well as to achieve desired resource condition; a mosaic within the total type which provides for a mix of successional stages.

Standards and guidelines that relate to this analysis:

- Manage suitable rangeland at Level D. Rangeland in less than satisfactory conditions will be treated with improved grazing management along with the installation of structural and non-structural improvements (5G, 5D, 6J).
- Develop structural improvements in association with Allotment Management Plans (AMP) to maintain utilization at levels appropriate with management intensity and AMP objectives (5G, 6J).
- Develop structural improvements as prescribed in Allotment Management Plans to maintain utilization at appropriate levels in Key areas (5D).
- Minimal range improvements necessary for Level C management and protection of forage and soil resources. Maintain utilization at acceptable levels within key forage producing areas (6F).
- Wildlife habitat improvement needs would be integrated into range forage improvement projects identified in approved AMP (5D).
- Allotment management plans and rotation schedules would be formulated and implemented to avoid elk displacement from identified calving areas (5D).
- Habitat requirements for threatened, endangered, and sensitive species would take precedence over requirements for other species (5D).
- Continue periodic inspections and maintenance of existing wildlife exclosures and restoration projects, and improve the level of protection and maintenance (5D).
- Continue cooperative management with AGFD and SRP on Roosevelt Lake wildlife area (6F)

Management Levels in project area given by Tonto NF Land Management Plan (p 243)

Level	Description of Range Management Levels

Identifier	
B	Management controls livestock numbers so that livestock use is within present grazing capacity. Improvements are minimal and constructed only to the extent needed to protect and maintain the range resource in the presence of grazing.
C	Management seeks full utilization of forage allocated to livestock. Cost effective management systems and techniques, including fencing and water development, are designed and applied to obtain relatively uniform livestock distribution and use of forage, and to maintain plant vigor.
D	Management seeks to optimize production and utilization of forage allocated for livestock use consistent with maintaining the environment and providing the multiple use of the range. From all existing range and livestock management technology, practices may be selected and used to develop cost effective methods for achieving improved forage supplies and uniform livestock distribution and forage use. Cultural practices such as brush control, type conversion, fertilization, site preparation and seeding of improved forage species may be used to improve quality and quantity of forage. Cultural practices may be combined with fencing and water developments to implement complex grazing systems and management methods.

Forest Service Policy

- 2550.1- the Multiple Use Sustained Yield Act states that management of national forests must provide "sustained yields in perpetuity without impairment of the productivity of the land."
- 2550.3-"manage forests and rangelands in a manner that will improve soil productivity."
- 2520.02-"to protect National Forest System watersheds by implementing practices designed to maintain or improve watershed condition, which is the foundation for sustaining ecosystems and the production of renewable natural resources, values, and benefits."

Forest Service Manual 2500 (USDA 2004) provides direction for managing all Forest Service lands. Objectives and policy for riparian areas (FSM 2526.02 and 2526.03) include:

- Protect, manage, and improve riparian areas while implementing land and resource management activities
- Manage riparian areas in the context of the environment in which they are located, recognizing their unique values
- Manage riparian areas under the principles of multiple-use and sustained-yield, while emphasizing protection and improvement of soil, water, and vegetation, particularly because of their effects upon aquatic and wildlife resources. Give preferential consideration to riparian-dependent resources when conflicts among land use activities occur
- Give attention to land along all stream channels capable of supporting riparian vegetation (36 CFR 219.27e)
- Give special attention to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. This distance shall correspond to at least the recognizable area dominated by the riparian vegetation (36 CFR 219.27e). Give special attention to adjacent terrestrial areas to ensure adequate protection for the riparian-dependent resources

Best Available Science

Grazing by domestic livestock can impact vegetation by changing the mix of species in the plant community (species composition), by changing the density and frequency of perennial herbaceous plants (frequency), and by changing the vigor of grazed plants. Combined conditions of composition, density, and plant vigor can be used to measure condition and trend in rangeland plant communities. Desired conditions for these communities are to:

- Increase cover of native herbaceous species with an ultimate goal of achieving ecosystem potential
- Increase plant basal area and litter cover
- In grasslands, increase foliar canopy cover, basal cover, and vigor of grass species that decrease under grazing pressure
- In chaparral, increase foliar canopy cover and vigor of shrub species preferred by grazing animals
- In pinyon-juniper woodlands, increase all of the above attributes
- In Sonoran Desert communities allow for increased reproduction of native perennial plants.

Soils

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). 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 (USDA Forest Service, 2012). It would be desirable for all soils within the allotment to be in satisfactory; however, since some of the soils are naturally in a unsatisfactory condition and soil improvement will take longer than the 10 years for this authorization, the desired condition would be for them to maintain their current condition within grazing management.

Forest Plan Direction

The 1987 Tonto National Forest Plan (p 44) articulated the following desired conditions:

- Manage vegetation to achieve satisfactory or better watershed conditions.
- Management activities with the desert zone must fully recognize the limitations this unique ecosystem has to the impacts of man's uses and activities.

Forest Service Manual Direction

- 2550.1 – Authority 1, The Multiple use-Sustained Yield-Act states that management of the National Forests must provide "sustained yields in perpetuity without impairment of the productivity of the land."

- 2550.3 – Policy "Manage forest and rangelands in a manner that will improve soil productivity."
- 2520.02 - Objective "To protect National Forest System watersheds by implementing practices designed to maintain or improve watershed condition, which is the foundation for sustaining ecosystems and the production of renewable natural resources, values, and benefits."

Desired Soil Condition

The desired condition is to have all soils in satisfactory condition as described in FSH 2509.18-99-1; however, this is a long-term goal. Complete recovery of all soils is unlikely to occur within 10 years. Rates of recovery will differ depending on several factors such as magnitude of past soil loss, inherent soil properties, current vegetative ground cover, and type of ecosystem. The desired conditions for soils are to:

- Maintain or improve the approximately 60% of soils currently in **satisfactory condition**.
- Improve the approximately 25% of soils that are in **impaired soil condition** so that they are reaching or moving towards **satisfactory condition.**
- Improve the approximately 15% of soils that are in **unsatisfactory soil condition** so that they are reaching or moving toward at least **impaired condition.**

Watershed and Riparian

Direction for managing riparian areas on the Tonto National Forest is found in the Tonto Forest Plan (USFS 1985, 1996). The intention of the plan (USFS 1985, 1996) is to manage riparian areas for protection of soil, water, vegetation, wildlife, and fish populations. The project specific desired condition statements are listed in the Affected Environment Section. Key standards and guidelines/desired conditions from the Tonto Forest Plan (1985; amended 1996) include:

- Coordinate with range to achieve utilization in the riparian areas that will not exceed 20 percent of the current annual growth by volume of woody species.
- Coordinate with range to achieve at least 80 percent of the potential riparian overstory crown coverage.
- Coordinate with range to achieve at least 50 percent of the cottonwood-willow and mixed broadleaf acres in structural Type I (tall trees with well-developed understory) by 2030.
- Rehabilitate at least 80 percent of the potential shrub cover in riparian areas through the use of appropriate grazing systems and methods.
- Rehabilitate and maintain, through improved management practices, mixed broadleaf riparian to achieve 80 percent of the potential overstory crown coverage. Natural regeneration is anticipated to achieve most of this goal. Artificial regeneration may be necessary in some areas.

- Re-establish riparian vegetation in severely degraded but potentially productive riparian areas. Natural regeneration is anticipated to achieve this goal, but artificial regeneration may be necessary in some areas.
- Rehabilitate cottonwood willow Type II (tall trees with little or no understory) to achieve conversion to Type I (tall trees with well-developed understory) by the year 2030. Natural regeneration is anticipated to achieve most of this goal, but artificial regeneration may be necessary in some areas.

The Forest Service Manual (USFS 2004) provides direction for managing all Forest Service lands. Objectives and policy for riparian and watershed areas (FSM 2526.02 and 2526.03) include:

- To protect, manage, and improve riparian areas while implementing land and resource management activities.
- To manage riparian areas in the context of the environment in which they are located, recognizing their unique values.
- Manage riparian areas under the principles of multiple-use and sustained-yield, while emphasizing protection and improvement of soil, water, and vegetation, particularly because of their effects upon aquatic and wildlife resources. Give preferential consideration to riparian-dependent resources when conflicts among land use activities occur.
- Give attention to land along all stream channels capable of supporting riparian vegetation (*36 CFR 219.27e*).
- Give special attention to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. This distance shall correspond to at least the recognizable area dominated by the riparian vegetation (*36 CFR 219.27e*). Give special attention to adjacent terrestrial areas to ensure adequate protection for the riparian-dependent resources.

The most common conditions limiting proper functioning condition of stream channels in the project area are high width-depth ratios, excessive erosion or deposition, and lack of riparian vegetation (elements of Mason and Johnson 1999). Restoration and recovery of stream channel stability and proper functioning condition is dependent upon restoration and recovery of riparian vegetation. Stream channel recovery requires a longer time horizon than that considered in this management proposal. Riparian improvement and recovery can occur within the time frame of this plan consequently desired condition are developed for riparian vegetation rather than stream channel stability. The desired conditions to achieve riparian improvement are to maintain residual herbaceous vegetation along the greenline or streambank and to improve Riparian Health rating (Thompson et al, 1998) to greater than 67 percent in key reaches with a current health rating of less than 67 percent and maintain or improve riparian health rating in key reaches with a current health rating of greater than 67 percent. Several laws, regulations, policies, standards and guidelines apply to this resource within the project area including;

Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act)

Objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Among other things it specifies that nonpoint sources of pollution be identified and that procedures be set forth to control them to the extent feasible.

- Forest and Rangeland Renewable Resources Planning Act of 1974
  Contains references to the need to protect and where appropriate improve the quality of the soil and water resources.
- National Forest Management Act of 1976
  Stresses the need to protect and improve the quality of soil and water resources, and avoid permanent impairment of productive capability of the land.
- Clean Water Act of 1977
  Stresses federal agency compliance with Federal, State and local substantive and procedural requirements related to the control and abatement of pollution to the same extent as required of nongovernmental entities.
- Executive Order 11988
  Among other things this Order requires each agency to provide leadership and take action to restore and preserve the natural and beneficial values of floodplains.
- Executive Order 11990
  This order requires each agency to take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

Wildlife

General wildlife resource goals for the Tonto National Forest are outlined on page 20 of the Forest Plan and include providing for species diversity, maintaining viable populations of existing species, improving habitat for selected species, and managing to increase population levels of threatened and endangered species.

Standards and guidelines that apply to this analysis (in addition to those already described):

- Maintain a minimum of 30 percent effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas. Where less than 30 percent exists, it will be the management goal to obtain a minimum of 30 percent effective ground cover.
- Allow for forage to maximize threatened and endangered species, management indicator species, and emphasis harvest species.
- Forage use by grazing ungulates will be maintained at or above a condition which assures recovery and continued existence of threatened and endangered species.

These allotments fall within management areas 5G, 5D, 6F, and 6J of the Forest Plan. Management emphasis for these areas is on wildlife habitat improvement, livestock forage production, and dispersed recreation. Objectives are to improve livestock forage production and wildlife habitat diversity, as well as to achieve desired resource condition; a mosaic within the total type which provides for a mix of successional stages.

Standards and guidelines that relate to this analysis:

- Manage the desert scrub type to emphasize production of javelina, Gambel's quail, and mule deer (6F, 6J).

- Manage higher ecosystem extensions in the desert scrub type to emphasize cottontail production (6F, 6J).
- In the pinyon-juniper type, manage toward a goal of 25-50 percent cover of browse shrubs in key deer areas (6J).
- Manage the pinyon-juniper type to emphasize the production of mule deer (5G) and whitetail deer (6J).
- Manage the chaparral type to emphasize production of whitetail deer (5G).
- Manage oak to enhance band-tailed pigeon and whitetail deer habitat, especially within ½ mile of water (5D).
- Wildlife habitat improvement needs would be integrated into range forage improvement projects identified in approved AMP (5D).
- Allotment management plans and rotation schedules would be formulated and implemented to avoid elk displacement from identified calving areas (5D).
- Habitat requirements for threatened, endangered, and sensitive species would take precedence over requirements for other species (5D).
- Continue periodic inspections and maintenance of existing wildlife exclosures and restoration projects, and improve the level of protection and maintenance (5D).
- Locate and analyze peregrine falcon habitat, and document and correct disturbances to habitat (5D, 5G, 6F, 6J).
- Continue cooperative management with AGFD and SRP on Roosevelt Lake wildlife area (6F)
- Rehabilitate bald eagle nesting habitat by improving riparian habitat on alluvial benches.

Arizona Game and Fish Department goals and objectives identified in their Wildlife Strategic Plan are as follows:

- For big and small game: 1) Maintain, enhance, and restore populations of game wildlife to provide for recreational opportunities, including wildlife viewing. 2) Minimize adverse impacts to wildlife and wildlife resources
- Maintain big game populations at levels that provide diverse recreation opportunities.
- Goals for tree squirrels include maintaining or enhancing habitat and to continue to allow for recreational and aesthetic uses
- Goals for cottontail rabbits are to maintain or enhance hunting opportunities by enhancing habitat and improving access to habitat
- Increase waterfowl production and wintering populations within Arizona through habitat development, and to provide recreational opportunities for as many individuals as possible
- Goals for quail and dove include maintaining or enhancing hunting opportunities by enhancing habitat and improving access to habitat
- The mission of the AZGFD non-game wildlife program is to conserve, enhance and restore non-game and endangered wildlife as part of the natural diversity of Arizona, and provide opportunities for the public to enjoy these resources through uses compatible with their protection

Additional management objectives include:

- Provide at least 40 percent ground cover around springs and riparian areas for wildlife hiding cover.
- Increase forb production. Forbs are important constituents of wildlife diets (game and non-game species) and are particularly critical during brooding and rearing
- Continue to provide access to water for game and non-game species. Wildlife escape ramps and access ramps would be provided and maintained on all cattle troughs.

- In riparian areas across the allotment provide for regeneration of vegetation to achieve multiple age classes and complex vegetative structure for wildlife habitat.
- To provide for the needs of special status species, desired conditions for the next 10 years are to:
  - Maintain conservative use in upland areas to minimize impacts on riparian habitat in the watershed to provide for the southwestern willow flycatcher, and yellow billed cuckoo.
  - Allow for continued recovery and development of riparian areas in Greenback Creek for spikedace, southwestern willow flycatcher, northern Mexican garter snake, and yellow billed cuckoo.

Direct and Indirect Effects

Range and Vegetation

Grazing by domestic livestock can impact vegetation by changing the mix of species in the plant community being grazed (species composition), by changing the density and frequency of perennial herbaceous plants (plant frequency), and by changing the vigor of grazed plants. The combined effects of composition, density, and plant vigor are used to measure the condition and trend of rangeland plant communities.

A review of best available scientific information from the field of rangeland management supports the concept that conservative or moderate livestock use yields results in plant vigor and diversity that are similar to an absence of livestock grazing. These studies do not specify whether soils influenced by livestock grazing pressure were in satisfactory condition or some form of impaired condition (i.e. compacted) when studies began. Climatic fluctuations such as precipitation rates continue to play a significant role in this concept as well. Stocking rates must be assessed frequently on these grazing allotments, regardless of the alternative chosen, due to bimodal, localized precipitation patterns and frequent regional drought events.

Predicted climatic changes over the next several years indicate warmer and drier conditions will develop in the southwest. A recent summary of scientific information provided in *Rangelands* (Archer and Predick, 2008) notes that these projections will likely affect vegetation composition, diversity, and rate of growth in desert ecosystems, reduce water availability, and trigger soil erosion losses through a reduction in stability as soil moisture content decreases and the intensity of rainfall events increases. Adaptive management strategies will become increasingly important if this occurs. Development of water sources would help alleviate localized effects of grazing by improving distribution.

Livestock grazing on vegetation directly impacts plants by removing current year's growth. Warm season perennial grasses such as curly mesquite and three-awns are opportunistic and will become productive following spring moisture and summer monsoonal moisture. Grama (*Bouteloua*) species should receive very light grazing pressure during periods of rapid growth, which typically follow summer monsoon rain events. They can then be grazed more aggressively following seed set in fall and winter months with little undesirable effect. Curly mesquite (*Hilaria belangeri*) should be protected from use during key growth periods to facilitate seed set and stolon production, which can help stabilize loose soils.

The leaves and beans of jojoba (*Simmondsia chinensis*) are palatable and nutritious and provide an important source of forage in Sonoran desert pastures (NRCS Plants Database 2008). A study conducted on nearby Campaign allotment demonstrated jojoba's tolerance of browsing by cattle. Jojoba initiated new twigs from lateral buds to compensate for loss of apical buds and twigs. Heavy browsing greatly reduced shrub size and forage yield, but moderate browsing resulted in yields similar to those on ungrazed plants (NRCS Plants Database 2008; Roundy and Ruyle 1989).

Studies on jojoba seedling survival indicate that rates of survival are dependent on climatic and biotic factors. Seedlings in sheltered areas had a higher rate of survival than those more exposed to climatic extremes and rodent predation (Sherbrooke 1977). Macroplots (.10 acre circular plots) were established by Forest and Park specialists on Tonto National Monument, which contains comparable vegetation and soils and has not been grazed for 30 years. Results of those macroplots indicated a high presence of jojoba seedlings under existing mature vegetation with high surface litter presence. An appropriate level of seedling recruitment for viable population sustainability is not well-demonstrated in current literature. On allotments in this analysis, jojoba is generally limited to south-facing slopes (25-55 percent) at lower to mid-elevations. Recruitment does not appear to be affected by grazing; the majority of these areas have many young jojoba plants with little to no hedging observed in 2012. Red Hill Pasture on 7/K allotment has lower recruitment and a higher proportion of decadent plants, but this may be related to soil condition and climate since livestock use of this area is low.

Studies considering other woody, perennial Sonoran Desert species indicate that climate and elevation are more responsible for diversity and density than livestock grazing (Hall, 2005). Perennial grasses are also more dependent upon climatic factors for survival however some studies indicated that grasses were more vigorous when grazing pressure occurred during dormancy (Hall, 2005).

Saguaro seedling establishment is slow and highly dependent upon temperature, rainfall (soil moisture), and herbivory by insects. Micro-sites (nurse plants) are important for regulating temperature and providing shade essential for saguaro establishment. Livestock affect saguaro seedling establishment through trampling under nurse plants (particularly mesquite and palo verde) and through herbivory. Indirect effects can also occur through the reduction of multi-storied shrubby canopy layers, which in turn reduces litter, understory cover, and nurse plant cover (Hall, 2005).

The conclusion of a literature synthesis provided by The Nature Conservancy is that "continuous grazing in which livestock are maintained within fenced allotments yearlong is not a feasible grazing management strategy on Sonoran Desert public lands" (Hall, 2005). The report also states that flexible stocking rates and the ability to move livestock quickly in response to changing conditions is the best management strategy.

Flowers and beans of catclaw (*Acacia*), mesquite (*Prosopis*), and mimosa are palatable and desirable to livestock in late spring and early summer following adequate winter precipitation. In years of low precipitation or during hot summer months, these plants often become dormant and retain only a minimum cover of leaves.

Various species of spring annuals are the preferred choice for livestock grazing when adequate winter moisture allows sufficient growth. Spring annuals can occur in all life zones

on these allotments but are most prevalent at lowest elevations in the Sonoran Desert. They are most abundant following winter and early spring rains when the ground begins to warm, usually in March and April but occasionally extending into early May. Pasture inspections on these allotments indicate grazing pressure on accompanying shrubs is reduced while annuals are green and palatable. Once annuals begin to cure, use of palatable shrubs begins to increase in response to new growth and flower production resulting from winter moisture. Grazing of annual forbs and grasses led to changes in composition of annual plant communities in a two-year study on grazed versus ungrazed desert sites (Waser and Price, 1981). Sites became dominated by a few annual species while species considered relatively rare tended to drop out of grazed sites.

As stated by Venable and Pake (1999) in the Sonoran Desert ecosystems, annuals can make up to 50 percent of the local flora. Due to the variation in rainfall that occurs in this ecosystem, annual plants are very diverse and thus highly responsive to the climatic variations typical in the Southwest. Species diversity of annuals is also more likely to decline from a site as compared to perennials plants. This may affect ants and rodent populations whose primary food source is from the seeds of annuals as well as grasshoppers, rabbits and larger grazing animals which browse on the vegetative parts of annual plants.

False mesquite (*Calliandra*) produces good quality browse in early spring following adequate winter precipitation and is often available before onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but will become productive again following adequate moisture from summer monsoon rains. False mesquite can withstand aggressive grazing pressure and often becomes the dominant forage plant on the landscape when perennial grasses have been reduced or removed.
Tonto Basin, Walnut, and 7/K allotments are adjacent to five other active livestock grazing allotments within the same watersheds and there are four areas directly adjacent to the project area that is not grazed. Those areas not authorized to have livestock include; the Three Bar Wildlife area to the south of the 7/K allotment, Tonto Creek Riparian Unit that encompasses Tonto Creek and splits the project area, Haufer Wash Research Natural Area north of the Tonto Basin Allotment and just west of Highway 188 and Kayler Spring riparain exclosure north of the Tonto Basin Allotment and just east of Tonto Creek.

Soils

Livestock grazing can affect soil quality in several ways. Pressure exerted on the soil surface by large animals can cause compaction. Grazing can reduce vegetation and litter cover. These factors can lead to decreased rainfall infiltration, increased runoff, increased erosion, and reduced soil organic matter and root growth. Changes in soil quality can also affect the productivity and composition of plant communities (USDA NRCS, 2001).

Direct Effects: trailing by cattle on steeper slopes can physically displace soils, leading to erosion. Hoof action of cattle can also directly impact soils by compacting soils. Risk for compaction is greatest when soils are wet (NRCS, 1996). Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion. Dr. Jim Sprinkle (University of Arizona Cooperative Extension Service 2012) cites Sharrow (2007) who reports that while infiltration may be slowed on compacted soils, water holding capacity is not reduced. Sharrow also notes: “Soil compaction is a natural and dynamic process. Gravity is the major cause of soil compaction. The weight of a layer of soil compacts the soil

beneath it. The downward force of gravity applied to the soil surface by any object in contact with it compacts the soil. For instance, the weight of a tree is transferred down to the soil, which is compacted by the load. Interestingly, trees and other woody vegetation also compact soil through root expansion. It is not unusual to see trees that have formed a pronounced mound under their trunk by simple expansion of roots over many years pushing the soil up and away from the trunk. This lateral compression compacts nearby soils. The current compactness of soil is a dynamic equilibrium between these compactive factors and restorative processes that decompact soils. Restorative processes are very poorly understood and documented. Shrinking and cracking of vertic clay soils; freezing and thawing; activities of ants, worms, and other soil animals; and the formation of fine root channels by plants are frequently cited restorative forces. Livestock grazing may potentially influence these forces through impacts upon the litter layer that both insulates the soil surface and serves as food and habitat for soil surface organisms. The ability of these restorative forces to reform soil pore space and to increase water infiltration rates during periods of non-grazing is largely unknown."

Cattle tend to concentrate on flatter areas especially if they are fairly open. Holechek reports that cattle tend to use 10 to 30 percent slopes thirty percent less often than 0 to 10 percent slopes and 30 to 60 percent slopes sixty percent less often than flats. Slopes over 60 percent are seldom used (Holechek and Piper 1992). Because of a tendency for cattle to use flatter slopes, areas of impacted soils are more likely to be found on gentler slopes. Building new fences and developing waters, as mentioned in the proposed action, would have extremely small, localized direct impacts to soils.

Biological soil crusts in the Sonoran Desert influence nutrient cycling, nitrogen fixation, and nutrient availability to plants; seedling germination and vascular plant growth; water infiltration and runoff; and soil stabilization and erosion. Livestock grazing affects soil crusts through trampling, which reduces biological crust cover, frequency biomass, species richness and diversity, and ecological function (Hall, 2005). Crusts are also affected by mechanical disturbances from off-road vehicles.

Indirect Effects: cattle indirectly impact soils by removing vegetation resulting in a loss of protective cover including litter. Loss of vegetation and litter reduces infiltration and exposes the soils to raindrop impact and overland flow thus leading to soil crusting and increased erosion. Reduced cover can result in a loss of soil organic matter and a reduction in soil microbes which play a significant role in nutrient cycling. Soils lower in organic matter have poorer structure which can also affect infiltration and root growth. Building fences and developing waters would indirectly affect soils by improving distribution of cattle, resulting in a net positive effect.

Watershed and Riparian

Riparian areas, with their high species diversity and structural complexity, provide critical terrestrial and aquatic habitat to wildlife species from adjacent upland and riparian area environments. Cattle tend to congregate in many riparian areas. They favor riparian forage and water availability, shade in warm months and gentle topography. Excessive grazing, trampling and trailing impacts can destabilize and break down stream banks, cause mechanical damage to shrubs and small trees, reduce or eliminate woody seedlings and

saplings, expose soils, eliminate or shift native herbaceous species to weedy or exotic species with reduced root systems, and cause widening or incision of stream channels (Trimble and Mendel 1995, Clary and Kruse 2003). These changes may lead to loss of stream stability and function (Rosgen 1996). Stream channel profile, stream bank stability, streamside vegetation, channel bottom embeddedness, stream sediments and stream temperature are all aquatic species habitat features that can be directly or indirectly affected by livestock grazing practices. Maintaining native obligate riparian plants is extremely important to many streams because of their resistance to the erosive energy of flowing water (Clary and Kruse 2003). Herbaceous riparian vegetation is especially important to stabilizing stream bank, point bar and floodplain deposits. Development of these features is critical to the channel restoration process (Clary and Kruse 2003). One of the most important factors influencing riparian conditions is utilization (Mosley et al 1999, Clary and Kruse 2003).

Stream channels and riparian areas can also be affected indirectly by watershed condition and/or stream channel conditions above and below the stream reach of interest. Soil compaction, decreased infiltration, and loss or alteration of upland vegetation can cause increased runoff and higher peak flows, leading to channel adjustments and decrease in stream function (Gori and Backer 1995).

Existing condition of streams and riparian areas is the result of cumulative effects of historic and recent management, natural disturbances, and the interaction between these two agents of change. This discussion includes 5th code watersheds for each allotment and begins with settlement of lands in the vicinity of Greenback Creek and Tonto Creek in the 1870s. This area was considered settled and fully stocked with cattle by 1890 (Croxen 1926). There have been many accounts of historic overgrazing and subsequent drought and flood events that occurred throughout central and southeastern Arizona (Wagoner 1952). Forest Service range management files (File Code 2210) document concentrated use at water sources including springs and riparian areas.

Other activities and management actions include road development, lack of road maintenance, off-road vehicle use, mining, fire suppression, juniper treatments, prescribed fire, and wildfires. These activities can cause short and/or long-term sedimentation into stream channels.

Climate change presents additional considerations. According to Arizona Drought Monitor Report (ADWR 2012), long-term drought status for Gila County is “abnormally dry” as of January 2012, which has likely had an effect on these allotments. According to NOAA National Climatic Data Center data, there has been a marked upward trend in globally averaged annual mean surface temperatures since the mid-1970s (Shein 2006). Models used by Seager et al. (2007) to predict how climate change will affect the southwestern United States indicate this region has begun transitioning to a dryer climate which will continue into the 21st century. However, models are too broad-scale to predict how climate change might affect monsoons (Lenart 2005), which contribute 40 percent of total annual precipitation received on Tonto NF.

Wildlife

Livestock grazing can affect wildlife species and their habitats in several ways if not managed correctly. Grazing may reduce vegetation growth and litter cover. Litter encourages plant recovery after drought because it traps seeds and lowers evaporative loss (Milchunas 2006). The seeds and subsequent plants provide wildlife with food, nesting sites, and cover. Rainfall amounts on the allotment vary and are unpredictable within and among years. Growing seasons on the allotment tend to be bimodal. Managers and livestock permittees can manage for droughts by reducing stocking rates or de-stocking to maintain organic litter for subsequent plant recovery. The Tonto Drought Policy will assist resource managers to minimize impacts to resources from livestock grazing during drought.

Cattle may cause localized compaction of soils, especially when wet, resulting in increased runoff and reduced infiltration of rainfall into upland soils. Increased runoff can degrade riparian areas, and reduced infiltration can limit moisture available to upland plants. Therefore, wildlife that uses vegetation for food, nesting sites, and cover could be affected.

Grazing may also affect vegetation communities by selectively impacting plant species that are palatable to livestock or those species that are less able to withstand grazing. Often these are the same species palatable to wildlife browsers such as deer. Early succession plant communities consisting of a diverse mixture of grasses, forbs, and scattered shrubs are required by a variety of wildlife species. The presence of forbs and scattered shrubs, along with native grasses, enhances nesting and brooding cover and produces a quality food source for many wildlife species (Harper 2007). Cattle grazing can cause these early successional communities to diminish by promoting seral stage advancement.

Riparian plants are especially palatable. Riparian and wetland communities represent a small percentage of the landscape in the Southwest but support high plant and animal diversity and productivity (Milchunas 2006). These areas provide water, forage, and cover to wildlife associated with adjacent upland communities, including livestock, as well as riparian obligate species for all or part of their life cycles. The riparian overstory is often reduced by livestock grazing (Kauffman and Krueger 1984), and this stratum provides cover and nesting habitat for many vertebrates and affects water temperature for aquatic organisms. Streamside vegetation influences bank and channel morphology via altering flow velocities, reducing cutting during flood conditions, and holding erosion inputs from uplands. Riparian areas are potentially impacted to a greater degree than adjacent uplands by livestock, but these areas can recover from disturbance more quickly than uplands due to faster vegetation growth rates (Milchunas 2006).

Direct Effects: Riparian and upland areas provide important terrestrial and aquatic habitat to wildlife species. Congregation of livestock (herding, stock tank areas, trailering, loading/unloading, maintenance of livestock facilities, branding) have direct effects to wildlife or associated habitat when considering grazing alternatives. Effects may include removal of vegetation, dust accumulation, noise, avoidance of areas by wildlife, and soil compaction. For the most part, effects associated with congregation of livestock are primarily within the uplands.

Upland areas and associated habitats are directly affected by grazing and associated activities through livestock consuming plants, bedding, congregating at water developments, herding, off-loading livestock, and branding activities. Upland vegetation density and composition are reduced if livestock grazing and associated activities are not managed to reduce or minimize such affects.

Livestock grazing can directly affect fisheries and wildlife by altering riparian and upland soils and vegetation composition, density and structure, water quality, quantity, temperature and flow patterns, shape and form of the stream channel, and aquatic and terrestrial faunal assemblage composition (Kauffman and Krueger 1984; Fleischner 1994, Trimble and Mendel 1995: Belsky et al. 1999). One of the most important factors influencing riparian conditions is utilization (Mosley et al 1999, Clary and Kruse 2003).

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

Threatened, Endangered, and Candidate Species

Southwestern willow flycatcher - Tonto Basin/Walnut/7K is adjacent to flycatcher habitat, sediment inflows from Tonto Basin/Walnut/7K may affect designated flycatcher critical habitat in Tonto creek. Habitat that meets the following characteristics (or has potential to attain these characteristics) should be considered as potential habitat for the flycatcher (Lutch et al. 2000).

- Perennial water or at least saturated soils within 500 meters of habitat patch.
- Stream gradients less than 1 percent or situations that mimic low gradients (such as beaver ponds, sloughs, backwaters, etc.).
- Appropriate vegetative species (either existing or with the ability of becoming established).

General Recommendations: From the Southwestern Willow Flycatcher Recovery Plan

1. Identify the most important riparian areas for the recovery of the southwestern willow flycatcher and riparian and aquatic organisms in general.
2. Identify the most appropriate areas for permitting livestock grazing given the biodiversity concerns for the particular land management unit.
3. Reconfigure grazing pasture boundaries to reflect the true productivity of rangelands associated with important flycatcher recovery areas, and allow differential management of units of varying ecological sensitivity.
4. Exclude livestock from sites where exclusion would result in the greatest ecological improvement and least economic loss.
5. If monitoring is less than annual, establish livestock use numbers based on drought years, not the average or wettest years, to provide for livestock operations that are viable given this region's propensity to experience prolonged drought. With annual monitoring, adjust livestock levels in response to reduced forage availability, poor vigor and physiological stress on forage plants, and/or decreased cover brought on by drought conditions.
6. Establish an adequate number of ungrazed areas at different elevation and geomorphic settings. These would provide land management agencies and researchers with a much-

needed series of sites against which to compare the condition of grazed watersheds (Brinson and Rheinhardt 1996) (see #8 below).
7. Institute and/or improve record-keeping and documentation of grazing practices, retroactively where possible, so that the ecological effectiveness of various grazing practices can be more scientifically evaluated (see #8 below).
8. Work with state universities, private colleges, and research institutions to fund and facilitate research that better defines the ecological and hydrological effects and sustainability of livestock grazing in southwestern ecosystems, particularly southwestern riparian ecosystems.

Consideration of uplands is essential. Elmore and Kaufman (1994) reported that "simply excluding the riparian area (from grazing) does not address the needs of the upland vegetation or the overall condition of the watershed. Unless a landscape-level approach is taken, important ecological linkages between the uplands and aquatic systems cannot be restored and riparian recovery would likely be limited." Livestock grazing may alter the vegetation composition of the watershed (Martin, 1975, Savory 1988, Valentine 1990, Popolozio et al. 1994). It may cause soil compaction and erosion, alter soil chemistry, and cause loss of cryptobiotic soil crusts (Harper and Marble 1988, Marrs et al. 1989, Orodho et al. 1990, Schlesinger et al. 1990, Bahre 1991). Cumulatively, these alterations contribute to increased erosion and sediment input into streams (Johnson 1992, Weltz and Wood 1994). They also contribute in changes to infiltration, water holding capacity of the watershed, and runoff patterns, thus increasing the volume of flood flows while decreasing their duration (Brown et al. 1974, Gifford and Hawkins 1978, Johnson 1992). As a result, groundwater levels may decline and surface flows may decrease or cease (Cheney et. al. 1990, Elmore 1992).

Mexican Spotted Owl (Threatened with Critical Habitat):
Direct Effects: Grazing has been proposed for the Bearhead Canyon PAC and the Buck Basin PAC during the breeding season. This could cause a direct effect to reproductive success with monitoring that has to be done with cattle to make sure they don't exceed utilization and to move cattle if utilization is exceeded while they are in the pasture. Also, a large elk herd uses the same area and utilization in riparian areas is already being exceeded by these wild ungulates. The cause of this is probably the drought that is occurring and water is only present in certain areas like Gun Creek (from the confluence of Skunk Tank Canyon), Bearhead Spring, and some other small springs/seeps in the area.

The USFWS recommends these conservation measures to avoid harassment of owls: where feasible, the Tonto NF shall avoid activities within 0.25 mile of PACs during the MSO breeding season (March 1 to August 31) that could result in disturbance to owls (USFWS 2012 LRMP BO).

Effects on Mexican spotted owls from grazing by wild ungulates and domestic livestock are complex, and multiple factors may determine specific influences. These factors include local and regional climatic patterns, biotic community associations and ecology, soil types and conditions, and the timing, intensity, and duration of vegetation removal associated with the presence of grazing animals. Adding to the complexity are the interrelationships of grazing and other ecological processes, such as changes in herbaceous plant composition, woody vegetation structure, soil stability and ecology, and fire regimes.

Although the effects of grazing on owl are complex, they generally fall into two categories: (1) those that result in relatively short-term effects requiring short recovery periods to restore suitable habitat characteristics; and (2) those that result in long-term alterations in plant-species composition and vegetation structure. For example, properly managed grazing in key owl foraging areas that consistently maintains residual herbaceous biomass of forage species, sufficient to allow for individual plants to recover and reproduce during most growing seasons, should provide cover and food sources for some prey species (especially during drought periods), and may also prove beneficial to owls over the long-term by cropping plants to a level that increases owls' access to prey species associated with herbaceous cover habitat types. In contrast, grazing that allows for moderate- to high intensity grazing throughout several successive growing seasons may result in impaired vegetation productivity and ultimate changes in species composition, density, and vigor, which can degrade spotted owl habitat characteristics over the long-term.

Indirect Effects: Grazing can adversely affect the owl primarily through four indirect effects: (1) diminished prey availability and abundance (Ward 2004, Willey 2007, Willey and Willey 2010), (2) increased susceptibility of habitat to destructive fires, (3) degradation of riparian and meadow plant communities, and (4) impaired ability of plant communities to recover or develop into more suitable spotted owl habitat. These impacts are most likely to affect owls in certain geographic portions of the Colorado Plateau (CP), Southern Rocky Mountain (SRM), Upper Gila Mountain (UGM), and Basin and Range-East EMUs (see Part II.3), where individuals forage in or adjacent to grazed areas preferred by wild and domestic ungulates, including montane meadows, riparian corridors, or canyon bottoms (Ward and Block 1995, Willey 2007, Willey and Willey 2010).

Consistent moderate- to high-intensity grazing during the growing season reduces height and horizontal distribution of herbaceous plants that serve as protective cover and food sources for some of the owl's prey species, most notably voles (Birney et al. 1976, Getz 1985, Peles and Barrett 1996). Reduction of herbaceous plant biomass may also influence the food of other prey species (e.g., white-footed mice; *Peromyscus* spp.) by removing or reducing the availability of plant seeds. Over time, without sufficient opportunities for growing season biomass recovery and seed production within these plant communities, their ecological condition will not be maintained or improved (Holechek et al. 2001), and some sites may fall into a degraded ecological condition (Kothmann 2009). Where limited herbaceous cover and seed production persist in preferred owl foraging areas over several breeding seasons, reduction of prey availability can limit the energy intake of those owls, particularly when other prey species are concurrently limited. These conditions can contribute to reduced reproduction and declines in some owl populations (Willey and Willey 2010).

In areas that are heavily grazed over long periods of time, reductions in herbaceous ground cover and increased density of shrubs and small trees can decrease the potential for beneficial low intensity ground fires while increasing the potential for destructive, high-intensity crown fires (Zimmerman and Neuenschwander 1984). Low-intensity ground fires prevent fuel accumulation, stimulate nutrient cycling, promote grasses and forbs, discourage shrubs and small trees, and perpetuate the patchiness that supports small mammal diversity, all indirectly

or directly beneficial to owls. High-intensity crown fires reduce or eliminate foraging, wintering, dispersal, roosting, and nesting habitat components.

Excessive grazing in riparian areas can reduce or eliminate important shrub, tree, forb, and grass cover, all of which in some capacity support the owl or its prey. Poorly managed grazing of riparian plant communities can also physically damage stream channels and banks (Ames 1977, Kennedy 1977, Kauffman et al. 1983, Blackburn 1984, Clary and Webster 1989, Platts 1990). Deterioration of riparian vegetation structure can allow channel widening. This event, in turn, elevates water and soil temperatures and thus evaporation and lowering of water tables, as well as significantly increasing the potential for accelerated flood damage (Platts 1990).These processes alter the microclimate and vegetative development of riparian areas, potentially impairing its use by spotted owls. Prolonged use of these key habitats by large ungulates can alter plant reproduction and recruitment (e.g., cottonwoods, oaks), along with other negative habitat impacts including alteration of stream corridor morphology and hydrology, compaction of soil, and removal of stabilizing vegetation such as willows, sedges, and other native plants (Kennedy 1977, Rickard and Cushing 1982, Kauffman and Krueger 1984, Fleischner 1994, Krueper 1996). These impacts retard development of riparian, oak, and other plant communities into habitat that can be used by owls for roosting, nesting, or dispersal. Where riparian areas act as refuges for small mammals during drought periods, the impacts of grazing also may influence future prey abundance.

Yellow-billed Cuckoo (Proposed threatened with critical habitat):
This species is proposed for listing and inhabits similar habitat patches as the southwestern willow flycatcher. There have been observations of yellow-billed cuckoo on the allotments along Tonto Creek. Cattle management activities on these allotments have the potential to affect riparian habitat in the watershed.

Northern Mexican Garter snake (Proposed threatened with critical habitat):
Well-managed grazing can occur with limited effects to this species when the presence or absence of nonnative species is considered, and management emphasis is directed towards limiting some access to riparian and aquatic habitats within occupied habitat. These actions, combined with management that disperses livestock away from riparian areas, reduce the threats of livestock grazing on northern Mexican garter snakes and their habitats (USFWS 2008). Szaro et al. (1985, p. 360) assessed the effects of improper livestock management on a sister taxon. They found that western (terrestrial) garter snake (*Thamnophis elegans vagrans*) populations were significantly higher (versus controls) in terms of abundance and biomass in areas that were excluded from grazing, where the streamside vegetation remained lush, than where uncontrolled access to grazing was permitted. Preliminary garter snake survey data from Burger (2008) from the States of Durango and southern Chihuahua, Mexico, indicate that the northern Mexican garter snake is less susceptible to population impacts associated with physical disturbances to its habitat, such as livestock grazing, when the biotic community is comprised of wholly native species.

Headwater Chub (Sensitive, Candidate for Listing):
As early as the turn of the century, Chamberlain (1904) identified cattle grazing, erosion, and water diversions for irrigation and mining as causes of water quality problems resulting in the

decline and extinction of Southwestern fishes. Platts (1991) concluded that livestock grazing negatively impacts riparian habitats and fish populations. Livestock trample stream banks, compact soils, and remove protective riparian vegetation from the stream bank, resulting in increased erosion, sedimentation, water temperatures, and decreased habitat quality for native fish species.

Watershed degredation causes arroyo cutting, erosion and the disappearance of riparian vegetation; direct results of a lowered water table (Rinne and Minckley 1991). Grazing impacts stream morphology by contributing to the deterioration of soil stability and porosity and increasing erosion and soil compaction (Fleischner 1994). In grazed areas, stream channels contain more fine sediment, stream banks are more unstable, and banks are less undercut (Platts 1991). The activities of livestock (removal of vegetation and trampling) are additive in their effects on the aquatic habitat. The trampling and loss of undercut banks results in a homogenization of habitat types, this process is accelerated by removal of riparian plant species, particularly sedges, grasses, and shrubs, which stabilize undercut banks. In addition, trampling results in wider channels, which results in higher summer and colder winter water temperatures, but these temperature changes, are exacerbated by the removal of vegetative and undercut bank cover. Removal of riparian vegetation results in lower plant density and less complex structure, which results in increased erosion and therefore increased turbidity. Turbidity is also increased due to trampling of stream banks and urination onto unprotected soils (Platts 1991).

Cumulative Effects

Range and Vegetation

The Tonto Basin, Walnut and 7/K grazing allotments are bordered by several other allotments with the Tonto National Forest that are within the same watersheds and have term grazing permits issued, authorizing livestock grazing. To the north are the allotments H4, Del Shay, 76 and Soldier Camp; to the east are the allotments Buzzard Roost and Greenback; to the South is the Dutchwoman Allotment and to the west is the Sunflower and Diamond Allotment. Cumulative impacts from these adjacent areas that are grazed under conservative use guidelines are anticipated to be minimal in contrast to the size and complexity of the watersheds themselves. Additional cumulative impacts to the project area include;

Range NEPA: In addition to the current document looking at authorizing livestock grazing on the Tonto Basin, Walnut and 7/K Allotments, several other grazing allotments within the Tonto National Forest are going through are going through or will soon be going through Environmental Assessments for proposed grazing authorizations. These current assessment include but is not limited to; Coolidge-Parker on the Globe Ranger District, Sunflower on the Mesa Ranger District, Diamond Rim on the Payson Ranger District and Copper Creek/Horseshoe on the Cave Creek Ranger District. Additionally the following Allotments are expected to be analyzed in the near future; Dagger, Poison Springs, Hicks-Pikes Peak, Sedow, Haystack Butte, Chrysotile and Flying V & H.

Herber-Reno/Morgan Mountain Sheep Driveway: The sheep driveway crosses the Tonto Basin Allotment. Twice a year up to two bands of sheep are driven across the Tonto Basin Allotment for no more than a total of ten days each way, once during the spring and once during the fall. The decision for the authorization for this driveway was signed in 2011. Inspections following the sheep driveway have found only very light use and no conflicts of resources between the sheep and authorization of cattle in this area has been identified.

Travel Management: Impacts from off-highway recreational vehicles, which occasionally travel off designated routes cause impacts to soil and vegetation. Within arid environments these areas can take years to recover from disturbances. The Tonto National Forest is currently undergoing a Travel Management Analysis. The Travel Management Rule is intended to analyze alternate motorized routes in order to provide access and a recreation experience sufficient so vehicle operators no longer feel compelled to travel off established roads or trails. Best management practices that will be outlined under the Travel Management document should mitigate any effects caused by off road travel. Permittees may still be authorized through their term grazing permit to travel off designated routes for construction and maintenance of range improvements and certain livestock management activities.

Historic Grazing: Historic grazing on these allotments also contributes to cumulative effects. Stocking rates were disproportionately high during the first half of the 20th century and intensive management was not practiced as it is now. Impaired soils and vegetation observed today are likely a result of those early impacts followed by stocking rates of several hundred animals each year throughout the remainder of that century.

Noxious Weeds: Noxious weeds are present along Highway 188, which contains numerous invasive weeds which are beginning to spread onto the allotments in the project area. Arizona Department of Transportation chemically treats invasive weeds in the highway right-of-way but existing populations have been persistent over the last few years. Invasive weed populations can also be found adjacent to Roosevelt Lake spreading up drainages, recently an influx of Fountain grass (*Pennisetum setaceum*) has started to establish below the high water mark around Roosevelt Lake. Livestock are one vector of movement of invasive plants; however even in the absence of livestock grazing weeds would continue to spread through human dispersal, wildlife dispersal, and wind and water dispersal, recreation and roads appear to be the major method of dispersal in this area. On the Tonto Basin Allotments, Malta star thistle is the most common invasive plant, occurring in nine pastures (Appendix D). Recent completion and implementation of a Forest Weeds Environmental Assessment should mitigate the spread of these noxious weeds.

Soils

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. Activities include:

- Past grazing: past grazing actions, some that occurred more than a century ago often with very high stocking rates, have resulted in soil erosion and compaction in many areas.

- Current grazing: current stocking rates are very low compared with rates that occurred in the past. Because of low numbers, current grazing is not likely to prevent but may slow recovery of compacted soils. In a few heavily used areas where cattle tend to concentrate, recovery may not occur.
- Adjacent allotments in the same watersheds contribute to cumulative effects. All adjacent allotments have implemented managed grazing with conservative utilization levels.
- Other actions causing compaction include historic land management practices such as cholla removal treatments in Sonoran desert pastures and off-road vehicle travel.
- Loss of roots and organic matter in the soil profile through loss of vegetative cover due to historic management and current climatic conditions may exacerbate soil compaction by above-mentioned actions along with increasing potential rainfall impacts on bare soils.
- Wildfires:
    - The Picture Fire burned 10,650 acres within Tonto Basin Allotment in 2003. About 65 percent burned at low severity, about 25 to 30 percent at moderate severity, and the remainder at high severity. Most of the burn occurred in Clover/Bearhead Pasture in ponderosa pine and pinyon/juniper vegetation. Areas that burned generally have more herbaceous production than similar areas which did not burn. The 2005 Edge Complex Fire burned 2,652 acres on the eastern side of Tonto Basin Allotment in Sycamore and Mount Ord pastures. About half burned at moderate to high severity in chaparral vegetation, which is recovering quickly.
    - Three wildfires covered about 90 percent of 7/K Allotment. They include the 1996 Lone Fire (12,275 acres), the 2005 Three Fire (4,502 acres), and the Edge Complex Fire (5,999 acres). Most of the moderate and high severity burn occurred in chaparral vegetation which is recovering quickly. Most semi-desert grassland and Sonoran Desert experienced low severity burn.
- Travel Management: unauthorized cross country travel can impact soils and vegetation through direct impacts on soils and removal or degradation of herbaceous or woody vegetation. Travel Management Rule (TMR) is intended to analyze alternate motorized routes in order to provide access and a recreation experience sufficient so vehicle operators no longer feel compelled to travel off established roads or trails. Enforcement of TMR is imperative to assure compliance. Improperly maintained roads can cause soil erosion, where runoff from roads is allowed to concentrate, leading to localized erosion downslope. Road maintenance that includes Best Management Practices should reduce sedimentation into streams and be beneficial to overall watershed conditions.
- Introduction of non-native invasive plants has led to a small, localized increased risk of erosion.

Watershed and Riparian

The existing condition of streams and riparian areas on these allotments is the result of the cumulative effects of historic and recent management, natural disturbances, and the interaction between these two agents of change. This discussion includes the 5th code watersheds listed in the existing conditions for each allotment and begins with the settlement of lands in the vicinity of Greenback Creek and Tonto Creek in the 1870s.
This area was considered settled and fully stocked with cattle by 1890 (Croxen 1978). There have been many accounts of the overgrazing and subsequent drought and flood events that occurred throughout central and southeastern Arizona (Wagoner 1952). The Forest Service

Range Management files (File Code 2210) document concentrated use at water sources including springs and riparian areas.

Other grazing allotments within the 5th code watersheds listed include: H-4, Cross F, Bar T Bar, Del Shay, Soldier Camp, Seventy-Six, Greenback, and Boneyback. All of these allotments are grazed. Impacts on these allotments may have cumulative downstream effects on stream channels and riparian areas within the project area. However, all either have current NEPA or are on the schedule to be analyzed, so additional impacts should be minimal.

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

Climate change presents additional considerations. According to the Arizona Drought Monitor Report (ADWR 2012), the long-term drought status for Gila County is "abnormally dry" as of January 2012, which has likely had an effect on these allotments. According to NOAA National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein 2006). Models used by Seager, et al. (2007), to predict how climate change will affect the southwestern United States indicate that this region has begun the transition to a dryer climate which will continue into the 21st century. However, the models are too broad scale to predict how climate change might affect the monsoons (Lenart 2005), which contribute 40 percent of the total annual precipitation received on the Tonto National Forest.

Wildlife

Cumulative effects include both NEPA and ESA definitions. The definitions of each are as follows:

1. NEPA - The impact on the environment which results from the incremental impact of the Action when added to other past, present, and reasonably foreseeable future actions regardless of what agency undertakes them (state, private, federal).
2. ESA - Future state, private, and non-federal (tribal in some cases) activities that are reasonably certain to occur within the action area.

The action area has been described from the standpoint of watersheds that drain the analysis area, because of downstream effects to listed and sensitive species. This approach includes effects of the Action from a larger landscape scale which includes affects to the watershed across time and space. Due to the location of the action area and its remoteness in central Arizona and the TNF, most cumulative effects are federal or state.

Vegetation and soils were impacted by livestock in the past when the allotment was more heavily stocked than more recent levels. Many of the vegetation communities on gentler slopes have reduced species diversity, decreased plant vigor, and decreased forage production as a result of heavy stocking rates and associated impacts to vegetation, soils, and

riparian areas. Cattle grazing began in Tonto Basin shortly after the Civil War in the late 1800's, which predates the Forest Service (Croxen 1926).

Figure 32: Cumulative effects past, present, and foreseeable future actions

Effects	Forest Service	State	Private landowners or outside agency control
Loss or modification of habitat	Future and current grazing (-1) Mining (-1) Fuels management (+1) Non-native treatment (+1) Construction activities (-1) Current proposals for road designation (-0.5)	Mining (-1) Creation of wildlife waters (+1) Native Fish Stocking (+1) Special Status Species Stocking (+1)	SRP Roosevelt Dam Operations (net=0; flycatcher) Mining (-1) Drought (-1) Urban development (-1)
Curtailment of habitat or range	Major road construction (-1)		Major road construction (-1)
Disturbance	Visitor use (-1) Wildlife closures (+1) Outfitter guiding (-1) Visitor restrictions (+1)	Hunting (-1)	
Direct mortality	Road kill (-1)		Poaching (-1)
Disease and predation	Visitor use (-1)		Non-native Fish Stocking (-1)

Unique to Action Area:

1. Grazing Allotments adjacent to analysis area or within the action area. These allotments are all managed at conservative use (30-40 percent) with upland and riparian conditions on the ground showing a trend towards desired future conditions.
2. Recreational Uses
    a. OHV use in area increasing
    b. Hunting
    c. Mining
    d. Fuel wood harvest
    e. Camping adjacent to flycatcher habitat
3. Prescribed Fire
    a. Maverick Prescribed Burn falls within the Greenback Creek watershed.
4. Wildland Fire
    a. Mistake Peak Fire burned within the Greenback Creek Watershed.
5. AZGFD
    a. Creation of wildlife waters
    b. Reintroductions of special status species.

   c. Hunting
6. Private
   a. New agricultural fields (alfalfa) are being created within the action area adjacent to flycatchers in Quartz ledge. This will cause an increase in cowbird abundance.
   b. Slow population increase within Tonto Basin
7. Other Impacts
   a. Elk herds although stabilized continue to degrade riparian areas within the upper elevations of Tonto Basin allotment.
   b. Extended drought period

Figure 34: Relative impacts of alternatives on federally-listed and sensitive species and on bird species of concern

Status	Magnitude of Effects		
	-1	-2	+1
Federally-listed species (T&E)	Likely to adversely affect for many species, but a jeopardy opinion would be unlikely.	Likely to adversely affect for many species, and 1 species could reach a jeopardy opinion	Beneficial in short or long term
Forest Sensitive Species (FS)	Not likely to affect population viability or trend towards federal listing	May affect population viability or trend towards federal listing for at least 1 species	Beneficial in short or long term
Tonto NF migratory bird species of concern (birds)	Not likely to affect migratory bird populations	May affect migratory bird populations	Beneficial in the short or long term.

Past actions: Effects from past actions are already described under affected environment for general wildlife and special status wildlife and plants and alternative 1.

Tonto NF foreseeable actions: Reasonable foreseeable actions that can affect wildlife resources are reauthorization of livestock grazing allotments, fuels reduction projects, forest thinning, watershed improvement projects, recreation management (obliteration of social trails and dispersed campsites, designation of trails, and campsites), lands special use permits (new issuances and maintenance on existing structures), personal use activities, and new road construction. While these activities can directly and indirectly affect wildlife species as well as cause destruction or modification to wildlife and plant habitat, these actions are planned to minimize (and when possible, to eliminate) effects to species and their habitat above current conditions and have mitigation measures and Best Management Practices designed to mitigate disturbance that may occur from project implementation.

Legal and illegal personal use activities, particularly fuel wood harvesting, affect wildlife and their habitat. Removal of dead and downed wood can result in loss of habitat for invertebrates, small mammals, and reptiles; all of which are important prey items for wildlife of higher tropic levels. Removal of snags not only can affect prey species like invertebrates and reptiles; it also results in loss of bat roosting habitat and bird nesting and roosting habitat.

Illegal fuel wood harvesting has resulted in removal of large, Gambel oak trees, which are also important for birds that nest in their natural cavities.

Summary: Desired future conditions could still be met with these cumulative effects although at a slower rate.

Figure 35: Special status of species for the Endangered Species Act (ESA) and determinations within Tonto Basin/Walnut/7K grazing allotment

Common Name	Scientific Name	ESA	Effect Determination
Southwestern Willow Flycatcher	*Empidonax trailii extimus*	E, CH	Likely to adversely affect
Mexican Spotted Owl	*Strix occidentalis lucida*	T, CH	Not likely to adversely affect
Yellow-billed Cuckoo (DPS)	*Coccyzus americanus*	PT, PCH	Not likely to adversely affect
Spikedace	*Mega fulgida*	CH	Not likely to adversely affect
Headwater Chub	*Gila nigra*	C	Not likely to adversely affect
Northern Mexican Garter snake	*Thamnophis eques megalops*	PT, PCH	Not likely to adversely affect
Narrow-headed Garter snake	*Thamnophis rufipunctatus*	PT, PCH	Not likely to adversely affect

C=Candidate for listing, CH = Critical Habitat, T= Threatened, E= Endangered, DPS = Distinct Population Segment, PT= Proposed Threatened, PCH= Proposed Critical Habitat

Alternative 1: No Action

Range and Vegetation

This alternative should meet most objectives outlined in the Forest Plan in the shortest amount of time, as compared to the other two alternatives, however this alternative does not "make forage from lands suitable for grazing available to qualified livestock operators" (FSM 2201). The Tonto National Forest Resource and Land Management Plan designates management areas that have been identified as being suitable for livestock grazing within the project area and continued domestic livestock grazing is consistent with the goals, objectives, standards, and guidelines of the Forest Plan. The lands that have been determined to be suitable for livestock grazing as determined by the Forest Pan make up the majority of the project area being analyzed. Furthermore where consistent with other multiple use goals and objectives there is Congressional intent to allow for 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)*. It is also 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).*

Under this alternative, direct and indirect effects associated with livestock grazing would be removed. Cumulative effects would occur through grazing on adjacent allotments. Use of palatable vegetation by wildlife would still occur. Recovery rates for species vigor and diversity would be dependent upon climate, fire, recreational impacts, and wildlife use but are anticipated to be relatively faster without livestock grazing pressure. Areas which have crossed an ecological threshold and are now dominated by a particular species such as cholla, juniper, or Bermuda grass may not achieve potential without significant intervention to include treatment of vegetation and soils. Nonuse would promote growth of biological soil crusts, which can reduce germination rates of invasive species such as red brome (*Bromus rubens*) and provide opportunity for native species to return to invaded areas more quickly. The spread of Noxious weeds may be reduced in this alternative, since livestock are one vector in the transport and spread of noxious weeds and their seeds, however weeds could still be spread through recreational activities and by wildlife.

Soils

This alternative meets the intent of the Forest Plan. The quickest and most likely recovery from past grazing activities would normally occur with complete protection from grazing. Amount of time required for complete recovery after degradation can vary from several years to decades depending on severity of impacts and the nature of the ecosystem. Over half of impaired and unsatisfactory soils occur in Sonoran Desert vegetation. Recovery of soils is likely to be slower than in other ecosystems because of limited moisture for plant recovery and lower chance of recovery of compacted soils. Actions that normally help compacted soils to recover such as shrink/swell from changes in moisture, and freeze/thaw from extreme temperature are limited in desert soils. Higher elevation ecosystems are likely to recover more quickly than desert sites. Although soil conditions currently less than satisfactory are largely attributable to cumulative effects of historic grazing, continued grazing could slow or prevent recovery in some areas. Even though recovery is expected to be faster under this alternative than the other alternatives, many areas with impaired or unsatisfactory soil conditions would not improve rapidly. Current long-term drought and possible climate change can reduced the ability of ecosystems to recover even in the absence of grazing.

Direct and Indirect Effects:

General Effects on Soil Condition: Hoof action of cattle can cause direct impacts by compacting soils. Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (NRCS, 1996, 1998, 2001). Therefore, the quickest and most likely recovery from past grazing activities would normally occur with complete protection from grazing. The amount of time required for complete recovery after degradation can vary from several years to decades depending on the severity of the impacts and the nature of the ecosystem. Over half of the impaired and unsatisfactory soils in the analysis area occur in Sonoran Desert vegetation. Recovery of Sonoran Desert soils are likely to be slower than in other ecosystems because of limited moisture for plant recovery and a lower chance of recovery of compacted soils. Actions that normally help compacted soils to recover such as shirk/swell, due to changes in moisture, and freeze/thaw, do to extreme temperature changes, are limited in desert soils. Higher elevation ecosystems are likely to recover more quickly than desert sites.

Although the soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, continued grazing could slow or prevent recovery

in some area. Even though recovery is expected to be faster under this alternative than the other alternatives, many areas with impaired or unsatisfactory soil conditions will not improve rapidly.

- Effects on Biological (Cryptogamic) Crusts: Biological crusts play an important role in some ecosystems especially Sonoran Deserts and, to a somewhat lesser extent, the other ecosystems in the analysis area. Crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on soil crusts. Grazing can have detrimental effects on the amount of biological crusts. (Beymer, 1992, pp 139-140.) Removing grazing impact is likely to increase the cover of biological soil crusts.

Cumulative Effects:

The direct and indirect effects of this alternative, when combined with other past, present, or reasonably foreseeable actions (cumulative effects) as listed above, will be generally beneficial to soils and vegetation. The lack of grazing would allow compacted soils to recover quicker than with grazing. However, as stated in the direct and indirect effects, potential for recovery and rate of recovery will vary by ecosystem type and condition.

The current long-term drought and possible climate change can reduced the ability of ecosystems to recover. Other effects from other activities and management actions that have occurred within the watersheds are mostly localized or short-term.

Watershed and Riparian

This alternative meets the intent of the Forest Plan. Riparian areas are generally regarded as having high inherent potential for recovery from disturbance (Milchunas 2006). Stream channel and riparian area recovery are considered optimal when direct effects of livestock grazing are eliminated (Clary and Kruse 2003). Amount of time required for riparian recovery after severe degradation can vary from several years to decades (Clary and Kruse 2003). Recovery is dependent on size and existing condition of watersheds, stream channel and riparian area (flow regime, channel gradient, dominant channel substrate, watershed area, type and extent of riparian vegetation), future management, climate and natural disturbances (Kindschy 1987, 1994). Most rapid recovery can be expected in channels with small watersheds, perennial flow or sub-surface flow, an existing source of riparian vegetation, and availability of fine sediments. Much of the flatter portions of Tonto Basin and Walnut Allotments are in impaired or unsatisfactory condition. A No Grazing Alternative usually provides the most rapid increase of upland vegetative cover, species diversity, and improvement of impaired and unsatisfactory condition soils. These changes reduce surface runoff, dampen peak flows, and decrease the probability of channel adjustments, impacts to riparian vegetation and loss of channel function. Implementation of this alternative should maintain or improve existing condition of upland watersheds.

Direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects) as listed above, should result in reaching

desired conditions at the fastest rate. Potential for recovery and rate of recovery would vary by key reach. Where there is potential for recovery of riparian vegetation, eliminating direct and indirect effects of livestock grazing should allow the most rapid rates of recovery. Where riparian vegetation is meeting desired conditions this alternative would provide the most protection for maintaining those conditions. There would be no effects to water quality under this alternative.

Direct Effects of No Grazing. Riparian areas are generally regarded as having high inherent potential for recovery from disturbance (Milchunas 2006). Stream channel and riparian area recovery are considered optimal when the direct effects of livestock grazing are eliminated (Clary and Kruse 2003). The amount of time required for riparian recovery after severe degradation can vary from several years to decades (Clary and Kruse 2003). Recovery is dependent on the size and existing condition of the watershed, stream channel and riparian area (flow regime, channel gradient, dominant channel substrate, watershed area, type and extent of riparian vegetation), future management, climate and natural disturbances (Kindschy 1987, 1994). The most rapid recovery can be expected in channels with small watersheds, perennial flow or subsurface flow, an existing source of riparian vegetation, and availability of fine sediments.

Indirect Effects of No Grazing. Much of the flatter portions of the Tonto Basin and Walnut Allotments are in impaired or unsatisfactory condition (see soils report). The No Grazing Alternative usually provides the most rapid increase of upland vegetative cover, species diversity, and improvement of impaired and unsatisfactory condition soils. These changes reduce surface runoff, dampen peak flows, and decrease the probability of channel adjustments, impacts to riparian vegetation and loss of channel function. Implementation of this alternative should maintain or improve the existing condition of the upland watersheds.

Cumulative Effects. The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects) as listed above, should result in reaching desired conditions at the fastest rate. However, as stated in the direct effects, 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 would provide the most protection for maintaining those conditions.

Consistency with the Riparian Area Management Direction. The No Grazing Alternative eliminates the direct and indirect effects of cattle grazing to recovering stream channels, riparian areas and watersheds within the allotments. This alternative meets the intent of Forest Plan direction to protect, manage, and restore riparian areas.

Wildlife

Alternative 1 rated highest of all alternatives due to removal of livestock grazing and no cumulative grazing effects on wildlife species. Removal of livestock grazing would reduce impacts to upland and riparian resources and associated species. Riparian resources would

likely improve to a greater degree even within the context of other recreational activities that occur within the area. With discontinuation of grazing wildlife habitat conditions would improve. Riparian areas would continue to recover from past grazing and fire effects. Recruitment of woody and herbaceous riparian species, including deergrass, would increase. It is expected that, over time, structural and age class diversity in riparian areas would improve. That would result in increased potential for riparian dependent wildlife species to occur on the allotment. Improvements in aquatic and riparian habitat would likely be quicker as compared to the other alternatives.

Soil compaction problems and herbaceous plant vigor in key areas would improve without livestock grazing and it is expected that, over time, watershed and soil conditions across the allotment would continue to improve. Upland habitat capability for game species such as deer and quail would generally increase in herbaceous vigor and density in openings. Small game and non-game 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 grazing alternatives.

One undesirable effect of the No Grazing alternative would be removal or lack of maintenance of waters. Structures that provide water to cattle also provide water to wildlife, including amphibians, birds, ungulates, bears, and bats. Wildlife using these waters may have become dependent on them, and these individuals may suffer from declines. However, these declines would likely be temporary, and the overall improvements of removing cattle outweigh the short-term costs to wildlife.

Management Indicator Species

MIS were selected during the Forest Planning process to adequately monitor implementation of project actions on wildlife habitat and species diversity. These indicator species reflect general habitat conditions or significant habitat components which are of value to these and other species with similar habitat needs. Please see Appendix B for species that may be on Tonto Basin, Walnut, and 7K Allotments.

Due to the small changes relative to current forest-wide habitat, we have determined that the project alternatives will have an effect to the 12 MIS. Determinations are shown in Figure 37.

Tonto NF MIS Species	Tonto NF Habitat Trend	Tonto NF Population Trend	Alt 1 Net change (determination)	Alt 2 Net Change (determination)	Alt 3 Net Change (determination)
Elk	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Ash-throated Flycatcher	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Spotted Towhee	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Black-chinned Sparrow	Static	Stable	Increase	Decrease	Decrease

Tonto NF MIS Species	Tonto NF Habitat Trend	Tonto NF Population Trend	Alt 1 Net change (determination)	Alt 2 Net Change (determination)	Alt 3 Net Change (determination)
Savannah Sparrow	Upward /Static	Stable	Increase	Decrease	Decrease
Horned Lark	Upward/Static	Decrease	Increase	Decrease	Decrease
Black-throated Sparrow	Downward/Static	Stable	Increase	Decrease	Stable/Decrease
Canyon Towhee	Downward/Static	Decrease	Increase	Decrease	Stable/Decrease
Bald Eagle	Static	Stable	Increase	Decrease	Decrease
Bell's Vireo	Static	Decrease	Increase	Decrease	Decrease
Arizona Gray Squirrel	Static	Stable	Increase	Decrease	Decrease
Common Black Hawk	Static	Decrease	Increase	Decrease	Decrease

Figure 37: Determinations compared by alternative

Migratory Birds

Executive order 13186, of 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." No designated Important Bird Areas occur within the action area. There is an overwintering designated area along the southern end of the Tonto Basin allotment. This area is closed to use from November 15 – February 15 for overwintering geese.

Tonto Creek and its tributaries serve as corridors for migration of birds within and through the Tonto National Forest. Although relatively small watersheds, migratory birds use the riparian areas for habitat needs while migrating to different latitudes depending on the time of year. Historically, perennial and intermittent channels in these allotments most likely supported higher cover of riparian vegetation, broader floodplains, stable channels, and more extensive perennial water than currently observed (Mason and Grove 2009). Therefore, riparian areas in these allotments most likely do not provide as much habitat for migratory birds as they did in the past.

Migratory Bird Summary Determinations

Alternative 1 would be most beneficial to migratory birds as grazing would be removed from the landscape. Please see Appendix B for effects to all migratory bird species for each alternative.

Bald and Golden Eagle

Alternative 1 will be wholly beneficial to eagles as no grazing will allow for prey species to increase over time and for riparian conditions to improve increasing nesting areas for Bald Eagles.

Alternative 2: Proposed Action

Range and Vegetation

This alternative is consistent with vegetation and rangeland goals, objectives, standards, and guidelines as outlined in the Forest Plan. Direct and indirect effects of livestock grazing on vegetation and rangeland would remain similar to those effects that have occurred within the project area over the last 20 years, which are much less than historic rates. Rangeland management research indicates conservative or moderate livestock use may result in similar plant vigor and landscape appearance as compared to the absence of livestock grazing (Holechek et al. 1999, Navarro et al. 2002, Loeser et al. 2007). Studies also demonstrate that woody perennial Sonoran Desert species composition, diversity and density is driven more by climate and elevation than livestock grazing (Hall et al. 2005). Vegetation and rangeland conditions within the Sonoran desert appear to be relatively stable as shown by several photos taken at key areas showing similar woody vegetation across multiple years of monitoring.

Noxious weeds would continue to be spread by livestock and grazing activities and soil disturbance as a result of livestock may increase density and spread of noxious weeds. Treatment using herbicide was recently authorized through finalization of a forest-level EA for noxious weed management that should help mitigate any effects of noxious weeds.

Future drought conditions and the slow increase from current authorized numbers to permitted numbers may result in inspections showing a reduced authorized number is needed based on the resources available. This would be done through adaptive management and yearly authorizations provided in annual authorized instructions. Likewise, years of abundant spring rainfall may also show through inspections that even with full permitted numbers, use is significantly below utilization limits, providing an increase in litter cover as is currently occurring in many areas. Consistent monitoring and implementation of adaptive management would provide the basis for future management decisions, as the proposed permitted numbers in this Environmental Assessment are based on the review of past monitoring data, production and utilization studies, and inspections. Through working with permittees on a yearly basis, authorized numbers could be adjusted through adaptive management to meet any resource concerns. Except in years of extensive drought like that seen in 2002, the proposed numbers are expected to be maintained while still meeting forest goals and objectives, having more localized effects in specific areas as discussed in the analysis rather than an overall reduction in forage.

Proper distribution of livestock on the allotments is essential to reaching desired conditions. Development of new water sources should improve distribution however even with improved water developments and properly maintained pasture divisions, livestock would still tend to concentrate on flatter terrain and near surface water. Some of these areas already exhibit impaired soil and vegetation conditions, and proper use levels may be met quickly with

concentrated use. Changes in management will be necessary if herding, fencing, water developments, and salting are not effective in distributing animals across the landscape.

Construction of structural range improvements may increase the number of acres that are accessible to cattle where they were previously limited by distance and access to available water sources. This increased access to vegetation should improve livestock distribution and utilization, while reducing grazing pressure on plants that are currently accessible to cattle.

Soils

This alternative meets intent of the Forest Plan. Although soil conditions that are currently less than satisfactory are largely attributable to cumulative effects of historic grazing, continued grazing could slow or prevent recovery in some areas. If key areas are closely monitored and utilization standards are not exceeded (light to conservative grazing utilization or light grazing intensity), use of adaptive management techniques should, over time, allow improvement but it may take more than ten years for some areas with impaired and unsatisfactory soil condition to improve to a better condition class. If guidelines are not met, these areas may not improve or improvement may be delayed. Overall improvement is likely to be slower than under Alternative 1. Areas on 7/K Allotment impaired because of wildfire are likely to continue to improve with vegetative recovery. Overall effects of grazing twenty cattle for six months in Clover /Bearhead Pasture (Tonto Basin Ewing) would be minimal because of a very low stocking rate (approximately 300 acres/AUM). Exceptions could be impacts to small localized areas if cattle stay in those areas for long periods of time. Developing new or improved water sources would be a positive indirect effect that improves cattle distribution. Building new fences and pipelines would have very minor direct effects on soils but indirect effects should be positive by improving distribution.

Direct and Indirect Effects:

General Effects on Soil Condition: Hoof action of cattle can cause direct impacts by compacting soils. Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (NRCS, 1996, 1998, 2001). Therefore, the quickest and most likely recovery from soil compaction due to past grazing activities would normally occur with complete protection from grazing. The amount of time required for complete recovery after degradation can vary from several years to decades depending on the severity of the impacts and the nature of the ecosystem. Although the soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, continued grazing could, in some cases, slow or prevent recovery in some areas. However, if key areas are closely monitored and utilization standards or grazing intensity standards are met (light to moderate grazing utilization up to 40 percent or light grazing intensity on Sonoran Desert soils in impaired or unsatisfactory condition), the use of adaptive management techniques should, over time, allow soil conditions to improve. It may take more than ten years for some areas with impaired and unsatisfactory soil condition to improve to a better condition class. If guidelines are not met, these areas may not improve or improvement may be delayed. The overall improvement under Alternative 2 is likely to be slower than under Alternative 1.

- Can't measure utilization in most Sonoran desert areas, use grazing intensity, instead of utilization. Current management (low) numbers will likely allow recovery; full permitted numbers could hamper recovery if cattle are not moved as scheduled.

- Allotment Specific Effects on Soil Condition:
    - Tonto Basin Allotment: About forty-five percent of the Tonto Basin Allotment contains soils that are in less than satisfactory condition. Most of these occur on slopes of less than 40 percent and most of these occur in Sonoran Desert or semi-desert grasslands. Under this alternative, about 48,000 acres of impaired and unsatisfactory soils (28,000 acres Cline and 20,000 acres Ewing) would be grazed. Since most of these soils occur in drier/hotter ecosystems, improvement, even if utilization guidelines are met, is likely to be slow.
    - Walnut Allotment: About three-quarters of the Walnut Allotment contains soils that are in less than satisfactory condition. Most of these occur on slopes of less than 40 percent and most of these occur in Sonoran Desert or semi-desert grasslands. Under this alternative, about 9,000 acres of impaired and unsatisfactory soils would be grazed. Since most of these soils occur in drier/hotter ecosystems, improvement, even if utilization guidelines are met, is likely to be slow.
    - Seven/K Allotment: About forty percent of the Seven/K Allotment contains soils that are in less than satisfactory condition. Most of these occur in Sonoran Desert or semi-desert grasslands but a substantial amount occurs on steeper grassland and chaparral slopes burned in wildfires. Under this alternative, about 7,000 acres of impaired and unsatisfactory soils would be grazed. The flatter desert soils are likely to improve slowly under this alternative. Areas that are impaired because of wildfire are likely to continue to improve with recovery from wildfire.

Effects on Biological (Cryptogamic) Crusts: Biological crusts play an important role in some ecosystems especially Sonoran Deserts and, to a somewhat lesser extent, the other ecosystems in the analysis area. About 50,000 acres of Sonoran Desert vegetation occurs within the analysis area. This includes over 36,000 acres on the Tonto Basin Allotment (30 percent of the allotment), over 6,000 acres of the Walnut Allotment (more than half), and about 7,000 acres (40 percent) of the Seven/K Allotment. Biological crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on soil crusts. Other studies show that grazing can have detrimental effects on the amount of biological crusts. (Beymer, 1992, pp 139-140.) The level of disturbance to soil crusts is influenced more by the amount of hoof action rather than by utilization. Therefore even if the utilization limit of 40 percent is met, grazing may slow or prevent the recovery of biological soil crusts.

Effects of Grazing Clover/Bearhead Pasture (Tonto Basin Allotment): The overall effects of grazing twenty cattle for six months in the Clover/Bearhead Pasture would be minimal because of a very low stocking rate (approximately 300 acres/AUM). Exceptions could possibly be impacts to small localized areas if cattle stay in those areas for long periods of time.

- Effects of Improvements: (Tonto Basin and Walnut Allotments) Developing new or improved water sources will be a positive indirect effect that improves cattle distribution. Building new fences and pipelines will have very minor direct effect on soils but the indirect effect should be positive by improving distribution.

Cumulative Effects:

The direct and indirect effects of grazing management when combined with other past, present, or reasonably foreseeable actions (cumulative effects discussed above), should result in most areas moving toward desired conditions although at a slower rate than under Alternative 1. Some impaired and unsatisfactory soils may improve at a slower rate than with no grazing since compacted soil may recover more slowly because of continued hoof action of cattle. However, as stated in the direct and indirect effects, potential for recovery and rate of recovery will vary by ecosystem type and condition. The current long-term drought and possible climate change can reduced the ability of ecosystems to recover. Other effects from other activities and manageme nt actions that have occurred within the watersheds are mostly localized or short-term.

Watershed and Riparian

This alternative meets intent of the Forest Plan. Existing condition of riparian areas, riparian vegetation utilization, residual vegetation heights and availability of off-channel water developments are elements most likely to affect riparian area and stream channel condition and recovery. Most stream channels are in impaired or unstable condition (Mason and Johnson 1999). Much of the water available to livestock is located in springs and riparian areas. Riparian utilization guidelines were developed to maintain or increase existing riparian vegetation.

The proposed action recommends mitigating direct effects of livestock grazing in key reaches by using riparian utilization measurements (ITT 1999). If riparian area utilization guidelines are followed and cattle are moved when use guidelines are met, undesirable direct effects of grazing would be minimized and riparian area and stream channel condition should improve. However, utilization guidelines were not intended for riparian areas that have potential to support riparian vegetation, but do not, or support very low cover or density of riparian vegetation. Clary and Webster (1989) recommend grazing of riparian areas in early seral condition be deferred until riparian vegetation re-establishes and ecological status improves. Riparian areas in early seral condition include Lambing, Sycamore, Reno, Walnut, and Hymn Book Spring. These channels have potential to support riparian tree seedlings and herbaceous understory based on photo points and comparison areas. Once a proposed fence to exclude Greenback Creek is built, it would no longer be a key reach and direct effects would be the same as for Alternative 1.

Grazing of impaired and unsatisfactory condition uplands may slow rates of upland recovery, indirectly slowing the rate of riparian area and stream channel recovery from scouring effects of increased runoff and higher peak flows. If management prescriptions are followed and cattle are moved when use guidelines are met, undesirable indirect effects of grazing will be minimized. Direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable are likely to result in attainment of desired conditions for many riparian areas at a slower rate than for Alternative 1 (except Greenback Creek, which will be the same as Alternative 1 once fenced). If key reaches without vegetation or vegetation in early seral condition are rested until they regain sufficient accessible, palatable riparian, they are likely to attain desired conditions. If they are grazed before they regain

sufficient accessible, palatable riparian vegetation, it is unlikely they will improve or attain desired conditions.

Piping water away from riparian areas for use by cattle could have the positive effect of drawing cattle away from riparian areas; however it may reduce water available for riparian vegetation. Effects of any new water developments will be minimized by use of groundwater policy and Best Management Practices (BMPs). With continued drought and higher temperatures, small water sources may dry up leaving less water for cattle and wildlife. Piping water away from riparian areas may reduce water available for riparian vegetation, and in combination with a dryer climate may cause mortality of riparian vegetation (Serrat-Capdevila et al. 2007).

Direct Effects of Grazing. The existing condition of riparian areas, riparian vegetation utilization, residual vegetation heights and availability of off-channel water developments are the elements most likely to affect riparian area and stream channel condition and recovery. Most of the stream channels on the allotments are in impaired or unstable condition (Mason and Johnson 1999). Much of the water available to livestock is located in springs and riparian areas.

The riparian utilization guidelines were developed to maintain or increase existing riparian vegetation. The proposed action recommends mitigating the direct effects of livestock grazing in key reaches by using riparian utilization measurements (implementation monitoring) (ITT 1999). 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 improve. This mitigation measure should be effective for the key reaches listed in Figure 28.

Allotment	Pasture	Key Reach
Tonto Basin	Lambing	Quartz Ledge Canyon
	Methodist/Bathtub	Oak Creek and Sprouse Spring, Methodist Creek, Greenback Creek (until fenced)
	Bouquet/Cline	Greenback Creek
	Ft. Reno Holding	Reno Creek
	Sycamore	Walnut Canyon, Sycamore Creek
	Long Mesa	Park Creek
	Clover/Bearhead	Clover Spring, Bearhead Canyon, Lambing Creek, Upper Mud Spring, Gun Creek
7/K	Buck Basin	Ash Creek, Big Pine Spring
	Mountain	Bumblebee
	Ash Creek	Bumblebee
Walnut	Juniper I	Juniper Canyon

Allotment	Pasture	Key Reach
	Juniper II	Juniper Canyon

Figure 28 Key reaches for Alternative 2 that have sufficient vegetation to be managed by implementation monitoring.

However, the utilization guidelines were not intended for riparian areas that have the potential to support riparian vegetation, but do not, or support very low cover or density of riparian vegetation. Clary and Webster (1989) recommend that grazing riparian areas in early seral condition be deferred until riparian vegetation re-establishes and ecological status improves. Because the riparian vegetation on the channels listed in figure 29 is low in density or in early seral condition, riparian utilization measurements may not effectively identify the threshold of unacceptable impact that would trigger moving cattle from the riparian area or pasture, or use levels may be reached quickly. These channels do have the potential to support riparian tree seedlings and an herbaceous understory based on photo points and comparison areas and should be rested until riparian vegetation has become re-established. At that time they would then be managed using riparian utilization measurements (implementation monitoring).

Allotment	Pasture	Key Reach
Tonto Basin	Lambing	Lambing Creek
	Mt. Ord	Sycamore Canyon
	Long Mesa	Reno Creek, Buena Vista Spring
	Mesquite Flat	Walnut Canyon
	Clover/Bearhead	Juniper Canyon, Maverick Basin, Rock Creek
Walnut	Holding	Walnut Creek
Walnut	Edward Spring	Walnut Creek
	Juniper II	Hymn Book Spring

Figure 29. Key reaches for Alternative 2 that do not have sufficient vegetation to be managed with implementation monitoring.

This alternative also proposes to build a fence to divide the Methodist/Bathtub Pasture and exclude Greenback Creek from grazing. Once the fence is built, Greenback Creek would no longer be a key reach and the direct effects would be the same as for alternative 1.

Indirect Effects of Grazing. Grazing of impaired and unsatisfactory condition uplands may slow the rates of upland recovery, indirectly slowing the rate of riparian area and stream channel recovery from the scouring effects of increased runoff and higher peak flows. If management prescriptions are followed and cattle are moved when use guidelines are met, the negative, indirect effects of grazing will be minimized.

Cumulative Effects. The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects discussed above), are likely to result in attainment of desired conditions for the riparian areas in table 1, but at a slower rate than for alternative 1 (except Greenback Creek, which will be the same as

alternative 1 once fenced). Clover Spring supports a wetland that would be impacted very quickly. If the key reaches in table 2 are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they too are likely to attain desired conditions. If they are grazed before they regain sufficient accessible, palatable riparian vegetation, it is unlikely they will improve or attain desired conditions.

Consistency with Riparian Area Management Direction. This alternative should meet the intent of Forest Plan direction to protect, manage, and restore riparian areas if the described design features are successful. The design features have a high probability of success for the key reaches in table 1, with the exception of Clover Spring. If the key reaches in table 2 are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they will also have a high probability of success.

Direct Effects of Improvements. Division fences are proposed in the Tonto Basin Cline Wells, Tonto Basin Ewing, and Walnut Allotments and new corrals are proposed on Tonto Basin Cline Wells. There would be no direct effects of division fences or new corrals to riparian areas or stream channels.

This proposal includes extending pipelines and adding drinkers to the following springs: Daniels Spring (4A-1971) and Packard Spring (36-103010) on Tonto Basin Cline Wells, Edwards Spring (36-24328) and Grapevine Spring (36-24356) on Walnut. Inventory data provides some information about these springs (see table A5); however, there has been much work done on the developments recently.
Piping water away from riparian areas for use by cattle could have the positive effect of drawing cattle away from riparian areas; however, it may reduce water available for riparian vegetation. Effects of any new water developments will be minimized by use of the groundwater policy and best management practices (BMPs).

Indirect Effects of Improvements. Additional division fences and alternative water sources could lead to better cattle distribution (Holechek 1997). However, placing new waters in areas that have not received much use may cause new areas of heavy use (McAuliffe 1997). The effect of building a fence to divide the Methodist/Bathtub Pasture and exclude Greenback Creek from grazing is discussed above under the direct effects of grazing.

Wildlife

This Alternative meets the intent of the Forest Plan with conservation and design features for threatened, endangered, and sensitive species. Herbaceous plant vigor and localized soil compaction (wet meadows, spring, and seeps) within key areas would likely be slower to recover under this alternative, compared to the other alternatives due to yearlong rotational grazing by wild and domestic ungulates.

Overall, it is expected that, over time, watershed and soil conditions across the allotment would continue to improve under this alternative relative to historic grazing levels, although improvement would be slower than other alternatives. Over time, upland habitat capability

for game species such as deer and quail may slowly improve due to increase in herbaceous vigor and density in the openings of chaparral and piñon/juniper woodlands due to light to conservative use under this alternative, compared to higher past utilization limits. Improvements to upland habitat are expected to be slower under this alternative, compared to the other alternatives due to year-long grazing, except in Clover/Bearhead pasture where grazing would only occur from September through February. Riparian habitat and stream channels are expected to improve under this alternative, although at a slower rate than the other alternatives, if management prescriptions are followed and cattle are moved when use guidelines are met.

The slower recovery relative to other alternatives is due to year-long use of the allotment. Small game and non-game species would generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity, although at slower rates than Alternative 1 for the reasons described above. Improvements in these resource conditions would be expected to occur more slowly than they would under implementation of other alternatives for the reasons outlined above. **MIS:** generally, with improvement in soils and vegetation under this alternative, improvements in wildlife habitat should occur over time, although at a slower rate and to a lesser degree than Alternative 1 for the reasons mentioned above.

Habitat conditions for riparian (summer tanager, hooded oriole, black hawk, western wood pewee) and aquatic (macroinvertebrates) species are expected to improve over time due to lower grazing levels than historical levels, although at a slower rate than Alternative 1, if management prescriptions are followed and cattle are moved when use guidelines are met. Slower recovery is due to year-long use of the allotments.
Species that are indicators of good ground cover (ash-throated flycatcher) and general woodland conditions (juniper titmouse) would likely experience the smallest habitat gain under this alternative than any of the other alternatives because it could result in the lowest potential for increases in native perennial grasses in the most frequently used areas. This is due to yearlong rotational use. Chaparral species (rufous-sided towhee, black-chinned sparrow) may experience the smallest habitat gain under this alternative than any of the other alternatives for reasons outlined above.

Habitat conditions for desert scrub species (black-throated sparrow, brown towhee) are not as likely to improve under this alternative due to reasons outlined above. **TES**: Indirect effects to watershed conditions should be minor with light to moderate grazing and have little effect to southwestern willow flycatcher habitat and yellow-billed cuckoo habitat. Direct and indirect effects to Mexican spotted owl habitat should be minor under light to conservative grazing and implementation of design features for PACs and riparian areas. Effects to Chiricahua leopard frog habitat, headwater chub habitat, and spikedace habitat may be significant under continuous summer grazing proposed for Clover/ Bearhead pasture and access to riparian areas in other places on these allotments. Grazing of riparian areas would be detrimental to habitat for garter snakes. Development of water sources can introduce non-native species which pose a threat to garter snakes and other native species. This alternative would be least beneficial to wildlife as more undesirable cumulative effects occur for wildlife species than other alternatives due to year-long grazing and access to riparian areas.

Management Indicator Species
MIS were selected during the Forest Planning process to adequately monitor implementation of project actions on wildlife habitat and species diversity. These indicator species reflect general habitat conditions or significant habitat components which are of value to these and other species with similar habitat needs. Please see Appendix B for species that may be on Tonto Basin, Walnut, and 7K Allotments.

Due to the small changes relative to current forest-wide habitat, we have determined that the project alternatives will have an effect to the 12 MIS. Determinations are shown in Figure 37.

Tonto NF MIS Species	Tonto NF Habitat Trend	Tonto NF Population Trend	Alt 1 Net change (determination)	Alt 2 Net Change (determination)	Alt 3 Net Change (determination)
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Ash-throated Flycatcher	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Spotted Towhee	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Black-chinned Sparrow	Static	Stable	Increase	Decrease	Decrease
Savannah Sparrow	Upward /Static	Stable	Increase	Decrease	Decrease
Horned Lark	Upward/Static	Decrease	Increase	Decrease	Decrease
Black-throated Sparrow	Downward/Static	Stable	Increase	Decrease	Stable/Decrease
Canyon Towhee	Downward/Static	Decrease	Increase	Decrease	Stable/Decrease
Bald Eagle	Static	Stable	Increase	Decrease	Decrease
Bell's Vireo	Static	Decrease	Increase	Decrease	Decrease
Arizona Gray Squirrel	Static	Stable	Increase	Decrease	Decrease
Common Black Hawk	Static	Decrease	Increase	Decrease	Decrease

Figure 37: Determinations compared by alternative

Migratory Birds
Executive order 13186, of 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." No designated Important Bird Areas occur within the action area. There is an overwintering

designated area along the southern end of the Tonto Basin allotment. This area is closed to use from November 15 – February 15 for overwintering geese.

Tonto Creek and its tributaries serve as corridors for migration of birds within and through the Tonto National Forest. Although relatively small watersheds, migratory birds use the riparian areas for habitat needs while migrating to different latitudes depending on the time of year. Historically, perennial and intermittent channels in these allotments most likely supported higher cover of riparian vegetation, broader floodplains, stable channels, and more extensive perennial water than currently observed (Mason and Grove 2009). Therefore, riparian areas in these allotments most likely do not provide as much habitat for migratory birds as they did in the past.

Migratory Bird Summary Determinations
The Proposed Action will likely impact local birds. Any unintentional take reasonably attributable to the implementation of this action alternative is not likely to have any measurable negative effect on the overall migratory bird populations. Considering that the TCRU is protected from grazing and is the main flyway most migratory birds will not be impacted by grazing at a large scale. Smaller springs and Greenback Creek would be impacted, but the impact will most likely be in the winter time so as to maintain current riparian habitat within most of the allotments. Overall effect to migratory birds will be minimal with managed grazing and the adaptive management trigger points.

Bald and Golden Eagle

The proposed action may effect, not likely to adversely affect Bald and Golden Eagles. This is due to conservative use in the uplands allowing for prey species to be maintained and because the TCRU is not grazed allowing for improved riparian conditions for Bald Eagle. There are closures around eagle nests that prohibit activity during the breeding season (Dec – May). Golden eagle nests are generally found in or around cliff faces and are not subject to human activity.

Alternative 3: Modified Proposed Action

Range and Vegetation

This alternative meets the intent of the Tonto National Forest Land and Resource Management Plan. Nonuse of Sonoran Desert pastures may help move these areas toward improved species vigor and diversity more quickly although recovery rates would be dependent upon the same factors described under the No Grazing alternative. Nonuse would promote growth of biological soil crusts, which can reduce germination rates of invasive species such as red brome and allow for native plants to re-establish more readily. Proposed range improvements would improve livestock distribution, which may reduce concentrated impacts to vegetation in areas repeatedly visited by livestock under current management. Impacts to vegetation in pastures authorized for use on Walnut Allotment would become more concentrated due to fewer pastures to choose from when establishing annual rotation schedules. Impacts to vegetation on Tonto Basin Ewing Allotment would shift from Sonoran Desert to juniper grassland and be intensified as cattle were concentrated in fewer pastures.

Effects from noxious weeds would be the same as Alternative 1 for ungrazed areas and Alternative 2 for grazed areas.

Soils

This Alternative meets intent of the Forest Plan. Defers or rests about 28,000 acres of impaired and unsatisfactory soil out of a total of 48,000 acres on Tonto Basin Allotment. These rested/deferred acres are more likely to improve at a faster rate than Alternative 2. Effects on the remaining 20,000 acres of impaired/unsatisfactory soil would be similar to Alternative 2. For areas currently in satisfactory condition, if utilization standards are met (light to moderate grazing utilization up to 40 percent), use of adaptive management techniques should, over time, allow those areas to continue to meet standards. For Walnut Allotment, about 3,500 acres of impaired and unsatisfactory soil out of a total of 9,000 acres would be rested. These rested acres are more likely to improve at a faster rate than under Alternative 2. Effects on the remaining 5,500 acres of impaired/unsatisfactory soil would be similar to Alternative 2. For areas currently in satisfactory condition, if utilization standards are met (light to conservative grazing utilization up to 40 percent), use of adaptive management techniques should, over time, allow those areas to continue to meet standards. Clover/Bearhead Pasture (Tonto Basin Ewing) would be grazed by up to 266 head of adult cattle yearlong and up to 193 yearlings for six months or about nine acres/AUM. This is contrasted with Alternative 2 which has a stocking rate of about 300 acres/AUM. Stocking under Alternative 3 is considerably higher than Alternative 2 with much greater animal impacts although a stocking rate of nine acres/AUM is not considered exceptionally high (University of Arizona, 2004). For areas currently in satisfactory condition, (87 percent), if utilization standards are met (light to conservative grazing utilization up to 40 percent), use of adaptive management techniques should, over time, allow these areas to continue to meet standards and for other areas not in satisfactory condition to begin to move towards desired condition. New range improvements would have effects similar to those in Alternative 2.

Direct and Indirect Effects:

General Effects on Soil Condition: Grazing can affect soil condition (See general effects under Alternative 1). Allotment Specific Effects on Soil Condition:

- Tonto Basin Allotment: Alternative 3 would defer or rest about 28,000 acres of impaired and unsatisfactory soil out of a total of 48,000 acres in that category. These rested/deferred acres are more likely to improve or improve at a faster rate than under Alternative 2. The effects on the remaining 20,000 acres of impaired/unsatisfactory soil would be similar to Alternative 2. For the areas currently in satisfactory condition, if utilization standards are met (light to moderate grazing utilization up to 40 percent), the use of adaptive management techniques should, over time, allow those areas to continue to meet standards.
- Walnut Allotment: Alternative 3 would rest about 3,500 acres of impaired and unsatisfactory soil out of a total of 9,000 acres in that category. These rested acres are more likely to improve or improve at a faster rate than under Alternative 2. The effects on the remaining 5,500 acres of impaired/unsatisfactory soil would be similar to Alternative 2.For the areas currently in satisfactory condition, if utilization standards are met (light to moderate grazing utilization up to 40 percent), the use of adaptive management techniques should, over time, allow those areas to continue to meet standards.

Effects on 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. About 24,000 acres of the 40,000 acres of Sonoran Desert within the Tonto Basin Allotment would be deferred or rested in Alternative 3. Almost 3,000 acres of the 6,500 acres of Sonoran Desert within the Walnut Allotment would be rested in Alternative 3. Biological crusts bind and protect soil from both water and wind erosion. Preliminary studies show reduced germination of cheatgrass (*Bromus tectorum*) on soil crusts. Other studies show that grazing can have detrimental effects on the amount of biological crusts. (Beymer, 1992, pp 139-140) The level of disturbance to soil crusts is influenced more by the amount of hoof action rather than utilization. Therefore even if the utilization limit of 40 percent is met, grazing may slow or prevent the recovery of biological soil crusts in the pastures that are not rested or deferred. Since about 60 percent of the Sonoran Desert acres would be differed or rested, this alternative would be more likely to increase the cover of biological crusts than Alternative 2.

Effects of Grazing Clover/Bearhead Pasture (Tonto Basin Allotment): Under Alternative 3 the Clover/Bearhead Pasture would be grazed by up to 266 head of adult cattle (bulls, cows, cow/calf pairs) yearlong and up to 193 yearlings for six months or about nine acres/AUM. This is contrasted with Alternative 2 which has a stocking rate of about 300 acres/AUM. The stocking under Alternative 3 is considerably higher than Alternative 2 with much greater animal impacts although the stocking rate of nine acres/AUM is not considered exceptionally high (University of Arizona, 2004, p3). For the areas currently in satisfactory condition, 87 percent of the pasture, if utilization standards are met (light to moderate grazing utilization up to 40 percent), the use of adaptive management techniques should, over time, allow these areas to continue to meet standards and for other areas not in satisfactory condition to begin to move towards desired condition.

Effects of Improvements: (Tonto Basin and Walnut Allotments) Developing new or improved water sources will be a positive indirect effect that improves cattle distribution. Building new fences will have very minor direct effect on soils but the indirect effect should be positive by improving distribution.

Cumulative Effects:
The direct and indirect effects of grazing management when combined with other past, present, or reasonably foreseeable actions (cumulative effects discussed above), should result in most areas moving toward desired conditions although at a slower rate than under Alternative 1. For those pastures rested or deferred the improvement will be the same as Alternative 1. Most impaired and unsatisfactory soils, not within the rested or deferred pastures, will likely improve at a slower rate 8 than with no grazing since compacted soil will recover more slowly because of continued hoof action of cattle. However, as stated in the direct and indirect effects, potential for recovery and rate of recovery will vary by ecosystem type and condition. The current long-term drought and possible climate change can reduced the ability of ecosystems to recover. Other effects from other activities and management actions that have occurred within the watersheds are mostly localized or short-term.

Watershed and Riparian

This alternative meets intent of the Forest Plan. Effects of this alternative would be the same as Alternative 2 for all key reaches except those in pastures named below.

Placing Bouquet and Cline Pastures in nonuse for five years would allow recovery of riparian vegetation and stream channel features on Greenback Creek in those pastures. Direct effects would be the same as for Alternative 1 for the first five years and the same as Alternative 2 after five years, if grazing resumes.
There are no key reaches in proposed rested Kayler and Malone Holding Pastures on Tonto Basin Allotment therefore there would be no direct effects. Grazing of impaired and unsatisfactory condition uplands may slow rates of upland recovery, indirectly slowing the rate of riparian area and stream channel recovery from the scouring effects of increased runoff and higher peak flows. If management prescriptions are followed and cattle are moved when use guidelines are met, undesirable indirect effects of grazing will be minimized. Some pastures with high amounts of impaired or unsatisfactory soils are being rested in this alternative. Resting these pastures would have the same indirect effects on riparian areas and stream channels as Alternative 1 for the period of rest. Direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects discussed above), are likely to result in attainment of desired conditions for vegetated riparian areas at a similar rate as Alternative 2 but at a slower rate than for Alternative 1. If key reaches with vegetation in a low seral state are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they too are likely to attain desired conditions. If they are grazed before they regain sufficient accessible, palatable riparian vegetation, it is unlikely they would improve or attain desired conditions. Effects of proposed range improvements are the same as described in Alternative 2.

Direct Effects of Resting Pastures. The effects of this alternative would be the same as for alternative 2 for all key reaches except those in the pastures named below.

Placing Bouquet/Cline and Methodist/Bathtub pastures in nonuse for five years would allow for recovery of riparian vegetation and stream channel features on Oak Creek and Sprouse Spring, Methodist Creek and Greenback Creek in those pastures. The direct effects would be the same as for alternative 1 for the first five years and the same as alternative 2 after five years, if grazing resumes.

Because this alternative would implement adaptive management, and cattle would be moved when use guidelines are met, this alternative would provide more protection for riparian areas than alternative 2 in the Clover/Bearhead Pasture. Improvement of riparian areas would be slower than for alternative 1 but faster than for alternative 2 for this pasture.

There are no key reaches in the proposed rested pastures of Lake, Kayler, or Malone Holding pastures on Tonto Basin Cline Allotment or the Cottonwood or Haystack pastures on the Walnut Allotment; therefore, there will be no direct effects.

Allotment	Pasture	Key Reach
Tonto Basin	Clover/Bearhead	Clover Spring, Bearhead Canyon, Lambing Creek, Upper Mud Spring, Gun Creek
	Lambing	Quartz Ledge Canyon

Allotment	Pasture	Key Reach
	Methodist/Bathtub (after 5 years)	Oak Creek and Sprouse Spring, Methodist Creek, Greenback Creek
	Bouquet/Cline (after 5 years)	Greenback Creek
Tonto Basin	Ft. Reno Holding	Reno Creek
	Sycamore	Walnut Canyon, Sycamore Creek
	Long Mesa	Park Creek, Buena Vista Spring
7/K	Buck Basin	Ash Creek, Big Pine Spring
	Mountain	Bumblebee
	Ash Creek	Bumblebee
Walnut	Juniper I	Juniper Canyon
	Juniper II	Juniper Canyon

Figure 30 - Key reaches for Alternative 3 that have sufficient vegetation to be managed by implementation monitoring.

Allotment	Pasture	Key Reach
Tonto Basin	Clover/Bearhead	Rock Creek, Maverick Basin, Juniper Canyon
	Lambing	Lambing Creek
	Mt. Ord	Sycamore Canyon
	Long Mesa	Reno Creek
	Mesquite Flat	Walnut Canyon
Walnut	Holding	Walnut Creek
	Edward Spring	Walnut Creek
	Juniper II	Hymn Book Spring

Figure 31 - Key reaches for Alternative 3 that do not have sufficient vegetation to be managed with implementation monitoring.

Indirect Effects of Resting Pastures. Grazing of impaired and unsatisfactory condition uplands may slow the rates of upland recovery, indirectly slowing the rate of riparian area and stream channel recovery from the scouring effects of increased runoff and higher peak flows. If management prescriptions are followed and cattle are moved when use guidelines are met, the negative, indirect effects of grazing will be minimized. Some pastures with high amounts of impaired or unsatisfactory soils are being rested in this alternative. Resting these pastures would have the same indirect effects on riparian areas and stream channels as alternative 1 for the period of rest (see soils report).

Cumulative Effects. The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects discussed above), are likely to result in attainment of desired conditions for the riparian areas in table 3, at a similar rate as alternative 2 but at a slower rate than for alternative 1. If the key reaches in table 4 are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they too are likely to attain desired conditions. If they are grazed before they regain sufficient accessible, palatable riparian vegetation, it is unlikely they will improve or attain desired conditions.

The main differences between alternatives 2 and 3, for riparian areas are: the key reaches in the Clover/Bearhead Pasture will be managed by monitoring to achieve desired conditions in alternative 3, the key reaches in the Methodist/Bathtub and Bouquet/Cline pastures will be rested for five years providing the effects of alternative 1 for those years in alternative 3, and Greenback Creek in the Methodist/Bathtub Pasture will not be excluded in alternative 3.

Consistency with Riparian Area Management Direction. This alternative should meet the intent of Forest Plan direction to protect, manage, and restore riparian areas if the described design features are successful. The design features have a high probability of success for the key reaches in table 3. If the key reaches in table 4 are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they will also have a high probability of success.

Direct Effects of Improvements. The fence to divide the Methodist/Bathtub Pasture and exclude Greenback Creek would not be built, however the pasture is proposed to be rested for five years. The effects to Greenback Creek are discussed above under direct effects of resting pastures.

Division fences are proposed in the Tonto Basin Cline Wells, Tonto Basin Ewing, and Walnut Allotments and new corrals are proposed on Tonto Basin Cline Wells. There would be no direct effects of division fences or new corrals to riparian areas or stream channels.

This proposal includes extending pipelines and adding drinkers to the following springs: Daniels Spring (4A-1971) and Packard Spring (36-103010) on Tonto Basin Cline Wells, Edwards Spring (36-24328) and Grapevine Spring (36-24356) on Walnut. Inventory data provides some information about these springs (see table A5); however, there has been much work done on the developments recently.

Piping water away from riparian areas for use by cattle could have the positive effect of drawing cattle away from riparian areas; however, it may reduce water available for riparian vegetation. Effects of any new water developments will be minimized by use of the groundwater policy and best management practices (BMPs).

Indirect Effects of Improvements. Additional division fences and alternative water sources could lead to better cattle distribution (Holechek 1997). However, placing new waters in areas that have not received much use may cause new areas of heavy use (McAuliffe 1997). The effect of building a fence to divide the Methodist/Bathtub Pasture and exclude Greenback Creek from grazing is discussed above under the direct effects of grazing.

Wildlife

This Alternative meets the intent of the Forest Plan. Deferred use of pastures with Sonoran Desert vegetation would promote effects similar to those described under Alternative 1 for upland and riparian areas in those pastures. Use of other pastures as identified for this alternative would create effects similar to those described for Alternative 2. Effects for Clover/Bearhead pasture would be exacerbated by a higher stocking rate for this unit, especially in unprotected riparian areas.

Management Indicator Species

MIS were selected during the Forest Planning process to adequately monitor implementation of project actions on wildlife habitat and species diversity. These indicator species reflect general habitat conditions or significant habitat components which are of value to these and other species with similar habitat needs. Please see Appendix B for species that may be on Tonto Basin, Walnut, and 7K Allotments.

Due to the small changes relative to current forest-wide habitat, we have determined that the project alternatives will have an effect to the 12 MIS. Determinations are shown in Figure 37.

Tonto NF MIS Species	Tonto NF Habitat Trend	Tonto NF Population Trend	Alt 1 Net change (determination)	Alt 2 Net Change (determination)	Alt 3 Net Change (determination)
Elk	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Ash-throated Flycatcher	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Spotted Towhee	Static	Stable	Increase	Stable/Decrease	Stable/Decrease
Black-chinned Sparrow	Static	Stable	Increase	Decrease	Decrease
Savannah Sparrow	Upward /Static	Stable	Increase	Decrease	Decrease
Horned Lark	Upward/Static	Decrease	Increase	Decrease	Decrease
Black-throated Sparrow	Downward/Static	Stable	Increase	Decrease	Stable/Decrease
Canyon Towhee	Downward/Static	Decrease	Increase	Decrease	Stable/Decrease
Bald Eagle	Static	Stable	Increase	Decrease	Decrease
Bell's Vireo	Static	Decrease	Increase	Decrease	Decrease
Arizona Gray Squirrel	Static	Stable	Increase	Decrease	Decrease
Common Black Hawk	Static	Decrease	Increase	Decrease	Decrease

Figure 37: Determinations compared by alternative

Migratory Birds

Executive order 13186, of 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." No designated Important Bird Areas occur within the action area. There is an overwintering

designated area along the southern end of the Tonto Basin allotment. This area is closed to use from November 15 – February 15 for overwintering geese.

Tonto Creek and its tributaries serve as corridors for migration of birds within and through the Tonto National Forest. Although relatively small watersheds, migratory birds use the riparian areas for habitat needs while migrating to different latitudes depending on the time of year. Historically, perennial and intermittent channels in these allotments most likely supported higher cover of riparian vegetation, broader floodplains, stable channels, and more extensive perennial water than currently observed (Mason and Grove 2009). Therefore, riparian areas in these allotments most likely do not provide as much habitat for migratory birds as they did in the past.

Migratory Bird Summary Determinations
The modified proposed action will likely impact local birds. Any unintentional take reasonably attributable to the implementation of this action alternative is not likely to have any measurable negative effect on the overall migratory bird populations. Considering that the TCRU is protected from grazing and is the main flyway most migratory birds will not be impacted by grazing at a large scale. Smaller springs and Greenback Creek would be impacted, but the impact will most likely be in the winter time so as to maintain current riparian habitat within most of the allotments. Overall effect to migratory birds will be minimal with managed grazing and the adaptive management trigger points.

Bald and Golden Eagle

The modified proposed action may effect, not likely to adversely affect Bald and Golden Eagles. This is due to conservative use in the uplands allowing for prey species to be maintained and because the TCRU is not grazed allowing for improved riparian conditions for Bald Eagle. There are closures around eagle nests that prohibit activity during the breeding season (Dec – May). Golden eagle nests are generally found in or around cliff faces and are not subject to human activity.

ADDITIONAL EFFECTS CONSIDERED BY RESOURCE

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 late spring and 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 existing vegetation. The ability for lightning caused fire to spread and affect large areas across the landscape was significantly reduced. Additionally, aggressive fire suppression policies adopted by state and federal agencies virtually eliminated the role of fire in natural

ecological processes. In many cases, ecosystems today are very different from those where fire was once an integral part of the landscape (Allen 1996).

There are five natural fire regimes based on the average number of years between fires, severity of fire, and its effects on dominant overstory vegetation. Fire regime condition classes (FRCC) measure the degree of departure from reference conditions, possibly resulting in changes to key ecosystem components. The table below displays existing conditions for vegetation types found on Tonto Basin and Walnut Allotments.

Figure 38: Existing Fire Regime Condition Class (FRCC)

Vegetation Type	Natural Fire Regime	Mean Fire Interval (Historic)	Current Fire Regime Condition Class
Sonoran Desert	III infrequent, mixed severity	75 yrs.	3 High departure
Semi-Desert Grassland	II frequent, stand replacement	10 yrs.	2 Moderate departure
Interior Chaparral	IV less frequent, stand replacement	45 yrs.	1 Low departure
Pinyon-juniper	III frequent, mixed severity	31 yrs.	3 High departure
Ponderosa pine	I frequent, low-moderate severity	4 yrs.	2 Moderate departure

Very little research exists on fire ecology of Sonoran Desert uplands. However, given the recent history of large fires that have occurred throughout desert portions of Tonto NF, it is apparent that some dominant plant species (giant saguaro and foothill paloverde) associated with this ecosystem are very intolerant of fire (Narog et al 1995). Post fire studies indicate mortality rates may approach 80-100 percent in mature stands of saguaro and paloverde (Wilson et al 1996). Introduction and expansion of non-native plant species, especially grasses, has changed characteristics of fuel beds. In many locations on the Tonto NF, combination of herbaceous and shrub layers, including many introduced species, forms a nearly continuous and highly flammable fuel component in the Sonoran Desert. This is especially evident during abnormally wet precipitation cycles.

Sonoran Desert vegetation most closely identifies with fire regime group III, infrequent (35-100 yrs.) mixed severity fires. Mean fire interval is about 75 years with high variation due to year to year variation in shrub mortality and grass and forb production related to drought and moisture cycles combined with variation in ignitions and associated fire weather. On the Tonto Basin allotment, Sonoran Desert covers approximately 30 percent (36,170 acres) of the landscape. A small portion of this vegetation type burned during the Edge fire of 2005 on the west side of Highway 188 otherwise there has been no significant fire (>100 acres) in this vegetation type the past 20 years. Drought, historical grazing practices, and cholla expansion have put this vegetative type into FRCC III.

Desired Condition: Reference condition characteristics have been identified and descriptions developed for each vegetation type represented on the allotments. These

reference conditions are an estimate of the historical mix of vegetation successional classes, fire frequency and severity across the landscape. In simple terms, they represent an ongoing process and how different vegetation groups responded and evolved before natural fire cycles were disrupted.

The long term goal for fire management on the Tonto National Forest is to re-introduce fire back into fire dependent ecosystems, and allow it to resume its natural role (Hart et al 2011). This will most likely be accomplished through combined use of prescribed fire, mechanical treatments, and wildland fire for resource benefits. Prescribed fires can be used to mimic naturally occurring fire, enhance native plant species, control invasive plants, provide forage and habitat for wildlife, contribute to nutrient cycling, and create diversity in vegetative structure and distribution. Mechanical treatments are useful in areas where effects of prescribed fire are not acceptable, but once applied may set the stage for future fire use. Wildland fire for resource benefits allows managers the option to take the Appropriate Management Response (suppress, contain or confine) to naturally ignited wildland fires to accomplish specific resource objectives in predetermined areas.

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).

Effects: removal of fine fuels through livestock grazing would continue to limit the ability of fire to spread across the landscape. If livestock are removed from the allotment through selection of a No Grazing Alternative, fire would resume a more natural role yet still be limited by grazing activity in similar vegetation types on adjacent allotments and by climatic conditions. In Sonoran desert vegetation, removal of grazing may allow non-native grasses to expand and increase potential for uncharacteristic wildfire, potentially damaging fire-sensitive species such as saguaro cactus and foothills palo verde.

Alternative 1: No Action

The alternative meets the intent of the Forest Plan to use unplanned ignitions to improve fuel conditions in fire-dependent ecosystems. Grazing to remove non-native grasses in spring may reduce fire threats which can cause undesirable changes in this plant community through elimination of fire-sensitive native plants such as saguaro cactus. Uncharacteristic fuel conditions caused by grazing (removal of fine fuels across a large area) outside Sonoran desert would improve fastest under this alternative however amount of fine fuel growth would depend on climatic factors and other impacts such as cross-country travel. Increased fine fuels in semi-desert grasslands and juniper grasslands would lead to greater success of prescribed fuels treatments designed to return these ecosystems to a more natural fire regime. Grazing would still occur on adjacent allotments and continue to affect the project area indirectly. Absence of grazing would provide opportunity for biological soil crusts to increase, potentially reducing invasive species such as red brome, which contributes to uncharacteristic fire behavior in desert ecosystems. Conversely, until biological soil crusts are well-established, absence of grazing in desert ecosystems may contribute to abundance of fine fuel buildup of non-native grasses and forbs which may lead to uncharacteristic large fires.

Alternative 2: Proposed Action

Meets the intent of the Forest Plan to use unplanned ignitions to improve fuel conditions in fire-dependent ecosystems could still be met through grazing rotations that provide opportunity for fine fuels to accumulate in areas where managed fire is identified. Grazing pressure on non-native annual grasses can reduce fine fuel loads and potentially reduce uncharacteristic fires. Success of using livestock grazing to reduce fuel loading in desert ecosystems is dependent upon timing, intensity, and duration of use. Grazing outside Sonoran desert would continue to remove native fine fuels and contribute to uncharacteristic fuel conditions. Success of prescribed fires would continue to be limited by lack of fine fuels. Mitigation through nonuse for a specified period (rest from grazing) ahead of prescribed burning could increase the chance of successful treatments however this would be dependent upon climatic conditions during the period of rest.

Alternative 3: Modified Proposed Action

Effects to desert pastures placed in nonuse would be similar to those described under Alternative 1. Effects to all other pastures would be similar to Alternative 2.

Heritage

Tonto Basin, 7/K, and Walnut allotments are known to contain many prehistoric archaeological sites representing occupation, agricultural modification and use of this area by people related to Hohokam and Salado archaeological traditions over a period of 8,000 to 10,000 years. It also contains many historic sites reflecting the use and occupation by Apache hunters, gatherers and farmers, Anglo ranchers, stockmen, miners and prospectors, and the US Forest Service.

Few archaeological surveys have been conducted within the allotments. As a result, only a handful of sites have been formally inventoried. Many more are known or have been reported and informal reconnaissance has revealed that some areas within the allotment have very high site densities. Known heritage properties include a wide variety of features ranging from multi-room prehistoric settlements to simple artifact scatters. Most features are prehistoric and consist of collapsed stone masonry structures ranging from single room field houses to large compound sites, various water control devices such as check dams and terraces, and roasting pits for processing agave. There are also a large number of features associated with a long history of cattle ranching and a few reflecting sporadic attempts at small-scale mining and ore processing. Many other prehistoric and historic archaeological sites are represented by nothing more than a scatter of artifacts on the surface.

No traditional cultural properties, native plant gathering areas or tribal sacred sites are currently known to be located on the allotment. The nearby Conway Ranch area is known to have been important historically to the Dilzhe'e or Tonto Apache, many of whom were known to gather there seasonally to harvest acorns well into the 20th century. No specific efforts to identify and inventory such areas have been made.

From the 1870s to early 1920s, grazing of what would become these three allotments was heavy and unregulated. This resulted in an initial reduction of vegetation cover which would have affected heritage resources through soil loss, erosion, and trampling. Since establishment of allotments and implementation of grazing management, impacts to known

heritage resources inventoried have lessened and, in many cases, these properties may have improved in condition as vegetative cover has returned.

Effects: Impacts to heritage resources, especially archeological sites, are generally defined as anything that results in the removal of, displacement of, or damage to artifacts, features, and/or stratigraphic deposits of cultural material. In the case of heritage resources which are eligible for inclusion in the National Register of Historic Places, this can also include alterations of a property's setting or context. For traditional cultural properties and sacred places, additional considerations may include alterations in the presence or availability of particular plant species. Heritage resources, depending on their nature and composition, are subject to several different types of impact from activities associated with grazing. Direct impacts from grazing are those resulting from concentrated livestock trampling or construction. Indirect impacts include erosion and changes in vegetative composition and density that alter the setting and geographic context of sites.

Since site condition assessments for heritage resources are not available for any time prior to the introduction of European livestock species to the Southwest, some level of effect is assumed to have contributed to the current condition of all sites on the allotment. Given the non-renewable nature of heritage resources -- particularly archeological and historic sites -- any portion of them that has been damaged or removed diminishes their cultural and scientific value permanently. The missing parts cannot be replaced. Therefore, all effects to heritage resources are considered cumulative.

Based on a history of observation and consultation with the State Historic Preservation Officer (SHPO), managed grazing is not considered in and of itself to constitute an effect on heritage resources when the grazing strategy is designed to match herd size with capacity and distribute livestock as evenly as possible across the allotment in order to avoid localized concentrations of animals and the resultant impacts to soils and vegetation associated with intense trampling. Changes in grazing strategy are likewise not considered to have an effect provided that whatever new strategy is implemented does not alter these conditions.

Adverse effects are likely if a proposed grazing strategy were to introduce livestock into an area not known to have been grazed historically. They may also be expected when a grazing strategy proposes shifting to a more intensive system where higher permitted numbers or high intensity/short duration schedules would concentrate livestock in confined areas where either the absolute or relative stock density would cause a significant increase in surface disturbances due to trampling that would be above previous or existing levels. This could result in either direct or indirect adverse effects depending on the degree of trampling resulting from localized concentration and on the presence or absence of heritage resources in the concentration area, the nature of the resource and its resistance to such impacts, and the distance to other heritage sites. For the most part, these conditions tend to be associated with the construction of range improvements designed to provide water or to concentrate and hold stock for roundup or shipping. Thus, the greatest potential for direct adverse effects to heritage resources is associated with the construction of range improvements and the access roads needed to build and maintain them.

Alternative 1: No Action – No Grazing

This Alternative meets the intent of the Forest Plan and requirements of SHPO. Effects to heritage resources by livestock grazing would be eliminated through this alternative. Impacts to heritage resources by other activities such as mining, recreation, and fuels treatments would still occur.

Alternative 2: Proposed Action

This Alternative meets intent of the Forest Plan and requirements of SHPO. Proposed livestock numbers are within recent historical stocking rates and not anticipated to cause undesirable effects to heritage resources. Mitigation through light to conservative grazing intensity is anticipated to maintain or improve watershed conditions so indirect effects to heritage resources would be minimal. Range improvement construction, salting and water placement are mitigated by performing site-specific archaeological clearances prior to ground-disturbing activities to avoid impacts to heritage resources. Access routes to construction sites are mitigated by performing site-specific clearances to avoid heritage resources.

Alternative 3: Modified Proposed Action

This Alternative meets intent of the Forest Plan and requirements of SHPO. Effects of this alternative are the same as Alternative 2 for grazed areas and the same as Alternative 1 for ungrazed areas.

Recreation

Several designated hiking trails pass through Tonto Basin and 7/K Allotments, including a section of the Arizona Trail along the western boundaries. No wilderness areas are included within the allotment boundaries. All three allotments are used frequently by big and small game hunters, hikers, horseback riders, sight-seers, and motorized recreationists using a wide variety of all-terrain vehicles. Encounters between recreationists and livestock are common.

Desired Condition: Members of the public have expressed interest in continued motorized, horseback and hiking access to lands within these allotments for hunting and other recreational activities. Travel Management Rule will provide maps of available roads and motorized users will be encouraged to travel these routes and stay off closed routes within the allotments.

Direct and Indirect Effects: Removing livestock grazing could benefit recreational users, particularly if obstructions such as fences, cattle guards, and gates were removed. Visual quality and overall user experience could improve with removal of range improvements and livestock. Some users rely on water developments while hiking or horseback riding in the area and may experience an undesirable effect if those water developments were removed or no longer maintained.

Gates are occasionally left open by users, providing opportunity for livestock to move into pastures not authorized for grazing under annual allotment grazing plans. Constructing walk-throughs or replacing wire gates with swing gates or cattle guards could make access easier. Occasionally, range improvements are vandalized through shooting or tampering with operational parts, creating financial burdens to the permittee. Rarely, hikers on active

grazing allotments have been threatened by bulls protecting cows or cows protecting calves. Cattle frequently use established hiking trails to move from one part of the allotment to another, particularly on steeper slopes or where vegetation limits movement across the landscape.

Cumulative Effects: Cumulatively, recreational users have access to most public lands in the project area by motorized vehicle, and all public lands in the area by foot or horseback. Most forest lands adjacent to these allotments are active grazing allotments although there are places inaccessible to livestock while accessible to users traveling on foot. Three Bar Wildlife Area adjacent to 7/K Allotment, and Haufer Research Area adjacent to Tonto Basin Allotment, provide livestock-free recreational opportunities. Motorized travelers would experience livestock and range improvements along most designated routes in the project area.

Alternative 1: No Action – No Grazing

This alternative meets intent of the Forest Plan. Recreational users would not encounter livestock on these allotments. Gates, fences, and other range improvements may be removed depending on need for these facilities to meet other resource objectives, which could enhance recreational access. Removal of developed water and corrals could be detrimental to some recreational users such as horseback riders, outfitter/ guides, and hunters. Roads maintained specifically to access range improvements may fall into disrepair.

Alternative 2: Proposed Action

This Alternative meets intent of the Forest Plan. Recreational users would continue to experience existing range improvements, new range improvements, and livestock presence on the allotment. Gates are occasionally left open by users, providing opportunity for livestock to move into pastures not authorized for grazing under annual allotment grazing plans. Occasionally, range improvements are vandalized through shooting or tampering with operational parts, creating financial burdens to the permittee. Rarely, hikers on active grazing allotments have been threatened by bulls protecting cows or cows protecting calves. Cattle frequently use established hiking trails to move from one part of the allotment to another, particularly on steeper slopes or where vegetation limits movement across the landscape. Some recreational users would continue to benefit from developed roads, developed water, and corrals.

Alternative 3: Modified Proposed Action

This alternative meets intent of the Forest Plan. Recreational users would not encounter livestock in pastures identified for deferred use. Effects for grazed pastures would be similar to those described for Alternative 2.

Air and Water Quality

Air - Air quality for the project area is monitored by Arizona Department of Environmental Quality under direction from the Clean Air Act and Environmental Protection Agency, who provide National Ambient Air Quality Standards (NAAQS). The project area is not in a nonattainment area or maintenance area for regulated air pollution and the Proposed Action and No Grazing Alternative are expected to have a minimal effect on air quality (ADEQ 2011).

Desired Condition Air: Projects related to the Proposed Action, Alternative 3, and No Grazing Alternative are subject to NAAQS and should strive to keep particulate matter within those standards during normal operations or special projects.

Water- Arizona Department of Environmental Quality (ADEQ) evaluates the water quality status of waters within the state in a Nonpoint Source Assessment Report (2011a). No streams on the allotment have been evaluated by ADEQ for the 2010 report.

The ADEQ 2006/2008 report indicated that Greenback Creek was in full support of designated uses of aquatic and wildlife-cold water fisheries (A&Wc), full body contact recreation (FBC), fish consumption (FC), agricultural livestock watering (AgL), agricultural irrigation (AgI). Greenback Creek was not monitored for the 2010 report.

Roosevelt Lake is listed as Attaining Some Uses by ADEQ (2011a) due to inconclusive sampling for aquatic and wildlife-warm water fisheries (A&Ww), full body contact recreation (FBC), domestic water source (DWS), agricultural livestock watering (AGL) and agricultural irrigation (AGI). However, the lake was added to the 303d list of impaired waters by the U.S. Environmental Protection Agency (EPA) for fish consumption (FC) due to exceedance of the narrative water quality standards for mercury in fish tissue. A fish consumption advisory is currently in place (EPA 2009). A TMDL is scheduled to begin in 2014 (ADEQ 2011b).

Designated uses for non-ephemeral, unlisted tributaries above 5000 feet are aquatic and wildlife-cold water fisheries (A&Wc), FC, and FBC. Designated uses for non-ephemeral, unlisted tributaries below 5000 feet are A&Ww, FC, and FBC. Designated uses for ephemeral, unlisted tributaries are aquatic and wildlife-ephemeral water fisheries (A&We) and partial body contact recreation (PBC) (A.A.C. R18-11-105).

Desired Condition Water: ADEQ has jurisdiction from the Environmental Protection Agency to implement the Clean Water Act in Arizona. The Southwest Region has a Memorandum of Understanding with ADEQ in which the Forest Service agrees to use Best Management Practices for on-ground projects to continue "Attaining All Uses".

Effects: Particulate matter (10 microns and smaller) dispersed during activities associated with livestock grazing management can penetrate human and animal lungs. Inhaling particulate matter 2.5 microns and smaller has been linked to increases in death rates, heart attacks, plaque and clotting, respiratory infections, asthma attacks, and cardiopulmonary obstructive disease (ADEQ 2011). Effects can be mitigated through proper site preparation and construction techniques and through site restoration following ground-disturbing activities. These effects could occur during livestock gathering (heavy trailing, increased vehicle movement) and during construction of range improvements.

Desired Condition Water: ADEQ has jurisdiction from the Environmental Protection Agency to implement the Clean Water Act in Arizona. The Southwest Region has a Memorandum of Understanding with ADEQ in which the Forest Service agrees to use Best Management Practices for on-ground projects to continue "Attaining All Uses".

Effects: Any potential impacts to water quality would be mitigated with Best Management Practices (BMPs).

Cumulative Effects: Cattle grazing in adjacent allotments and across the Tonto National Forest can increase ground disturbance and aid in the release of dust into the air. In many arid environments microbiotic soil crusts hold in dust particles during storm events but are easily trampled by cattle and allow for dust to escape in absence of litter and vegetation cover as is common on soils in arid environments (Field, Jason P. et al. 2010).

Alternative 1: No Action – No Grazing

There would be no effects to air and water quality by livestock grazing under this alternative. Effects from recreational activities, mining activities, and activities associated with small communities around Tonto Basin would still occur. Effects to air quality would be minimized without livestock gathering and trailing however use of roads in the area would still occur and construction of improvements for wildlife or recreational benefit could still occur on the allotment. Air quality would still be affected by activities on other active grazing allotments in the project area and by continued recreation and gravel mining operations in Tonto Basin.

Alternative 2: Proposed Action

ADEQ has issued an Impaired assessment for Roosevelt Lake and Tonto Creek for fish consumption (FC) due to exceedance of narrative water quality standards for mercury in fish tissue. The source of mercury is unknown. An analysis is scheduled to begin in 2014 (ADEQ 2011). Any potential impacts to water quality would be mitigated with Best Management Practices (BMPs). Particulate matter (10 microns and smaller) dispersed during activities associated with livestock grazing management can penetrate human and animal lungs. Effects can be mitigated through proper site preparation and construction techniques and through site restoration following ground-disturbing activities. These effects could occur during livestock gathering (heavy trailing, increased vehicle movement) and during construction of range improvements.

Alternative 3: Modified Proposed Action

Effects would be similar to those as described in Alternative 2 however by not grazing pastures that are mostly within the Sonoran Desert there is a reduced chance of particulate matter associated with livestock grazing activities occurring on the most susceptible soils; additionally these areas would act as a buffer to any sediment movement towards Tonto Creek and Roosevelt Lake.

Climate

Climate on these allotments is characterized by a bimodal precipitation pattern with about sixty percent occurring as frontal systems in winter from December to March and about forty percent occurring as monsoons in summer from July to September. Summer storms can be more intense than winter storms but are generally of shorter duration and smaller aerial extent.

According to Arizona Drought Monitor Report (ADWR 2012), Arizona remains in a long-term drought, which has likely had an effect on the allotments. According to NOAA National Climatic Data Center data, there has been a marked upward trend in the globally

averaged annual mean surface temperature since the mid-1970s (Shein, 2006). Models used by Seager et al. (2007) to predict how climate change will affect the southwestern United States indicate this region has begun the transition to a dryer climate which will continue into the 21st century. However, the models are too broad-scale to predict how climate change might affect monsoons, which contribute 40 percent of the total annual precipitation received on the Tonto National Forest (Lenart, 2005).

The nearest climate gauge to the allotment is Roosevelt 1WNW. The period of record is 1905 to present and the average annual precipitation is 16.89 inches. Data indicates seven out of the last ten years have had below average precipitation, with 2002 being below fifty percent of average.

Desired Condition: USDA Strategic Plan for 2010-2015 sets a departmental goal to "ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources." As a measure of this goal, all National Forests are to come into compliance with a climate change adaptation and mitigation strategy. The Plan and A Roadmap for Responding to Climate Change has been developed and is available on the agency's national website (http://www.fs.fed.us/climatechange/).

Direct and Indirect Effects: Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al. 2010). This effect is anticipated to be minor in the project area as cumulative livestock numbers are low and distributed broadly across the landscape for all grazing allotments in Tonto Basin. It would be difficult to separate effects of livestock emissions from those produced by other human activities, such as passenger vehicles and off-road vehicles traveling on roads in the project area, industrial activities such as mining, and outflow from major metropolitan areas such as Phoenix, Arizona, which lies 60 miles west of the project area.

Livestock grazing may or may not affect climate by altering the abundance or type of carbon-sequestering vegetation available on the landscape (Brown et al. 1997; Asner et al 2004; Archer and Predick 2008). Implementation of Best Management Practices and utilization guidelines is anticipated to mitigate this effect across the project area.

Climatic fluctuations, on the other hand, can have a profound effect on livestock grazing. Photo point monitoring from the nearby Boneyback Allotment demonstrates how varied production of vegetation can be as precipitation and temperatures fluctuate. Implementing an adaptive management strategy will be critical for responding to these fluctuations by adjusting stocking rates as needed in periods of below average or above average precipitation to meet desired conditions for all resources.

Cumulative Effects: Climate in the Southwest is predicted to become dryer and more arid with increased likelihood of droughts occurring in the coming decades. One recent study looking at climate models, states that there is a high likelihood the Southwestern U.S. could experience a prolonged megadrought in the last half of this century (Cook et. al. 2015).

Alternative 1: No Action – No Grazing

Removal of livestock from the allotments through selection of a No Grazing Alternative would reduce emissions slightly however it would be difficult to measure this change.

Emissions would continue to be generated from neighboring allotments in the project area. Eliminating grazing pressure on vegetation may also have a slight benefit for carbon sequestration; again, this would be difficult to measure on such a small scale.

With continued drought and higher temperatures, small water sources may dry up leaving less water for wildlife and causing mortality to riparian vegetation. Removing water developments from allotments and allowing water to remain at spring sources may offset or delay this effect. Removal of livestock from allotments would reduce methane emissions slightly however it would be difficult to measure this change. Emissions would continue to be generated from neighboring allotments in the project area. Eliminating grazing pressure on vegetation may also have a slight benefit for carbon sequestration; again, this would be difficult to measure on such a small scale.

Alternative 2: Proposed Action

With continued drought and higher temperatures, small water sources may dry up leaving less water for cattle and wildlife. Piping water away from riparian areas for use by cattle may reduce water available for riparian vegetation, and in combination with a dryer climate may cause mortality of riparian vegetation (Serrat-Capdevila et al. 2007). Research indicates livestock grazing may affect climate through emissions of methane gas produced by cattle (Gill et al. 2010). This effect is anticipated to be minor in the project area as cumulative livestock numbers are low and distributed broadly across the landscape. It would be difficult to separate effects of livestock emissions from those produced by other human activities, such as passenger vehicles and off-road vehicles traveling on roads in the project area, industrial activities such as mining, and outflow Phoenix, Arizona, which lies 60 miles west of the project area. Livestock grazing may or may not affect climate by altering abundance or type of carbon-sequestering vegetation available on the landscape (Brown et al. 1997; Asner et al 2004; Archer and Predick 2008). Implementation of Best Management Practices and utilization guidelines is anticipated to mitigate this effect across the project area.

Alternative 3: Modified Proposed Action

Effects would be the same as described in Alternative 2.

Socioeconomics

Tonto Basin's population is divided between two communities; Roosevelt at the eastern end of Theodore Roosevelt Lake, and Punkin Center/ Tonto Basin along Tonto Creek north of the lake. These communities are completely surrounded by the Tonto National Forest. At present these communities are primarily retirement and second home communities, with the median age of the population being 58.4 years. 2000 Census data recorded a population of 840 residents in Punkin Center and 616 in Roosevelt. The local economy is dominated by ranching, tourism/ recreation, retirement and gravel mining industries.

Gila County, with a population of 53, 144 (2012 Census), encompasses approximately 4,752 square miles. Within the county, ownership or administrative control occurs as follows: the US Forest Service -55.5 percent of the land, Apache Tribe -37 percent, individuals and corporations -3.7 percent, US Bureau of Land Management -1.9 percent and the state of Arizona –less than 1 percent (Arizona Department of Commerce, Gila County Profile). With

little private land to assess property taxes, the county is dependent upon funding from the federal government. The US Government makes payments to Gila County under various programs, the two most important being:

1. Payments in Lieu of Taxes (PILT). These payments are made to the local governments based upon the acreage of federal land within the county, population, consumer price index and previous year payments. In 2012, Gila County received $3,271,245 from this program.

2. Secure Rural Schools and Community Self Determination Act of 2000 (PL 106-393). Traditionally, the federal government had returned 25 percent of the revenues collected on Forest Service lands from grazing permits, timber sales, etc to the counties on which these revenues were generated. With decreased timber sales and fees generated from grazing permits, the above Act was designed to "...restore stability and predictability to the annual payments made to States and counties containing National Forest System lands and public domain lands managed by the Bureau of Land Management for use by the counties for the benefit of public schools, roads and other purposes." Under the legislation, the County would receive a fixed income from the federal government, regardless of the income generated on the federally administered lands. The amount is to be based on the average of the highest three years within a ten-year period. Gila County has elected to be funded under the Act, rather than continue to receive 25 percent of the revenues generated from the Forest Service System lands.

Alternative 1: No Action – No Grazing

This alternative would not affect future payments received through PILT or PL 106-393. Tonto Basin and Gila County could be affected by a No Grazing alternative due to the amount of money made by permittees and how much is spent in the local economy. Other permittees outside this analysis would continue to spend money in the community. Removal of livestock from allotments could result in some loss of culture and lifestyle tied to ranching. Current permittees have had family ranching in Tonto Basin for several generations. A No Grazing alternative could intensify feelings of mistrust, loss of personal control, and threaten lifestyles, resulting in negative attitudes towards the Forest Service and other federal agencies in general. Conversely, individuals who perceive grazing to be an unsuitable use of federal lands may feel increased trust and increased positive attitude towards the Forest Service. These individuals may perceive an increased social benefit from livestock removal. The Forest Service is a multiple use agency with a mission to provide sustainable products and services to the public. This alternative would not meet multiple use objectives for these allotments although those objectives would continue to be met on adjacent allotments.

Alternative 2: Proposed Action

Sustainable economic benefits to permittees in this analysis would remain at their highest potential through maximum flexibility in use of the allotments. Personal characteristics such as self-sufficiency, independence, hard work, and other traits associated with the ranching lifestyle would most likely be protected. Continuation of ranching operations in a sustainable manner would provide for continuation of culture and lifestyle tied to ranching in this area. Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel decreased trust and increased negative attitude towards the Forest Service, and other federal agencies in general. These individuals may perceive a decreased social benefit from continuing grazing. This alternative meets Forest Service sustained multiple use objectives.

Alternative 3: Modified Proposed Action

Economic benefits to permittees would be reduced in this alternative due to reduced flexibility in maintaining sustainable grazing operations. Tonto Basin Ewing would experience economic hardship from deferred use of almost half of that allotment. Year-long grazing may not be feasible in Clover/ Bearhead pasture because elevation allows snowfall to accumulate, which could limit livestock access to forage. This could require the permittee to remove cattle from the allotment in years with high snowfall accumulation. Walnut Allotment permittees may also experience economic hardship through deferred use of Cottonwood Pasture, which is currently used annually through deferred grazing. The permittees have spent considerable time and money over the last two years, repairing range improvements in Cottonwood Pasture to improve livestock distribution and disperse grazing effects. Other effects would be somewhat compromised in comparison to what is described in Alternative 2. This alternative meets Forest Service sustained multiple use objectives.

Social Environment

The social environment for this analysis comprises the people living in and adjacent to Tonto National Forest and is perhaps the most diverse and emotionally charged arena in ecosystem management. Forest resources play an important social role for the people of the Southwest. Goods, services, and uses available from National Forests represent major components in the lives of many residents within Tonto National Forest, especially those in rural areas.

Geographically this region has two types of very distinct population centers. There are several small rural communities scattered along and within the boundaries of the Forest. In addition, the Phoenix metropolitan area abuts the Forest along its western boundary. Smaller communities tend to rely at least partially on Forest resources (mining, ranching and timber) for their economic development. This is evidenced by Gila County Land Use and Resource Policy Plan for public lands, which states, "Federal and state agencies need to recognize and take into account the critical role that public lands in Gila County play in the overall functioning of the County, and in the County's economy and tax base" (Gila County 1997 updated 2010). The Phoenix metropolitan area and Tonto Basin area have experienced great population growths in recent years. The influx of people in recent decades has also brought about more diverse views and public opinion regarding appropriate uses of the public lands. The demand for recreational type activities on public lands is greatly increasing.

Few generalizations can be made about the communities across the Southwest. They are as diverse as the people who live there and due to the increasing desirability of the Southwest as a living location. The diversity is ever increasing. It should not be expected that all residents have the same or even similar points of view on various issues.

Lifestyles

Ranching and the grazing of domestic livestock have been a part of the Southwest culture for 400 years. Grazing sheep and cattle in the Southwest was introduced by the Spanish in the late 16th century. The tradition of an open range endured for several hundred years before Anglo-Americans arrived in the Southwest, and when they came, the new arrivals expanded the traditional pastoral practices into modem range-cattle and sheep industries. In the Southwest, the National Forests were of equal or greater importance to the people for their range resources as they were significant for timber, watershed or mineral resources (Baker et al. 1988)

Economic Impacts

Other than reported actual livestock numbers (from Bills for Collections) that have been placed on these allotments, data has not been provided to the Forest Service in regards to economic returns from ranching operations or expenses incurred for maintenance of range improvements. Stocking rates have been quite variable throughout recent history on these allotments due to fluctuating resource conditions, recurrent drought, and economic considerations.

Research is available that discusses the influence stocking rates can have on economic returns. Generally, heavier stocking rates result in the greatest gross economic returns, while moderate stocking rates maximize net economic returns (Holechek et al. 2004). Over time, heavy stocking tends to result in higher death loss, a greater need for supplemental feeding, especially in years of below average precipitation, and lower weaning weight percentages. Under heavy stocking rates, livestock tend to make high gains for a few years, especially when precipitation remains at average or above average levels. However, during drier periods, livestock productivity tends to reduce per animal unit and per unit area. The severity of reduction is related to the stocking density, i.e. heavier stocking rates result in more severe reductions in economic returns than moderate stocking rates, especially in drought years. Under the adaptive management proposal, desirable stocking rates would be moderate over the long-term to achieve desired resource conditions.

A No Grazing alternative would not affect future payments received through PILT or PL 106-393. Tonto Basin and Gila County could be affected by a No Grazing alternative due to the amount of money made by these permittees and how much is spent in the local economy. This is related to a multiplier effect, or that monies spent in a community are often re-spent. Multipliers in rural communities are generally lower than for large municipal areas as expenditures for large ticket items are usually made outside the local area. Multipliers of 1.25 to 1.75 are common in rural areas associated with adjacent public lands (Loomis, 1993).

A No Grazing alternative and Alternative 3 would create economic hardships for the permittees through cessation of their grazing opportunity or a shift to a limited opportunity to graze cattle.

Social Impacts

Removal of livestock from the allotments could result in loss of some of the culture and lifestyle tied to ranching. Current permittees for all of these allotments have had family ranching in Tonto Basin for several generations. Implementing the No Grazing alternative could intensify feelings of mistrust, loss of personal control, and threaten lifestyles, resulting in negative attitudes towards the Forest Service and other federal agencies in general. Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel increased trust and increased positive attitude towards the Forest Service and other federal agencies in general. These individuals may perceive an increased social benefit from livestock removal.

Personal characteristics such as self-sufficiency, independence, hard work, and other traits associated with the ranching lifestyle would most likely be protected under the Proposed Action. Continuation of the ranching operation in a sustainable manner would provide for continuation of the culture and lifestyle tied to ranching in this area.

Conversely, those individuals who perceive grazing to be an unsuitable use of federal lands may feel decreased trust and increased negative attitude towards the Forest Service, and other federal agencies in general. These individuals may perceive a decreased social benefit from continuing grazing.

CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID TEAM MEMBERS:

Interdisciplinary Team Leader, Tonto Basin RD -	Debbie Cress (2009 – 2013)
Interdisciplinary Team Leader, Tonto Basin RD -	Eric Hoskins (2014 – 2015)
Rangeland Management Specialist, Tonto Basin RD –	Debbie Cress (2009–2013)
Rangeland Management Specialist, Tonto Basin RD	Eric Hoskins (2009 – 2015)
Forest Range Staff, Tonto NF-	Chandler Mundy (2015)
Soil Scientist, Tonto NF -	Norm Ambos (2009 – 2012)
Hydrologist, Tonto NF -	Lynn Mason (2009 – 2014)
Natural Resource Specialist	Ryan Nicholas (2015)
Wildlife Biologist, Tonto Basin RD	Gregg Dunn (2009 – 2015)
Fire Management Officer, Tonto Basin RD -	Mike Behrens (2009 – 2012)
Assistant Fire Management Officer, Tonto Basin RD -	Jason Cress (2009 – 2013)
Archaeologist, Tonto NF -	Scott Wood (2009 – 2014)
Recreation Specialist, Tonto Basin RD -	Annette Smits (2009 – 2010)
Recreation Specialist, Globe RD -	Frederick Phillips (2015)
Forest Planner, Tonto NF -	Genevieve Johnson (2009 – 2011)
Forest NEPA Coordinator, Tonto NF -	Thomas, Marianne (2014 – 2015)
Ecosystems Staff Officer, Tonto NF -	Chuck Denton (2010 – 2015)
District Ranger, Tonto Basin RD -	Kelly Jardine (2010 – 2015)

FEDERAL, STATE, AND LOCAL AGENCIES:

Natural Resources Conservation Service

Tonto Natural Resource Conservation District

Arizona Game and Fish Department

Salt River Project

Arizona Department of Environmental Quality

Globe Chamber of Commerce

City of Globe
Gila County Board of Supervisors
Gila County Community Development
Southern Gila County Economic Development Corporation
US Fish and Wildlife Service
Gila County Extension Service
Arizona Department of Transportation
Arizona Department of Agriculture
US Army Corps of Engineers
Environmental Protection Agency
US Park Service- Tonto National Monument
Bureau of Reclamation

TRIBES:

Ft. McDowell Yavapai Nation
Yavapai-Prescott Tribe
Yavapai-Apache Nation
Tonto Apache Tribe
Pueblo of Zuni
Salt River Pima-Maricopa Indian Community
Hopi Tribe
San Carlos Apache Tribe
White Mountain Apache Tribe
Gila River Indian Community

OTHERS:

Tonto Basin RD grazing permittees
Maricopa Audubon Society
Mogollon Sporting Association
Arizona Desert Bighorn Sheep Society
Arizona Wildlife Federation
People for the West
Sierra Club
Western Watersheds Project
Center for Biological Diversity
Gila County Cattle Growers

Forest Guardians

Audubon Society

Arizona Trails Association

Gila County Trails Association

Nature Conservancy

APPENDIXES

APPENDIX A – (Range Definitions)

Definitions as provided in FSH 2209.13, Chapter 90

Adaptive Management is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change, and improving management.

Reference: Nyberg, J.B., Forest Practices Branch, BC Forest Service. An Introductory Guide to Adaptive Management For Project Leaders and Participants, January 1999.

Apparent Trend: An interpretation of trend based on observation and professional judgment at a single point in time.* An assessment, using professional judgment, based on a one-time observation. It includes consideration of such factors as plant vigor, abundance of seedlings and young plants, accumulation or lack of plant residues on the soil surface, and soil surface characteristics (i.e. crusting, gravel pavement, pedestalled plants, and sheet or rill erosion). Interagency Technical Reference 1734-4

Benchmark: A permanent reference point, in range inventory and effectiveness (trend) monitoring, it is used as a point where changes in vegetation, in response to applied management through time, are measured. Adapted from "A Glossary of Terms Used in Range Management" Fourth Edition edited by the Glossary Update Task Group, Society for Range Management, Thomas E. Bedell, Chairman. 1998. Second Printing 2003.

Deferment: The delay of grazing to achieve a specific management objective. A strategy aimed at providing time for plant reproduction, establishment of new plants, restoration of plant vigor, a return to environmental conditions appropriate for grazing, or the accumulation of forage for later use. *

Deferred Grazing: The delay of grazing in a non-systematic rotation with other land units. *

Deferred-Rotation: Any grazing system which provides for a systematic rotation of the deferment among pastures. *

Desired Conditions: Descriptions of the social, economic and ecological attributes that characterize or exemplify the desired outcome of land management. They are aspirational

and likely to vary both in time and space. Adapted from: *Foundations of Forest Planning: Volume 1(Version 2.0) Model of a Forest Plan*. USDA Forest Service, January 2005

Ecological Site (ES) is a kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and its response to management.* Also refer to the National Range and Pasture Handbook, USDA, Natural Resources Conservation Service, page 3.1.

Ecological Site Description (ESD): ESDs contain information about soil, physical features, climatic features, associated hydrologic features, plant communities possible on the site, plant community dynamics, annual production estimates and distribution of production throughout the year, associated animal communities, associated and similar sites, and interpretations for management. ESDs are narratives and map units containing ecological sites. Many ESDs also have State and Transition Models developed for them. Refer to the National Range and Pasture Handbook, USDA, Natural Resources Conservation Service, page 3.1-1.

Ecological Type is a category of lands with a distinctive (i.e., mappable) combination of landscape elements. The elements making up an ecological type are climate, geology, geomorphology, soils, and potential natural vegetation. Ecological types differ from each other in their ability to produce vegetation and respond to management and natural disturbances. (Terrestrial Ecological Unit Inventory Technical Guide: Landscape and Land Unit Scales, USDA Forest Service, Gen Tech Report WO-68, 2005)

Ecological Units: Map units designed to identify land and water areas at different levels of resolution based on similar capabilities and potentials for response to management and natural disturbance. These capabilities and potentials derive from multiple elements: climate, geomorphology, geology, soils and potential natural vegetation. Ecological units should, by design, be rather stable. They may, however, be refined or updated as better information becomes available. (Terrestrial Ecological Unit Inventory Technical Guide: Landscape and Land Unit Scales, USDA Forest Service, Gen Tech Report WO-68, 2005)

Frequency (as a management tool) refers to the number of times forage plants are defoliated during the grazing period. (Reed Floyd, Roy Roath, and Dave Bradford. 1999. The Grazing Response Index: A Simple and Effective Method to Evaluate Grazing Impacts. *Rangelands* 21(4): 3-6).

Frequency (as a measurement for trend): The ratio between the number of sample units that contain a species and the total number of sample units.*

Grazing Intensity is the degree of herbage removed through grazing and trampling by livestock. Grazing intensity may be described in terms herbage removed during the grazing and/or growing period or as a utilization level at the end of the growing period. It is important to clearly define how intensity is being viewed and described. Removal of leaf material, when the plant is actively growing can affect root growth which in turn affects future leaf growth. Sufficient leaf area is essential to support plant functions through

photosynthesis. Heavy to severe intensity or utilization can affect current plant development and growth, as well as growth during subsequent growing seasons.

Grazing Intensity is discussed by Holechek (Reference 1 below):

> **Light**- Only choice plants are used. There is no use of poor forage plants. The range appears practically undisturbed.
>
> **Moderate**- About ½ of the good and fair forage value plants are used. There is little evidence of livestock trailing and most of the accessible range shows some use.
>
> **Heavy**- Range has a clipped or mowed appearance. Over half of the fair and poor value forage plants are used. All accessible parts of the range show use and key areas are closely cropped. They may appear stripped if grazing is very severe and there is evidence of livestock trailing to forage.

The above descriptions may be especially helpful when reviewing grazing during the growing season.

Additional qualitative assessment of grazing intensity can be determined using the Landscape Appearance Method. It can be found in the Interagency Technical Reference 1734-3 *Utilization Studies and Residual Measurements,* page 119.

Grazing Intensity as depicted as a utilization level at the end of the growing season as discussed by Holechek, (Reference 2 below):

Light to non-use	0-30 percent
Conservative	31-40 percent
Moderate	41-50 percent
Heavy	51-60 percent
Severe	61+ percent

References: (1) Holechek, Jerry L., Rex D. Pieper, and Carlton H. Herbel. 2004. Range Management, Principles & Practices. Prentice Hall, page 248. (2) Holechek, Jerry L. and Dee Galt. 2000. Grazing Intensity Guidelines. *Rangelands* 22(3): 11-14.

An additional qualitative grazing assessment and planning tool is the Grazing Response Index (GRI). Reed Floyd, Roy Roath, and Dave Bradford. 1999. The Grazing Response Index: A Simple and Effective Method to Evaluate Grazing Impacts. *Rangelands* 21(4): 3-6.

Grazing Occurrence is how often a given area is grazed. How often a pasture is exposed to grazing or rested from grazing provides for different responses within the plant community due to differing opportunities for plant recovery.

Grazing Period is defined as the length of time grazing livestock or wildlife occupy a specific land area. * The length of time a pasture is exposed to grazing affects many variables

such as potential for regrowth of plant material, soil impacts and animal behavior. The grazing period influences the intensity of grazing and the frequency of grazing. It can also influence items tied to animal behavior such as trailing, and trampling such as between loafing and watering areas.

Key Area: A relatively small portion of a range selected because of its location, use or grazing value as a monitoring point for grazing use. It is assumed that key areas, if properly selected, will reflect the overall acceptability of current grazing management over the range. *

Key Species (1): Forage species whose use serves as an indicator to the degree of use of associated species. (2) The species which must, because of their importance, be considered in the management program.*

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives. This process must be conducted over time in order to determine whether or not management objectives are being met. *

> Implementation Monitoring- This short-term monitoring answers the question, was the management implemented as designed. Annually documents several items. Examples include:
> 1) Were management actions implemented as designed, and
> 2) Did the management actions achieve the annual effect expected?
>
> Items which may be documented through implementation monitoring include, but are not limited to: actual use (livestock numbers and days), condition of range improvements, utilization, wildlife observations.
>
> Effectiveness Monitoring- This long-term monitoring documents whether management actions are having the expected progress towards achieving resource management objectives.

Resource Management Objectives are concise statements of measurable, time –specific outcomes intended to achieve desired conditions. The objectives for a plan are the means of measuring progress toward achieving or maintaining desired conditions. Adapted from: *Foundations of Forest Planning: Volume 1(Version 2.0) Model of a Forest Plan*. USDA Forest Service, January 2005

A good objective is "**SMART**": **Specific** in what it will accomplish; **M**easurable in what it will produce; **Achievable** (has a good chance of being carried out); **Realistic** within the given time frame and budget; and **Timefixed** (has an endpoint). Leslie, M. G.K. Meffe, J.L. Hardesty, and D.L. Adams. 1996. *Conserving Biodiversity on Military Lands: A Handbook for Natural Resources Managers.* The Nature Conservancy, Arlington, VA.

Rest is to leave an area of grazing land ungrazed or unharvested for a specific time, such as a year, a growing season or a specified period required within a particular management practice. *

Rest-Rotation: A grazing management scheme in which rest periods for individual pastures, paddocks or grazing units, generally for the full growing season, are incorporated in a grazing rotation. *

Seasonal Utilization is the amount of utilization that has occurred before the end of the growing season. Interagency Technical Reference 1734-3, page 1.

Terrestrial Ecosystem Survey Terrestrial Ecosystem Unit Inventory: (TES/TEUI): is the systematic examination, description, classification, mapping and interpretation of terrestrial ecosystems. A terrestrial ecosystem is an integrated representation of soil, climate and vegetation as modified by geology, geomorphology, landform and disturbance processes. Refer to Terrestrial Ecological Unit Inventory Technical Guide: Landscape and Land Unit Scales, USDA Forest Service, Gen Tech Report WO-68, 2005.

Timing is the time of season grazing occurs relative to the phenological stage of plant development, such as early growth period, reproductive period, or dormant period. Disturbance, such as that from grazing, may provide differing responses within the plant depending upon the stage of development.

Trend: The direction of change in an attribute as observed over time.*

Utilization is the proportion or degree of the current year's forage production that is consumed or destroyed by animals (including insects). The term may refer either to a single plant species, a group of species, or to the vegetation community as a whole. Interagency Technical Reference 1734-3, page 133.

* Definition from "A Glossary of Terms Used in Range Management." Fourth Edition, edited by the Glossary Update Task Group, Society for Range Management, Thomas E. Bedell, Chairman. 1998. Second Printing 2003.

Additional Definitions
Seasonal grazing: grazing restricted to one or more specific seasons of the year (Holecheck et al. 2004).
Yearlong grazing: continuous grazing for a calendar year (Holechek et al. 2004).
Managed grazing: implementing a grazing system to accomplish specific management objectives. Can include:

- Continuous grazing- grazing a particular pasture or area the entire year, including dormant season
- Deferment- a period of nongrazing during part of the growing season
- Grazing system- planned effort by rangeland managers to leave some grazing areas unused for at least part of the year

- Rest- distinguished from deferment in that nonuse occurs for twelve consecutive months rather than just part of the growing season
- Rotation- scheduled movement of grazing animals from one pasture to another

Season-long- grazing a particular area or pasture for an entire growing season (Howery et al. 2000).

APPENDIX B – (Wildlife)

15 MIS will be potentially affected by the project alternatives. A crosswalk between the potential vegetation classification and the 1985 Forest Plan vegetation types are listed below:

MIS	Forest Plan habitat classification	Potential Vegetation Classification
Elk	Conifer Forest	Ponderosa Pine and mixed conifer
Turkey	Conifer Forest	Ponderosa Pine and mixed conifer
Abert Squirrel	Conifer Forest	Ponderosa Pine and mixed conifer
Ash-throated Flycatcher	Pinyon-Juniper	Pinyon-juniper grassland & pinyon-juniper chaparral
Spotted Towhee	Pinyon-Juniper/Chaparral	Pinyon-juniper grassland & pinyon-juniper chaparral
Black-chinned Sparrow	Chaparral	Interior chaparral & pinyon-juniper chaparral
Savannah Sparrow	Desert grassland	Colorado Plateau Grassland & semi-desert grassland
Horned Lark	Desert grassland	Colorado Plateau Grassland & semi-desert grassland
Black-throated Sparrow	Desert scrub	Desert communities
Canyon Towhee	Desert scrub	Desert communities
Bald Eagle	Riparian	Low elevation riparian
Bell's Vireo	Riparian	Low elevation riparian
Arizona Gray Squirrel	Riparian	High elevation riparian
Common Black Hawk	Riparian	High elevation riparian

Tonto NF MIS Species	Tonto NF Habitat Trend	Tonto NF Population Trend	Alt 1 Net change (determination)	Alt 2 Net change (determination)		Proposed Action (determination)
Elk	Static	Stable	Stable	Increase		Stable/Decrease
Turkey	Static	Stable	Stable	Increase		Stable/Decrease
Abert Squirrel	Static	Decrease	Stable	Increase		Stable/Decrease
Ash-throated Flycatcher	Static	Stable	Stable/Decrease	Increase		Stable/Decrease
Spotted Towhee	Static	Stable	Stable/Decrease	Increase		Stable/Decrease
Black-chinned Sparrow	Static	Stable	Decrease	Increase		Decrease
Savannah Sparrow	Upward /Static	Stable	Decrease	Increase		Decrease
Horned Lark	Upward/Static	Decrease	Decrease	Increase		Decrease
Black-throated Sparrow	Downward/Static	Stable	Decrease	Increase		Decrease
Canyon Towhee	Downward/Static	Decrease	Decrease	Increase		Decrease
Bald Eagle	Static	Stable	Decrease	Increase		Decrease
Bell's Vireo	Static	Decrease	Decrease	Increase		Decrease
Arizona Gray Squirrel	Static	Stable	Decrease	Increase		Decrease
Common Black Hawk	Static	Decrease	Decrease	Increase		Decrease

MIS Determinations: Due to the changes relative to current forest-wide habitat, we have determined that the project alternatives will have an effect on overall forest population to the 14 MIS. Determinations are as follows (no change <1 percent, Decrease >5 percent, and Stable/Decrease >1 percent, <5 percent).

APPENDIX C – (Soil Quality Monitoring)

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). The rationale and procedure for monitoring soil quality is located in FSH 2509.18 supplement of the Forest Service Manual. Soils are evaluated and assigned a soil 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, draft procedure for assessing soil condition examines more parameters and gives a more refined evaluation of soil condition.

Categories of soil condition are satisfactory, impaired, and unsatisfactory. The following is a brief description of each soil condition category:

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 (hydrologic function, soil stability, and nutrient cycling) signify a reduction of soil function. The ability of the 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 the cause and degree of decline in soil functions. Changes in management practices or other preventative actions may be appropriate.

Unsatisfactory - The soil indicators (hydrologic function, soil stability, and nutrient cycling) signify that loss of soil function has occurred. Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs, and recover from impacts. Past and/or current management activities have resulted in a loss of soil function. Existing management activities need to be evaluated to determine if the current management activities are contributing to the loss of soil function. In some cases, current management activities may not have caused the loss of soil function, but may be preventing recovery of functions.

APPENDIX D – Invasive Weed Summary

Invasive Weeds Present in the Project Area

Walnut Allotment:	Holding Pasture: Malta Star Thistle – 8.1ac
	Haystack Pasture: Malta Star Thistle - 0.6ac
	Cottonwood Pasture: Malta Star Thistle – 0.4ac
Tonto Basin Allotment:	Reno Holding Pasture: - Malta Star Thistle – 26.6ac
	Long Mesa Pasture: - Malta Star Thistle - 13ac
	Mesquite Pasture: Malta Star Thistle - 0.8ac
	Kayler Pasture: Malta Star Thistle – 5.8ac
	Bouquet Pasture: Malta Star Thistle – 1.2ac
	Lake Pasture: Malta Star Thistle – 4ac
Seven Slash K Allotment:	Red Hill: Malta Star Thistle – 71.9ac
	Sweet Resin Bush – 4ac
Highway 188:	Right of Way - Malta Star Thistle – 55.11ac
	Black Mustard – 0.1ac
	Charlock Mustard – 1.2ac
	Asian Mustard – 2ac

APPENDIX E – Vegetation Classes

7/K Allotment

Each vegetation type is listed by TES climatic gradient (Terrestrial Ecosystem Survey Handbook, Appendix B). All vegetation types on the allotment occur within the LSM gradient which represents a climate that receives primarily winter precipitation and has mild winters. Within the LSM gradient climate classes 2, 3, 4, and 5 occur. Class 2 represents Sonoran Desert, 3 the semi-desert grassland zone, Class 4 is within the woodland zone and includes pinyon-juniper-oak woodlands and chaparral. Climate Class 5 is within the ponderosa pine zone

Streamside Vegetation

This unit is a broad grouping of streamside vegetation. Vegetation is extremely variable. See the Stream Channels/Riparian Vegetation Report from a more detailed description of drainages and riparian vegetation.

Sonoran Desert (LSM, 2)

This potential vegetation type is found on the lowest elevations within the allotment and on steep south facing slopes at mid elevation. It occurs mostly on nearly level to moderately steep plains and hills. Contained within this type are the following Mid Scale Dominance Types: Triangle Bursage (AMDE4), Creosote Bush (LATRT), Littleaf Paloverde (PAMI5), Velvet Mesquite (PRVE_2), Jojoba (SICH_2), and Sonoran Desert Mixed Evergreen and Deciduous Shrub (SEDX_2). Elevations range from 2150 to 3600 feet. Mean annual precipitation ranges from 13 to 16 inches.

The key indicator species are giant saguaro (*Carnegia gigantea*), little-leaf paloverde (*Parkinsonia microphylum*), jojoba (*Simmondsia chinensis)*, and, on highly calcareous soils, creosote bush (*Larrea tridentata tridentata*). Other species present include, velvet mesquite (*Prosopis velutina*), ocotillo (*Fouquieria splendens*), pricklypear cactus (*Opuntia phaeacantha*), white brittlebush (*Encelia farinosa*), flat top buckwheat (*Eriogonum fasciculatum*), threeawn, (*Aristida spp*.), triangle bursage (*Ambrosia deltoidea*), jumping cholla (*Opuntia fulgida*), catclaw acacia (*Acacia greggii*), hedgehog cactus (*Echinocereus spp*.), turpentine bush (*Happlopappus spp*.), red brome (*Bromus spp*.), six week fescue (*Vulpia octoflora octoflora*), and spurge *(Euphorbia spp*.). Other species such as globemallow (*Sphaeralcea spp.*), shrubby deer vetch (*Lotus rigidus*), Mormon tea (*Ephedra spp.*), false mesquite (*Calliandra eriophylla*), range ratany (*Krameria grayi*), and threeawn (*Aristida spp*.) may also occur. On some of the steeper slopes, a variety of grasses can be found including hairy grama (*Bouteloua hirsuta*), slender grama *(B. repens*), sideoats grama (*B. curtipendula*), curlymesquite (*Hilaria belangeri*), bush muhly (*Muhlenbergia porteri*), tanglehead (*Heteropogon contortus*), cane beardgrass (*Bothriochloa barbinoides barbinoides)*, tridens (*Tridens spp*.), and desert stipa (*Stipa speciosa*).

Most slopes less than about 15 percent have impacts from domestic livestock grazing. The understory of palatable perennial grasses, forbs, and half-shrubs is sparse and reproduction of jojoba is limited. On steeper slopes species such as globemallow, shrubby deer vetch, Mormon tea, false mesquite**,** range ratany, and threeawn occur. On granite slopes the soils are subject to erosion.

Semi-Desert Shrubland/Grassland (LSM, 3)

This potential vegetation type occurs as an open semi-desert shrubland/grassland and is found at mid elevations within the allotment. It occurs mostly on nearly level to steep plains and hills, mostly on soils derived from granite. Contained within this type are the following Mid Scale Dominance Types: False Mesquite (CAER), Catclaw Mimosa (MIACB), Velvet Mesquite (PRVE_3), Jojoba (SICH_3), Grama Species (BOUTE), and Semi-Desert Mixed Evergreen and Deciduous Shrub (SEDX_3). Elevations range from 2800 to 5600 feet. Mean annual precipitation ranges from about 14 to 18 inches.

Nearly all of the type occurs on soils derived from granite and it tends to contain a higher density of shrubs and half-shrubs than most semi-desert grasslands. The canopy coverage of shrubs is normally greater the 10 percent.The key indicator species are velvet mesquite, false mesquite, jojoba, threeawn, and fluffgrass *(Dasyochloa pulchella*). Other commonly occurring species include sideoats grama, curlymesquite, hairy grama, blue grama *(Bouteloua gracilis)*, and black grama (*B. eriopoda*). Range ratany, desert spoon (*Dasilyrion wheeleri*), beargrass (*Nolina microcarpa*), catclaw acacia, and Wright buckwheat (*Erigonum wrightii*) are common. A small amount of redberry juniper (*Juniperus coahuilensis*) and turbinella oak *(Quercus turbinella)* may occur at higher elevations. Blue paloverde (*Parkinsonia florida*) may occur at lower elevations.

Since nearly all of this type occurs on granite, it tends to be erosive. Signs of current erosion include rills, pedestalled grasses, and soil buildup behind shrubs.

Woodlands (LSM, 4)

This potential vegetation type occurs in minor amounts on the allotment. It is a woodland with an overstory of, most commonly, Arizona pinyon (*Pinus fallax*) and alligator juniper (*Juniperus deppeana*). Redberry juniper may also occur at lower elevations. Emory (*Quercus emoryii*) and Arizona white oak (*Q. arizonica*) are common at higher elevations and turbinella oak occurs at lower elevations. The density of overstory trees varies. The primary Mid Scale Dominance Types contained with these types are: Arizona Pinyon (PIMOF), Shade Intolerant Evergreen Tree Species Mix (TEIX_4), Redberry Juniper (JUCO11), and Alligator Juniper (JUDE2). Elevations range from 5600 to 6000 feet. Mean annual precipitation ranges from 18 to 24 inches.

Other common species may include, desert ceanothus (*Ceanothus gregii)*, mountain mahogany (*Cercocarpus montanus*), sotol, red barberry (*Mahonia haematocarpa*), banana yucca (*Yucca baccata*), Mormon tea, prickly pear, and skunkbush sumac (*Rhus trilobata*). In some disturbed areas catclaw mimosa (*Mimosa aculeaticarpa* var. *biuncifera*) is common.

The understory production of grasses is normally sparse. On this allotment the woodlands tend to have shrubby understories and are often found as openings within chaparral.

Chaparral (LSM, 4)

This potential vegetation type occurs as dense stands of sclerophyllus shrubs. The canopy coverage of shrubs normally exceeds 50 percent. The overstory of trees is less than 10 percent. Very little herbaceous growth is produced in the understory. Contained within this type are the following Mid Scale Dominance Types: Pointleaf Manzanita (ARPU5), Pointleaf

Manzanita_Turbinella Oak (ARPU5_QUTU2), Mountain Mahogany_Turbinella Oak (CEMO2_QUTU2), Turbinella Oak (QUTU2), Arizona White Oak_Emory Oak (QUAR_QUEM), Semi-Arid Evergreen and Deciduous Shrub Mixed (SEDX_4), and Semi-Arid Evergreen Shrub Mixed (SEMX_4), and Alligator Juniper_Oak Species (JUDE2_QUERC). Elevations range from 3000 to 6000 feet. Mean annual precipitation ranges from 18 to 24 inches.

At low to mid elevations the key indicator species is turbinella oak. At higher elevations turbinella oak is normally replaced by Arizona white oak or Emory oak. Other commonly occurring species include catclaw mimosa, birchleaf mountain mahogany, skunkbush sumac, sugar sumac (*Rhus ovata*), desert ceanothus, Wright buckwheat, red barberry (*Mahonia haematocarpa*), pointleaf manzanita (*Arctostaphylos pungens*), and pringle manzanita (*A. pringlei*). Scattered redberry juniper occurs throughout the unit. Alligator juniper may occur at higher elevations.

The understory is normally sparse. Key browse species such as mountain mahogany, Wirght silktassel, and desert ceanothus are common throughout most of this type. Nearly all of this type burned in the 1996 Lone Fire and about half burned in the 2005 Three and Edge Complex Fires.

Ponderosa Pine Forests (LSM, 5)

This vegetation type occurs in minor amounts at the highest elevations within the allotment. Contained within these types are the following Mid Scale Dominance Types: Ponderosa Pine Oak Species (PIPO_QUERC), Ponderosa Pine (PIPO), and Evergreen/Shade Intolerant Tree Mix (TEIX_5). Elevations range from 4800 to 5800 feet. Mean annual precipitation ranges from about 20 to 26 inches. The overstory is dominated by ponderosa pine (*Pinus ponderosa*), Arizona white oak, Emory oak, and alligator juniper. Other species present include pointleaf and pringle manzanita, mountain mahogany, desert ceonothus, blue grama, sideoats grama, mutton bluegrass (*Poa fendleriana*), dryspike sedge (*Carex foenea*), goldenrod *(Solidago spp.),* and a variety of other perennial forbs. Understory herbaceous production is normally low.

Tonto Basin Allotment

The vegetative types listed in Tables 2 and 5, were developed from the in-progress TES survey, aerial photo interpretation, and on-the-ground observations. They are aggregated from the vegetation types listed in the tentative TES legend. A few delineations were modified slightly to depict a more accurate representation of existing condition. Not all types and delineations were field validated. The vegetation map serves as a basis for identification of coarse-filter vegetation types by pasture.

In some cases, the vegetation was mapped as an association of two vegetation types. Where two vegetation types occur together in one map unit, the drier vegetation component normally occurs on southern aspects while the wetter component occurs on northern aspects. The following vegetation types are derived from TES information, on-site observations, and stereo-photo interpretation.

Each vegetation type is listed by TES climatic gradient. On this allotment, columns three through five of the Low Sun Mild (LSM) portion of the gradient are found. The LSM gradient represents

a climate that receives primarily winter precipitation and has mild winters. Column two represents the Arizona Upland Division of the Sonoran Desert, column three is the semi-arid grassland zone, column four represents the woodland zone including chaparral, and column five the ponderosa pine zone. For a description of TES climatic gradients, please refer to the TES Handbook (TESH), page 3-2.

Streamside Vegetation

This unit is a broad grouping of streamside vegetation and is extremely variable. Except for Tonto Creek and a few short perennial reaches of other streams, most of the drainages consist of ephemeral channels. A few drainages support riparian vegetation. See the Riparian Specialist's Report from a more detailed description of drainages and riparian vegetation.

Sonoran Desert (Paloverde) (LSM, 2)

This vegetation type is found on the lowest elevations within the allotment and on some steep south facing slopes at mid elevation. It is among the more extensive vegetation types within the allotment and occurs on nearly level plains to steep mountain slopes. Elevations range from 2200 to 4200 feet. Mean annual precipitation ranges from 13 to 18 inches.

The key indicator species are giant saguaro *(Carnegia gigantea)*, little-leaf paloverde *(Parkinsonia microphylum)*, triangle bursage *(Ambrosia deltoidea)*, jojoba *(Simmondsia chinensis)*, pricklypear cactus *(Opuntia phaeacantha*), white brittlebush (*Encelia farinosa)*, flat top buckwheat *(Eriogonum fasciculatum),* and trace amounts of threeawn, *(Aristida spp.)* and false mesquite *(Calliandra eriophylla)*. Other species present include, jumping cholla *(Opuntia fulgida)*, catclaw acacia *(Acacia greggii)*, hedgehog cactus *(Echinocereus spp.)*, turpentine bush *(Happlopappus spp.),* red brome *(Bromus spp.)*, six week fescue *(Vulpia octoflora octoflora)* and spurge *(Euphorbia spp.).*

The understory forage production is very limited except for areas of steep slopes or very rocky ground. Currently, on slopes less than about 40 percent, the understory is almost void of perennial grasses and over time, has been replaced by annual bromes and annual forbs including spurge. On a large number of flats, jumping cholla is the dominant species. On some of the steeper slopes, a fair grass cover can be found including slender grama *(Bouteloua repens)*, threeawn, hairy grama *(Bouteloua hirsuta)*, sideoats grama *(Bouteloua curtipendula)*, bush muhly *(Muhlenbergia porteri)*, tanglehead *(Heteropogon contortus),* cane beardgrass *(Bothriochloa barbinoides barbinoides),* tridens *(Tridens spp.),* desert stipa (*Stipa speciosa*) and a variety a forbs.

Overall, the portions of this vegetation type accessible to cattle produce almost no herbaceous forage. Some parts of this type will produce a limited amount of browse, mostly from jojoba.

Sonoran Desert (Creosote) (LSM, 2)

This vegetation type is found on the lowest elevations within the allotment normally on areas with calcareous soils. Elevations range from 2200 to 3000 feet. Mean annual precipitation ranges from 13 to 16 inches.

The key indicator species is creosote bush **(***Larrea tridentata tridentata***)** which often dominates a site. Giant saguaro and little-leaf paloverde occur in varying amounts. Jojoba, an important browse species, is sparse on some sites but may be co-dominant on other sites. The understory is normally very sparse with few or no perennial grasses.

Overall, this vegetation type produces almost no perennial herbaceous forage. Some parts of this type will produce a limited amount of browse, mostly from jojoba.

Jojoba/Sideoats Grama Semi-Desert Grasslands (LSM, 3)

This vegetation type occurs as a semi-desert grassland with a somewhat shrubby overstory, normally on steep or rocky slopes. Elevations range from 3000 feet on south aspects to 4000 feet on north aspects. Mean annual precipitation ranges from 14 to 20 inches.

The key indicator species are velvet mesquite (*Prosopis velutina),* catclaw acacia, pricklypear cactus *(Opuntia spp.),* desert ceanothus *(Ceanothus greggii),* catclaw mimosa *(Mimosa aculeaticarpa),* Wright buckwheat, and jojoba. Blue paloverde can be found on the hotter/drier parts of this type. Redberry juniper (*Juniperus coahuilensis*) and turbinella oak *(Quercus turbinella*) may occur on cooler/moister sites.

The following graminoids are typically found: blue grama *(Bouteloua gracilis)*, hairy grama, sideoats grama, bush muhly, tanglehead, cane beardgrass, threeawn, tridens, desert stipa, green sprangletop *(Leptochloa dubia)* and a variety a forbs. Where this type occurs on accessible slopes less than about 30 percent, the site is dominated by curlymesquite with other grasses occurring only in protected areas.

Jojoba Shrubland (LSM, 3)

This vegetation type occurs as a semi-desert shrubland dominated by jojoba. It normally occurs on north facing slopes. Elevations range from 2200 to 3400 feet. Mean annual precipitation ranges from 15 to 20 inches.

The key indicator species is jojoba. Other species that may occur include velvet mesquite, catclaw acacia, pricklypear cactus *(Opuntia spp.),* mountain mahogany, desert ceanothus, catclaw mimosa *(Mimosa aculeaticarpa),* and Wright buckwheat.

Gramainoid cover is normally sparse but can include sideoats grama, bottlebrush squirreltail (*Elymus elymoides*), and tanglehaed.

This vegetation type normally contains a fair amount of palatable shrubs, mostly jojoba, but on some sites mountain mahogany and desert ceanothus are dense enough to offer good browse.

Velvet Mesquite/Curlymesquite Semi-Desert Grasslands (LSM, 3)

This vegetation type occurs as a semi-desert grassland, normally on mesas and rolling hills. The dominant slopes are less than 30 percent. Elevations range from 3000 to 5200 feet. Mean annual precipitation ranges from 15 to 20 inches.

The key indicator species are velvet mesquite, catclaw acacia, pricklypear cactus *(Opuntia spp.),* desert ceanothus, catclaw mimosa *(Mimosa aculeaticarpa),* Wright buckwheat and jojoba. Blue paloverde can be found on the hotter/drier parts of this type. Redberry juniper and turbinella oak may occur on cooler/moister sites. Most of this vegetation type is fairly open except for some heavily used areas where catclaw acacia, catclaw mimosa, or pricklypear may dominate the site.

Throughout most of this type, the understory is heavily dominated by curlymesquite (*Hilaria belangeri*). Other grasses such as sideoats grama, bottlebrush squirreltail, and junegrass (*Koleria macrantha*), only occur beneath the protection of shrubs. Nearly all of this vegetation type has been heavily impacted by domestic livestock.

Velvet Mesquite/Turpentine Bush (LSM, 3)

This vegetation type occurs as semi-desert scrub on nearly level plains and moderately steep to steep hills. Elevations range from 2500 to 5000 feet. Mean annual precipitation ranges from 15 to 18 inches.

The key indicator species are velvet mesquite and turpentine bush. Other species include catclaw acacia, pricklypear cactus *(Opuntia spp.),* red barberry (*Mahonia haematocarpa*) and snakeweed. Scattered redberry juniper may also occur.

The understory is almost completely devoid of perennial grasses except for an occasional threeawn or curlymesquite.

Most of this vegetation type has been heavily impacted by domestic livestock grazing.

Redberry Juniper/Turbinella Oak (LSM, 4, -1)

This vegetation type occurs on moderately steep hills and mountains, often associated with rock outcrop. Elevations range from 2600 feet on north aspects to 4600 feet on south aspects. Mean annual precipitation ranges from 15 to 20 inches.

The key indicator species are redberry juniper, turbinella oak, desert ceanothus, and mountain mahogany (*Cercocarpus montanus).*

The understory production consists of threeawn, sideoats grama, hairy grama, curlymesquite, junegrass, green sprangletop, and Wright buckwheat. On gentler slopes, curlymesquite is the dominant grass.

Redberry Juniper/Curlymesquite (LSM, 4, -1)

This vegetation type occurs as a semi-arid grassland with scattered redberry juniper. It is found on nearly level plains, moderately steep hills, and steep mountains. Elevations range from 2600 feet on north aspects to 5300 feet on south aspects. Mean annual precipitation ranges from 15 to 20 inches.

The key indicator species are redberry juniper and curlymesquite. Scattered turbinella oak, desert ceanothus, and mountain mahogany may also occur.

On flatter slopes, much of this vegetation type has been heavily impacted by domestic livestock. In these areas, the grass component is heavily dominated by curlymesquite. On steeper slopes and areas less impacted by grazing, the understory production consists of threeawn, sideoats grama, hairy grama, curlymesquite, junegrass, green sprangletop, and Wright buckwheat.

Turbinella Oak/Mountain Mahogany Chaparral (LSM, 4)

This vegetation type occurs on moderately steep to very steep hills and mountains. Elevations range from 4200 to 6600 feet. Mean annual precipitation ranges from 18 to 22 inches.

The key indicator species are turbinella oak, birchleaf mountain mahogany, skunkbush sumac, sugar sumac **(***Rhus ovata)*, desert ceanothus, Wright buckwheat, hollyleaf buckthorn *(Rhamnus crocea)*, beargrass (*Nolina microcarpa)*, and redbarberry. The canopy coverage of shrubs normally exceeds 50 percent.

The understory is normally sparse containing only a few perennial grasses. Species include sideoats grama, hairy grama, black grama (*Bouteloua eripoda*), bottlebrush squirreltail, junegrass, and plains lovegrass *(Eragrostis intermedia)*. Most of the vegetation type contains palatable shrubs including mountain mahogany and desert ceanothus.

Turbinella Oak/Manzanita Chaparral (LSM, 4)

This vegetation type occurs on moderately steep to very steep hills and mountains. Elevations range from 4200 to 6600 feet. Mean annual precipitation ranges from 18 to 22 inches.

The dominant species are turbinella oak and manzanita (*Arctostaphylos pungens*). Other species may include birchleaf mountain mahogany, skunkbush sumac, sugar sumac, desert ceanothus, Wright buckwheat, hollyleaf buckthorn, beargrass, and redbarberry. The canopy coverage of shrubs normally exceeds 50 percent.

The understory is normally sparse containing only a few perennial grasses. Most of the vegetation type contains relatively few palatable shrubs compared to the turbinella oak/mountain mahogany vegetation type.

Pinyon/Redberry Juniper/Oak Woodland (LSM, 4, 0)

This vegetation type occurs on nearly level to steep plains, hills, and mountains. Elevations range from 4000 to 5500 ft. Mean annual precipitation ranges from 18 to 22 inches.

The key indicator species are Arizona pinyon pine *(Pinus fallax)*, redberry juniper, Arizona white oak *(Quercus arizonica)*, Emory Oak *(Quercus emoryii)*, turbinella oak, mountain mahogany, sugar sumac, skunkbush sumac, and desert ceanothus.

The understory contains sideoats grama, hairy grama, curlymesquite, bottlebrush squirreltail, junegrass, threeawn, and Wright buckwheat. On flatter slopes, the understory is dominated by Curlymesquite and buckwheat. Herbaceous forage is normally limited because of a dense overstory. In some places, this type offer fair browse, especially on steeper slopes.

Pinyon/Alligator Juniper/White Oak/Blue Grama (LSM, 4, +1)

This vegetation type occurs on nearly level to steep plains, hills, and mountains. Elevations range from 4500 to 5300 ft. Mean annual precipitation ranges from 18 to 22 inches.

Most of this type occurs on fine textured soils, is fairly open, and normally contains a fair amount of herbaceous production. The key overstory indicator species are Arizona pinyon pine, alligator juniper *(Juniperous deppeana)*, Arizona white oak, Emory oak, turbinella oak, mountain mahogany, sugar sumac, skunkbush sumac, and desert ceanothus.

The understory contains sideoats grama, hairy grama, curlymesquite, bottlebrush squirreltail, junegrass, threeawn, and Wright buckwheat. On flatter slopes, the understory is dominated by curlymesquite and buckwheat. In some places, this type offers fair browse, especially on steeper slopes.

Pinyon/Alligator Juniper/White Oak/Manzanita (LSM, 4, +1)

This vegetation type occurs on nearly level to steep plains, hills, and mountains. Elevations range from 4900 to 6500 ft. Mean annual precipitation ranges from 18 to 22 inches.

Most of this type occurs on shallow to moderately deep soils and normally has a dense, shrubby understory. Because of the dense woody cover, the herbaceous forage production is limited. The key overstory indicator species are Arizona pinyon pine, alligator juniper, mazanita, Arizona white oak, and Emory oak. Other species include mountain mahogany, sugar sumac, skunkbush sumac, and desert ceanothus. The more palatable shrubs are normally sparse. The understory is normally sparse and contains limited amounts of sideoats grama, hairy grama, curlymesquite, bottlebrush squirreltail, junegrass, threeawn, and Wright buckwheat.

Alligator Juniper Savanna (LSM, 4, +1)

Most of this vegetation type occurs as an open grassland with an overstory of scattered alligator juniper. The canopy coverage of juniper is normally less than 5 percent. This type is found in the same ecotone as the pinyon/juniper/oak type. It predominantly occurs on level plains and a few steep hills, normally on fine textured soils. Elevations range from 5200 to 5600 ft. Mean annual precipitation ranges from 18 to 22 inches

Key herbaceous species include sideoats grama, blue grama, hairy grama, threeawn, bottlebrush squirrel tail, mutton bluegrass *(Poa fendleriana)*, and annual bromes. In areas with high amounts of clay at the surface, plant composition includes western wheatgrass *(Agropyron smithii)*, and vine mesquite *(Panicum obtusum*).

The dominant overstory species is alligator juniper. Arizona pinyon pine, Arizona white oak, Emory oak, turbinella oak, birchleaf mountain mahogany, sugar sumac, skunkbush sumac, and desert ceanothus occur only in isolated patches or beneath junipers that act as nurse trees.

Alligator Juniper Woodland (LSM, 4, +1)

Most of this vegetation type was formerly an alligator juniper savanna. Grazing pressure and lack of fire have allowed junipers and other woodland species to encroach into this type. Most of the junipers are less than 50 years old. Herbaceous forage is normally much less than in the alligator juniper savanna type. In the past, many areas of alligator juniper woodland have been treated (pushed) with the management objective to maintain grasslands and to increase available forage. In recent years, these treated areas have not been maintained and, as a result, the areas now have dense stands of younger junipers. This type is found in the same ecotone as the pinyon/juniper/oak type, predominantly on level plains and a few steep hills. Elevations range from 4600 to 5600 ft. Mean annual precipitation ranges from 18 to 22 inches. Soils are fine textured and, in areas that have been severely impacted, some Vertisols are appearing. Soils are typically compacted. Sheet and gully erosion are common.

The dominant herbaceous species is hairy grama. Most other herbaceous species only occur in protected areas such as beneath prickley pear cactus or catclaw. Forage production is normally less than in alligator juniper savannas. Key species include sideoats grama, blue grama, hairy grama, threeawn, bottlebrush squirrel tail, mutton bluegrass, and annual bromes. In areas with high amounts of clay at the surface, plant composition includes western wheatgrass, and vine mesquite.

The dominant overstory species is alligator juniper. In more mature stands, Arizona pinyon pine, Arizona white oak, Emory oak, turbinella oak, birchleaf mountain mahogany, sugar sumac, skunkbush sumac, desert ceanothus may occur in substantial amounts but not a dense as in pinyon/juniper/oak woodland. In other areas, with more recent alligator juniper encroachment, the above species may be absent or occur only as seedlings or saplings associated with juniper nurse trees

Arizona Cypress (LSM, 4, +1)

This community type is found in the same ecotone as the pinyon/juniper/oak type in limited extent. Elevations range from 4500 to 5200 feet. Mean annual precipitation ranges from 18 to 22 inches. It occurs on hills and mountains on slopes ranging form 40 to 80 percent. Plant composition is similar to the pinyon/juniper/oak type except the tree overstory includes Arizona cypress *(Cupressus arizonica arizonica*) instead of juniper species. The understory is normally sparse, producing little herbaceous forage.

Ponderosa Pine/Arizona White Oak (LSM, 5)

This vegetative type occurs at the highest elevations within the allotment. Elevations range from 4800 to 7200 ft. and are found on plains, hills, and canyons on slopes ranging from 0 to 80 percent. Mean annual precipitation ranges from 22 to 26 inches.

The key indicators are ponderosa pine *(Pinus ponderosa scopulorum)*, alligator juniper, Arizona oak, Emory oak, and trace amounts of Gambel oak (*Quercus gambelii)* occur. Pinyon pine can be found at lower elevations within this type where it grades into pinyon/juniper woodlands. Other species present include pointleaf and pringle manzanita (*Arctostaphylos pringlei),* mountain mahogany and desert ceonothus, blue grama, sideoats grama, mutton bluegrass, dryland sedge (*Carex geophila*), goldenrod *(Solidago spp.),* and a variety of other perennial forbs.

Parts of this type were burned in the 2003 Picture Fire. Areas that burned are more open and produce more forage than unburned areas.

Ponderosa Pine/Weeping Lovegrass (LSM, 5)

This seral grassland vegetation type is the result of seeding following the Pine Mountain Burn during the 1960s. In the first few years following the burn, this type produced several thousand pounds of weeping lovegrass (*Eragrostis curvula*) per acre. In the years since, ponderosa pine trees have become re-established and, in many places, a thick cover of manzanita brush occurs. As a result, the herbaceous forage has been reduced to around 100 pounds per acre in most upland areas. Weeping lovegrass remains dense in the few deep alluvial soils in the area. Elevations range from 5400 to 6000 feet with mean annual precipitation ranging from 24 to 30 inches. It occurs on nearly level plains to moderately steep and steep hills, mountains and escarpments.

Trees and shrubs found include small amounts of ponderosa pine, alligator juniper, Arizona oak, Emory oak, pointleaf and pringle manzanita, mountain mahogany and desert ceonothus. The understory is composed almost exclusively of seeded weeping lovegrass, with trace amounts of plains lovegrass, and sideoats grama.

Walnut Allotment

The vegetative types listed in Tables 4 and 5, were developed from the in-progress TES survey, aerial photo interpretation, and on-the-ground observations. They are aggregated from the vegetation types listed in the tentative TES legend. A few delineations were modified slightly to depict a more accurate representation of existing condition. Not all types and delineations were field validated. The vegetation map serves as a basis for identification of coarse-filter vegetation types by pasture.

In some cases, the vegetation was mapped as an association of two vegetation types. Where two vegetation types occur together in one map unit, the drier vegetation component normally occurs on southern aspects while the wetter component occurs on northern aspects. The following vegetation types are derived from TES information, on-site observations, and stereo-photo interpretation.

Each vegetation type is listed by TES climatic gradient. On this allotment, columns two through four of the Low Sun Mild (LSM) portion of the gradient are found. The LSM gradient represents a climate that receives primarily winter precipitation and has mild winters. Column two represents the Arizona Upland Division of the Sonoran Desert, column three is the semi-arid

grassland zone, and column four represents the woodland zone including chaparral. For a description of TES climatic gradients, please refer to the TES Handbook (TESH), page 3-2.

Streamside Vegetation

This unit is a broad grouping of streamside vegetation and is extremely variable. Except for Tonto Creek and a few short perennial reaches of other streams, most of the drainages consist of ephemeral channels. A few drainages support riparian vegetation. See the Riparian Specialist's Report from a more detailed description of drainages and riparian vegetation.

Sonoran Desert (Paloverde) (LSM, 2)

This vegetation type is found on the lowest elevations within the allotment and on some steep south facing slopes at mid elevation. It is the most extensive vegetation types within the allotment and occurs on nearly level plains to steep mountain slopes. Elevations range from 2300 to 3700 feet. Mean annual precipitation ranges from 13 to 18 inches.

The key indicator species are giant saguaro *(Carnegia gigantea)*, little-leaf paloverde *(Parkinsonia microphylum)*, triangle bursage *(Ambrosia deltoidea)*, jojoba *(Simmondsia chinensis)*, pricklypear cactus *(Opuntia phaeacantha*), white brittlebush (*Encelia farinosa)*, flat top buckwheat *(Eriogonum fasciculatum),* and trace amounts of threeawn, *(Aristida spp.)* and false mesquite *(Calliandra eriophylla)*. Other species present include, jumping cholla *(Opuntia fulgida)*, catclaw acacia *(Acacia greggii)*, hedgehog cactus *(Echinocereus spp.)*, turpentine bush *(Happlopappus spp.),* red brome *(Bromus spp.)*, six week fescue *(Vulpia octoflora octoflora)* and spurge *(Euphorbia spp.).*

The understory forage production is very limited except for areas of steep slopes or very rocky ground. Currently, on slopes less than about 40 percent, the understory is almost void of perennial grasses and over time, has been replaced by annual bromes and annual forbs including spurge. On a large number of flats, jumping cholla is the dominant species. On some of the steeper slopes, a fair grass cover can be found including slender grama *(Bouteloua repens)*, threeawn, hairy grama *(Bouteloua hirsuta)*, sideoats grama *(Bouteloua curtipendula)*, bush muhly *(Muhlenbergia porteri)*, tanglehead *(Heteropogon contortus),* cane beardgrass *(Bothriochloa barbinoides barbinoides),* tridens *(Tridens spp.),* desert stipa (*Stipa speciosa*) and a variety a forbs.

Overall, the portions of this vegetation type accessible to cattle produce almost no herbaceous forage. Some parts of this type will produce a limited amount of browse, mostly from jojoba.

Sonoran Desert (Creosote) (LSM, 2)

This vegetation type is found on the lowest elevations within the allotment normally on areas with calcareous soils. Elevations range from 2300 to 2900 feet. Mean annual precipitation ranges from 13 to 16 inches.

The key indicator species is creosote bush **(***Larrea tridentata tridentata***)** which often dominates a site. Giant saguaro and little-leaf paloverde occur in varying amounts. Jojoba, an important

browse species, is sparse on some sites but may be co-dominant on other sites. The understory is normally very sparse with few or no perennial grasses.

Overall, this vegetation type produces almost no perennial herbaceous forage. Some parts of this type will produce a limited amount of browse, mostly from jojoba.

Velvet Mesquite Semi-Desert Grasslands (LSM, 3)

This vegetation type occurs as a semi-desert grassland, normally on mesas and rolling hills. Elevations range from 3000 to 4700 feet. Mean annual precipitation ranges from 15 to 20 inches.

The key overstory species are velvet mesquite, catclaw acacia, pricklypear cactus *(Opuntia spp.),* desert ceanothus, catclaw mimosa *(Mimosa aculeaticarpa),* Wright buckwheat and jojoba. Blue paloverde can be found on the hotter/drier parts of this type. Redberry juniper and turbinella oak may occur on cooler/moister sites. Most of this vegetation type is fairly open except for some heavily used areas where catclaw acacia, catclaw mimosa, or pricklypear may dominate the site.

On flats and fine textured soils, the understory is normally dominated by curlymesquite (*Hilaria belangeri*). Other grasses such as sideoats grama, bottlebrush squirreltail, and junegrass (*Koleria macrantha*), only occur beneath the protection of shrubs. On medium textured soils, and steeper slopes, black grama (*Bouteloua eriopoda*) may be dominant.

Redberry Juniper/Turbinella Oak (LSM, 4, -1)

This vegetation type occurs on moderately steep hills and mountains, often associated with rock outcrop. Elevations range from 3500 feet on north aspects to 4000 feet on south aspects. Mean annual precipitation ranges from 15 to 20 inches.

The key indicator species are redberry juniper, turbinella oak, desert ceanothus, and mountain mahogany (*Cercocarpus montanus).*

The understory production consists of threeawn, sideoats grama, hairy grama, curlymesquite, junegrass, green sprangletop, and Wright buckwheat. On gentler slopes, curlymesquite is the dominant grass.

Redberry Juniper/Curlymesquite (LSM, 4, -1)

This vegetation type occurs as a semi-arid grassland with scattered redberry juniper. It is found on nearly level plains, moderately steep hills, and steep mountains. Elevations range from 3200 feet on north aspects to 4700 feet on south aspects. Mean annual precipitation ranges from 15 to 20 inches.

The key indicator species are redberry juniper and curlymesquite. Scattered turbinella oak, desert ceanothus, and mountain mahogany may also occur.

On flatter slopes, much of this vegetation type has been heavily impacted by domestic livestock. In these areas, the grass component is heavily dominated by curlymesquite. On steeper slopes

and areas less impacted by grazing, the understory production consists of threeawn, sideoats grama, hairy grama, curlymesquite, junegrass, green sprangletop, and Wright buckwheat.

Turbinella Oak/Manzanita Chaparral (LSM, 4)

This vegetation type occurs on moderately steep to very steep hills and mountains. Elevations range from 3700 to 4000 feet. Mean annual precipitation ranges from 18 to 22 inches.

The dominant species are turbinella oak and manzanita (*Arctostaphylos pungens*). Other species may include birchleaf mountain mahogany, skunkbush sumac, sugar sumac, desert ceanothus, Wright buckwheat, hollyleaf buckthorn, beargrass, and redbarberry. The canopy coverage of shrubs normally exceeds 50 percent.

The understory is normally sparse containing only a few perennial grasses. Most of the vegetation type contains relatively few palatable shrubs compared to the turbinella oak/mountain mahogany vegetation type.

Pinyon/Redberry Juniper/Oak Woodland (LSM, 4, 0)

This vegetation type occurs on nearly level to steep plains, hills, and mountains. Elevations range from 3700 to 4000 ft. Mean annual precipitation ranges from 18 to 22 inches.

The key indicator species are Arizona pinyon pine *(Pinus fallax)*, redberry juniper, Arizona white oak *(Quercus arizonica),* Emory Oak *(Quercus emoryii),* turbinella oak, mountain mahogany, sugar sumac, skunkbush sumac, and desert ceanothus.

The understory contains sideoats grama, hairy grama, curlymesquite, bottlebrush squirreltail, junegrass, threeawn, and Wright buckwheat. On flatter slopes, the understory is dominated by Curlymesquite and buckwheat. Herbaceous forage is normally limited because of a dense overstory. In some places, this type offer fair browse, especially on steeper slopes.

APPENDIX F – General Administration of Grazing Permits

19.1 – Drought Guidelines

a Drought is an inevitable occurrence in the southwestern United States. The question for land managers is not *will* drought occur, but *are land managers prepared for drought*? Land managers and grazing permittees, must plan for drought as a normal part of management and business. The Standardized Precipitation Index (SPI) is a unit of measure that compares recent precipitation values for a period of interest with long term historical values to assess moisture conditions in a given area. In the Southwestern Region, anytime the SPI reaches a value of minus 1.00 or less for the preceeding 12 month period, grazing allotments should be evaluated for existing drought conditions.

It is imperative that land managers understand how drought affects plants, thereby affecting rangeland resources and how management can buffer the consequences of drought. It is equally imperative to communicate the effects of drought and the associated management actions taken to buffer those consequences.

Drought effects are varied, depending upon the attribute being reviewed. On an individual plant basis, vigor and reproductive ability may be hampered. On a landscape scale, various species within a vegetation community may be affected differently, thereby affecting community dynamics amongst plants, soil conditions, and water quantity and quality.

A diversity of factors should be considered when devising management actions on the National Forests in the Southwestern Region. Such factors would include species diversity, past grazing use, timing of grazing, intensity of management, and conditions of improvements to support grazing activities. These factors along with precipitation data provide flexibility to the line officer to make decisions based on recommendations from district rangeland management specialists.

Livestock Grazing Guidelines consist of four elements.

1. Drought Evaluation.

   a. The Regional Forester will monitor trends in the SPI in order to provide Forest Supervisors and District Rangers adequate time to begin discussions with the livestock industry and grazing permittees before viable options for coping with drought conditions are foregone.

   b. Anytime the SPI reaches a value of - 1.00 or less for the preceeding 12 month period, grazing allotments will be evaluated for the existence of drought conditions.

   c. When drought conditions have been identified, Forest Supervisors will evaluate grazing allotments for drought related conditions from an interdisciplinary perspective.

   d. Although SPI may not have reached – 1.00, for the preceeding 12 month period, Forest Superviors may evaluate grazing allotments for apparent drought conditions.

   e. When the SPI for the preceeding 12 month period becomes positive rangeland resources may be evaluated for indications of recovery of drought conditions.

2. Management Process

   a. Vegetation resources affected by drought across the Forest, will be evaluated from an interdisciplinary perspective.

   b. Drought evaluation should result in recommended management actions needed to protect rangeland resources.

c. Factors considered in evaluations include, but are not limited to, local precipitation data and departures from normal, current range management status, current stocking levels, available water, and management intentions of the permittee.

d. District Rangers have the responsibility to consider recommendations from drought evaulations and implement appropiate management in consultation with affected permittees.

e. Drought evaluations should be conducted periodically to reassess conditions and evaluate the need for further action.

3. Stocking During and After Drought

a. District Rangers will consider stocking levels on allotments based on precipitation events, and allotment specific conditions in collaboration with livestock permittees.

b. Stocking levels should consider circumstances such as: drought-induced mortality thereby reducing forage produced per acre, species diversity, plant vigor, condition of range improvements, management intensity, and availability of water.

c. Management following drought should be devoted to allowing for the recovery of the rangeland vegetation.

(1) This means providing for improved plant vigor and restoring soil cover through plant litter.

(2) Focusing on recovery of the resource through rest or incremental restocking will ensure more rapid and longer lasting recovery from drought.

d. General recommendations for drought recovery.

(1) Rest pastures for at least one entire growing season or more following severe droughts.

(2) Use pastures when key forage species are dormant for at least one growing season.

(3) Defer grazing until key forage species have produced mature seed.

(4) Assess various attributes of an allotment prior to making decisions regarding restocking.

(a) Plant vigor- The relative robustness of a plant in comparison to other individuals of the same species.

(b) Current forage production- The amount of forage currently produced. Usually expressed as pounds of herbaceous forage per acre.

(c) Multiple Use Values- The other values provided for by rangeland resource, i.e. wildlife habitat, and aesthetics.

(d) Permittees ability to restock- The ability of the permittee to place livestock on the allotment. This could be related to such items as current herd size, available labor, and current condition of range improvements.

4. Communication Plan. Most permittees will want to protect the grazing resource, which they are dependent upon. Early communication provides them maximum time to develop alternatives for their operations and provide suggestions to the Forest Service. Consistent effective communication with others, such as NRCS, FSA, BLM, State, Local, and Tribal Governments as well as non-governmental organizations regarding affects of drought, and potential collaborations is essential.

a. Drought related communications involving multiple Forests will be coordinated by Forest Supervisors with assistance from the Regional Forester as requested.

b. Communications concerning rangeland management during and after drought on individual Forests will be coordinated by Forest Supervisors.

c. District Rangers will initiate communication with grazing permittees at the first sign management changes may be needed due to drought.

d. Management due to drought must be approached in a collaborative manner between district personnel and permittees.

19.2 – Considerations for Re-stocking and Management of Grazing Allotments Post Wildfire and Other Disturbances

Rangelands have evolved with a high degree of disturbance. The ability to adapt management to respond to changing conditions in the ecosystem is critical to the sustainability of rangelands. Management must be responsive to outcomes from managed actions such as livestock grazing and prescribed fire, but also must be responsive to unplanned events such as wildfire, flood and extreme drought. These disturbances can produce critical changes in resource conditions. It may be necessary to gather information quickly and perform an assessment of each allotment in order to adapt range management to allow for ecosystem recovery following disturbance. The following provides a strategy for prioritizing the assessment of impacts and determining appropriate post-disturbance management.

Adapting management following a significant disturbance often requires a fairly rapid assessment of ecological conditions and infrastructure damage. In the case of wildfire, indicators such as ground cover, species presence, forage production, and infrastructure damage may be the focus of the assessment and/or monitoring needed for designing restocking strategies. The need for and intensity of assessment required is dependent upon the degree of disturbance. Smaller scale disturbances of less intensity may require a different degree of analysis than larger scale disturbances with greater degrees of intensity. For example a small fire with low to moderate burn severity, would likely require a less intensive analysis than a large fire with extensive

moderate to high burn severity. Other considerations include factors such as the presence of riparian areas or federally listed species or their habitat. The Inter-Disciplinary Team (IDT) and line officer should determine the level of assessment required prior to restocking and document the rationale for their determination.

Prioritizing allotment assessment after disturbances is often needed when a large-scale disturbance (e.g., wildfire) involves multiple allotments. Priorities can be based on various criteria, such as livestock permitted on-dates, potential resource management issues and permittee dependence on national forest system lands. Once allotments have been prioritized, quantitative or qualitative information can be used to identify impacts to potential livestock use and management. At a minimum, forage availability, water availability, ground cover and infrastructure damage may need to be assessed. Forage availability often includes information about plant species presence or composition including multiple life-forms, vigor, production, and plant reproductive capacity.

As part of the assessment, the need for Endangered Species Act (ESA) section 7(a)(2) consultation with Fish and Wildlife Service should also be determined.

19.3 – Suggested Applications and Coordination for Restocking Analysis and Evaluation.

Several readily available tools can be utilized for assessing the ability to return livestock to an allotment post disturbance. The following provides guidance to efficiently conduct an analysis for the appropriate return of livestock.

Geographic Information System (GIS) layers are helpful to assist in anticipating damage, assessing priorities for analysis and informing management decisions. Example GIS layers to be used include: Burn Severity, Soil and Vegetation Types, Slope Class, Infrastructure, Monitoring Areas, Threatened and Endangered (T&E) Species, Aquatics, and Wildlife Habitat.

Burn Severity - Burn Severity maps provide a broad over view of the affected areas. Pastures comprised of primary range, readily accessible by livestock with low burn severity can potentially be assessed first for the possibility of restocking. Low burn severity areas often are composed of vegetation types which recover quickly, such as grasslands. Pastures comprised of primary range, readily accessible to livestock with moderate-high burn severity often require longer periods of time for vegetative recovery, have increased potential for invasive species, (Hunter et al, 2006) and increased potential of infrastructure damage. These pastures may require additional actions to achieve resource objectives and remain compliant with AMPs and ESA requirements.

Vegetative recovery may be slowed in areas of high burn severity in part due to hydrophobic soil conditions. All fires do not result in hydrophobic soils. Factors contributing to their formation are: a thick layer of litter before the fire; a severe slow-moving surface and crown fire; and coarse textured soils such as sand or decomposed granite. Hydrophobic conditions increase the rate of water runoff. Percolation of water into the soil profile is reduced, making it difficult for seeds to germinate and for the roots of surviving plants to obtain moisture (DeGomez, 2011).

Soil and Vegetation Types - Areas dominated by herbaceous vegetation prior to fire may be prioritized for assessment for several reasons. Fire in herbaceous dominated areas generally moves faster with less intensity. Generally herbaceous vegetation types recover faster than those dominated by trees. This is influenced by several relationships such as the factors contributing to hydrophobic soil conditions as described above. Herbaceous dominated areas often provide the majority of the forage and therefore need to be prioritized for assessment. This is especially true when combined with factors affecting animal behavior such as proximity to water and slope, which is addressed below.

Slope Class - Although areas with steep slopes may have experienced more intense fire due to preheating of the fuels uphill and may be more prone to erosion, this does not necessarily increase cause for concern when assessing an allotment for restocking. Areas with slopes above 40 percent generally are not readily utilized by livestock. Therefore, the re-introduction of livestock may not hinder the recovery of steep slopes. Initially, attention may be focused on slopes below 40 percent to assess recovery and to ensure any management, including possible livestock grazing, allow these areas to continue to recover. Areas with slopes less than 15 percent slope serve as filters for erosional sediment coming from the slopes above. Assessing these areas is critical as these areas are readily accessible by livestock. Management of these areas must address leaving enough residual vegetation to protect the site, allow for continued vegetation recovery and to allow for the filtering of sediment from the slopes above.

Infrastructure - Infrastructure, (e.g. fencing, watering facilities, and animal working facilities) is critical to management of livestock and therefore needs to be assessed prior to returning livestock. Restocking must be supported by infrastructure repair, often requiring the phasing in of livestock commensurate with the reconstruction of the infrastructure.

T&E, Aquatics and Wildlife Habitat Areas - The presence or absence of T&E species, aquatic habitat, and wildlife habitat is important for addressing potential impacts to species, multiple use concerns, and possible cumulative impacts from the disturbance and the planned grazing. Effects to species may occur as a direct result of the fire or post-fire effects such as flooding or ash flows.

Monitoring Areas - Monitoring areas are reflective of the areas important to the livestock operation and reflective of the livestock management effects in pastures and, therefore, are important areas to assess when determining the return of livestock. Collecting monitoring data can be helpful; however, abbreviated assessment can occur as well, especially when large scale disturbance has occurred which necessitates a rapid assessment of several allotments. Forage availability assessment on a pasture-by-pasture basis can provide reliable and valuable data. Important indicators to address when assessing forage availability include ground cover, species composition and forage production. Observations of features associated with erosion can also be observed and documented.

Established monitoring areas can be utilized to compare pre-disturbance and post-disturbance conditions. These may address both upland and riparian areas which were likely impacted by the disturbance and which likely are influenced by livestock management. Established monitoring

areas offer the opportunity and the ability to evaluate the integration of the 1) impact of the disturbance, 2) ecosystem recovery, and 3) effects of planned livestock management.

Addressing impacts from disturbance such as fire may utilize established monitoring procedures and formalized assessments for uplands and riparian areas. Formalized assessments such as Proper Functioning Condition (PFC) can be utilized to address allotments with riparian areas. Areas displaying high-moderate burn severity can have PFC assessments conducted to document fire and flood-related effects or changes since previous PFC assessments. Streams to be reassessed can be prioritized using Burn Severity mapping, and knowledge of Burned Area Emergency Response (BAER) treatments, and potential effects from flood events.

Each allotment needs to be evaluated individually for restocking opportunities as there is no formula for determining when returning livestock is appropriate. Site-specific factors should be considered. The allotment site-specific analysis considers the recovery of soil and perennial plants. Allotments are evaluated on a pasture-by-pasture basis. The items listed above in combination should be reviewed relative to total pasture area, livestock behavior, management objectives and weather patterns following the fire to ascertain the ability to sustain livestock grazing.

It is important that the plants likely to be grazed are not permanently damaged by livestock and, therefore, can still experience recovery. Examples of criteria for assessing if plants are ready to be grazed include: 1) seed heads or flowers present, 2) multiple leaves or branches present, and/or 3) a root system that does not allow plants to be easily pulled from the ground. Presence of at least one of the criteria being present prior to livestock being re-introduced can be documented as evidence of plant recovery, high vigor and plant reproductive ability (Fraser, 2003).

In summary, there are ecological aspects of restocking, such as ground cover for soil protection, species composition and production to provide for wildlife and livestock forage needs while allowing for plant recovery. There are management aspects such as water availability and presence of a functional infrastructure. In addition, collaboration amongst stakeholders is important. This includes the local inter-disciplinary (ID) team, permittees, federal, state, county and local government entities and non-governmental organizations (NGOs). When developing a strategy for restocking, document the criteria evaluated; the assessment and/or monitoring results including GIS analysis; the collaboration amongst stakeholders; and the rationale for the restocking strategy. The strategy may be a staged approach to incrementally restock based on continuing evaluation of fire affected areas.

19.4 – References.

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TONTO NATIONAL FOREST RANGELAND DROUGHT POLICY

Climate in the Southwestern United States is highly variable with periods of drought being a relatively common occurrence. Consequently, planning for drought is a necessary part of prudent resource management.

Drought has a pronounced impact on National Forest resources. Rangeland plants are dependent on soil moisture for survival and are usually affected by lack of precipitation early in the drought cycle. Lack of adequate soil moisture affects virtually every physiological process in plants often resulting in a loss of plant vigor, and in extreme cases, plant mortality. Droughts that result in a reduction of vegetative ground cover can lead to increased soil erosion, a loss of site productivity and degradation of water quality. Lack of adequate forage and available water negatively affects both wildlife and domestic livestock.

Livestock use can accentuate the effects of drought by further stressing forage plants and depleting limited water supplies. Management of livestock prior to, during, and after drought is extremely important in order to protect soils, long-term site productivity, water quality, wildlife and other Forest resources and activities.

Policy. Rangelands will be managed so as to protect soil, water and other Forest resources during and after drought. The following principles will be utilized in implementing this policy:

- Drought conditions will be evaluated systematically utilizing a consistent Forest-wide approach.

- Conservative stocking of rangelands at all times will be a fundamental strategy in reducing drought impacts.

- During drought, each grazing allotment will be considered on a case-by-case basis for purposes of specifying management actions needed to protect Forest resources.

- Rangelands will be managed so as to protect forage plants after a drought has ended. Usually this will entail rest for a minimum of one growing season after normal precipitation resumes. After extended or severe drought, two or more growing seasons rest may be required.

Procedures.

Defining Drought. To respond to drought conditions in a timely and consistent manner, the Standardized Precipitation Index (SPI), shall be utilized to define drought. The SPI compares recent precipitation values to long-term historical norms to determine the dryness or wetness of a particular area. When the SPI for a particular Arizona Climate Division (as defined by NOAA) is at a value of –0.70 or less (larger negative number) for a specific time period (usually 9 to 12 months as determined by the Forest Drought Team), that area of the Forest shall be considered to be in a drought. An SPI value of
-0.70 indicates that precipitation is approximately 50 percent of the long-term average amount. (Note: This definition of drought is much more stringent than the Society of Range Management's definition with states that drought is "…prolonged dry weather when precipitation is less than 75 percent of the average amount"). The severity of the drought shall be indicated by the size of the negative number, the larger the number the more severe the drought. The primary purpose of the drought index will be to initiate an evaluation of drought conditions by the Forest Drought Team.

Forest Drought Team. The Forest shall establish and maintain a team whose primary purpose shall be to assess drought conditions and make recommendations as to any management actions needed to protect Forest resources.

Composition of Team. The team shall consist of the District Range/Watershed Staff from each District, the Group Leaders for Biological Resources and Physical Resources, a District Ranger, Wildlife Biologist, Soil Scientist, and Hydrologist. Other individuals who express an interest will also be considered for inclusion on the team. The Group Leader for Physical Resources in consultation with the Forest Supervisor shall be responsible for specifying individual team members. The Forest Supervisor shall notify individuals of their membership on the Forest Drought Team in writing.

Drought Team Responsibilities. The Drought Team shall meet whenever the SPI for a Climate Division within the Forest declines to a value of –0.70 or less, or when Team members feel that drought conditions have been reached (even though the SPI has not declined to a value of -0.70). The Forest Hydrologist shall be responsible for tracking the SPI and notifying other team members when the threshold value of -0.70 is equaled or exceeded. The Drought Team shall assemble and assess all available information relative to drought and rangeland conditions, and discuss needed actions.

If the Drought Team determines that drought conditions exist, potentially affected grazing permittees shall be notified in writing that an evaluation of drought effects on rangeland conditions is being conducted.

No later than three weeks after the determination is made that drought conditions exist, each allotment totally or partially within drought affected areas shall be assessed and a brief report written that 1) describes the current situation on the allotment and
2) recommends any management actions needed to protect Forest resources. Where field observations are needed to assess range conditions, the assessment will be considered as a high priority and Forest personnel shall be made available to assist. When considering the current situation on an individual grazing allotment, the Team shall consider such factors as: local precipitation data and departures from normal, current range conditions, current stocking levels, available water, and management intentions of the permittee.

Once the assessment is made, the Team shall forward their recommendations to the appropriate District Ranger(s) through the Forest supervisor. The District Ranger shall determine the actions necessary to implement the Team's recommendations and notify the Forest Supervisor prior to implementation. Permittee notification and subsequent administrative actions will be completed as directed in FSM 2200.is imperative that management actions designed to minimize the effects of drought be implemented in a timely manner. In the case of livestock removal, it shall normally be accomplished within a maximum of 30 days after permittee notification. To the degree possible, timeframes allowed for the implementation of needed management actions shall be consistent throughout the Forest.

Throughout the drought, the Team shall meet periodically to reassess conditions and evaluate the need for further actions. The frequency of meetings shall be determined by the Team, but shall not exceed two months.

Conclusion of Drought. Drought periods shall end when the SPI for the last 12 months becomes positive. Even though precipitation has returned to normal, rangeland plants normally need more time to recover. The Team shall establish standards for re-stocking allotments that will ensure the protection of rangelands until proper recovery is complete. Generally, after normal precipitation resumes, re-stocking to full capacity shall not occur until after a minimum of one growing season of rest. In cases of prolonged or severe drought, two or more seasons of rest may be required prior to re-stocking. To the degree possible, timeframes for re-stocking rangelands shall be consistent Forest–wide. Restocking shall not occur until after concurrence of the Forest Supervisor.

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