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Southwestern Region

Tonto National Forest

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Final Environmental Assessment for Sunflower Allotment Grazing Analysis

Gila and Maricopa Counties, Arizona

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Chapter 1: Purpose Of and Need for Action

The Tonto National Forest, Mesa Ranger District (District) has prepared this Environmental Assessment (EA) in compliance with the *National Environmental Policy Act of 1970* (NEPA) and other relevant Federal and State laws and regulations. This EA discloses the direct, indirect, and cumulative environmental effects that will result from the proposed action and alternatives. This project will analyze the authorization of cattle on the Sunflower Allotment.

Allotment Description and Location

The Sunflower Allotment encompasses approximately 155,480¹ acres northeast of Fountain Hills, Arizona extending from the Salt River and Saguaro Lake up along Four Peaks, ending just south of Sunflower, Arizona (Figure 1). It lies east and west of State Route 87 and is accessed by numerous forest roads. The allotment contains portions of 1985 Tonto National Forest Plan (Forest Plan) Management Areas (MA) 3D (Four Peaks Wilderness²), 3E (Bush Highway Research Natural Area), 3H (Proposed Sycamore Creek Natural Area), and 3I (General Management Area).

¹ The allotment, unit, and pasture acreages within this document and included in the specialist reports vary slightly. This variance can be attributed to any of the following: inclusion or exclusion of acreage associated with traps or handling facilities; the use of outdated data; or digitizing errors. However, these slight variances do not impact the analysis of the proposed action on the various resource areas.

² Within the designated Four Peaks Wilderness area, there are also lands identified as a wild burro territory. Although this area, located northeast of Saguaro Lake, once contained a small herd (approximately 20 burros), no burros have been documented in this area since the early 2000s.



Figure 1: Vicinity Map³ of Sunflower Allotment

³ This product, and all maps for the Final Environmental Assessment for Sunflower Allotment Grazing Analysis and project record, is produced from geospatial information prepared by the U.S. Department of Agriculture, Forest Service. By removing the contents of this package or taking receipt of these files via

Elevation on the allotment ranges from 1,540 feet to 7,657 feet at Brown's Peak, the northernmost peak of Four Peaks. Vegetation types within the allotment include Sonoran desert scrub, semi-desert grassland, interior chaparral, pinyon-juniper, and pockets of ponderosa pine at upper elevations. There is also riparian vegetation found in association with numerous springs and creeks throughout the allotment.

Climate on the Sunflower Allotment is characterized by a bimodal precipitation pattern—two separate weather patterns that provide precipitation—with about 60 percent precipitation occurring as frontal systems in the winter, from December to March, and the remaining occurring as monsoons in the summer, from July to September. Summer storms can be more intense than winter storms, but are generally shorter duration and smaller aerial extent. The mean annual precipitation within the allotment ranges from 11 inches at the lower elevations to 24 inches at the higher elevations. The mean annual soil temperature ranges from 68 degrees Fahrenheit at lower elevations to 52 degrees Fahrenheit at higher elevations (USDA FS, SW Region, 1985).

The Sunflower Allotment is divided into four units: Cline, Cottonwood, Desert, and Dos S. Smaller sub-units, or pastures, lie within most units (Figure 2). A portion of the Heber-Reno sheep driveway⁴ runs through the Dos S Unit.

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⁴ A sheep driveway is a corridor that authorizes bands of sheep to be moved through two times annually. Heber-Reno sheep driveway encompasses roughly 19,440 acres within the Sunflower allotment and allows passage from southern grazing grounds on private property to northern grazing grounds on the Apache-Sitgreaves National Forest. This driveway is not included in the allotment's capable acreage. Length of time on the portion of the driveway crossing the allotment is generally less than three days each way. An environmental assessment and Decision Notice/Finding of No Significant Impact was issued February 15, 2011 authorizing continued used of the driveway.



Figure 2: Map of Units within Sunflower Allotment

Allotment Management History

Records indicate that the Sunflower allotment has been grazed by livestock since the early 1900s. However, stocking rates at that time are unknown. A 1966 grazing capacity estimate determined that an appropriate stocking rate was 2,707 head of cattle yearlong, or 25,250 animal unit months⁵ (AUMs) on the allotment's then approximately 187,470 acres. This stocking rate was slightly above the average from previous years. At that time, vegetative trend was static or downward.

Between 1966 and 1988, permitted numbers were decreased to 1,700 cattle yearlong, plus yearlings for five months. This allotment was not successfully managed at this stocking rate, in part because of the substantial lack of distribution and no planned periods of rest. As a result, a decision notice was signed August 17, 1988 approving the division of the allotment into management units⁶. A management plan approved this strategy on December 14, 1989. Five units were established on the allotment: Cline Unit, Cottonwood Unit, Desert Unit, Diamond Unit, and the Dos S Unit. Management systems were developed for each unit within the allotment. A permit was signed February 8, 1988 authorizing 1,700 cattle yearlong and 1,118 offspring, or yearlings, from January 1 through May 31 annually. The Desert Unit was specifically designated for up to 500 yearlings, no longer requiring nutrition from their mother, and up to 50 adult cattle, those being permanently removed from other units on the allotment from October 15 through May 15. Use within this unit was based on annual precipitation and production of annual plants.

Given the size of the allotment, the environmental analysis was conducted on management units instead of the allotment as a whole. In 1991, an environmental assessment was initiated on the Dos S Unit to develop a livestock grazing strategy. A decision notice was issued on August 5, 1994, which implemented a grazing strategy that included the following seven pastures: Adams, Maverick, Otero, Picadilla, Pine Creek, Ranger Station, and Sycamore Creek Riparian. Permitted numbers were 650 adult cattle yearlong with 165 yearlings for five months ending May 31. In the decision, the Sycamore Creek Riparian Pasture was closed to all livestock grazing during the initial ten years of management and the upland pastures were to be managed with a Santa Rita grazing system, which employs a short duration, high intensity grazing.

On August 4, 1993, the Diamond Unit (29,467 acres) was taken out of the total Sunflower Allotment acreage and a new permit for the Diamond Allotment (#12-781) was issued for 450 adult cattle yearlong and 293 yearlings. This resulted in the Sunflower Allotment being approximately 158,000⁷ acres in size with a permitted number of 1,250 adult cattle yearlong and 825 yearlings from January 1 through May 31.

⁵ The amount of forage needed by an "animal unit" (AU) grazing for one month. The quantity of forage needed, based on the cow's weight, and the animal unit is defined as one mature 1,000 pound cow and her suckling calf. It is assumed that such a cow nursing her calf will consume 26 pounds of dry matter of forage per day.

⁶ Management units were developed to facilitate livestock management on the allotment, given the amount of acreage within the allotment. Management units are smaller than the allotment and broken up into smaller pastures to allow for rotational grazing.

⁷ Updated geographic information system data the acreage associated with the current Sunflower Allotment is actually closer to approximately 155,000 acres.

In July 1999, an analysis was conducted on the Cottonwood and Cline Units. A decision notice was issued on November 20, 2000. The decision reduced adult cattle within the Cottonwood Unit from 400 to 100, placing the authorization of those 100 into non-use for a period of ten years⁸, stating that the Cottonwood Unit would not be restocked to 100 without additional environmental analysis. This decision also authorized, for the Cline Unit, 35 adult cattle yearlong in a two pasture rotation, where cattle would spend six months in one pasture and six months in the other.

Table 1 shows the number of permitted cattle, both adults and yearlings, at the end of 2000 on the Sunflower Allotment.

Unit Name	Season of Use	Permitted Number
	Adult Cattl	e
Cline 01/01 – 12/31		35
Cottonwood	01/01 - 12/31	100
Desert	10/15 - 05/15	Up to 50
Dos S	10/15 - 5/15	650
	Yearlings	
Desert	10/15 - 05/15	Up to 500
Dos S	01/01 - 05/31	

 Table 1: Livestock Numbers for Sunflower Allotment by Unit (2000)

On April 13, 2000, Mesa District Ranger directed removal of all livestock from the Sunflower Allotment by July 1, 2000. This decision was made as a result of drought conditions within the allotment and a resulting lack of forage production. On March 11, 2002, the district ranger issued a notice of non-compliance to the permittee for failure to completely remove all livestock from the allotment. As a result of this non-compliance, the permitted numbers were temporarily canceled, as documented in a certified letter dated November 4, 2002. Two days later, a permit modification was issued, reflecting this temporary cancelation and reduced numbers, which would take effect when cattle were authorized back onto the allotment. Table 2 shows the decrease in permitted numbers only affecting the Dos S and Desert Units.

Table 2	Livestock	Numbers for	Sunflower	Allotment by	Unit (2002)
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Unit Name	Season of Use	Permitted Number
	Adult Cattle	
Cline	01/01 - 12/31	35
Cottonwood	01/01 - 12/31	100*
Desert	10/15 - 05/15	Up to 50
Dos S	01/01 - 12/31	312
Yearlings		
Desert	10/15 - 05/15	Up to 163
Dos S	01/01 - 05/31	165

*This unit was already in non-use from a previous decision and was not decreased further.

⁸ This 10 year period officially began when the permittee was notified by letter on November 4, 2002.

In 2007, a new environmental analysis was completed on the Dos S and Desert Units. The proposed action was to continue non-use of these two units, for a period of five years to coincide with termination of the non-use period imposed on the Cottonwood Unit. This was done to allow for a full allotment analysis to be conducted in 2012. A decision memo was issued on September 12, 2007, and a permit modification (#12018A) was signed on November 9, 2007.

Existing Conditions

Existing conditions in this section are limited to those resources that will be affected by grazing and do not represent the existing condition for all resources present within the Sunflower Allotment⁹. This section will only address the existing conditions for range vegetation, soils, riparian areas, watersheds, and wildlife.

Vegetation

Rangeland vegetation existing conditions are broken out by management unit within the allotment, while soil, riparian area, and watershed are described for the allotment as a whole.

Existing upland conditions on the allotment have been measured utilizing the best available scientific information and most current data available, collected through standard agency procedures. The allotment contains multiple key areas 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, production, as well as soil and watershed condition that are representative across the allotment.

Parker Three-Step monitoring transects—cluster (C) and pace transects (PT)—were established in key areas on the allotment in the mid-1960s. This monitoring method provides information on range condition to be used for management planning and decision making. One of the factors included in surveying a site is the composition of three classes of plant species: decreasers, increasers, and invaders, which aid 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, the 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 or invaders, the poorer the condition (Dyksterhuis, 1951; National Research Council, 1994).

Cline Unit

This unit occurs in the east central portion of the Sunflower Allotment. It is a small unit consisting of approximately 9,800 acres; bounded on the northeast by the Tonto Basin Ranger

⁹ For existing conditions by resource area, see Chapter 3 of this document.

District, the south by the Cottonwood Unit, the north and west by the Dos S Unit. Elevations range from 3,400 feet in Cottonwood Creek to 6,236 feet on Pine Mountain. Soils are generally granitic, with terrain which varies from rolling hills to steep, rugged slopes (Figure 3¹⁰).

¹⁰ Within the Cline Unit of the Sunflower Allotment there are no perennial streams or major lakes or rivers.



Figure 3: Map of Cline Unit, Including Pastures

This area was managed for vegetation type conversion during the 1960s, when prescribed burning and herbicides were used to reduce the density of chaparral species and provide a seedbed for introduced grasses. Records indicate that in 1979 and 1981, two prescribed burns were completed within this unit, with 1,200 and 1,500 acres, respectively treated. In 1996, the Lone Fire burned approximately 5,000 acres within the Cline Unit.

Vegetation consists primarily of interior chaparral and pinyon-juniper. The herbaceous component is comprised mainly of introduced lovegrass species (*Eragrostis spp.*), with some sand dropseed (*Sporobolus cryptandrus*) present. Important riparian areas include Picadillo Creek, Cottonwood Creek, Tejanos Spring, and Mud Spring.

There are three Parker Three-Step clusters; C1, C2, and C3 within this unit; however, these have not been reread since their establishment in 1968 and 1969 due to the density of chaparral. In 2014, apparent trend was assessed at seven locations within the Cline Unit. In all but two of the sites, vegetation trend was rated as moving "toward" or "stable". The two locations where vegetation was rated as moving "away from" were two sites dominated by introduced lovegrass.

Cottonwood Unit

This unit is roughly 49,400 acres in size, with approximately 90 percent of the unit within the designated Four Peaks Wilderness area. The unit is bounded to the south by the Salt River, including Canyon Lake and Apache Lake, to the north by the Cline and Dos S units, to the west by the Desert Unit, and to the east by the Tonto Basin Ranger District (Figure 4).



Figure 4: Map of Cottonwood Unit, Including Pastures

Elevations range from 1,720 feet at the Salt River to 7,657 feet at Brown's Peak, the northernmost peak of Four Peaks. The terrain varies from relatively gently rolling slopes on the west side of the unit, to steep mountainous terrain in the Four Peaks area on the east side of the unit. Soils are generally granitic, varying from decomposed granite on the gentler west half of the unit, then grading into granite boulders and exposed granite cliffs to the east. Mean annual precipitation ranges from 15 - 24 inches, with the amount generally increasing with elevation.

Vegetation is generally Sonoran Desert scrub in the lower elevations, chaparral and desert grassland in the mid-elevations and pockets of ponderosa pine can be found on the northeast slopes in the higher elevations. Important riparian areas include Alder Creek, Cottonwood Creek, Boulder Creek, and Cane Spring Canyon. Table 3 shows the monitoring results of the only Parker Three-Step cluster within this unit.

Key Area	Dates Read	Existing Vegetation Conditions
Parker 3-Step Cluster 11	1965, 1983, 2012	2012 – Stable trend. High number of "Invader" species.

Table 3: Cottonwood Parker Three-Step Data

In 2014, apparent trend was assessed at four locations within the Cottonwood Unit. Vegetation and soil within each of the four sites rated as "toward" or "stable", with the exception of two sites that lacked lichen development on rocks, an attribute used to assess soil.

Desert Unit

The Desert Unit of the Sunflower Allotment includes 19,300 acres of Sonoran Desert scrub along the south end of the allotment. Elevations range from 1,600 feet near the Salt River to 2,520 feet. The unit is bounded on the south by the Salt River (Saguaro Lake), to the west by Highway 87, to the east by the Cottonwood Unit, and the north by the Cline Unit. This area is characterized by a series of ridges and drainages that run north and south. Slopes are gentle to moderately steep comprised primarily of decomposed granite. Accelerated erosion occurs in areas where little perennial vegetation exists. There is no riparian habitat on the Desert Unit (Figure 5¹¹).

¹¹ Within the Desert Unit of the Sunflower Allotment there are no perennial streams or springs.



Figure 5: Map of Desert Unit

The Desert Unit has historically been used as a seasonal unit from October 15 through May 15, when annual winter precipitation provides for the production of annual grasses and forbs. Livestock use is a combination of a limited number of adult cull cows and yearlings from the Dos S, Cottonwood, and Cline units. Because this unit is dependent upon annual precipitation, considerable variation in production occurs from year to year. The primary browse species within this unit is jojoba; however, additional palatable browse species include: range ratany, wolfberry, and Calliandra. Three-awn species are the dominant perennial grass species within this unit.

Although data were collected multiple times over the last several decades, species composition (decreaser, increaser, invaders) was compared using the two most recent data sets to detect any changes since in composition after livestock were removed in 2002 (Table 4).

Unit	Key Area	Dates Read	Existing Vegetation Conditions
Desert	Pace Transect PD	2002, 2012	2012 –stable trend. Improvement due to an increase in "decreasers" and less bare ground.
Desert	Parker 3-Step Cluster 10	1965, 1983, 1992, 2002, 2012	2012 data –stable trend with an increase in triangle leaf bursage (invader species).
Desert	Parker 3-Step Cluster 14	1967, 1984, 1992	1992 data –stable trend. Condition score due to density of "Invader" species.

Table 4: Desert Unit Existing Condition Data

Dos S Unit

The unit encompasses roughly 79,500 acres located northeast of the Phoenix metropolitan area along Highway 87, which bisects the unit into a west and east half. This division was incorporated into the management of the unit as the rotation included use of the west pastures for six months, then movement to the east pastures for six months. The unit is bounded to the north by the Diamond Allotment, to the southwest by the Fort McDowell Indian Reservation, to the west by the Cave Creek Ranger District, to the southeast by the Desert Unit, and the east by the Cline Unit. It contains the following pastures: Adams, Dos S, Otero, Ranger Station, Maverick, Picadilla, Pine Creek, and Sycamore Creek Riparian (Figure 6).



Figure 6: Map of Dos S Unit, Including Pastures

In 1994, the entire length of Sycamore Creek within the allotment was fenced off to exclude livestock access. Maintenance of the exclosure fence proved difficult, as this area is highly used by recreationists, including off-highway vehicles (OHV). Portions of this fence are in various states of disrepair, including some sections that are completely absent.

The Dos S Unit is comprised of the following vegetation types: Sonoran desert scrub, interior chaparral, semi-desert grassland vegetation, and mixed broadleaf deciduous riparian. Elevation ranges from 1,540 feet to 6,100 feet.

Table 5 below includes the Parker Three-Step and Pace monitoring data for the Dos S Unit. As was mentioned for Table 4, species composition (decreaser, increaser, invaders) was compared using the two most recent data sets to detect any changes in composition after livestock were removed in 2002.

Pasture	Key Area	Dates Read	Existing Vegetation Conditions
Maverick	Pace Transect 5	1965, 2002, 2012	2012 data –upward trend. Improvement in number of "Increasers" from 2002.
Pine Creek	Pace Transect 7	1965, 2002	2002 data –stable trend.
Maverick	Parker 3-Step Cluster 5	1965, 1977, 1984, 2002, 2007, 2012	2012 data –upward trend. Improvement in number of "Increaser" forage plants and plant vigor between 2002 and 2012.
Otero	Parker 3-Step Cluster 6	1965, 1984, 2002	2002 data –downward trend, likely due to a marked decline in "Increaser" forage plants.
Adams West	Parker 3-Step Cluster 9	1965, 1976, 1983, 2002, 2012	2012 data –stable trend. Rating in 2002 was "Poor" with downward trend. Change in trend due to an increase in "Decreaser" forage plants and decrease in bare ground.
Adams East	Parker 3-Step Cluster 12	1967, 1984, 2002, 2012	2012 data –upward trend. Improvement due to increase in number of "Decreaser" forage plants and litter.
Adams East	Parker 3-Step Cluster 13	1967, 1984, 2002, 2012	2012 –upward trend. Improvement due to an increase in forage plant density and decrease in the amount of bare ground.

Table 5: Dos S Unit Existing Condition Data

In 2014, apparent trend was assessed at five locations within the Dos S Unit. Apparent trend looks at multiple attributes to assess current vegetation and soil condition compared to site potential, and is either rated as "toward" or "stable" or "away from". In all five of the sites, vegetation trend was rated as moving "toward" or "stable".

Soils

Soils within the analysis area are highly variable due to the wide variety of parent materials, landforms, and climate. Topographical features on the allotment range from nearly level alluvial fans to rugged steep slopes and canyons. The soil condition represents an approximation.

Interpretations are based on historical livestock use patterns and slope characteristics. Flatter and more open areas tend to experience greater impacts than steeper slopes or areas with dense vegetation. Slopes of up to 40 percent are considered suitable for grazing (Figure 7).



Figure 7: Map of Slope for Sunflower Allotment (Unit/Pastures)

Categories of soil condition are classified as: satisfactory, impaired, and unsatisfactory¹². Soil condition is an evaluation of soil quality based on an interpretation of factors which effect vital soil functions, which 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 satisfactory soil condition class covers 8,482 acres (six percent). Generally these soils have not been heavily impacted. These areas are either on slopes that have not been as heavily used or they have heavy shrub cover that has prevented heavy use.

Two percent (3,083 acres) have a satisfactory-unsatisfactory soil condition. These are riparian areas in the Sonoran Desert. They have areas that are easily accessed and have been heavily used in the past and are in unsatisfactory soil condition. Within these same delineations are areas that are much harder for cattle to access due to large boulders and rock outcrop and therefore these reaches are still in satisfactory soil condition.

Forty-five percent of the soils (70,125) have an impaired soil condition. These soils occur on 0 to 60 percent slopes. Generally, these soils have slight to moderate soil compaction and have lost part of the original "A" horizon through moderate sheet and rill erosion. These soils have not been compacted as much as the heavily used soils in unsatisfactory condition. Nutrient cycling is limited, as well, with a poor distribution of litter in the interspaces.

The unsatisfactory soil condition class is 7,797 acres (five percent) of the analysis area. These soils occur in flat, open areas. These soils have high amounts of surface compaction and poor soil porosity and root distribution resulting in moderate to high amounts of sheet, rill, or gully erosion. Nutrient cycling is limited, as well, with a poor distribution of litter in the interspaces. Vegetation diversity and species composition is relatively low.

Forty-two percent of the soils (65,747 acres) were mapped unstable. These soils are geologically unstable and occur on steep slopes or parent rocks that tend to be erosive such as granite and poorly cemented conglomerate. Some other areas of unstable soils occur on sharp slopes scattered throughout the project area but occur in areas too small to map (Figure 8¹³).

¹² For more detailed information on soil conditions, see the Soils Report in the project record.

¹³ On the map, the "satisfactory-unsatisfactory" soil condition is too small (two percent of the allotment) to be depicted on the map.



Figure 8: Map of Soil Condition for Sunflower Allotment

Riparian

The existing condition of riparian areas within the Sunflower Allotment have been affected by many factors, both natural disturbances, such as drought, fire, and floods, and human activities, such fire suppression and grazing.

A stream reach is defined as any length of stream between two points. Key reaches, similar to upland key areas (Interagency Technical Team, 1996), are stream channels/ springs/ riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key species. Key reaches are synonymous with designated monitoring areas defined by Burton *et al.* (2011) as the location where monitoring occurs. Table 6 displays the key reaches by pasture. The six riparian areas have the potential to improve within a relatively short time period

(10 years) or have reached desired condition, and have been identified as key reaches for this analysis (Figure 9). Riparian vegetation helps to stabilize stream cannels.

Unit	Pasture	Kev Reach	Existing Condition
Dos S	Mayerick	Mayerick	The Riparian vegetation layer (Tonto GIS) indicates 1.7
2005	in a verien	Spring	miles of Fremont cottonwood-conifer riparian vegetation
		Canvon	occurs up and downstream from Mayerick Spring. Riparian
			vegetation is also evident on Google Earth $(1/29/2013)$.
Cline	Cline	Picadilla	In 2013 the vegetation consisted of sanling and pole size
0	0	Creek	sycamore, pole size Goodding's willow and cottonwood.
			hackberry sugar sumac seep willow and desert broom
			Dense, large deergrass occurs on the banks and small
			floodplain. There are a multiple spots with scirpus (sedge)
			species.
Cline	Mud Spring	Teianos	Riparian vegetation extends above and below Forest
		Spring	Service Road (FSR) 143. Monitoring occurred in 1998 and
			1999, and a field visit in 2013. In 1998 and 1999, there was
			little vegetation to monitor and use was high on what was
			there. In 2013, the reach above the spring was in stable
			condition. Vegetation consists of spotty deergrass, sapling,
			and pole sycamore with a few large trees. Below the spring
			the channel is steep with large boulders which limit access.
			Photo points taken from 1996 to 2010 show an increase in
			density of riparian vegetation. Riparian health was rated as
			stable below FSR 143. The reach above FSR 143 and a
			tributary to Tejanos Spring have not been assessed for
			riparian health.
Cline	Cline	Brushy	Downstream from FSR 143, the channel supports sapling
		Basin	and pole size sycamore and some small sapling willow.
			Deergrass lines the channel and is thick in some places.
			Riparian health is rated as stable in this reach. Upstream
			from FSR 143, vegetation is sparse and consists of sapling
			and pole sycamore, and occasional deergrass. Riparian
			health is rated as impaired in this reach. Photo points up and
			downstream of the road taken from 1996 to 2010 show an
<u> </u>			establishment of some woody riparian vegetation
Cottonwood	Cottonwood	Cane	2013 - The reach adjacent to the spring supports dense
		Springs	vegetation which consists mainly of hop bush, pole size
		Canyon	willows, and seep willow. The riparian health rating was
		(Hidden	stable hear the spring but has not been rated above the
		Water Spring)	spring. Above the spring vegetative diversity is low and
		Spring)	consists of pole size willows, a few deelgrass plants, and a
			flood plain and there is thick rabbit's foot gross in portions
			of the channel. There is not enough evolutions
			ringerion vogetation to provide for statistically valid annual
			use monitoring
Cottonwood	Cottonwood	Alder Creek	Monitoring occurred in 1999 and 2000 Regeneration of
Cononwood	Cononwood	AIGUI CIEEK	cottonwoods and willows was occurring. Deergrass was
			snarse Use on the woody species was within guidelines
			Rinarian health ratings were not assessed during these
			monitoring efforts

Table 6: Key Reach Existing Conditions



Figure 9: Map of Key Reaches within Sunflower Allotment

Watershed Condition Assessment

In 2010, a national effort was completed by the Forest Service to assess the condition of all 6^{th} code watersheds on National Forest System (NFS) land. Sixth code watersheds are typically 10,000 – 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 6^{th} 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 6^{th} code watersheds in the project area are shown Table 7 and Figure 10. Condition descriptions in the figure correlate with the condition ratings in the table as follows: good – functioning; fair – functioning at risk; and poor – impaired. Six of the 11 watersheds in the project area are in impaired condition. The indicators that received the lowest scores in these impaired condition watersheds include: aquatic biota, aquatic habitat, soil, rangeland vegetation, and invasive species¹⁴.

6th Code Watershed	Condition
Middle Sycamore Creek	Functioning at risk
Lower Sycamore Creek	Impaired
Rock Creek	Functioning at risk
Mesquite Wash	Functioning at risk
Cottonwood Creek	Impaired
Cane Spring Canyon	Functioning at risk
Salt River-Apache Lake	Impaired
Salt River-Canyon Lake	Functioning at risk
Salt River-Saguaro Lake	Impaired
Bulldog Canyon-Salt River	Impaired
Jones Canyon	Impaired

Table 7: Watershed Existing Condition for 6th Code Watersheds

¹⁴ Indicators assessed as impaired within the Sunflower Allotment portion of each of the 6th code watersheds are identified in Hydrology, Riparian, and Watershed Report in the project record.



Figure 10: Map of Watershed Condition Classes for Sunflower Allotment

Wildlife

The various vegetation types in the project area support a variety of game and nongame species. Populations of both large and small game species trends throughout the allotment are stable (J. Dickson, personal communication May 7, 2015).

Availability of forage, and ground and canopy cover, are essential to sustaining wildlife populations, as is the availability of water. Wildlife not only use "live water" (perennial or

intermittent streams), but often depend on the availability of developed waters (dirt tanks and troughs), especially during times of drought.

Special Status Species

Special status species are those given status by agencies responsible for managing plants, wildlife, and their associated habitat because of declines in the species' population or habitat. Birds are given provisions under the *Migratory Bird Treaty Act*. Special status species that occur, or have suitable habitat on the allotment and will be analyzed in this assessment are listed in Table 8. A complete list of special status species will be included in Chapter 3 of this document, with justification as to their inclusion or exclusion from further analysis.

Additionally, the District has initiated consultation with the U.S. Fish and Wildlife Service (USFWS), pursuant to Section 7 of the *Endangered Species Act* (*16 U.S.C. 1531-1544*), as amended, in regard to the effects of the proposed action, on the following threatened, endangered, and candidate species known to occur on the allotment: Gila topminnow, desert pupfish, Mexican spotted owl (MSO) critical habitat, and Sonoran Desert tortoise.

Common Name	Scientific Name	Status			
Gila topminnow	Poeciliopsis occidentalis occidentalis	ESA Endangered			
Desert pupfish	Cyprinodon macularius	ESA Endangered			
Mexican spotted owl critical habitat	Strix occidentalis lucida	N/A			
Sonoran Desert tortoise	Gopherus morafkai	ESA Candidate, FS Sensitive			
Bezy's night lizard	Xantusia bezyi	Sensitive			
Lowland leopard frog	Rana yavapaiensis	Sensitive			
Desert sucker	Catostomus clarki	Sensitive			
Mapleleaf false snapdragon	Mabrya acerifolia	Sensitive			
Hohokam agave	Agave murpheyi	Sensitive			

Table 8: Special Status Species

Endangered – Federally Listed as Endangered Under ESA; **Candidate** - Fish and Wildlife Service has enough information on file to propose listing as threatened or endangered but listing has been precluded by other agency priorities; **Sensitive** – On Regional Forester's Sensitive Species List (2013)

Management Indicator Species

Management indicator species (MIS) were selected during the Tonto National Forest planning process that lead to the 1985 Forest plan because their population changes are believed to indicate the effects of management activities (*36 CFR 219.19(a)(1)*). The MIS approach is designed to function as a means to provide insight into effects of forest management on plant and animal communities. These indicator species reflect general habitat conditions or habitat components that are of value to these and other species with similar habitat needs. Habitats for a large number of the forest MIS occur on the Sunflower Allotment. Because most MIS are not rare species and the allotment contains a wide variety of vegetation types, it is assumed that at least some individuals of each MIS are present on the allotment. The MIS included in this analysis are discussed in Chapter 3.

Desired Conditions

Desired Conditions for the Sunflower Allotment are based on Forest Plan guidance and sitespecific knowledge of the allotment and are tied to the existing conditions described earlier in this chapter: range vegetation; soils; riparian areas; watersheds; and wildlife.

Vegetation

According to the Forest Plan, the Tonto National Forest should manage vegetation types such as: chaparral, semi-desert grasslands, and desert scrub to meet the needs of both game and non-game species (pp. 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.

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). According to Forest Service Manual 2550.2, the desired conditions for soils are to "maintain or restore soil quality on National Forest System lands. Manage resource uses and soil resources on NFS lands to sustain ecological processes and condition so that desired ecosystem services are provided in perpetuity." Further, the Forest Plan indicates that projects should improve soil productivity (p. 19). Ecological land units are assigned a soil condition category which is an indication of the status of soil functions. Soil condition categories reflect soil disturbances resulting from both planned and unplanned events. Current management activities provide opportunities to maintain or improve soil functions that are critical in sustaining soil productivity (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 an unsatisfactory or unstable condition and soil improvement will take longer than the anticipated ten years for this authorization, the desired condition would be for soils within the allotment to maintain their current condition within grazing management practices.

Riparian

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, the desired condition statements identified below are developed for riparian vegetation rather than stream channel stability:

• Prior to Monsoon events or winter rains, maintain residual herbaceous vegetation along the greenline or streambank to protect the banks from erosion.

• 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. Maintain or improve riparian health rating in key reaches with a current health rating of greater than 67 percent.

Wildlife

General wildlife resource goals for the forest are outlined in (Forest Plan, p. 20) and include providing for species diversity in the ecosystem, maintaining or improving wildlife and fish populations through improvement of habitat, ensuring that fish and wildlife habitats are managed to maintain viable populations of existing species, preventing adverse modification of critical habitat for threatened and endangered species, and managing to improve threatened, endangered, and sensitive (TES) species with a goal of increasing population levels that would remove them from the lists.

Purpose of 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) and continued domestic livestock grazing is consistent with the goals, objectives, standards, and guidelines of the Forest Plan (Forest Plan pages 24, 91 - 118).

It is Forest Service policy to make forage available to qualified livestock operators from lands suitable for grazing consistent with land management plans (*FSM 2203.1; 36 CFR 222.2 (c)*).

It is Forest Service policy to continue contributions to the economic and social well-being of people by providing opportunities for economic diversity and by promoting stability for communities that depend on range resources for their livelihood. (*FSM 2202.1*)

There is a need for change:

- The allotment has been in non-use for over ten years. The non-use decision included reevaluating the allotment after ten years to determine when grazing could resume.
- There is a need to develop a livestock management plan that will maintain or continue to move toward desired conditions.

Proposed Action

The proposed action for the Sunflower Allotment is to authorize livestock grazing in a manner that is consistent with Forest Plan standards, guidelines, and objectives and maintains or improves natural resource conditions. Livestock will be grazed using a rotational system in the Cline, Cottonwood, and portions of the Dos S unit (Figure 11). Stocking rates, within each unit, will be independent from the other units and managed as separate herds system. Proposed permitted use

will vary between 2,700 and 6,300 AUMs year-long. The Otero, Ranger Station, Sycamore Creek Riparian, and Adams—west of SR 87—pastures within the Dos S Unit, and the Desert Unit will be placed into non-use (approximately 56,724 acres total) until such time as a new environmental analysis is conducted to show the need for these pastures and the effects of authorizing grazing within them. This proposed action is discussed in greater detail in Chapter 2 of this EA.



Figure 11: Map of Proposed Pastures and Non-use within Sunflower Allotment

Decision Framework

The Mesa District Ranger is the official responsible for the decision regarding management of the allotment in this analysis. Based on this analysis, the District Ranger will issue a draft decision notice as to whether or not livestock grazing will continue to be authorized, which will trigger the predecisional objection process. Once a final decision is signed, implementation of this decision to continue livestock grazing would occur through issuance of a new term grazing permit. An allotment management plan (AMP) and annual operating instructions (AOI) would include any management actions, mitigation measures, and monitoring requirements necessary to the decision. These documents would also describe permitted numbers of animals, season of use, allowable utilization standards, and the terms of the grazing permit.

Public Involvement

In 2013, a scoping letter was sent out initiating the necessary National Environmental Policy Act (NEPA) compliance required to authorize grazing on the Sunflower allotment. On July 05, 2013, a Draft environmental assessment (EA) was made available for comment; and on September 17, 2013, a decision notice, including a finding of no significant impact, was signed by the District Ranger authorizing grazing on the Sunflower Allotment. Subsequent to this decision, appeals to the project were submitted and the decision was remanded back to the District Ranger.

In 2014, District and Forest range personnel, worked with the permittee to collect data across the allotment and develop a proposed action that incorporated allotment management objectives along with Forest Plan goals and objectives. The project was listed in the Schedule of Proposed Actions in August 2014. On November 14, 2014, a Public Notice was published in the Arizona Capitol Times, the newspaper of record, and a scoping letter was sent to 36 individuals, including state and federal agencies, environmental organizations, local government, and tribes. Participants were given 30 days to review and comment. Sixty-four comments were received from the scoping process. These comments were analyzed and considered to determine if additional alternatives were needed to address resource concerns. On April 10, 2015 a public notice in the *Arizona Capitol Times* newspaper began the 30 day comment period on the draft EA. Over 5,750 comments were received, nearly all of which were form letters¹⁵.

Based on the comments received from public involvement, the Forest Service identified six primary concerns, listed below, that were raised related to the proposed action that was scoped. Some of these are either addressed in one of the two alternatives, are part of the analysis of the alternatives, and/or have been addressed through mitigation measures incorporated into the proposed action as shown directly following the concern.

1) Address the cumulative environmental impacts of authorizing livestock grazing in an area already heavily impacted by recreational activities.

Chapter 3 includes a detailed discussion of the affected environment and the direct, indirect, and cumulative effects of the alternatives on each of the resource areas.

¹⁵ For a complete detail on how comments on the draft EA were addressed, see the Response to Comment Report in the project record.

2) Range capacity determination.

Forest Service personnel and the grazing permittee collected production data at 22 sites throughout the allotment. Ecological map units were used in determining selected sites. Capacity was estimated based on herbaceous and browse production, with consideration of conservative utilization levels (30 - 40 percent), slope, and distance to water. Estimated capacity is further discussed in Chapter 2 of this document.

3) Develop an alternative which would defer into non-use pastures that currently lack "developed water" sources, and authorize grazing only where such infrastructure already exists rather than develop natural springs or riparian areas.

All of the units/pastures included in the proposed action currently have developed water sources and infrastructure in place.

The Forest Plan includes standards and guidelines under MAs 3I and 3D which recommend the use of structural and non-structural improvements and increased management to improve rangeland in less than satisfactory condition (Forest Plan, pp 101, 114, 115).

Best Management Practices included in Forest Service Handbook (FSH) 2509.22 – Soil and Water Conservation Practices Handbook would be used to protect soil and water resources:

- 22.12 Controlling Livestock Distribution: to manage sustained forage production and forage utilization by livestock while protecting soil and water resources. Maintain healthy ecosystems for wildlife and other resources.
- 22.13 Rangeland Improvements: to improve, maintain or restore range resources, including soil and water through the use of rangeland improvements.
- 4) Develop an alternative which will defer all pastures with riparian habitat to non-use and authorize grazing only where the permit holder can transport water to upland improvements.

All of the units/pastures, with the exception of the Desert Unit, contain some riparian habitat. The Desert Unit and a large portion of the Dos S Unit containing Sycamore Creek, Mesquite Wash, and Log Corral Canyon are proposed for non-use. Deferring the remaining units/pastures would be equivalent to the "No Grazing" alternative and will be analyzed in this document.

5) Develop an alternative that excludes livestock grazing from all pastures containing Sonoran Desert habitat.

Lands within the Sunflower Allotment have been identified as suitable for livestock use. The Forest Plan identifies four MAs within the Sunflower allotment; 3I, 3D, 3E, and 3H. The majority of the allotment is within MA 3I with an emphasis on managing (Level D) for a variety of renewable natural resources with primary emphasis on improvement of wildlife habitat, livestock forage production, and dispersed recreation. The majority of the Four Peaks Wilderness area is located in the southeastern portion of the allotment and is within MA 3D, with management (Level B) emphasis on "wilderness values while providing livestock grazing opportunities". MA 3H includes the proposed Sycamore Creek Natural Area (60 acres) which is to be managed at Level B. MA 3E includes the Bush Highway Research Natural Area (488 acres) with an emphasis on management to provide opportunities of non-disruptive research and education (Forest Plan pp 91 – 118). MA 3E is managed at Level A, which excludes the area from livestock grazing through fencing (Forest Plan p. 103). MAs 3H and 3E are located in the Dos S and Desert Units respectively, which are both proposed for non-use.

With the exception of MA 3E, none of these MAs include the exclusion of livestock grazing from Sonoran Desert habitat.

The "No Grazing" alternative includes an analysis of the effects of livestock exclusion from Sonoran Desert habitat.

6) Consider climate change and drought impacts on range capacity.

The Tonto National Forest follows Southwestern Regional drought guidelines found in Forest Service Handbook 2209.13. These guidelines consist of four elements: drought evaluation, management process, stocking during and after drought, and communication plan.

The issuance of the yearly annual operating instructions provide sufficient flexibility to allow management to be adjusted in recognition of changing circumstances such as drought or seasonal fluctuations in forage production. If monitoring indicates that desired conditions are not being achieved in a particular unit/pasture, management will be modified in cooperation with the permittee. Changes may include administrative decisions such as the specific number of livestock authorized annually, specific dates of grazing, class of animal (cow/calf pairs versus yearlings, steers or heifers, etc.) or livestock herd movement.
Chapter 2: Alternatives, Including the Proposed Action

This chapter describes and compares alternatives considered for the Sunflower Allotment analysis. It includes a description of each alternative considered. This section also presents alternatives in comparative form to help the reader see their differences and similarities.

Alternative 1 - No Action/No Grazing

Forest Service Policy requires the Forest Service to identify no grazing as the no-action alternative (Forest Service Handbook 2209.13). Under this alternative, the term grazing permit will be cancelled following guidance in *36 CFR 222.4* and *FSM 2231.62*. According to Forest Service Manual, Southwest Region Supplement 2240.3(2), "The Government holds title to all range improvements." Existing boundary fences will be assigned to adjacent permittees (if applicable). Interior fences and other infrastructure will be removed, as funding or workforce allows, mitigating potential adverse impacts to wildlife and public users. Water developments, important for wildlife, will be maintained, where feasible, or removed using other program funds or volunteers.

Alternative 2 - Proposed Action

The following proposed action was modified from the one scoped on November 14, 2014, and does not include the use of prescribed fire techniques in portions of the allotment to address fire condition class regimes. These treatments were removed to focus the actions of this analysis on actions specifically related to the reauthorization of grazing.

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

Authorization

The Mesa Ranger District, Tonto National Forest, proposes to authorize livestock grazing in the project area under the following terms:

Permitted Livestock Numbers

Proposed permitted use numbers will vary from 2,700 to 6,300 Animal Unit Months (AUMs¹⁶), year-long. Table 9 shows this range of numbers per unit based on estimated capacity numbers. A rotational system of grazing will be implemented which will allow plants an opportunity for growth or regrowth.

¹⁶ The amount of forage needed by an "animal unit" (AU) grazing for one month. The quantity of forage needed, based on the cow's weight, and the animal unit is defined as one mature 1,000 pound cow and her suckling calf. It is assumed that such a cow nursing her calf will consume 26 pounds of dry matter of forage per day.

			Capacity Numbers
	Estimated Initial	Maximum Stocking –	Based on 2014
	Stocking	Upper Limit	Production Data
Unit	(cow/calf pairs)	(cow/calf pairs)	AUMs/Number
Cottonwood East	50 - 75	100 - 125	2 500/200
Cottonwood West	50 - 75	100 - 125	3,399/300
Cline	75 - 100	125 - 150	1,841/153
Dos S	50 - 75	100 - 125	2,524/210
Total	225 - 325	425 - 525	7,964/664

Table 9: Proposed Stocking Numbers Based on Estimated Production

These capacity numbers are based on 2014 production data collected at 22 Terrestrial Ecosystem Unit Inventory (TEUI) map units throughout the allotment¹⁷, trend data, apparent trend ratings, historical grazing numbers and management, and permittee knowledge and experience.

Availability of forage for livestock is based upon topography (slope), distance to water, and type or class of livestock. Adjustment to the total production for these variables can have an effect on stocking rate and identify opportunities for installation of additional range infrastructure such as water developments (NRCS, 2009). Table 10 below indicates the general guidelines for determining the amount of adjustment.

Table 10. Aujusti	icit l'actors in Det	ci mining Capacity	
Distance to Water	Percent		Percent
(feet)	Adjustment	Percent Slope	Adjustment
2640	100	0 - 15	100
5280	90	15 - 30	70
7920	70	31 - 60	40
10560	50	>60	0

 Table 10: Adjustment Factors in Determining Capacity

When determining capacity numbers, Tonto National Forest Geographical Information System (GIS) data were used to evaluate forage availability based upon topography. Locations of all existing range improvements on the Tonto National Forest, including the Sunflower allotment, have not been inventoried using a Global Positioning System (GPS) device and added to the *Structural Improvement* GIS layer in the corporate database. Therefore, the District used available GIS data, range improvement maps, satellite imagery, and permittee/district personnel knowledge to identify improvement locations to adjust capacity based on distance to water.

Initial stocking, within any given unit, will not occur until all existing water developments (windmills, pipelines, storage tanks, dirt tanks, and troughs) and new and/or existing unit/pasture fences (interior and allotment boundary) are functional and maintained to Forest Service Standard as required in *Forest Service Manual 2240.41(a)*. Prior to any livestock returning to the allotment, a unit/pasture inspection will be conducted by Forest Service personnel and the permittee/manager to evaluate range condition, water distribution, and availability, and ensure improvements are functional.

¹⁷ Capacity estimates are based on average herbaceous forage production collected from March through May 2014, considering forage consumption of ungulates, per AUM. Capacity adjustments were made for conservative forage utilization guidelines (30-40 percent) distance from water and percent slope (Holechek *et al.* 2004).

Initial stocking numbers, within any given unit, will not exceed those listed in the "Estimated Initial Stocking' numbers listed in Table 9. 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 Mesa District Ranger with the permittee based on the results of monitoring and successful implementation of management practices. Other considerations include development of new range improvements, forage utilization patterns, economic factors, and climate forecasts. Typical increases may be around 15 percent annually, up to the upper limit shown in Table 9. For example, for the Cline Unit it will take four to five years to reach the maximum stocking limit at an approximately 15 percent increase per year.

Grazing System

Livestock will be grazed using a rotational system. Stocking rates, within each unit, will be independent from the other units and managed as separate herds. The Otero, Ranger Station, Sycamore Creek Riparian, and Adams—west of State Route 87—pastures within the Dos S Unit, and the Desert Unit, will be placed into non-use (approximately 56,724 acres total). Non-use within these units/pastures will benefit riparian resources and sensitive species concerns associated with Sycamore Creek and Mesquite Wash. Additionally, non-use will benefit Sonoran Desert tortoise populations and habitat known to occur in the Adams pasture and remove conflict between heavy recreational pressure and livestock grazing practices. Non-use will continue until such time as a new environmental analysis is conducted to show the need for these pastures and the effects of authorizing grazing within them. Table 11 includes the proposed unit/pasture scheme, as well as the 2014 estimated AUMs and approximate acreage of each.

			Proposed	
Unit	Pastures	Approximate AUMs [†]	AUMs/Unit	Acreage
Cline	Ballantine	708	900 - 1,800	6,228
	Cline	714		5,613
	Mud Springs	419		4,307
				Total: 16,148
Cottonwood	Adams	283	600 - 1,500	2,426
Unit West	North	1159		12,469
	South	550		9,819
				Total: 24,714
Cottonwood	Alder Creek	648	600 - 1,500	11,051
Unit East	Cane Springs North	388		5,167
	Cane Springs South	571		10,822
				Total: 27,040
Dos S	Maverick	567	600 - 1,500	5,296
	Picadilla	1089		11,205
	Pine Creek	868		13,482
				Total: 29,983
Totals		7,964	2,700 - 6,300	97,885*
[†] Based on 2014 Production Data				

 Table 11: Proposed Unit/Pastures Including Estimated and Proposed AUMs and Acreage

*This number does not include the acreage associated with the various traps and corrals used for livestock management.

The reconfiguration of the Cline, Cottonwood (East and West), and Dos S Units will primarily be accomplished using existing fencing and natural barriers; however, there are a couple of known locations where short sections of new unit and/or pasture boundary fences or gap fencing will be constructed. When natural boundaries are used, livestock drift can occur along roads, trails, and drainages, if accessible to livestock. Active management practices such as herding and salting can be used to minimize this. However, if these management practices don't correct livestock from drifting between pastures, the permittee will be responsible for immediately locating areas of drift and installing fence to ensure livestock remain in the appropriate pasture. Additionally, each unit herd will be ear tagged using different colored tags in order to differentiate between unit herds. This will be required to ensure that livestock are within their designated units; and if not, identify locations where additional gap fencing may be needed.

Each unit will be managed using a rotational grazing system, in which pastures within each unit will receive periodic deferment allowing for plant physiological needs in order to achieve desired resource conditions¹⁸. Pasture use periods will be kept flexible to the extent possible in consideration of estimated AUMs. Actual pasture season of use each year will depend on observed resource conditions. The grazing period within each pasture will be based upon weather/climate conditions, water availability, current growing conditions, and the need to provide for plant regrowth following grazing. The length of the grazing period within each pasture will also be considered and managed for the desired grazing intensity and utilization guidelines.

¹⁸ Desired resource conditions and management objectives for each resource area are identified and discussed in Chapter 3 of this analysis.

Management Tools

If monitoring indicates that desired resource conditions outlined in Chapter 1 are not being achieved, in the desired time frame or areas for this allotment, there are tools, or administrative actions that will be used to modify management. Such changes may include annual administrative actions to adjust the specific number of livestock and/or animal unit months, specific dates for grazing, class of animal, or pasture rotations. These changes will not exceed limits for timing, intensity, duration, and frequency, as described in the proposed action.

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

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

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

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

- Extending or shortening time in a pasture based on utilization levels in uplands and riparian areas;
- Assessing the readiness of a pasture and changing its position in the rotation for the season;
- Time or season of pasture use;
- Resting a pasture for one or more growing seasons;
- High intensity, short duration, or other grazing system;
- In the event of extended drought, severe fire, or depleted rangelands, complete removal of livestock until rangelands have recovered;
- Decrease or increase herd size within the limits of the permitted numbers;
- Temporarily closing off water in a portion of a pasture to manipulate grazing pressure and intensity of use;
- Use of salt and mineral blocks to aid in distribution, especially away from critical areas such as riparian areas;
- Herding livestock;
- Excluding livestock from specific areas temporarily or permanently for other resource objectives; or
- 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 strategies;
- Generate documentation necessary in the AOI and/or permit and allotment files for the action to be implemented; and
- As necessary, conduct additional site specific surveying, such as for cultural resources.

Range Improvement Infrastructure

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. Existing range improvement infrastructure must be brought up to agency standard prior to installing any new developments. An exception to this could be that a particular existing improvement is determined, because of location, competing uses, livestock needs, or type is determined to no longer be feasible or necessary to maintain. Such improvements will then be removed. Allotment administration will determine whether identified structural improvements are necessary or need to be modified.

The effects of adding infrastructure such as fencing or waters to achieve resource objectives in the future will be disclosed in this document and tiered to this EA. All new structures will have heritage clearances prior to implementation. Additional sideboards include the following:

- New spring developments will be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering.
- Any new spring developments will be fence to exclude livestock access, with a trough(s) provided outside of the exclosure to provide water to livestock and wildlife.
- New troughs will be placed in the uplands, at least 300 feet away from riparian areas.
- New fencing will 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 18 inches to allow wildlife to safely pass under.
- Old fence material will be removed from the forest when fence is replaced or repaired;
- New troughs, supplements, and/or salt will not be located within .25 miles of the Sonoran Desert tortoises' preferred habitat, which includes rocky, boulder-covered hills and mountains in Sonoran Desert scrub habitat. This will help ensure that livestock congregation areas (near water) are outside of tortoise foraging areas.
- Place supplements where forage is abundant and current grazing use levels are low. Supplements should not be placed at any one location more than once during the grazing season to prevent concentration of livestock.
- Improvements proposed within Sonoran Desert tortoise habitat, will require preconstruction surveys and monitoring to ensure that individual tortoises are not present within the action area.

The following improvements will be constructed in order to facilitate livestock distribution throughout the allotment and assist in achieving the desired conditions and management objectives set forth in this analysis. The proposed fencing projects listed below will be installed prior to any livestock returning to the affected units/pastures. However, it is not necessary for the

proposed additional water developments to be completed in a specific order or even in the same year. At present, funding has not been secured for the implementation of the proposed water developments. Examples of potential funding sources include individual allotment permittee funding, permittee labor matches, a variety of potential grants and Range Betterment Funds. Implementation of the proposed range improvement infrastructure will be based on available funding and management objectives.

Proposed Fencing:

- Installation of an exclosure fence above and below Hidden Water Spring (T3N, R9E, Section 21) to allow riparian vegetation above and below the spring to improve. The spring itself is currently fenced to exclude livestock access to protect an established Gila topminnow population. The trough located outside of the current exclosure, which is fed by the spring, will remain in place to provide water for livestock. This location is within the Four Peaks Wilderness, so no mechanized or mechanical equipment can be used during installation. The installation of this type of improvement is provided for under the Wilderness Act establishing the Four Peaks Wilderness and the Forest Plan for MA 3D.
- Two sections of fence separating the Dos S Unit, Picadilla Pasture, and the Ballantine Pasture of the Cline Unit (T5N, R9E, Section 31). The remaining unit division will be accomplished using natural barriers.
- Installation of two sections of fence within the proposed Cottonwood West Unit to separate the North and South pastures (T4N, R9E, Sections 29 and 32; and T3N, R9E, Section 3).

Proposed Water Developments:

- Addition of a storage tank—equal to or less than 10,000 gallons—off Forest Service Road 3484 (T4N, R9E, Section 3) to supply water to a new 300 gallon trough in the Cline Unit/Cline Pasture (T5N, R9E, Section 34).
- Install a new pipeline from the existing Mountain Spring pipeline, to convey water to a new 300 gallon trough in Cline Unit/Ballantine Pasture. This pipeline currently conveys water to four troughs along its length (T5N, R9E, Section 34).
- Addition of a storage tank—equal to or less than 10,000 gallons—off Forest Service Road 3537 in the Dos S Unit/Maverick Pasture (T6N, R8E, Section 35). Water will be hauled to fill new tank. Pipeline will convey water from tank to a new 300 gallon trough (T5N, R8E, Section 2).
- Addition of a storage tank—equal to or less than 10,000 gallons—on the existing Mud Springs pipeline in the Dos S Unit/Pine Creek Pasture. This pipeline currently conveys water to four troughs along its length (T5N, R9E, Section 5).
- Addition of a storage tank—equal to or less than 10,000 gallons—in Rolls Trap (Cottonwood West Unit/South Pasture) (T3N, R8E, Section 1) to supply water to a new 300 gallon trough (T3N, R9E, Section 6). Water to fill the storage tank will be hauled to tank.
- In the Cottonwood West Unit/South Pasture, install approximately 1 mile of pipeline from an existing well (Cottonwood) to convey water to a new trough to be located in the uplands south of the well (T3N, R9E, Sections 8 and 17).
- Addition of a storage tank—equal to or less than 10,000 gallons—at the head of Mine Mountain Spring in Cottonwood West Unit/North Pasture (T4N, R9E, Section 9). Tank will supply water to the existing five troughs along the pipeline. Additionally, a pipeline and trough will be added to an existing trough along the pipeline (T4N, R9E, Sections 17 and 20). The new pipeline and trough will be installed within the Four Peaks Wilderness.

The installation of this type of improvement is provided for under the Wilderness Act establishing the Four Peaks Wilderness and the Forest Plan for MA 3D.

Monitoring

Forage utilization will be managed at a level corresponding to light to moderate grazing intensity in order to provide for grazed plant recovery, increases in herbage production, and retention of herbaceous litter to protect soils. Conservative use equates to 30 to 40 percent on herbaceous species and less than 50 percent use on browse. Consistent patterns of utilization in excess of 40 percent on key species in key areas will be used as a basis to modify management practices or take administrative actions necessary to reduce utilization in subsequent grazing seasons. It is inherent in the term "conservative use" that watershed conditions and vegetative ground cover will be optimized as appropriate to various range sites. At no time will excessive use be considered acceptable.

The goal is to achieve conservative use in the uplands over successive years. This strategy recognizes the importance of the annual operating instructions in allowing for modification of management. These actions include, but are not limited to; adjustments of timing, intensity, frequency, and duration of grazing to reach resource objectives (FSH 2209.13 - Chapter 90). The document, *Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands* (Smith *et al.*, 2005), will provide guidance for utilization data collection and interpretation.

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

Effectiveness Monitoring

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

Changes in riparian vegetation and stream channel geomorphology condition and trend will 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.

Implementation Monitoring

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

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

Information will be collected through routine pasture inspections and end of season utilization monitoring. Specific schedules for monitoring will 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, will ensure that wildlife needs and riparian and watershed conditions were moving toward desired conditions.

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

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

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

Riparian Utilization Monitoring

Riparian components in key reaches will be monitored using riparian utilization measurements (implementation monitoring) following methods in *Sampling Vegetation Attributes and Utilization Studies and Residual Measurements* (ITR, 1996, revised 1999) and *Multiple Indicator Monitoring (MIM) of Stream Channels and Streamside Vegetation* (Burton, *et al.* 2011) or the most current acceptable method.

In order to achieve Forest Plan Standards and Guidelines the following use guidelines for riparian components are as follows: *obligate riparian tree species* – limit use to less than 50 percent of terminal leaders (top one third of plant) on palatable riparian tree species accessible to livestock (usually less than 6 feet tall); *deergrass* – limit use to less than 40 percent of plant species biomass; *emergent species* (rushes, sedges, cattails, and horsetails) – maintain six to eight inches of stubble height during the grazing period.

The Forest Plan limits use to 20 percent of tree and shrub annual production *by volume*. The percent of leaders browsed was chosen as a surrogate guideline in place of percent volume because volume is an extremely difficult parameter to assess on an annual basis. The method employed for determining the percent of leaders browsed is an expedient and repeatable sampling technique. Mathematical relationships between the number of twigs browsed and percent of current annual growth removed have been established in previous studies (Stickney, 1966; USDA Forest Service, 1991a).

Utilization limits for herbaceous riparian vegetation are intended to do two things: 1) protect plant vigor and 2) provide physical protection of streambanks or the sediment on the greenline that could develop into a bank feature. Deergrass was selected as the key species to monitor because it is the most common obligate, riparian, native, perennial grass on the Tonto National Forest. Additionally, deergrass exhibits a number of traits that make it an ideal stream-stabilizing plant. The above ground attributes of deergrass aid in preventing soil loss through decreasing flow velocity, they also trap sediment which aids in the rebuilding of stream banks. Furthermore, deergrass is a bunchgrass with an extensive root system which acts to stabilize streambanks (Cornwall, 1998; Coppin, 1990; Clary and Kruse, 2003).

Monitoring short-term indicators, such as stubble height and woody utilization, during the grazing season, can help determine if grazing use criteria is moving riparian conditions toward management objectives over time (Burton, *et al.* 2011).

Once riparian utilization guidelines are met, cattle will be moved from the riparian area or to the next scheduled pasture, even though forage may still be available in the uplands. Actual use records in combination with utilization measurements will inform if it may become necessary to minimize or remove access to riparian habitat, if grazing pressure becomes a limiting factor in the use of pastures. Allowable use for riparian and upland vegetation is summarized in Table 12.

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

Table 12: Upland and Riparian Utilization Guidelines

Heritage Resource Monitoring

In accordance with Appendix H, the *Standard Consultation Protocol for Rangeland Management of the First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities* between the USDA Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation, signed December 24, 2003, monitoring will be conducted as part of the day-to-day activities of the professional cultural resource specialists and certified para-archaeologists working in the area. Grazing allotments cover most of any given forest, and when archaeologists are in the field conducting surveys, they are most likely surveying within a grazing allotment. The archaeologists will use these opportunities to observe and report on grazing activities, the effectiveness of the grazing strategy, and potential impacts to heritage resources. Any incidents of damage to historic properties from grazing will be reported, and the archaeologists will draw upon the protection measured outlined in the Protocol to ensure that the effects are avoided or minimized.

Invasive Species Monitoring

Invasive species known to occur within the project area will be treated as necessary. Permittee, Forest Service, or cooperators will coordinate weed inventory and treatment. Invasive species monitoring is carried out at the same time as allotment inspections are conducted and will follow monitoring practices established in the Environment Assessment for Integrated Treatment of Noxious or Invasive Weeds as detailed in the decision notice and finding of no significant impact, page five (August 2012). As noxious weed populations are found they are mapped, monitored, and treated. Treatment methods will follow guidelines established in the Environment Assessment for Integrated Treatment of Noxious or Invasive Weeds, with a decision notice signed on August 24, 2012.

Management Practices and Mitigation Measures

Range

Livestock management practices such as herding and salting are critical to achieve proper livestock distribution within each unit/pasture. The permittee will be required to furnish sufficient riders or herders for proper distribution, protection, and management of cattle on the allotment. Tonto National Forest Grazing Practices are as follows:

- Forest Plan Standards and Guidelines applicable to livestock grazing will be followed (Forest Plan, p. 24).
- Salt and/or supplements will be placed where forage is abundant and current grazing use levels are low. Salt and/or supplements will not be placed any closer than .25 miles from developed or live water, recreation sites, or designated trails except where prior written approval had been obtained from the District Ranger.
- No salting will occur within or adjacent to identified heritage sites. Salt will be removed from pastures when cattle have left an area, and not placed within a pasture until the cattle arrive. Additionally, salt will not be placed in the same location(s) each year.
- All troughs will be left full of water and operational year round for wildlife accessibility, unless in limited circumstances where extreme freezing conditions may damage facilities.
- When entering the next scheduled pasture, all livestock will be removed from the previous pasture within two weeks (dependent on terrain). This is critical for pastures with key riparian reaches.
- Permittee will ensure that enough time is allowed to remove livestock to meet the pasture move date(s) and avoid unauthorized and excess use.
- Permittee will ensure all infrastructures are in functioning condition prior to entering the next scheduled pasture.

Travel Management

The permittee will continue to access the allotment on existing roads and trails as designated by Forest maps to avoid the creation of illegal off-highway vehicle (OHV) trails. Road maintenance that is required to access range improvements or livestock management must receive a road use permit for any road work. Tonto National Forest is currently planning the implementation of Travel Management Rule. These programs are aimed at reducing non-essential roads for watershed and resource protection and will require the following:

- Travel Management Decision will be followed by the permittee.
- If access is needed to enter a motor vehicle restricted area, the permittee must have special authorization through an OHV Permit or special authorization through the AOI.

Road maintenance that is required to access range improvements or livestock management must receive a road use permit for any road work. In the event of significant future deviations from "current access needs" for motorized use as authorized by a Term Grazing Permit, there may be the requirement for additional environmental analysis on a site-specific basis, to comply with NEPA. The AOI authorizing each year's grazing activity will include a brief discussion of the use of vehicles and OHVs within the designated road system, any single purpose use roads or trails, and a description of the annually anticipated level of cross-country travel and access consistent with Part 3 of the term grazing permit and/or AMP.

Wilderness

Management emphasis for wilderness is on wilderness values. It provides for livestock grazing and recreation opportunities that are compatible with maintaining wilderness values and protecting resources. Section 4(c) of the *Wilderness Act of 1964* defines minimum requirements for administrative actions in wilderness areas, which includes grazing. Wilderness resources must be considered when preparing range improvement construction standards and techniques (2323.26a).

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

Compliance with the *Wilderness Act* in the Four Peaks Wilderness area is important and expected of all users on the allotments. The permittee should strive to maintain the untrammeled, natural conditions within wilderness areas. No motorized equipment should be used in wilderness areas without obtaining authorization from the Regional Forester.

Wildlife

Since site specific information regarding precise location and timing of the various and projects described above (water developments, pastures and fencing) are not available at this time, the Forest Service will implement the following actions to protect listed species:

- The Forest Service will conduct site specific analysis of effects to listed species and/or proposed species or designated and/or proposed critical habitat before projects are implemented.
- If the Forest Service determines that projects "may affect" any listed and/or proposed species or designated and/or proposed critical habitat, section 7 consultation with the Service will be reinitiated.
- All water developments will include wildlife access and escape ramps. When possible, waters will be kept available to wildlife year round.
- All fencing will be built to Forest Service standards to provide for wildlife passage through the fence. At a minimum, this will be a four-strand fence with smooth bottom wire 18 inches off the ground and a total height of 42 inches or less.
- Conservative forage utilization standards (30 40 percent) outlined in the proposed action will provide for adequate levels of residual plant cover to maintain fruits, seeds, and allow for plant regeneration in Mexican spotted own critical habitat.
- Livestock exclosure fences around Mud and Hidden Water Spring will be maintained to prevent unauthorized livestock access.
- Improvements proposed within Sonoran Desert tortoise habitat, will require preconstruction surveys and monitoring to ensure that individual tortoises are not present within the action area.
- New troughs, supplements, and/or salt will not be located within .25 miles of the Sonoran Desert tortoises' preferred habitat, which includes rocky, boulder-covered hills and mountains in Sonoran Desert scrub habitat. This will help ensure that livestock congregation areas (near water) are outside of tortoise foraging areas.
- The proposed action includes a rotational grazing strategy that provides annual and seasonal rest. This management strategy will allow for plant growth and reproduction throughout the allotment. Additionally, conservative utilization guidelines will ensure adequate residual vegetation to support tortoise forage requirements.
- Existing vehicular travel routes, trails, and/or channel crossing will be used to reduce soil, vegetation, and human disturbance to tortoise.
- Reduce soil and vegetation disturbance when conducting ranch activities. When practicable, livestock will be moved using established trails, roads, travel routes, and channel crossings.

• Implement grazing management practices to achieve or make significant¹⁹ progress toward meeting desired conditions within tortoise habitat.

Heritage

Mitigation of impacts to heritage resources is best accomplished by avoidance of these properties by the placement and construction of all range improvements. It can also be achieved by minimizing opportunities for the localized concentration of animals, improving distribution across the allotment and across each pasture, and by reducing the intensity of grazing for the allotment as a whole. In instances where proposed improvements will involve any potential for ground disturbance, such as stock tanks and other water developments, a 100 percent archaeological survey will be conducted for areas which have no previous survey coverage, or have outdated surveys, which do not conform to current standards. Other, more specific mitigation requirements may be identified as each of these improvements is developed and a heritage inventory is made of their areas of potential effect. Such protective measures are developed in accordance with the goals of the project, taking into account site vulnerability as well as the methods of project implementation. All inventoried heritage sites are treated as eligible for the National Register of Historic Places with the exception only of those that have been formally determined to be not eligible in consultation with SHPO. Archeological clearance must be approved with all necessary consultation with SHPO and the potentially interested Tribes prior to issuing any decision regarding the construction, modification, or removal of all improvements. This approach, based on long-term consultation with SHPO and on Region 3 policy as embodied in the First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities between the USDA Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation, signed December 24, 2003, and specifically, Appendix H, the Standard Consultation Protocol for Rangeland Management developed pursuant to Stipulation IV.A of the *Programmatic Agreement* is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

Protection measures identified under the *Protocol* include:

- Archaeological survey will be conducted for areas proposed for surface disturbance which have no previous survey coverage, or have outdated surveys, which do not conform to current standards.
- Relocation or redesign of proposed range improvements and ground-disturbing management practices to avoid direct and indirect impacts to historic properties.
- Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing use.
- Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing.
- Periodic monitoring to assess site condition and to ensure that protection measures are effective.

¹⁹ The term "significant" in this context is from the USFWS concurrence letter and relates to the Endangered Species Act, not NEPA.

Other mitigation measures involving data recovery, for example, may be developed and implemented in consultation with the SHPO as the need arises. The appropriate tribes will be consulted, if the mitigation is invasive or if it affects a TCP or other property of concern for them.

Riparian

The following are riparian mitigation measures:

- Installation of an exclosure fence above and below Hidden Water Spring (T3N, R9E, Section 21) to allow riparian vegetation above and below the spring to improve. The spring itself is currently fenced to exclude livestock access to protect an established Gila topminnow population. The trough located outside of the current exclosure, which is fed by the spring, will remain in place to provide water for livestock. This location is within the Four Peaks Wilderness, so no mechanized or mechanical equipment can be used during installation. The installation of this type of improvement is provided for under the Wilderness Act establishing the Four Peaks Wilderness and the Forest Plan for MA 3D.
- All existing and new developed springs will be fenced to exclude livestock access. A trough(s) will be located outside of the exclosure to provide water for wildlife and livestock.
- Livestock will not be trailed through riparian areas.
- Salt and/or mineral supplements will be placed at least .25 miles from riparian areas.
- New spring developments will be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering.
- New troughs will be placed in the uplands, at least 300 feet away from riparian areas.

Invasive Species

As noxious weed populations are found they are mapped, monitored, and treated. Treatment of invasive species will be carried out in accordance with practices established in the Environment Assessment for Integrated Treatment of Noxious or Invasive Weeds as detailed in the decision notice and finding of no significant impact, pages three and four (August 2012).

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative (Table 13). A more detailed analysis will be included in Chapter 3.

Resource	Alternative 1- No Action (No Grazing)	Alternative 2-Proposed Action
Upland Vegetation and Watershed Condition	 Minimal effects from light grazing by wildlife Maximum physiological growth requirements of the forage plants will be provided Likely increase in desirable forage plant densities, litter, species composition, vigor, and biomass Allow for the most rapid rate of improvement in soil and vegetation condition, density, 	 Effects identical to Alternative 1 in non-use areas of the Allotment In grazed areas, livestock will remove current year's vegetation growth. Physiological growth requirements of the forage plants will be met Under light to moderate grazing intensity (32 – 43 percent), desirable forage plants will likely maintain or increase in density, litter, species composition, vigor, and biomass.
	• Greatest potential to reduce plant stress	 Rate of recovery of impaired

Table 13: Comparison of Alternatives by Resource

Resource	Alternative 1- No Action (No Grazing)	Alternative 2-Proposed Action
	from climate change	vegetation and soils may be slower.Plant stress from climate change will continue
Soils	 Will provide the fastest increase to vegetative cover, species diversity, and improvement to soil condition Erosion will be lessened in riparian soils which depend on plants to hold soils in place. Will provide the quickest and most likely recovery from soil compaction due to past grazing activities Most likely to increase the cover of biological crusts and their ecological benefits The effects of removing improvements will be a minor, localized, short-term disturbance to soils. Greatest recovery of soils and chaparral communities affected by fire 	 Effects identical to Alternative 1 in non-use areas of the Allotment Under conservative use of 30 - 40 percent slopes, soils in impaired condition will be maintained, and may improve over time. Conditions of soils in unsatisfactory conditions should be maintained, but are unlikely to improve within the time frame of this project. Unsatisfactory soils within the allotment that will be grazed will likely take longer to improve. Development of biological crusts in grazing areas will be slowed or inhibited. The effects of removing or construction of water or range improvements will be a minor, localized, short-term disturbance to soils, but will protect excluded soils from further damage by livestock. Reduced recovery of soils and chaparral communities affected by fire
Hydrology, Riparian, and Watersheds	 Stream channel and riparian area recovery will be optimized Will maintain or improve the existing condition of the upland portion of the watersheds Riparian vegetation condition and large woody debris will be expected to improve in the Cane Spring Canyon and Middle Sycamore Creek watersheds. 	 Effects identical to Alternative 1 in non-use areas of the Allotment, as well as in pastures permitted for grazing where cattle will be excluded by fences. Riparian and stream channel condition will be maintained or improved with implementation of proper utilization guidelines. Potential effects to the reach below Tejanos Spring and Alder Creek. Slower recovery of the upland portion of the watersheds than Alternative 1. Grazed key reaches are expected to reach desired conditions at a slower rate. Riparian vegetation condition and large woody debris will be expected to improve in the Cane Spring Canyon and Middle Sycamore Creek watersheds.
Wildlife, Plants, and Fisheries	No change from current baseline condition for all wildlife, plants, and fisheries.	 Gila topminnow—no effect Desert pupfish—no effect Mexican spotted owl—may effect, but

Resource	Alternative 1- No Action (No Grazing)	Alternative 2-Proposed Action
		 will not likely adversely affect designated critical habitat Sonoran desert tortoise—may affect individual Sonoran desert tortoise, but will not result in a trend toward federal listing or loss of viability Bezy's night lizard—no effect on individuals or population viability Lowland leopard frog—may impact individuals, but is not likely to result in a trend toward federal listing or loss of viability Desert sucker—no effect on individuals or population viability Mapleleaf false snapdragon—no effect on individuals or population viability Hohokam agavemay impact individuals, but is not likely to result in a trend toward federal listing or loss of viability Mapleleaf false snapdragon—no effect on individuals or population viability Hohokam agavemay impact individuals, but is not likely to result in a trend toward federal listing or loss of viability MIS habitat is expected to improve over time, although at a slower rate and to a lesser degree than Alternative 1
Recreation and Wilderness	• No effect	 No effect in non-use areas Increase the number of recreationists/cattle encounters in both the wilderness and nonwilderness areas Recreationists may occasionally be visually impacted by cattle grazing near them May or may not encourage more responsible behavior by recreationalists Installed water improvements may benefit horseback and hunting recreationists No effect to outfitting and guiding operations
Invasive Species	No effect	No effect
Fire and Fuels	 Increased loading of fine fuels, annual and perennial grasses, and shrubs Faster burning fires with higher intensities increase effects on soils and vegetation Increased fuels could influence fire management strategies 	 Effects identical to Alternative 1 in non-use areas of the Allotment May control the growth and accumulation of fine fuels such as grasses and forbs Creates a more compact fuel bed reducing fire flammability and ability to spread Increases the efficiency of fire suppression activities
Heritage	 No effects from grazing Potential disturbance of heritage resources associated with the removal of range improvements and the roads 	 No effects from grazing at proposed stocking level Potential disturbance of heritage resources associated with the

Resource	Alternative 1- No Action (No Grazing)	Alternative 2-Proposed Action
	needed to access them	construction or removal of range improvements and the access roads needed to build and maintain them
Air Quality	 Effects from particulate matter will be minimized Use of roads in area will still occur and construction of improvements for wildlife or recreational benefit could still occur on the allotment Effects from surrounding areas and allotments will continue. 	 Minimal effects from particulate matter associated with livestock gathering (heavy trailing, increased vehicle movement) and during construction of range improvements Effects from surrounding areas and allotments will continue.
Climate	• Negligible effects unmeasurable at this scale	• Negligible effects unmeasurable at this scale
Socioeconomics	• Negligible effects	• Negligible effects

Chapter 3: Affected Environment and Environmental Consequences

This section summarizes the effects to the physical, biological, social, and economic environments from the No Action and Proposed Action alternatives.

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

Resource Reports

Each section in this chapter provides a summary of the project-specific reports, assessments, and input prepared by Forest Service resource specialists that are incorporated by reference in this Final EA. The following reports are incorporated by reference:

- Range Report (includes upland vegetation)
- Soils Report
- Watershed and Riparian Report (includes hydrology)
- Biological Assessment (BA) (includes wildlife, plants, and fisheries)
- Biological Evaluation (BE) (includes wildlife, plants, and fisheries)
- Management Indicator Species Report (includes wildlife, plants, and fisheries)
- Migratory Bird Report
- Recreation Report (includes Wilderness)
- Invasive Species Report
- Fire and Fuels Report
- Heritage Report
- Climate Report
- Socioeconomic Report

These reports are part of the project record on file at the Mesa Ranger District in Mesa, Arizona. Copies of these reports are available upon request by contacting Kelly Kessler, Project Leader, at (480) 610-3300 or by email at <u>kmkessler@fs.fed.us</u>.

Upland Vegetation

Some of the existing conditions for the upland vegetation within the Sunflower Allotment can be found in chapter 1 of this document. For brevity, this section will contain additional summary information as appropriate to help the reader understand the affected environment and environmental effects associated grazing authorization.

Affected Environment

Upland vegetation in the Sunflower Allotment can vary by unit and even pasture. However, the following is a list of vegetative types and the plants that comprise them:

- Interior chaparral is characterized by evergreen shrubs the most common being shrub live oak (*Quercus turbinella*). Other common shrubs include birchleaf mountain mahogany (*Cercocarpus montanus*), skunkbush sumac (*Rhus trilobata*), desert ceanothus (*Ceanothus spp.*), yellow silktassel (*Garrya flavescens*), Wright's silktassel (*Garrya Wrightii*), hollyleaf buckthorn (*Rhamnus crocea*), sugar sumac (*Rhus ovata*), and at higher elevations, manzanita (*Arctostaphylos pungens*). Inclusions of pinyon pine (*Pinus edulis*), juniper (*Juniperus spp.*), and ponderosa pine (*Pinus ponderosa*) are common within this community.
- Mixed communities are a mid-elevation mix of biotic communities that connect the Sonoran Desert scrub at lower elevation to the interior chaparral at higher elevations, as well as areas of semi-desert grassland biotic communities. Dominant shrub and sub-shrub species include; jojoba (*Simmondsia chinensis*), yellow paloverde (*Parkinsonia microphylla*), desert hackberry (*Celtis pallida*), fairyduster (*Calliandra eriophylla*), Wright's buckwheat (*Eriogonum Wrightii*), catclaw acacia (*Acacia greggii*), turpentine bush (*Ericameria laricifolia*), range ratany (*Krameria spp.*), snakeweed (*Gutierrezia sarothrae*), slender janusia (*Janusia gracilis*), pricklypear cactus (*Opuntia engelmannii*). Dominate herbaceous species include; curly mesquite (*Hilaria belangeri*), sideoats grama (*Bouteloua curtipendula*), and threeawn (*Aristida spp.*).
- Sonoran Desert Scrub is characterized by paloverde (Parkinsonia spp.) and various cacti, including saguaro. Dominate vegetation is perennial shrubs and small trees intermixed with various cactus species. Common shrub and sub-shrub species include; fairyduster (Calliandra eriophylla), jojoba (Simmondsia chinensis), turpentine bush (Ericameria laricifolia), desert globemallow (Sphaeralcea ambigua), Wright's buckwheat (Eriogonum Wrightii), menodora (Menodora spp.), desert hackberry (Celtis pallida), wolfberry (Lycium spp.), ocotillo (Fouquieria splendens) and range ratany (Krameria spp.). Annual grasses and forbs are common within the community with abundance varying considerably. Perennial grasses are also present, but far less common than exotic annuals such as red brome (Bromus rubens). Native perennial species include; curly mesquite (Hilaria belangeri), threeawn (Aristida), and sideoats grama (Bouteloua curtipendula).

Parker Three-Step monitoring sites (Cluster (C)) and pace transects (PT) were established in key areas on the allotment in the mid-1960s. This monitoring method was designed to measure long term vegetation condition, vegetation trend, soil stability, and soil trend. It collected both quantitative and qualitative data and provided a "scoring" technique for determining resource conditions. The score card approach in the data was intended to be directly tied to forage or specific resource values for livestock grazing (Ruyle and Dyess, 2010). The score card is based on very general plant species response to heavy grazing and is known to be a limited model of plant community dynamics. Primarily, species thought to be good forage plants or that had deep, fibrous roots were rated desirable. Undesirable plants were of low forage value or poorly adapted to holding soil in place. The intermediate group was composed of species between the 2 extremes or if little was known about the plant. Condition was calculated by scoring the individual species resulting in a qualitative rating of excellent, good, fair, poor, and very poor. These adjectives can become misleading when implying that they refer to general ecological trend. They primarily represent herbaceous for ge values for livestock.

Since the 1950s, the early range successional models have evolved to the current state and transition models in place today. Use of the terms excellent, good, fair, poor, and very poor

related to "range condition" is no longer used. But the data collected from the Parker 3-Step and subsequent monitoring techniques conducted "on top of" the old Parkers are still valuable information for determining trend. Apparent trend, as defined in *Sampling Vegetative Attributes* (ITT 1996) is used to determine if livestock management is meeting or moving towards the desired conditions.

Dos S Unit

The Dos S Unit encompasses approximately 79,500 acres north of Saguaro Lake. Permit number 12-690 issued August 4, 1993, permitted 650 cows/bulls yearlong and 237 natural increase for five months, with part of this increase kept on the unit and part moved to the Desert Unit. Management included movement between summer use and winter use areas (east and west pastures).

This unit was managed using a Santa Rita grazing system on six pastures plus one pasture managed for riparian objectives. Yearlong cow-calf with natural increase carried over. This plan required various range improvements, including 20 miles of fence and 12 cattle guards. The plan was to fence off the entire length of Sycamore Creek. The unit contains the following pastures; Adams, Otero, Maverick, Picadilla, Pine Creek, and Sycamore Creek Riparian. This Unit hasn't been grazed since 2002, when livestock were completely removed due to drought related resource concerns.

Unit Vegetation

Vegetation on the unit is comprised of the following; Sonoran desert scrub, mesquite bosque, mixed broadleaf deciduous riparian, interior chaparral, and desert grassland vegetation. Elevation ranges from 1,540 - 6,100 feet. Riparian on the Dos S Unit currently comprises approximately 3 percent of the total unit acreage.

The upland communities can be subdivided into three categories: 1) Interior chaparral, approximately 10,000 acres, is located along the east side of the unit. This vegetation type has been impacted the least by livestock grazing. The upper reaches of this community have historically shown little evidence of livestock use; 2) Mixed communities, approximately 16,000 acres, within this unit supports a mid-elevation mix of biotic communities that connect the Sonoran Desert scrub at lower elevation to the interior chaparral at higher elevations, as well as areas of semi-desert grassland biotic communities. This diversity makes this area the highest forage producer within the unit. Livestock use of this area has been variable with areas adjacent to water being heavily used while remote areas have received little to no use; and Sonoran Desert scrub, approximately 51,840 acres, where livestock use patterns are variable, with water availability being the controlling factor and where introduced species now provide considerable forage in the spring if adequate winter moisture is received.

Table 14 displays the historical data for the Dos S Unit using data gathered at Parker Three-step and pace transects.

Pasture	Cluster/ Transect	Date	Vegetation Trend
	PT 5	03/25/1965	Downward
		10/09/2002	Downward
		08/14/2012	Upward
		03/23/1965	Downward
Maverick		05/19/1977	Not Completed
	0.5	02/01/1984	Downward
	0.5	10/09/2002	Downward
		03/27/2007	Upward
		09/13/2012	Upward
Dina Craak	PT 7	04/07/1965	Stable
r me Creek		10/27/2002	Stable
	C 6	03/24/1965	Stable
Otero		02/09/1984	Stable
		10/08/2002	Downward
	С 9	07/09/1965	Stable
		11/16/1983	Stable
		10/08/2002	Downward
Adama		02/23/2012	Stable
Adams		08/03/1967	Downward
	C 13	02/17/1984	Downward
		10/07/2002	Downward
		08/15/2012	Upward

Table 14: Dos S Unit Parker Three-Step and Pace Transects

Livestock were completely removed from the allotment in 2002. Parker three-step data collected in 2002 and 2012 was compared to detect any changes in species abundance (composition) which may have occurred during the ten year non-use period:

- Cluster/Transect PT 5 (Maverick pasture):
 - **2002:** Calliandra (32 percent), curly mesquite (4 percent), buckhorn cholla (22 percent), prickly pear (13 percent), hedgehog cactus (7 percent), turpentine bush (5 percent), mesquite (6 percent), jojoba (2 percent), and three-awn spp. (less than one percent).
 - 2012: Calliandra (29 percent), curly mesquite (2 percent), buckhorn cholla (not listed), prickly pear (10 percent), hedgehog (8 percent), turpentine bush (2 percent), mesquite (not in transect), jojoba (2 percent), three-awn spp. (17 percent), and range ratany (6 percent).
 - The most notable changes in this key area is the 16 percent increase in three-awn spp. and the presence of range ratany (6 percent) noted in 2012, when absent in the 2002 monitoring.
- Cluster/Transect C5 (Maverick pasture)
 - **2002:** Calliandra (61 percent), three-awn spp. (4 percent), prickly pear (2 percent), curly mesquite (7 percent), sideoats grama (3 percent), hedgehog cactus (13 percent), catclaw acacia (1 percent), and broom snakeweed (1 percent).
 - 2007: Calliandra (58 percent), three-awn spp. (13 percent), prickly pear (1 percent), curly mesquite (7 percent), sideoats grama (3 percent), hedgehog cactus (3 percent), catclaw acacia (1 percent), and broom snakeweed (less than1 percent).
 - **2012:** Calliandra (52 percent), three-awn spp. (16 percent), prickly pear (12 percent) curly mesquite (3 percent), sideoats grama (1 percent), hedgehog cactus (2 percent), catclaw acacia (3 percent), and broom snakeweed (6 percent).

- The most notable changes seen are an increase in three-awn spp. from 4 percent in 2002 to 16 percent in 2012. However, prickly pear, and broom snakeweed have also increased during this period.
- Cluster/Transect C9 (Adams pasture)
 - **2002:** Calliandra (37 percent), hedgehog cactus (14 percent), buckhorn cholla (15 percent), flat-top buckwheat (6 percent), jojoba (6 percent), and range ratany (4 percent).
 - 2012: Calliandra (25 percent), hedgehog cactus (1 percent), buckhorn cholla (13 percent), flat-top buckwheat (5 percent), jojoba (8 percent), range ratany (trace), three-awn spp. (29 percent), and menodora (6 percent).
 - The most notable changes in this key area were the 29 percent increase in threeawn spp. and a 6 percent increase in menodora. In 2002, these species were present within the 50'x150' plot; however, they were not detected within any of the three transects. Also noted was a decrease in calliandra (12 percent), hedgehog cactus (10 percent), and range ratany (4 percent) from 2002 to 2012.
- Cluster/Transect C13 (Adams pasture)
 - **2002:** Calliandra (53 percent), three-awn spp. (9 percent), brittlebush (3 percent), janusia (2 percent), catclaw acacia (4 percent), and prickly pear (4 percent).
 - **2012:** Calliandra (41 percent), three-awn spp. (9 percent), brittlebush (4 percent), janusia (3 percent), catclaw acacia (13 percent), and prickly pear (8 percent).
 - The most notable changes were an increase in catclaw acacia and prickly pear, 9 percent and 4 percent respectively.

Additional Factors within Unit

The Dos S Unit, due to its close proximity to the Phoenix metropolitan area, receives intense recreational use including; OHV use (i.e. ATV's, motorcycles), target shooting, hiking, and horseback riding. An extensive network of primarily user created trails and two track roads have been created primarily within the Adams, Otero, and Sycamore Creek Pastures. This heavy recreational use has resulted in the following problems and conflicts with the livestock operation; vandalism of range improvements, cutting of Unit boundary fences, livestock harassment, and damage or destruction of forage resources through the creation of new trails.

The fence that was constructed to exclude the Sycamore Creek Riparian pasture from grazing (1994 DN) was completed (John Whitney, personal communication, November 2, 2012); however, large sections of the fence have been cut, removed, and/or destroyed by recreation users over the years.

Improvements

In addition to corral, trap, unit, and allotment fence maintenance, the following springs, pipelines, storage tanks, and stock tanks have not been maintained or cleaned out and are in need of repair with the Dos S Unit (Table 15).

Improvement Name	Improvement Type	Improvement Number
Highway Tank	Earthen Stock Tank	002215/341050
Ranger Station Well/Storage	Water Storage	002219/341054
Dos S Spring	Spring Development	002223/341058
Jano Gordo Well/Storage	Masonry Water Storage	002224/341059
Boulder Mountain Spring	Spring Development	002225/341060

Table 15: Range Improvements within Dos S Unit

Mine Mountain Spring/Pipeline	Spring Development	002228/341061
Pine Mountain Spring	Spring Development	002244/341072
Medlers Seep	Spring Development	002246/341073
Lower Well Water Storage	Water Storage	002247/341074
Brush Corral Spring	Spring Development	002252/341076
Mesquite Well Water Storage	Water Storage	002257/341081
Mud Spring	Spring Development	002259/341083
Hughes Tank	Earthen Stock Tank	002206/341041
Otero Tank	Earthen Stock Tank	002212/341047
Quartz Tank	Earthen Stock Tank	002213/341048
Mud Spring Pipeline	Steel Pipeline	002260/341083
Tunnel Spring	Spring Development	002265/341087
Hughes Pasture Tank No. 1	Earthen Stock Tank	002326/341143
Hughes Pasture Tank No. 2	Earthen Stock Tank	002327/341144
Camp Creek Spring	Spring Development	002329/341146
Hughes Well	Vertical Drilled Well	000716/341001
Otero Spring	Spring Development	000719/341002
Mesquite Spring	Spring Development	000730/341004

Desert Unit

The Desert unit of the Sunflower allotment includes approximately 19,300 acres of Sonoran desert scrub along the south end of the allotment. Elevations range from 1,600 feet near the Salt River to 2,250 feet. The unit is bounded on the south by the Salt River (Saguaro Lake), to the west by Highway 87, to the east by the Cottonwood unit, and the north by the Cline unit. This area is characterized by a series of ridges and drainages that run north and south. Slopes are gentle to moderately steep comprised primarily of decomposed granite. Accelerated erosion occurs in areas where little perennial vegetation exists. There is no riparian habitat on the Desert unit.

Unit Vegetation

The Desert unit has historically been used as a seasonal unit from October 15 through May 15, when annual precipitation (winter) provided for the production of annual grasses and forbs. Livestock use was a combination of a limited number of adult cull cows and yearlings from the Dos S, Cottonwood, and Cline units. Because this unit is dependent upon annual precipitation, considerable variation in production occurs from year to year. The primary browse species within this unit is jojoba, however, additional palatable browse species includes; range ratany, wolfberry, and calliandra. Three-awn species are the dominant perennial grass species within this unit.

Table 16 displays the historical data for the Dos S Unit using data gathered at Parker Three-step and pace transects.

Cluster/ Transect	Date	Vegetation Trend
DD	10/07/2002	Downward
FD	08/16/2012	Stable
	07/09/1965	Stable
PT 1 (C10)	10/21/1983	Stable
P1 1 (C10)	02/10/1992	Stable
	10/07/2002	Downward

Table 16	: Desert	Unit Parker	Three-Ster	and Pace	Transects
	· Dusuit			anu i acc	11 anscets

Cluster/ Transect	Date	Vegetation Trend
	08/20/2012	Stable
	08/03/1967	Stable
C 14	02/16/1984	Stable
	01/23/1992	Stable

Livestock were completely removed from the allotment in 2002. Parker three-step data collected in 2002 and 2012 was compared to detect any changes in species abundance (composition) which may have occurred during the ten year non-use period. It is important to note that in 2002 the transect stakes were not relocated, so three paced transects were completed in the general vicinity (approximately one acre) of the Parker location. In 2012, the original Parker three-step transects were relocated and read. Therefore, the comparison between 2002 and 2012 data may be slightly skewed:

- Cluster/Transect C10
 - 2002: Triangle-leaf bursage (33 percent), range ratany (19 percent), wolfberry (16 percent), globe mallow (9 percent), Mormon tea (5 percent), whitethorn acacia (5 percent), and three-awn spp. (4 percent).
 - **2012:** Triangle-leaf bursage (80 percent), range ratany (3 percent), wolfberry (2 percent), globe mallow (1 percent), Mormon tea (1 percent), whitethorn acacia (1 percent), and three-awn spp. (10 percent).
 - The data show a marked increase (47 percent) in triangle-leaf bursage and an increase (6 percent) in three-awn spp. The remaining dominant browse species decreased in the key area.
 - The Parker Three-Step and pace transects located within Desert Unit (PD, C10, C12, and C14) show that vegetation ratings are very poor or poor and soil ratings poor or fair. However, these data also indicate that vegetation and soil trends became stabilized or improved between 2002 and 2012. This trend may be due to changes in precipitation levels, removal of livestock, or a combination of both.

Additional Factors within Unit

Much of the Desert Unit was burned in 1996 by the 9,000 acre "River Fire". The Unit was not rested after the fire.

The Desert Unit is frequently referred to as "The Rolls", and receives very heavy recreational impacts by OHV users. An extensive network of trails and two-track roads has been created by this use. The heavy recreational use on the unit results in the following problems and conflicts with the livestock operation; vandalism of range improvements, cutting of unit boundary fences, livestock harassment, and damage or destruction of forage resources through the creation of new trails.

Improvements

In addition to corral, trap, unit, and allotment fence maintenance, the following stock tanks shown in Table 17 have not been maintained and are in need of cleaning out.

Improvement Name	Туре	Improvement Number
Brownie Stock Tank	Earthen Stock Tank	002201/341036
Palo Fiero Tank	Earthen Stock Tank	002202/341037
Bagley Tank	Earthen Stock Tank	002204/341039

Table 17: Range Improvements within Desert Unit

Improvement Name	Туре	Improvement Number
Saguaro Tank	Earthen Stock Tank	002210/341045
The Rolls Tank	Earthen Stock Tank	002266/341088

Cline Unit

This unit occurs in the east central portion of the Sunflower allotment. It is a small unit consisting of approximately 9,800 acres; bounded on the northeast by the Tonto Basin Ranger District, the south by the Cottonwood unit, the north and west by the Dos S unit.

Elevations range from 3,400 feet in Cottonwood Creek to 6,236 feet on Pine Mountain. Terrain varies from rolling hills to steep, rugged slopes. Soils are generally granitic, as described below for the Cottonwood unit.

Unit Vegetation

This area was managed for vegetation type conversion during the 1960s, when prescribed burning and herbicides were used to reduce the density of chaparral species and provide a seedbed for introduced grasses. Records indicate that in 1979 and 1981, two prescribed burns were completed within this unit, with 1,200 and 1,500 acres respectively treated. In 1996, the Lone Fire burned approximately 5,000 acres within the Cline unit.

Vegetation is predominantly interior chaparral, including such species as; scrub oak (*Quercus turbinella*), Emory oak (*Quercus Emoryi*), cat-claw acacia (*Acacia greggii*), desert ceanothus (*Ceanothus spp.*), and sugar sumac (*Rhus ovata*). The herbaceous component is comprised mainly of introduced lovegrass species (*Eragrostis spp.*), with some sand dropseed (*Sporobolus cryptandrus*) present. Important riparian areas include Picadilla Creek, Cottonwood Creek, Tejanos Spring, and Mud Spring.

There are three Parker Three-Step clusters; C 1, C2, and C3 within this unit, however, these haven't been re-read since their establishment in 1968 and 1969 due to the density of chaparral. A schedule of prescribed fire within this unit would improve the forage resource for livestock and habitat for wildlife.

In 1998 and 1999, riparian reaches were selected and established for utilization monitoring within the following riparian areas within the Cline unit; Tejanos Spring, Cottonwood Creek, Picadilla Creek, and Mud Spring. Data indicate that use on available woody and herbaceous species exceeded utilization standards set in the annual operating instructions (50%) in all reaches accept woody utilization in Picadilla Creek. This overutilization was likely the result of lack of maintenance of upland water developments and on the ground management (herding, salting) to facilitate proper livestock distribution. Range reports indicate that over utilization and improper management of this unit had been occurring since the late 1960s and early 1970s. During this time period, up to 225 head were permitted within this unit.

A 1973 production-utilization study determined that forage production ranged from 200 lbs. to 1,800 lbs. per acre. It is important to note that this study was conducted following several years of drought conditions.

This unit hasn't been grazed since 2002, when livestock were removed due to drought related resource concerns.

Additional Factors within Unit

Records indicate that in 1979 and 1981, two prescribed burns were completed within this unit, with 1,200 and 1,500 acres respectively treated. In 1996, the Lone Fire burned approximately 5,000 acres within the Cline unit.

Improvements

In addition to corral, trap, unit, and allotment fence maintenance, the following springs, pipelines, and trick tanks shown in Table 18 have not been maintained and are in need of repair.

Improvement Name	Improvement Type	Improvement Number
Fisher Spring	Spring Development	002229/341063
Cline Pasture Spring	Spring Development	002230/341064
Mud Spring	Spring Development	002231/341065
Willow Spring	Spring Development	002235/341067
Coyote Spring	Spring Development	002236/341068
Brushy Basin Spring	Spring Development	002242/341070
Four Peaks Spring	Spring Development	002251/341075
Mountain Spring	Spring Development	002255/341079
Mountain Spring Pipeline	Steel Pipeline	002256/341079
Brushy Trick Tank No. 1	Trick Tank	002355
Brushy Trick Tank No. 2	Trick Tank	002177/341015

Table 18: Range Improvements within Cline Unit

Cottonwood Unit

This unit is approximately 49,400 acres in size, with approximately 90 percent of the unit within the Four Peaks Wilderness. The unit is bounded to the south by the Salt River, including Canyon Lake and Apache Lake, to the north by the Cline and Dos S units, to the west by the Desert unit, and to the east by the Tonto Basin Ranger District.

Elevations range from 1,720 feet at the Salt River to 7,657 feet on Brown's Peak, the northernmost peak on Four Peaks. The terrain varies from relatively gently rolling slopes on the west side of the unit, to steep mountainous terrain in the Four Peaks area on the east side of the unit. Soils are generally granitic, varying from decomposed granite on the gentler west half of the allotment, then grading into granite boulders and exposed granite cliffs to the east. Mean annual precipitation ranges from 15 - 24 inches, with the amount generally increasing with elevation.

Much of the boundary separating this unit from the Dos S and Cline units is natural barrier. There are eight spring developments and some stock tanks which occur on the unit, as well as several holding pastures and corrals. Livestock distribution is generally accomplished through herding and salting.

Unit Vegetation

Vegetation is generally Sonoran desert scrub in the lower elevations, chaparral and desert grassland in the mid-elevations and pockets of ponderosa pine can be found on the northeast

slopes, in the higher elevations. Important riparian areas include Alder Creek, Cottonwood Creek, Boulder Creek, and Cane Spring Canyon.

Table 19 displays the historical data for the Dos S Unit using data gathered at Parker Three-step and pace transects.

Cluster/ Transect	Date	Vegetation Trend
	07/16/1965	Stable
C 11	10/31/1983	Stable
	03/06/2012	Stable

 Table 19: Cottonwood Unit Parker Three-Step and Pace Transects

Additional Factors within Unit

The westernmost portion of the unit, outside of the wilderness, is heavily used by UTVs and is easily accessible to other recreation users (i.e. target shooters). When the unit was stocked, conflicts between recreationist's and the livestock operation were frequent. Gates were frequently left open and range improvements were often shot. Heavy use by recreational users also occurs along two cherry stem roads (Forest Service Road 401 and a spur road off of Forest Service Road 143) that lead to Cane Spring and Mine Mountain Spring respectively. Both of these roads are within the Four Peaks Wilderness.

Improvements

In addition to corral, trap, unit, and allotment fence maintenance, the following springs, pipelines, and stock tank shown in Table 20 have not been maintained and are in need of repair.

Improvement Name	Improvement Type	Improvement Number
Cane Spring Pipeline	Steel Pipeline	002221/341056
Adams Spring	Spring Development	002222/341057
Brown Cabin Spring	Spring Development	002234/341066
Cienega Spring	Spring Development	002243/341071
Blue Spring	Spring Development	002253/341077
Seucito Spring	Spring Development	002254/341078
Talc Spring	Spring Development	002263/341085
Cane Spring Tank	Earthen Stock Tank	002207/341042
Cane Spring	Spring Development	002220/341055

Table 20: Range Improvements within Cottonwood Unit

Environmental Consequences

The alternatives are contrasted based on the likelihood of upland vegetation attaining the short and long-term desired conditions described above. The likelihood of attaining desired conditions depends largely on the type of management, maintenance of range improvements, permittee effort, and stocking rates. Meeting short-term utilization goals will limit the annual impacts of livestock grazing. Long-term desired conditions are expected to be achieved through attainment of short-term desired conditions. Conditions will be measured through effectiveness monitoring.

General Effects Associated with Grazing Authorization

Livestock grazing on vegetation directly impacts plants by removing the current year's growth. Warm season perennial grasses such as curly mesquite, three-awns, and sideoats grama are opportunistic and become productive following summer monsoonal moisture and spring moisture. Grama (*Bouteloua spp.*) 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 the fall and winter months with little negative 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 (USDA Forest Service 1988).

Turbinella oak (Quercus turbinella), buck brush (Ceanothus spp.), mountain mahogany (Cercocarpus spp.), and jojoba (Simmondsia chinensis) are palatable, and browsing of current year's growth occurs during winter and early spring months when perennial grasses and forbs have become dormant. False mesquite (Calliandra eriophylla) produces good quality browse in early spring following adequate winter precipitation and is often available before the onset of perennial grasses. It has a tendency to become dormant in early summer when precipitation is scarce but becomes 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 removed (USDA Forest Service 1988). Range ratany (Krameria parvifolia) is also a dominate browse species of fair forage value. This sub-shrub is most palatable in early spring and late fall, but can be browsed by livestock yearlong. Other important forage species on this allotment include a variety of shrubs. The flowers and beans of catclaw (Acacia spp.), mesquite (Prosopis spp.), and mimosa (Mimosa spp.) are palatable and desirable to livestock when produced in late spring and early summer following adequate winter precipitation. Browsing of flowers, beans, and current year's growth occurs during key production times and when herbaceous forage is scarce.

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 the Sunflower Allotment but, as previously mentioned, are more prevalent in the lower elevation units. 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. Unit and pasture inspections on the Sunflower Allotment and other allotments on the Mesa Ranger District indicate that grazing pressure on accompanying shrubs is reduced while annuals are green and palatable. Once they begin to cure, use of palatable shrubs in those areas begins to increase, as the shrubs are experiencing new growth and flower production resulting from the winter moisture.

Alternative 1 – Direct and Indirect Effects

Forest Service Policy requires the Forest Service to identify no grazing as the no-action alternative (Forest Service Handbook 2209.13). Under this alternative, the term grazing permit will be cancelled following guidance in *36 CFR 222.4* and *FSM 2231.62*. According to Forest Service Manual, Southwest Region Supplement 2240.3(2), "The Government holds title to all range improvements." Existing boundary fences will be assigned to adjacent permittees (if applicable). Interior fences and other infrastructure will be removed, as funding or workforce allows, mitigating potential adverse impacts to wildlife and public users. Water developments, important for wildlife, will be maintained, where feasible, or removed using other program funds or volunteers.

Grazing use levels on the key forage species in all key areas and adjacent areas on the allotment will be light. Wild ungulates such as mule deer, white-tailed deer, and elk could still impact herbaceous and browse plant species; however, these impacts are expected to be minimal. It is predicted that the physiological growth requirements of the forage plants would be favored in all key areas under this alternative. Therefore, areas on the allotment will likely increase in desirable forage plant densities and litter. Additionally, there will be an increase in plant species composition and improved vigor of forage plants within the allotment. The overall forage production (biomass) will also increase with no livestock grazing by cattle.

Alternative 2 - Direct and Indirect Effects

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

For the Otero, Ranger Station, Sycamore Creek Riparian, and Adams (west of SR 87) pastures within the Dos S Unit, and the Desert Unit, the direct and indirect effects of this alternative will be the same as were described under Alternative 1.

Records indicate that these flatter (less than ten percent slopes), lower elevation pastures/units received heavy use in the past, with upland utilization levels exceeding 50 percent. The Parker Three-Step and pace transects located within the Dos S Unit (C6 and C9) and Desert Unit (PD, C10, C12, and C14) show that vegetation ratings are very poor or poor and soil ratings poor or fair. However, these data also indicate that vegetation and soil trends became stabilized or improved between 2002 and 2012. This trend may be due to changes in precipitation levels, removal of livestock, or a combination of both. The continued non-use of these pastures will likely result in improved vegetation and soil conditions throughout these pastures/units the same as should be observed under Alternative 1.

For the remaining units/pastures, as identified above, implementing management tools and mitigation measures, conservative upland forage utilization guidelines, and conservative riparian forage utilization guidelines will allow this action to maintain and/or move vegetative conditions on the allotment toward desired conditions as described above. The flexibility given to resource managers to adjust the timing, intensity, frequency, and duration of livestock grazing in any pasture, at any time will ensure that plants are not used beyond levels that will provide for recovery, improved vigor, and recruitment of desirable species.

Under light to moderate grazing intensity (32 – 43 percent), research has shown an upward trend in ecological condition, as well as maintained vegetation productivity in arid to semi-arid rangelands (Holechek, 2006). Based on these use prescriptions, including the proposed range improvements, it is predicted that the physiological growth requirements of the forage plants will be favored in all key areas and adjacent areas on the allotment. Therefore, areas on the allotment will increase in desirable forage plant densities and plant residues. Additionally, there will be an increase in plant species composition and improved vigor of forage plants. The overall forage production (biomass) will be maintained in average precipitation years and increase in above average precipitation years. Additionally, an adequate forage surplus will become abundant in and adjacent to key areas of the allotment and will become important in years of below average precipitation by assisting to support livestock numbers and distribution. All these factors combined will influence range condition and trend to continue to remain stable or improve.

An ongoing Terrestrial Ecological Unit Inventory (TEUI) [formerly Terrestrial Ecosystem Survey (TES)] is currently being conducted on the Tonto National Forest. The Sunflower Allotment hasn't yet been mapped in its entirety. Once completed, these data will provide valuable information on site potential.

The proposed range improvement infrastructure, when implemented, in no particular order or time frame (driven by management objectives), will aid in growing season rest or deferment of pastures and will facilitate livestock distribution throughout the allotment. Typically, even during dry years, reliable water sources and water distribution throughout the allotment are the limiting factors, not forage availability.

Cumulative Effects

The Sunflower allotment is adjacent to nine other livestock grazing allotments, and two additional Ranger Districts; Cave Creek (CCRD) and Tonto Basin Ranger Districts (TBRD). The eight allotments include; Bartlett (CCRD), Tonto Basin, Three Bar, Roosevelt, and 7/K all on TBRD, and Diamond, Goldfield, Superstition, and Reavis on the Mesa Ranger District. Of these, only three allotments (Diamond, Tonto Basin, and 7/K) are currently stocked and within the same watersheds as the Sunflower Allotment. Each of these allotments are conservatively stocked and monitored to ensure conservative utilization standards are being met. As a result, cumulative watershed effects for these allotments are anticipated to be minimal in contrast to the size and complexity of the watersheds themselves.

Historic grazing on this allotment also contributed to cumulative effects. Stocking rates were disproportionately high during the first half of the 20th century. Impaired soils and vegetation observed today are likely a result of those early impacts followed by stocking rates of greater than 1,000 head of adults into the mid-1990s. Historical overuse by livestock, particularly in the lower elevations and flatter terrain of the allotment has led to impaired soil conditions and a reduction in the vigor and diversity of desirable plant species.

Range records indicate that there has been a population of trespass horses along the Lower Salt River (river), southwest of the allotment, since the 1930s. These horses presumably originated from the neighboring Ft. McDowell Indian Reservation and/or Salt River Pima Maricopa Indian Community, both of which border the Mesa Ranger District to the west/northwest. Although the horses are typically found along the river, within the boundary of the closed Goldfield Allotment, on occasion, they are observed east of the Bush Highway within the southernmost portion of the Desert Unit.

Unmanaged OHV use, as described under the "unit conflicts" section above, has had an enormous impact on the vegetation resource, particularly in the Adams and Otero pastures of the Dos S unit and the entire Desert unit. OHV use and unauthorized route proliferation have increased

dramatically over the past 30 years. Direct and indirect impacts include; destruction and loss of vegetation through the creation of unauthorized routes, soil loss and compaction, and the facilitation in the spread of noxious weeds either directly (transport) or indirectly (disturbed soil creates microsites) (Brooks and Lair, 2005).

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

Alternative 1 Cumulative Effects

With continued non-use of this allotment, this alternative is expected to allow for the most rapid rate of improvement in soil and vegetation condition, density, and diversity. However, even with the removal of grazing pressure, the impacts on soil and vegetation from OHV use and other recreational use such as target shooting are likely to continue. The effects of climate change and drought may still impact plant communities on the allotment, however, the continued absence of domestic grazing pressure may lessen plant stress, thereby reducing or slowing these effects.

Alternative 2 Cumulative Effects

In pastures/units included in the proposed action for re-authorization of livestock grazing, the effects of past livestock management combined with historic overgrazing may slow the rate of recovery of impaired vegetation and soils. However, through conservative use management tools, vegetation and watershed desired conditions should be realized, although not as rapidly as Alternative 1. Impacts to soil and vegetation from OHV use and other recreational use such as target shooting are likely to continue, as well as the effects of climate change on plant communities on the allotment.

In the pastures/units proposed for non-use, the effects will be the same as described under Alternative 1. However, even with the removal of grazing pressure, the impacts on soil and vegetation from OHV use and other recreational use such as target shooting are likely to continue. The effects of climate change and drought may still impact plant communities on the allotment, however, the continued absence of domestic grazing pressure within the proposed non-use pastures/units, and the incorporation of adaptive management principles, may lessen plant stress, thereby reducing or slowing these effects.

Soils

Affected Environment

The Sunflower Allotment is approximately 155,235 acres located on the Mesa Ranger District. It is located in the Central Highlands Physiographic Province (Chronic, 1983). The vegetation is extremely variable ranging from Sonoran Desert at the lowest elevations to ponderosa pine at the highest elevations. Elevations range from about 1,600 feet to 7,657 feet on Brown's Peak. The southeast part of the allotment is in the Four Peaks Wilderness.

The mean annual precipitation ranges from 11 inches at the lower elevations to 24 inches at the higher elevations. The mean annual soil temperature ranges from 68 degrees Fahrenheit at lower elevations to 52 degrees Fahrenheit at higher elevations (USDA FS, SW Region, 1985).

Existing Condition Data Sources

The data used for this analysis were include: 1) Terrestrial Ecological Unit Inventory (TEUI)/Terrestrial Ecosystem Survey (TES); 2) Geology and Soil Classification; 3) Slope; 4) Soil Condition; and 5) Vegetation Classification.

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

Terrestrial Ecological Unit Inventory (TEUI) -formerly Terrestrial Ecosystem Survey (TES)was conducted on the Tonto National Forest. Maps and a the map unit legend are maintained in internal GIS files.

Geology and Soil Classification

The allotment is underlain by a variety of geologic types. The geology is dominated by surficial alluvial fan and terrace deposits (Q), granite (Xg/YXg/Yg), volcanic rocks (Tv), metamorphosed volcanic rocks (Xmv), conglomerate sandstone (Tsy), and quartzite (Xq). Occurring along drainages, are smaller areas of metasedimentary rocks of sandstone and shale (Xms), sedimentary rocks of conglomerate, sandstone, mudstone and breccia (Tsm), basalt (Tb), and younger alluvial deposits (Qr) (Arizona Geological Service, 2000).

Soils within the analysis are highly variable due to the wide variety of parent materials, landforms, and climate. Desert soils (LSM, 2) are dominated by Torrifluvents along drainages, poorly developed Torriorthents and Haplocambids, well-developed Haplargids on non-calcareous flats and hills, and Haplocalcids on calcareous soils. The calcareous soils are normally associated with crucifixion thorn (Canotia holacantha) and creosote bush (Larrea tridentata var. tridentata). In the semi-arid grassland zone (LSM, 3), the most prevalent soils are well-developed Haplustalfs and Argiustolls. Calcidic Haplustalfs are located on the calcareous soils. In the chaparral type (LSM, 4), well-developed medium and fine textured Typic and Lithic Haplustalfs and Argiustolls dominate, but poorly developed soils also occur. In woodlands (LSM, 4), medium and fine textured Lithic and Typic Haplustalfs dominate. In the ponderosa pine zone (LSM, 5), Haplustalfs and Argiustolls are found on the more developed soils, while Haplustolls and Haplustepts are on the less developed soils. Soils within the riparian zone are normally young, poorly developed Fluvents, mostly coarse textured with large amounts of coarse fragments. However, the soils in the riparian zone are highly variable.

Slope

Topographical features range from nearly level alluvial fans to rugged steep slopes and canyons. Slope ranges are those assigned to the TEUI map units. Suitability of slopes for livestock grazing begins to decrease at slopes greater than 40 percent and becomes unsuitable at slopes greater than 60 percent (Holechek, 1992).

Soil Condition

Soil condition was evaluated using a combination of the ongoing TEUI/TES survey, the field work and mapping and a brief field inspection (Table 21). The soil conditon represents an approximation. It is not possible to examine all areas. Interpretations were based on historical livestock use patterns and slope characteristics. Flatter and more open areas tend to have experience greater impacts than areas with steeper slopes or dense vegetation. Areas with less than satisfactory soil condition reflect soil disturbances resulting from both planned and unplanned events²⁰.

	Soil	
Vegetation Type (Acres)	Condition	Percent of Vegetation Type* (Acres)
	Satisfactory-	
Cottonwood Willow Riparian Forest (3083)	Unsatisfactory	100 (3083)
	Satisfactory	21 (6,326)
Interior Chaparral (30,706)	Impaired	9 (2,654)
	Unstable	71 (21,727)
Mixed Broadleaf Deciduous Riparian Forest (13)	Impaired	100 (13)
Binuon/Luningr/Oak (108)	Satisfactory	81 (161)
r myon/Jumper/Oak (198)	Impaired	19 (37)
Ponderosa Pine Forest (Mild) (415)	Satisfactory	100 (415)
	Satisfactory	17 (1,580)
	Impaired	21 (1,886)
Semi-Desert Grassland (9,060)	Unsatisfact	
	ory	1 (70)
	Unstable	61 (5,524)
	Impaired	59 (65,535)
Sonoran Desert (111,750)	Unsatisfact	
Soliolali Desett (111,739)	ory	7 (7,727)
	Unstable	34 (38,497)

Table 21: Existing Soil Conditions by Vegetation Type within Sunflower Allotment

* Percentages may not total 100 percent due to rounding calculations.

Overall within the Sunflower Alltoment, the following soil conditions exist:

- Satisfactory-Unsatisfactory: 2 percent
- Satisfactory: 5.46 percent
- Impaired: 45.17 percent
- Unsatisfactory: 5.02 percent
- Unstable: 42.35 percent

²⁰ For more detailed information about soil condition, see the Soils Report in the project record.

Soil condition is likely to improve more rapidly under alternative 1 than under alternative 2. Compacted soils will begin to recover. Most of the improvement will occur in the flatter, desert soils in the southern part of the allotment.

Environmental Consequences

For this analysis, vegetation type was grouped into 6 broad categories called vegetation groups. These were then further broken down into more narrow vegetation groups. The narrow vegetation types were, in turn, groupings of similar vegetation sub-series. Plant sub-series are climax plant communities named for characteristic and diagnostic plants that distinguish one plant community from another (USDA, Terrestrial Ecosystem Survey Handbook, 1985). There may be a large degree of variability within the broad vegetation groups. The vegetative types were developed from TES/TEUI surveys, aerial photo interpretation, satellite imagery, and on-the-ground observations. Not all types and delineations were field validated. 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 (Table 22).

		Percent of
Vegetation Type	Total Acres	Vegetation Type
Cottonwood Willow Riparian Forest	3,083	2.0
Interior Chaparral	30,706	19.8
Mixed Broadleaf Deciduous Riparian Forest	13	0.01
Pinyon/Juniper/Oak	198	0.1
Ponderosa Pine Forest (Mild)	415	0.3
Semi-Desert Grassland	9,060	5.8
Sonoran Desert	111,759	72.0
Total	155,233	100

Table 22: Vegetation Types within Sunflower Allotment

The gradient analysis looks at the timing and amount of precipitation and seasonal climate. It also divides each gradient into life-zones (climate classes) ranging from hot/dry to cold/wet. The project area is within the low sun mild climatic gradient. The vegetation in this gradient receives more than half of its mean annual precipitation during the period of October 1 to March 30 and has mild winters. This gradient includes climate classes 2, 3, 4 and 5:

- Class 2 represents the Arizona upland division of the Sonoran Desert (Sonoran desert scrub).
- Class 3 represents the semi-desert grassland zone.
- Class 4 is within the woodland zone and includes juniper and pinyon/juniper, turbinella oak chaparral, and juniper savanna grasslands.
- Class 5 is within the ponderosa pine zone.

Assumptions and Methodology

Grazing by domestic livestock and other land disturbing activities 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 (plant frequency), and by changing the

vigor of affected plants. The combined effects on composition, density, and plant vigor can be used to measure the condition and trend of rangeland plant communities. Soils rely on plant communities to decrease soil disturbances, provide nutrients for soil fertility, and provide habitat for microorganism that benefit soils. Grazing can reduce the establishment of Saguaro seedlings and nurse plants that contribute to Saguaro seedling survival (Abou-Haidar, 1992; Blydenstein, 2004), which could in turn affect Sonoran Desert communities.

Incomplete or Unavailable Information

Not all vegetation types, soil conditions, and their associated delineations were field inspected and validated due to their inaccessible locations and are based on somewhat limited on-site data. Field validating all delineations for purposes of collecting on-site specific information will not be practicable. Some of the soil condition classes are projected from similar sites across the landscape and are based on theoretical approaches and methods generally accepted in the scientific community. Consequently, the soil condition classes assigned should not be interpreted with full confidence but used as a coarse-filter technique to assign gross range condition classes per vegetation type.

Analysis Area

For the following direct and indirect effects to soils from grazing authorization, the project area is the analysis area. However, Alternative 2 is split into two analyses: where cattle are to be authorized and where there will be no grazing within the allotment.

For the cumulative effects analysis, the area for the analysis is also the project area boundary as nearly all effects associated with land management need to occur within the project area to affect the soils in the allotment. It is understand that extreme weather or fire events could occur outside the project boundary that might affect the soils in the allotment, but even those affects likely need to happen within the boundary to be statistically measured.

General Effects Associated with Grazing Authorization

Livestock grazing can affect soil quality in several ways. Hoof action of cattle can affect soils by compacting soils. The risk for compaction is greatest when soils are wet (NRCS, 1996). Compaction decreases water infiltration, restricts rooting depth, and increases the hazard of water erosion (NRCS, 1996, 1998, 2001). Trailing by cattle on steeper slopes can physically displace soils, leading to erosion. Trampling by cattle in certain circumstances can temporally increase water infiltration rates but tend to decrease long-term rates (Roundy et al. 1992). Grazing can, under certain conditions, increase planting of grass seeds and seedling emergence (Winkle 1991). Cattle tend to concentrate on flatter areas especially if they are fairly open. Holechek reports that cattle tend to use 10 to 30 percent slopes thirty percent less often than 0 to 10 percent slopes and 30 to 60 percent slopes sixty percent less often than flats. Slopes over 60 percent are seldom used (Holechek, 1992). Because of the tendency of cattle to use flatter slopes, areas of impacted soils are more likely to be found on gentler slopes. Range improvements (e.g. fencing, water developments, etc.) can have slight, localized, short-term impacts to soils during construction. Building new fences and developing waters, as mentioned in the proposed action, will have minimal, localized direct impacts to soils.
Cattle also affect soils by removing vegetation resulting in a loss of protective cover including litter. The loss of vegetation and litter reduces infiltration and exposes the soils to raindrop impact and overland flow thus leading to soil crusting and increased erosion. The reduced cover can also result in a loss of soil organic matter and a reduction in soil microbes which play an important role in nutrient cycling. Soils that are lower in organic matter have poorer structure which also affects infiltration and root growth. Building fences and developing waters will indirectly affect soils by improving distribution of cattle resulting in a net positive effect. Other management actions, such as salting and water development, that affect livestock use patterns can improve cattle distributions and lessen impacts to heavily used areas but could lead to increased use of other areas that had been previously unused or lightly used.

Alternative 1 - Direct and Indirect Effects

This alternative will cancel the permit on the Sunflower allotment following the guidance in 36 CFR 222.4 and FSM 2231.62. Existing improvements no longer functional or needed for other purposes, including interior fences, cattle guards, and water developments will be evaluated for continued usefulness and removed as necessary.

The majority of the allotment is in either an impaired (44 percent) or in a satisfactory but inherently unstable (42 percent) soil condition (greater than 40 percent slope). Only about seven percent of the allotment is in satisfactory soil condition. Approximately five percent of the allotment is in unsatisfactory soil condition and about two percent is in a satisfactory-unsatisfactory soil condition. This alternative will provide the fastest increase to vegetative cover, species diversity, and improvement to soil condition.

The quickest and most likely recovery from soil compaction due to past grazing activities will 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 slow or prevent recovery in some areas. This alternative is likely to lead to the fastest overall improvement, however, even with complete rest it may take more than ten years for some areas with impaired and unsatisfactory soil condition to improve to a better condition class.

This alternative is most likely to increase the cover of biological crusts and their ecological benefits. The effects of removing improvements will be a minor, localized, short-term disturbance to soils.

Alternative 2- Direct and Indirect

The proposed action consists of four components: authorization, improvements, monitoring, and management practices.

The quickest and most likely recovery from soil compaction due to past grazing activities will normally occur with complete protection from grazing. This will happen in areas of the allotment that will not be authorized for grazing. The soil conditions that are currently less than satisfactory

are largely attributable to the effects of historic grazing and current management. Soils most likely to have impaired or unsatisfactory conditions occur on flatter areas, areas most likely to be used by livestock. These areas are likely to continue to receive use. However, if allowable use guidelines are not exceeded conservative use of 30 - 40 percent slopes, soils in impaired condition will be maintained, and may continue to improve over time. Conditions of soils in unsatisfactory conditions should be maintained, but are unlikely to improve within the time frame of this project. It is understood that unsatisfactory soils within the allotment that will be grazed will likely take longer to improve.

The Otero, Ranger Station, and Adams pastures (west of SR 87) within the Dos S Unit, and the Desert Unit, will be placed into non-use. For the current authorization, grazing will not occur in these areas. Non-use within these units/pastures will benefit riparian resources and sensitive species concerns associated with Sycamore Creek and Mesquite Wash, which will benefit soils that depend on plants to remain in place and not erode away. Areas in non-use will provide increases to vegetative cover, species diversity, and improvement to soil condition. Direct and indirect effects to soils in these non-use pastures/units are the same as those under Alterative 1.

In areas authorized for grazing, actions associated with livestock may slow or prevent the recovery of biological crusts if present. In the non-use areas, the effects will be the same as Alternative 1.

The effects of improvements (fence construction, tank construction or improvement, etc.) will be a minor, localized, short-term disturbance to soils. Range improvements (e.g. fencing, water developments, etc.) can have slight, localized, short-term impacts to soils during construction. Building new fences and developing waters, as mentioned in the proposed action, will have extremely small, localized direct impacts to soils. Building fences and developing waters will indirectly affect soils by improving distribution of cattle resulting in a net positive effect. Other management actions, such as salting and water development, that affect livestock use patterns can improve cattle distributions and lessen impacts to heavily used areas but could lead to increased use of other areas that had been previously unused or lightly used.

Cumulative Effects

Cumulative effects include the direct and indirect effects of the proposed action and alternatives when added to all past, present, and reasonably foreseeable future actions. Past grazing actions have resulted in soil erosion and compaction while current management has, in some cases, prevented or slowed recovery. The Forest Service Range Management files (File Code 2210) document the overgrazed condition of the uplands, springs, and riparian areas.

Improperly maintained roads can cause soil erosion where runoff from roads is allowed to concentrate. Roads can be a source of concentrated runoff which can lead to localized soil erosion downslope from roads. Unauthorized cross-country vehicle travel can negatively impact soils and vegetation through direct impacts on soils and removal or degradation of herbaceous or woody vegetation. Very heavy recreational use by OHV users occurs within the project area especially in the areas referred to as "The Rolls" and "Lower Sycamore". Many trails and two-track roads have been created with a lot of accompanying soil erosion.

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

- Highway reconstruction;
- Mining;
- Introduction of non-native invasive plants that lead to an increased risk of erosion and wildfire;
- Recreational camping;
- Introduction and spread of noxious weeds by hikers, vehicles, domestic animals, etc.; and
- Unauthorized livestock from adjacent allotments and other lands.

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

Alternative 1

Removing grazing from areas with impaired and unsatisfactory soils, often affected by compaction, may provide an opportunity for these soils to recover. The soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, heavy off-road vehicle use in certain areas and wildfires. Areas impacted by fires are more likely to recover under this alternative. Where off-road vehicle use remains heavy, no improvement is expected. This alternative may benefit Sonoran Desert communities. Grazing can also affect recovery of certain species within chaparral communities impacted by fire. No grazing will benefit these communities. Even with continuous rest, the rate of recovery is expected to be slow for most areas.

Alternative 2

The soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, heavy off-road vehicle use in certain areas and wildfires. Where off-road vehicle use remains heavy, no improvement is expected. This alternative may slow or reduce the Sonoran Desert habitat where grazing is authorized. Grazing can also affect recovery of certain species within chaparral communities impacted by fire.

Hydrology, Riparian, and Watershed

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

Range inspection reports dating back to the 1930s indicate that from the 1930s through 2000, springs and channel bottoms were used as waters. Salting occurred near the waters, causing cattle concentration and heavy use in these areas. The Brushy Basin portion of the allotment was

heavily grazed in the 1960s and 1970s. There are reports of loss of top soil and large areas of bare ground, especially near the road²¹.

Affected Environment

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

Streams

There are approximately 160 miles of named streams on the USGS 1:24,000 topographic quadrangles within the project area. In addition to the named streams, there are nearly 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 and are primarily headwater streams dominated by upland vegetation and ephemeral channels dominated by upland and xeric riparian vegetation. They provide the function relating to water quantity, water quality, flood regime, hydrological connectivity, riparian vegetation, and wildlife habitat (Meyer *et al.*, 2003; Levick *et al.*, 2007) within the watershed.

The US Army Corp of Engineers (2015) defines ephemeral, intermittent, and perennial streams as follows:

- **Ephemeral stream:** An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.
- **Intermittent stream:** An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.
- **Perennial stream:** A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Stream Channels

Stream channels are dynamic systems that are constantly being changed by the water and sediment flowing through the system. These changes obey the natural forces of gravity, friction and fluid cohesion (Janicke, 2000). A stable or properly functioning stream channel is dependent on its ability to resist the forces of erosion and will maintain its dimensions (width/depth ratio, gradient, and sinuosity) over time without excessive erosion or deposition (Barrett 1993, Rosgen 1996, Mason and Johnson 1999, Janicke 2000). A healthy riparian ecosystem contributes to channel stability by increasing resistance, thereby reducing flood peaks, trapping sediment and increasing groundwater recharge (Briggs 1996). Modifications that cause removal of vegetation will lower the channel's resistance to erosion and lead to an increased frequency and magnitude of flood impacts (Trimble and Mendel 1995, Rosgen 1996, Janicke 2000).

²¹ The Forest Service Range Management Planning (2210) files located at the Tonto National Forest Supervisor's Office in Phoenix.

Over half of the stream channels assessed in the project area are in impaired or unstable condition (Mason and Johnson 1999) in large part due to past or current 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. Channels that are in stable condition, or impaired but with sufficient riparian vegetation to resist the erosive forces of flood waters, experience little erosion or aggradation, and retain riparian woody and herbaceous species.

In mid-January 2010, three low pressure systems passed through Arizona within a week, causing intense rainfall and record flooding south and west of the Mogollon Rim (NOAA, 2010). The USGS gage, Sycamore Creek near Fort McDowell, AZ, (near the lower end of Sycamore Creek and within the Sunflower Allotment) recorded the fourth highest flow of record at 15,500 cubic feet per second in 2010 (USGS, 2013). This flood was greater than a ten year recurrence interval event (Pope *et al*, 1998).

The Flood Control District of Maricopa County (2013) installed a stream gage on Sycamore Creek after the Sunflower Fire (both the burned area and the gage are a short distance above the Sunflower Allotment) in June 2012. On August 16, 2012, a peak flow of 7906 cfs was recorded, which, according to USGS regression equations (Thomas *et al.*, 1995), is nearly the 100 year recurrence interval flood.

Given the initial impaired and unstable condition of many of the stream channels in the allotment and the magnitude of the flood events, some of the streams within the project area have lost riparian vegetation, downcut, eroded, and experienced excessive deposition (aggraded).

Riparian Areas

There are approximately 2,160 acres of mapped riparian vegetation on the Sunflower Allotment. This area represents less than two percent of the allotment. Presently, of approximately 160 miles of named stream channels, there are about 40 miles of perennial and intermittent stream channels that support obligate riparian vegetation. Obligate riparian vegetation needs access to perennially available surface or shallow sub-surface water. Based on Tonto National Forest Range Files (2210) and associated changes in both upland and riparian vegetation, the extent of riparian vegetation has been reduced from historic conditions (Croxen 1926; Haskett 1935; Heffernan 2008).

Key Reaches

A stream reach is defined as any length of stream between two points. Key reaches, similar to upland key areas (Interagency Technical Team 1996), are stream channels/springs/riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key species. Key reaches are synonymous with designated monitoring areas (DMA's) defined by Burton *et al.* (2011) as the location where monitoring occurs. Table 22 and Figure 12 display the key reaches by pasture. The six riparian areas have the potential to improve within a relatively short time period (ten years) or have reached desired condition, and have been identified as key reaches for this analysis.

Key Reach	Current Condition
Maverick Pastur	re (Dos S Unit)
Maverick Spring Canyon	Intermittent stream that originates just east of Maverick Mountain and flows south to its confluence with Brush Corral Canyon. The Riparian vegetation layer (Tonto GIS) indicates 1.7 miles of Fremont cottonwood-conifer riparian vegetation occurs up and downstream from Maverick Spring. Riparian vegetation is also evident on Google Earth (1/29/2013). There is no field data for this reach
Cline Pasture (C	line Unit)
Picadilla Creek	Intermittent stream that originates east of Pine Mountain and flows south and west to its confluence with Mesquite Wash. In 1998 and 1999, there was little vegetation to monitor and use was high on vegetation present in the reach. In 2013, the vegetation consisted of sapling and pole size sycamore, pole size Goodding's willow and cottonwood, hackberry, sugar sumac, seep willow, and desert broom. Dense, large deergrass occurs on the banks and small floodplain. There are a couple spots with scirpus (sedge) species. Livestock use was not evident. The riparian health rating for the majority of the key reach was 100% (a rating greater than 67% is considered stable). The remainder of the key reach was last assessed in 1998 and a health rating was not assigned. The channel is a Rosgen "B" type in stable condition. The dominant sediment size is boulder and gravel, with gravel from the 2005 Edge Fire filling some pools. A photo point downstream of the key reach shows some increase in woody riparian vegetation from 1996 to 2010. The remaining photo points show little change.
Brushy Basin	An unnamed tributary to Cottonwood Creek flows through Brushy Basin. The stream below Forest Service Road 143 lies in a very narrow valley, less than 30 feet wide. The channel is about 6-8 feet wide and supports sapling and pole size sycamore and some small sapling willow. Deergrass lines the channel and is thick in some places. The riparian health rating for this portion of the channel was rated as stable (94% rating). The channel is a Rosgen "B" type in slight impaired condition due to the large amount of sediment, probably from the 2005 Edge Fire, and the road. The dominant sediment is large cobble embedded in gravel and sand. Near the road is a short reach with large boulders that will make cattle access difficult. About 0.2 miles downstream, there is a drop-off that makes the downstream reach inaccessible. Upstream from the road the stream is impacted by OHVs driving in the channel and on the floodplain. Vegetation is sparse and consists of sapling and pole sycamore, and occasional deergrass. The riparian health rating for this portion of the road taken from 1996 to 2010 show an establishment of some woody riparian vegetation but a widening of the channel, probably due to OHVs.
Mud Springs Pas	sture (Cline Unit)
Tejanos Spring	Lies on a headwater tributary of Cottonwood Creek in Brushy Basin, approximately two miles from Tejanos Spring to its confluence with Cottonwood Creek. Riparian vegetation extends above and below Forest Service Road 143. In 1998 and 1999, there was little vegetation to monitor and use was high on what was there. Heavy livestock concentration was evident, by hoof prints, trailing, and feces. In 2013, the reach above the spring is a Rosgen "B" type in stable condition. Vegetation consists of spotty deergrass, sapling, and pole sycamore with a few large trees. Below the spring the channel is a steeper Rosgen "A" type with large boulders which limit access. Photo points taken from 1996 to 2010 show an increase in density of riparian vegetation. The riparian health rating for the reach of the channel below Forest Service Road 143 was stable (89%) in 2013. The reach above Forest Service Road 143 and the tributary to Tejanos Spring have not been assessed since 1998.
Cottonwood Pas	ture (Cottonwood Unit, West)
Cane Spring Canyon	Originates just west of Four Peaks and flows approximately 9.5 miles to its confluence with Cottonwood Creek. Most of the canyon lies within the Cottonwood Unit East. It is

Table 23: Current Condition of Key Reaches within Sunflower Allotment

Current Condition
mostly intermittent with a perennial reach just below Hidden Water Spring in the
Cottonwood Unit West. The majority of the stream is in a narrow steep canyon.
The reach below Hidden Water Spring was visited several times. In 1997, 1998 and
1999 there was very high use on woody vegetation and heavy trampling of streambanks
and vegetation. There were many fish and frogs. Vegetative diversity was very low.
There was no herbaceous vegetation to monitor. In 2013, the channel was a Rosgen "F"
stream type in impaired condition (Mason and Johnson, 1999). At the beginning of the
reach (downstream), the channel is deep and narrow with defined banks, but upstream it
is wide and shallow and braided in places, with no channel features. The reach adjacent
to the spring supports dense vegetation consisting of hop bush, pole size willows, and
seep willow. The riparian health rating is stable (80%) at the spring but has not been
rated above the spring. Above the spring vegetative diversity is low and consists of pole
size willows, a few deergrass plants, and a couple of sites with cattalis. Bermuda grass
covers the floodplain and there is thick rabbits foot grass in portions of the channel.
I nere is not enough available, palatable riparian vegetation to provide for statistically
valid annual use monitoring.
ture (Cottonwood Unit, East)
Originates on Four Peaks and flows south through the Cottonwood East Unit for
approximately six miles to its confluence with Apache Lake. It is primarily an
Intermittent stream but does support some reaches of perennial flow.
Upsueally non-rolest fram $\delta 2$, the channel nows in a harlow valley (50-100 feet) with a steep gradient (less than 4%). In 100% several mature individuals of Freemant
steep gradient (less than 4%). In 1998, several mature individuals of Fremont
species within the active channel. No native herbaceous species were noted. The stream
was downcut and had been impacted by flooding after the Lone Fire (1996).
Regeneration of cottonwoods and willows was occurring. Deergrass was sparse. Use on
the woody species was within guidelines. Google Earth (6-5-2012) shows about a
quarter mile of dense riparian vegetation above the trail, with spotty riparian vegetation
continuing upstream. Riparian health ratings were not assessed during this monitoring effort.



Figure 12: Map of Key Reaches within Sunflower Allotment

Water Quality

The Arizona Department of Environmental Quality evaluates the water quality status of waters within the state in a Nonpoint Source Assessment Report (2012). One stream and three lakes within the project area have been monitored. The water quality assessment for Sycamore Creek rates the creek as "inconclusive" due to lack of seasonal sampling. Apache Lake is rated "impaired" because dissolved oxygen violates the standard for the lake to support the aquatic and wildlife-warm water fisheries designated use. Apache Lake is rated "inconclusive" for full body contact recreation, domestic water source, and agricultural livestock watering due to lack of seasonal coverage and the need for additional samples to assess cadmium (dissolved), manganese, and lead (dissolved). All other uses are meeting water quality standards. Canyon Lake is rated "impaired" due to violations of the dissolved oxygen standard for aquatic and wildlife-warm water fisheries. All other uses are rated "attaining". Saguaro Lake is rated "attaining" for some uses because fish consumption is "attaining" while all other uses are "inconclusive" due to some exceedances of pH, dissolved oxygen, nitrogen, phosphorus, and thallium but sampling was not done as composites at 1, 2, and 5 meters as required.

Watershed Condition Assessment

There are one or more attributes rated for each of the twelve indicators used to assess overall watershed condition, Twenty-one total attributes were rated for each of the watersheds within the project area. Only six of these are likely to be affected by grazing management on the allotment. These include: presence of large woody debris in stream channels, stream channel shape and function, riparian vegetation condition, soil productivity and soil erosion (which were combined and assessed as soil condition), and rangeland vegetation condition (Potyondy and Geier, 2011).

In 2010, a national effort was completed by the Forest Service to assess the condition of all 6^{th} 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 6^{th} 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 6^{th} code watersheds in the project area are listed in Table 24 (Potyondy and Geier, 2011) and displayed in FIGURE (condition descriptions in the figure correlate with the condition ratings in the as follows: Good – Functioning, Fair – Functioning at Risk, Poor – Impaired). Six of the 11 watersheds in the project area are in impaired condition. The indicators that received the lowest scores in these impaired condition watersheds include: aquatic biota, aquatic habitat, soil, rangeland, and invasive species.

6 th Code Watershed	Condition
Middle Sycamore Creek	Functioning at risk
Lower Sycamore Creek	Impaired
Rock Creek	Functioning at risk
Mesquite Wash	Functioning at risk

Table 24: Watershed Condition within Sunflower	Allotment
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6 th Code Watershed	Condition
Cottonwood Creek	Impaired
Cane Spring Canyon	Functioning at risk
Salt River-Apache Lake	Impaired
Salt River-Canyon Lake	Functioning at risk
Salt River-Saguaro Lake	Impaired
Bulldog Canyon-Salt River	Impaired
Jones Canyon	Impaired



Figure 13: Map of Watershed Condition Class for Sunflower Allotment

Environmental Consequences

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

- GIS layers and feature classes used to provide allotment-wide information include National Wetland Inventory (NWI) (USDI 1991-1995), riparian vegetation, perennial streams, photo points, stream route, water points and constructed features.
- Photo points are repeat photography taken at the same location, year after year. A total of 49 photo points have been established in the project area, GIS points show the approximate locations.
- Documented riparian use monitoring and field trips, including stream channel classification using stream channel type description (Rosgen 1996), condition assessment, and water source inventory.

General Effects Associated with Grazing Authorization

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

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 streambanks, cause mechanical damage to shrubs and small trees, reduce or eliminate woody seedlings and saplings, expose soils, eliminate or shift native herbaceous species to weedy or exotic species with reduced root systems, and cause widening or incision of stream channels (Trimble and Mendel, 1995; Clary and Kruse 2003). These changes may lead to loss of stream stability and function (Rosgen, 1996). Stream channel profile, stream bank stability, streamside vegetation, channel bottom embeddedness, stream sediments, and stream temperature are all aquatic species habitat features that can be directly or indirectly affected by livestock grazing practices. Maintaining native obligate riparian plants is extremely important to many streams because of their resistance to the erosive energy of flowing water (Clary and Kruse, 2003). 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, 2005).

Alternative 1 – Direct and Indirect Effects

Riparian Areas

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). With 10 years rest, the riparian vegetation on some of the streams on this allotment (Picadilla Creek and Brushy Basin) has made substantial recovery, although the channels still need more time to be fully functional. The riparian vegetation on other streams on this allotment (such as Cane Spring Canyon) still needs more time to recover. Implementation of this alternative will allow recovery, or maintain or improve the existing condition of the riparian areas and stream channels.

This alternative 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 portion of the watersheds and benefit channel and riparian conditions.

Watershed Condition

Table 25 displays expected change in attribute ratings for the six attributes potentially affected by grazing management in the Sunflower allotment for this alternative. The attribute rating for riparian vegetation condition and large woody debris will be expected to improve a condition class in the Cane Spring Canyon and Middle Sycamore Creek watersheds. Improvement in these attributes alone will not be sufficient to improve the overall condition rating of these watersheds. The channel shape and function attribute is dependent on establishment of riparian vegetation and will take longer to achieve. The rating for this attribute may not improve within the time-frame of this project. Attributes with a "very slow improvement" rating will require many years or decades to improve a condition class. Attributes with this rating will also not improve within the time-frame of this project. It is unlikely riparian vegetation condition and large woody debris will

improve in the following watersheds due to OHV use: Lower Sycamore Creek, Mesquite Wash, Jones Canyon, Salt River-Saguaro Lake, and Cottonwood Creek.

	Percent	Large	Channel	Riparian		Rangeland
6th code	in	Woody	Shape and	Vegetation	Soil	Vegetation
Watershed	allotment	Debris	Function	condition	Condition	Condition
Salt River-	39	No Change	Very slow	No Change	Very slow	Slow
Apache Lake			improvement		improvement	improvement
Salt River-	30	No change	Very slow	No Change	Very slow	Very slow
Canyon Lake			improvement		improvement	improvement
Cane Spring	100	improve	Very slow	improve	Very slow	Very slow
Canyon			improvement		improvement	improvement
Cottonwood	100	No change	No change	No change	Very slow	Very slow
Creek					improvement	improvement
Jones Canyon	96	No change	No change	No change	No change	No change
Salt River-	48	No change	No change	No change	No change	No change
Saguaro Lake						
Bulldog Canyon-	9	No change	No change	No change	No change	No change
Salt River						
Rock Creek	99	No change	very slow	No change	Very slow	Very Slow
			improvement		improvement	Improvement
Mesquite Wash	100	No change	No change	No change	No change	Very Slow
						Improvement
Middle	85	improve	Very slow	Improve	Very slow	Very Slow
Sycamore Creek			improvement		improvement	Improvement
Lower Sycamore	92	No change	No change	No change	No change	No change
Creek						

Table 25: Watershed Condition Ratings, Alternative 1

Soil Condition is also an attribute that changes slowly and although improvements in soil condition are possible in some watersheds the rating for this attribute may not improve within the timeframe of this project. No change in the soil condition rating is expected in watersheds receiving heavy OHV use. Rangeland vegetation condition changes slowly in the Sonoran Desert (see rangeland analysis). More than 50 percent of all watersheds except the Salt River-Apache Lake watershed are occupied by Sonoran Desert vegetation. Improvements in these watersheds will happen very slowly. If rangeland vegetation condition rating of this watershed will also improve, from impaired to functioning at risk.

Alternative 2 – Direct and Indirect Effects

Riparian Areas

Riparian vegetation utilization, residual stubble height of emergent vegetation, and availability of off-channel water developments are the elements most likely to affect riparian area and stream channel condition and recovery. Many of the stream channels on the allotment are in impaired or unstable condition (Mason and Johnson, 1999). In some pastures, most of the water available to livestock is located in springs and riparian areas. Many springs are currently fenced to exclude livestock and the remaining unfenced springs will be fenced as part of the proposed action. It is the permittees responsibility to bring range improvements up to Forest Service standards prior to

placing livestock into a pasture. The Forest Service will inspect the range improvements to ensure they are functioning. Riparian conditions in pastures placed in non-use status (Otero and Ranger Station pastures within the Dos S Unit and the Adams West and Desert Pastures within the Desert Unit), non-use in the Sycamore Creek corridor, and in the exclosure constructed above and below Hidden Water Spring in Cane Spring Canyon should recover in a manner similar to that described in the No Grazing Alternative.

Implementation of the riparian utilization guidelines that are recommended for monitoring livestock impacts to riparian areas and stream channels are intended to maintain or increase existing riparian vegetation. The Annual Operating Instructions (AOIs) prepared by the Forest Service each year recommend mitigating the direct effects of livestock grazing in key reaches by using riparian utilization measurements (implementation monitoring) (ITT, 1999; Burton *et al.* 2011). If riparian area utilization guidelines are followed and cattle are moved when use guidelines are met, the negative, direct effects of grazing will be minimized, and riparian area and stream channel condition should be maintained or improved. This mitigation measure should be effective for all of the key reaches in grazed pastures.

Many of the reaches with perennial stream flow will be excluded from grazing. These include the mainstem of Sycamore Creek, Log Corral Canyon, Mesquite Wash, and the perennial reach above and below Hidden Water Spring in Cane Spring Canyon. Direct impacts to water quality will not be expected in these reaches. The only reaches with perennial flow that will be grazed will be the reach below Tejanos Spring and Alder Creek. Direct impacts to water quality in the portion of these reaches accessible to livestock could include increases in *E. coli* when livestock are in the pasture and increased sediment movement from direct disturbance to the channel.

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. BMPs will be implemented to protect water quality.

Watershed Condition

Table 26 displays expected change in attribute ratings for the proposed action and are based on the following assumptions, within ten years: Soil condition of "improve" will be expected to improve a condition class; Soil condition of "slow improvement" may also improve a condition class; and soil condition of "very slow improvement" will not be expected to improve a condition class.

	Percent	Large	Channel	Riparian		Rangeland
6th code	in	Woody	Shape and	Vegetation	Soil	Vegetation
Watershed	allotment	Debris	Function	condition	Condition	Condition
Salt River-	39	No Change	Very slow	No Change	Very slow	Slow
Apache Lake			improvement		improvement	improvement
Salt River-	30	No change	Very slow	No change	Very slow	Very slow
Canyon Lake			improvement		improvement	improvement
Cane Spring	100	Improve	Very slow	improve	Very slow	Very slow

 Table 26: Watershed Condition Ratings, Alternative 2

	Percent	Large	Channel	Riparian		Rangeland
6th code	in	Woody	Shape and	Vegetation	Soil	Vegetation
Watershed	allotment	Debris	Function	condition	Condition	Condition
Canyon			improvement		improvement	improvement
Cottonwood	100	No change	No change	No change	Very slow	Very slow
Creek					improvement	improvement
Jones Canyon	96	No change	No change	No change	No change	No change
Salt River-	48	No change	No change	No change	No change	No change
Saguaro Lake						
Bulldog Canyon-	9	No change	No change	No change	No change	No change
Salt River						
Rock Creek	99	No change	Very slow	No change	Very slow	Very slow
			improvement		improvement	improvement
Mesquite Wash	100	No change	No Change	No Change	No Change	Very Slow
						Improvement
Middle	85	improve	Very slow	Improve	Very slow	Very Slow
Sycamore Creek			improvement		improvement	Improvement
Lower Sycamore	92	No change	No change	No change	No change	No change
Creek			_		-	_

Both the large woody debris and riparian vegetation condition attribute ratings will improve in the Cane Spring Canyon (due to fencing of riparian area adjacent to Hidden Water Spring) and Middle Sycamore Creek (due to continued non-use of Sycamore Creek) watersheds. These improvements will not change the condition class of these watersheds.

Cumulative Effects

The existing condition of streams and riparian areas on this allotment 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 6th code watersheds listed in the tables above, the Sycamore Creek watershed for effects to Sycamore Creek, and begins with the settlement of lands in the 1880s.

Historic over-grazing has had the most extensive effect on watersheds, stream channels, and riparian areas. The range was considered over stocked with cattle by 1891 (Allen, 1989). There have been many accounts of the 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 the overgrazed condition of the uplands as well as springs and riparian areas.

Unmanaged OHV use, especially in the southern and Sycamore Creek portions of this allotment, is having adverse effects on stream channels and riparian areas, as well as the uplands. Sediment from the uplands is traveling down tributaries and depositing in streams like Cottonwood Creek and Sycamore Creek. Driving in channels and on stream banks is causing destruction of riparian vegetation and banks, which maintains a high width/depth ratio. High width/depth ratios mean the channel is wide and shallow and that high flows have less power to move sediment through the system thereby causing excessive deposition. Because driving in stream reaches such as lower Sycamore Creek, lower Log Corral Canyon, Brushy Basin above Forest Service Road 143 and Tejanos Spring above Forest Service Road 143 is preventing recruitment of woody and

herbaceous species, which are needed to facilitate stream bank recovery and a functioning stream, these reaches are not considered key reaches for this project. OHV use will continue to impact stream channel and riparian area condition and trend.

The Travel Management Rule is intended to analyze motorized route alternatives in order to provide access and a recreation experience sufficient so vehicle operators no longer feel compelled to travel off established roads or trails. Once routes are established, maps will be available to the public and modified as needed to reflect any changes. Enforcement of the Travel Management Rule will be essential to assure compliance and prevent resource damage. Successful implementation of the Travel Management Rule should accelerate recovery of riparian areas where these areas are currently being impacted by cross country travel.

The most recent wildfire to impact the project area was the Sunflower Fire in 2012. The fire burned an area north of the project area within the Sycamore Creek watershed. The effects of flooding after the fire can be seen in Sycamore Creek in the project area as large downed trees across the channel below Log Corral Canyon, ash deposits in the banks further downstream, and scoured channels below the burned area. Other large wildfires that impacted the project area by eroding uplands and channels and depositing sediments in channels include Lone Fire in 1996 and Edge Complex in 2005.

The only other grazing allotment within the 6th code watersheds listed that may have cumulative downstream effects on stream channels and riparian areas within the project area is the Diamond Allotment, but additional impacts should be minimal.

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

Climate change has the potential for additional impacts. According to the Arizona Drought Monitor Report for January 2015 (ADWR, 2015), the area containing the Sunflower Allotment would be classified as being within moderate drought. According to the National Oceanic and Atmospheric Administration's National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein, 2006). The Federal Advisory Committee Draft Climate Assessment Report is projecting higher temperatures and lower precipitation for the southwestern US (Garfin *et al.*, 2013). New modeling efforts for the North American monsoons indicate that the amount of monsoon moisture will change little, however, the monsoons will be delayed and most of the precipitation will come late in the season (September-October) (Cook and Seager, 2013).

Some stream reaches, such as Cottonwood Creek, Rock Creek, Boulder Creek and lower Picadilla Creek, that were considered riparian reaches in the 2000 National Environmental Policy Act assessment for the Sunflower Allotment, no longer seem to have potential to support riparian vegetation due to a combination of long term drought, impacts from OHVs, and historical grazing.

Alternative 1

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. 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, unless there are new or continued impacts from OHVs. Where riparian vegetation is meeting desired conditions this alternative will provide the most protection for maintaining those conditions.

Alternative 2

The direct and indirect effects of this alternative on key reaches that are grazed, 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 key reaches that do not sustain impacts from OHVs, but at a slower rate than for Alternative 1. Key reaches that will be grazed in this alternative include Maverick Spring Canyon, Picadilla Creek, Tejanos Spring (below Forest Service Road 143), Brushy Basin (below Forest Service Road 143), and Alder Creek. The key reach in Cane Springs Canyon (the fenced area above and below Hidden Water Spring) should recover at a rate greater than the grazed key reaches but at a rate slower than under the No Action alternative due to continued grazing of the uplands.

The key reaches that continue to incur impacts from unmanaged OHV travel, which at this time include Sycamore Creek and Mesquite Wash, are not likely to attain desired conditions unless implementation of the Travel Management Rule results in improved OHV management in these reaches. Neither of these reaches will be grazed under the proposed action.

Wildlife, Plants, and Fisheries

Section 2 of the *Endangered Species Act of 1973* (ESA), as amended 1978, 1979, 1982, and 1988 (16 U.S.C. 1531et seq.) declares that "...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." Section 7 directs Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats (16 U.S.C. 1536 et sq.). Federal agencies also must consult with the Secretary of the Interior (U.S. Fish and Wildlife Service) whenever an action authorized by the agency is likely to affect a species listed as threatened or endangered or to affect its critical habitat. The act mandates conference with the Secretary of the Interior whenever an action is likely to jeopardize the continued existence of any species proposed for listing as threatened or endangered, or whenever an action might result in destruction or adverse modification of critical habitat proposed for listing (16 U.S.C. 1536(a) 4). The following discussion on affected environment is available in the project record.

The various vegetation types in the project area support a variety of game and nongame species. The allotment is within Game Management Unit 22. Big game found on the allotment include:

desert bighorn sheep, black bear, mule deer, whitetail deer, javelina, and mountain lion. Elk do occur in limited numbers in the pine habitat near the top of Four Peaks. Whitetail deer inhabit higher and brushier areas (Cline Unit), while mule deer use the desert scrub and open chaparral vegetation types. Mule deer and javelina population trends unit wide are stable with severe localized impacts in the off-highway vehicle (OHV) recreation corridors. These corridors cover most of Adams Pasture and the southern portion of the Picadilla Pasture of the Dos S Unit, Desert Unit, and western portion of Cottonwood Unit. The presence of mule deer in these areas is low to nonexistent. White-tailed deer, black bear, and mountain lion population trends unit wide are stable. The elk population in the Four Peaks mountain range is stable (J. Dickson, personal communication May 7, 2015).

Game birds and small game found on the allotment include: Gambel's quail, mourning dove, white-winged dove, cottontail rabbit, black tailed jackrabbit, and Abert's and grey squirrels. Most small game populations rely heavily on rainfall, so populations can fluctuate annually. Currently small game populations are stable with no concerns (J. Dickson, personal communication May 7, 2015). Predators such as coyotes, bobcats, and gray fox, are commonly found on the allotment. Nongame species include a variety of birds, mammals, reptiles, and amphibians.

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

General Effects Wildlife, Plants, and Fisheries

Livestock grazing can affect wildlife species or habitats in several ways. Presence of cattle can cause compaction of soils, which may result in increased runoff and reduced rainfall infiltration. Grazing may also reduce vegetation and litter cover. The maintenance of residual biomass, to ensure plant vigor and ground cover on grazed rangelands, is critical for wildlife habitat and watershed protection throughout the year. Resource recovery following periods of drought, appear to be promoted by the presence of litter that traps seeds and lowers evaporative losses (Milchunas, 2006). It is essential for managers and livestock permittees to recognize the importance of responding to drought through reduced stocking or de-stocking during drought. The Tonto Drought Policy will assist resource managers in minimizing livestock grazing impacts during drought.

Precipitation patterns are an important consideration for both long and short-term goals. Rainfall on the allotment varies and may be highly erratic both within and between years. Growing seasons on the allotment tend to be bimodal.

Riparian and wetland communities represent a very small percentage of the land area in the southwest but are areas of high plant and animal diversity and productivity (Milchunas, 2006). Riparian areas and wetlands provide water and cover to animals that may be more associated with adjacent upland communities, including livestock, as well as many species that are riparian obligate species for all or part of their life cycles. These areas are probably more important to animals associated with uplands in arid and semiarid regions because of the refuge they provide

from the harsh environment. Livestock grazing in riparian areas has the potential to reduce the establishment of seedling riparian obligate woody species, thus affecting the age class and vertical structure of riparian areas. Streamside vegetation is an important component in the establishment of bank formation and channel morphology, as well as reducing sediment load from upland erosion. There is potential for these productive areas to be impacted by livestock to a relatively greater degree than adjacent, less productive upland communities, however, there is also the potential for more rapid recovery (Milchunas, 2006).

Direct Effects

Riparian and upland areas provide important terrestrial and aquatic habitat to wildlife species. Excessive grazing and trampling impacts destabilize and break down stream banks, which results in negative effects to aquatic wildlife. These effects may be realized through modification of stream morphology and function, increased siltation, and reduction of woody and herbaceous vegetation. During scouring floods, fish populations are more vulnerable to removal without stable banks and associated vegetation in place.

Congregation of livestock and livestock management practices, such as herding, may have direct effects to wildlife and/or habitat. Effects may include removal of vegetation, dust accumulation, noise, avoidance areas, and soil compaction. Upland vegetation density and composition may remain stable, if livestock grazing and associated activities are 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 (Trimble and Mendel, 1995). 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) may have indirect effects to wildlife or associated habitat when considering grazing alternatives. Effects may include removal of vegetation, dust accumulation, noise, avoidance areas, 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.

Hoof action by livestock can impact soils through compaction, especially when soils are wet. Compacted soils in the uplands have lower rates of water infiltration and may result in increased runoff and soil loss resulting in indirect negative effects to riparian aquatic and terrestrial species. As a result, wildlife habitat components may be affected, especially if riparian and upland conditions are not properly functioning.

Utilization of woody and herbaceous vegetation by livestock may result in increased stream temperatures, reduced ground cover and organic litter, which may indirectly affect aquatic and terrestrial wildlife through increased surface runoff and potentially reducing the establishment of

additional vegetative cover in the uplands and riparian areas. In addition, habitat available to prey species in the uplands and riparian area may be reduced by livestock grazing, resulting in reduced numbers of prey species and/or increased predation upon those species. Water quality may also be indirectly affected by livestock use in the uplands as a result of decreased infiltration of surface water and livestock fecal accumulation.

Threatened, Endangered, Proposed and Candidate Species Considered and Determinations

Species occurrence records, district files and personnel knowledge, and the US Fish and Wildlife Service (USFWS) Information, Planning, and Conservation (IPaC) decision support system were used in identifying listed species which may occur or have suitable habitat within the action area (IPaC Consultation Code 02EAAZ00-2015-SLI-0436). These species lists were reviewed to determine if any of these special status species have the potential to occur in the action area. For species with critical habitat designation within the project area, there is only one: the Mexican spotted owl (*Strix occidentalis lucida*)²². In addition to the Mexican spotted owl, Table 27 lists the species that are analyzed in detail within this document²³.

Common Name	Scientific	Status
Gila Topminnow	Poecilioposis occidentalis	Endangered Species Act: Listed
	occidentalis	Endangered
Desert Pupfish	Cyprinodon macularius	Endangered Species Act: Listed
		Endangered
Sonoran Desert	Gopherus morafkai	Endangered Species Act: Candidate
Tortoise		

 Table 27: Threatened, Endangered, and Candidate Species in Sunflower Allotment

Gila Topminnow

Gila topminnow are known to occur in two locations on the Sunflower Allotment: Mud Springs and Hidden Water springs.

Mud Spring

Mud Spring is located in the Mazatzal Mountains, approximately nine miles south of Sunflower, Arizona, just east of State Route 87 in the Dos S Unit. The watershed above the complex is small, consisting of a low hillside; vegetated by foothill paloverde, saguaro cactus, and low understory shrubs. The ponds and trough are vegetated with cattail, bulrush, and desert saltgrass. Topminnow were originally stocked in Mud Spring in 1982. They eventually made their way into a cement trough (fed by a pipe) and have been observed there since 1987. It was determined that the spring was capable of supporting multiple "ponds," which could be used to establish populations of topminnow. On February 11, 1994, the USFWS issued Biological Opinion 02-21-92-F-213 authorizing the construction of the ponds (USFWS, 1994). In 1996, four dugout ponds were constructed in a south-to-north line (south pond, middle-south pond, middle-north pond, and

²² The final ruling effective date for the Mexican spotted owl critical habitat is 8/31/2004.

²³ Special status species included on the USFWS list, but excluded from further evaluation, are addressed in the Biological Assessment and available in the project record.

north pond), and the area was fenced to exclude livestock from the ponds. Additionally, a new trough was installed outside of the exclosure to provide drinking water to livestock.

In 1997, the Arizona Game and Fish Department (AGFD) acquired topminnow from Boyce Thompson Arboretum, which were stocked into the south and middle-south ponds. In 1999, population augmentation in the aforementioned two ponds was again conducted, as well as stocking the remaining two ponds (middle-north and north) with topminnow (Robinson 2010). Subsequent stockings were conducted in 2007 and 2008.

Annual monitoring of the springs is conducted by AGFD, with reports submitted to USFWS and the Forest. Data collected during the 2012 monitoring effort indicate that topminnow populations in the south, middle-south, and cement trough are established and stable (Pearson, 2013).

Hidden Water Spring

Hidden Water Spring is located in Cane Springs Canyon within the Four Peaks Wilderness. It is within the Cottonwood Unit of the Sunflower Allotment, which has been in nonuse since May 22, 2002. Unlike Mud Spring it is located in a larger watershed, consisting of roughly 6,000 acres with very steep canyon topography. Hidden Water Spring was fenced from livestock in 1999 (USFWS 2002); however, observations made during a recent site visit showed that sections of the exclosure fence are missing and/or in need of repair.

Gila topminnows were re-established in Hidden Water Spring in 1976, making this the longest continually surviving re-established topminnow population, and thus, is extremely important. During a 2015 survey completed by AGFD, 642 topminnow were caught indicating that the population is doing well. Though no roads lead to Hidden Water Spring, vehicles can travel down Cottonwood Creek to Cane Springs Canyon. There is also a road into the upper drainage of Cane Springs Canyon. With increasing recreation, Hidden Water Spring and its associated pond may see some increase in recreational use, although given its remote location and small size; these effects will likely be insignificant.

Conservation Measures

The following species conservation measures were obtained from the *Management Practices and Mitigation Measures* section in chapter 1 of this document and from livestock management tools included in the proposed action in chapter 2. These measures are used in the determination of effects of the proposed action on the species.

- Mud Springs, including the four "potholes" and concrete drinker are fenced off to exclude livestock use. Fence will be functional prior to any livestock entering the Picadilla pasture of the Dos S unit.
- Existing exclosure fence around Hidden Water Spring, located in the proposed Cottonwood West unit/South pasture, will be maintained to standard to exclude livestock access.
- Conservative upland utilization levels will ensure maintenance of herbaceous cover, thereby increasing infiltration rates and reducing erosion and sediment loss which will help maintain water quality within the springs.

• An exclosure fence will be constructed within Cane Springs Canyon above and below Hidden Water Spring to exclude livestock and allow riparian vegetation within this key reach to improve.

Effects Analysis

The Framework outlines that one of the following criteria must be met for making "no effect" determinations for Gila topminnow:

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

The Framework states the following criteria must be met for a not likely to adversely affect determination for the Gila topminnow:

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

As previously mentioned, there haven't been livestock on the Sunflower allotment since 2002 per previous NEPA decisions. However, if cattle are authorized to return, no direct effects of livestock grazing, such as trampling, are anticipated due to the fact that Mud Spring, the four potholes, and the cement trough are fenced off to exclude livestock access. Prior to any livestock entering the Picadilla pasture of the Dos S unit, and throughout the pastures assigned grazing period, the fence will be checked to ensure that it is functional. The exclosure fence around Hidden Water Spring is currently in disrepair, however, prior to livestock entering the Cottonwood West Unit, and throughout the assigned grazing period, the fence will be checked to ensure that it is functional. Additionally, the proposed action includes the addition of a livestock exclosure fence upstream and downstream of Hidden Water Spring within Cane Spring Canyon to improve riparian habitat.

Livestock grazing can indirectly impact watershed condition and topminnow habitat through the removal of upland and riparian vegetation, and soil compaction both of which can increase runoff, thereby increasing sediment load and decreasing water quality. Recent visits to this allotment suggest that current range condition is in stable to improving condition. Though grazing may slow the recovery of watershed conditions, under conservative use grazing, range and soil conditions should not degrade, but rather remain stable or improve over time. Therefore, indirect effects resulting from upland livestock grazing to Gila topminnow are not likely to reach the level where take will occur, thus these indirect effects are insignificant or discountable to Gila topminnow.

Due to the small drainage area above Mud Springs' ponds, grazing outside the exterior fence will have little impact on the pond. Due to the ponds' close proximity to Forest Road 11 and SR 87, exclosure fence inspections will be convenient. The larger Cane Springs Canyon watershed above Hidden Water Spring may make this site more susceptible to livestock grazing impacts in the future. Water quality concerns and the potentially detrimental effect of livestock waste on fish (Taylor et al. 1991) are not expected to present a serious threat; this is also lessened by the fact that wetlands are noted for their ability to remove pollutants (Johnston *et al.*, 1990). This is also supported by the fact that the Gila topminnow population has flourished at Hidden Water Spring in the presence of cattle grazing for 30 years.

Determination of Effects

In 2005 the District reinitiated formal section 7 consultation under the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). At issue were the impacts on desert pupfish in Mud and Hidden Water springs, from the continued use of a 10-year term permit to graze livestock on the Sunflower Allotment. This reinitiation will amend the two existing biological opinions: (FWS file 02-21-92-F-213) for Mud Springs and (FWS file 02-21-99-F-300) for Hidden Water Springs. This amendment will provide for incidental take of desert pupfish as well as Gila topminnow. A *may affect, likely to adversely affect* determination was made and received USFWS concurrence (USFWS 02-21-05-F-0450) on May 19, 2006. The reasonable and prudent measures with terms and conditions and conservation measures identified in that biological opinion are still in effect and will be incorporated by reference. The status of the species, environmental baseline, effects of the action, cumulative effects, and conclusions remain the same for Gila topminnow. Therefore, for the purposes of this analysis, a determination of *no effect* will be made.

Desert Pupfish

Desert Pupfish are currently within only Mud Springs within the Sunflower Allotment.

Mud Springs

In 2005, the Forest requested to reinitiate formal section 7 consultation under the *Endangered Species Act of 1973* (16 U.S.C. 1531-1544), as amended, with the USFWS following AGFD's stocking of desert pupfish (pupfish) in Mud and Hidden Water Springs. On May 19, 2006, the USFWS issued their biological opinion (02-21-05-F-0450) (USFWS 2006), that the continuation of livestock grazing on the Sunflower Allotment was not likely to jeopardize the continued existence of this species; and ultimately, the project should benefit the desert pupfish.

On June 12, 2007, desert pupfish (n=146), acquired from Boyce Thompson Arboretum, were added to the existing Gila topminnow population in the south pond of Mud Spring (Robinson 2008). Stocking of desert pupfish is covered under the AGFD 10(a) 1(A) permit. Two additional stockings occurred in 2008, adding 175 pupfish into the middle-south pond, and 121 into the north pond. On August 26, 2009, the remaining pond, middle-north pond, was stocked with 49 pupfish taken from the south pond. Then again on October 15, 2009, desert pupfish originating from Bubbling Ponds Native Fish Conservation Facility were stocked into each of the four ponds (Robinson 2010).

A species is considered to have become established when it is reproducing to the point where it is self-sustaining. Monitoring data collected annually by AGFD from 2008 through 2012 indicate that desert pupfish are established in the south, middle-south, and north ponds (Robinson 2010). The most recent monitoring effort took place on July 5, 2012; no pupfish were detected in the middle-north pond. The lack of fish presence was speculated to be due to a water quality or water depth issue. The pond was greater than 12 inches deep, and was discolored due to a large saguaro that had fallen into the pond and was decomposing (C. Crowder, personal communication, July 5, 2012).

Hidden Water Spring

The Sunflower Allotment (Cottonwood Unit) was stocked with desert pupfish at Hidden Water Spring in 1976, but the stocking failed. As previously mentioned, the biological opinion (02-21-05-F-0450), issued by the USFWS on May 19, 2006 authorized the stocking of desert pupfish into Hidden Water Spring; although stocking efforts have not yet occurred.

Conservation Measures

The following species conservation measures were obtained from the *Management Practices and Mitigation Measures* section in chapter 1 of this document and from livestock management tools included in the proposed action in chapter 2. These measures are used in the determination of effects of the proposed action on the species.

- Mud Springs, including the four "potholes" and concrete drinker are fenced off to exclude livestock use. Fence will be functional prior to any livestock entering the Picadilla pasture of the Dos S unit.
- Existing exclosure fence around Hidden Water Spring, located in the proposed Cottonwood West Unit/South Pasture, will be maintained to standard to exclude livestock access.
- Conservative upland utilization levels will ensure maintenance of herbaceous cover, thereby increasing infiltration rates and reducing erosion and sediment loss which will help maintain water quality within the springs.
- An exclosure fence will be constructed within Cane Springs Canyon above and below Hidden Water Spring to exclude livestock and allow riparian vegetation to improve.

Effects Analysis

The effects of the proposed action on desert pupfish will be the same as those described for Gila topminnow above.

Determination of Effects

In 2005 the District reinitiated formal section 7 consultation under the *Endangered Species Act of 1973* (16 U.S.C. 1531-1544), as amended (Act). At issue were the impacts on desert pupfish in Mud and Hidden Water springs, from the continued use of a 10-year term permit to graze livestock on the Sunflower Allotment. This reinitiation will amend the two existing biological opinions; (FWS file 02-21-92-F-213) for Mud Springs and (FWS file 02-21-99-F-300) for Hidden Water Springs. This amendment will provide for incidental take of desert pupfish as well as Gila topminnow. A *may affect, likely to adversely affect* determination was made and received USFWS concurrence (USFWS 02-21-05-F-0450) on May 19, 2006. The reasonable and prudent measures with terms and conditions and conservation measures identified in that BO are still in effect and will be incorporated by reference. The status of the species, environmental baseline,

effects of the action, cumulative effects, and conclusions remain the same for desert pupfish. Therefore, for the purposes of this analysis, a determination of *no effect* will be made.

Mexican Spotted Owl Critical Habitat

On August 31, 2004, the USFWS designated approximately 3.5 million hectare (8.6 million acre) of critical habitat for the Mexican spotted owl (MSO) on Federal lands in Arizona, Colorado, New Mexico, and Utah (69 FR 53181). Within the critical habitat boundaries, critical habitat includes only protected and restricted habitats, as defined in the original Recovery Plan (USFWS 1995, revised 2012). Similarly, the primary constituent elements of critical habitat were listed as those habitat features recognized in the 1995 Recovery Plan as associated with Mexican spotted owl occupancy.

Primary constituent elements for the Mexican spotted owl are defined in the 1995 Recovery Plan (USDI FWS 1995) (USFWS 2004); and include the following:

- 1) Primary constituent elements related to forest structure:
 - a. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 percent to 45 percent of which are large trees with a trunk diameter of 12 inches (0.3 meters) or more when measured at 4.5 feet (1.4 meters) from the ground;
 - b. A shade canopy created by tree branches covering 40 percent or more of the ground; and
 - c. Large dead trees (snags) with a trunk diameter of at least 12 inches (0.3 meters) when measured at 4.5 feet (1.4 meters) from the ground.
- 2) Primary constituent elements related to maintenance of adequate prey species:
 - a. High volumes of fallen trees and other woody debris;
 - b. A wide range of tree and plant species, including hardwoods; and
 - c. Adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration.
- 3) Primary constituent elements related to canyon habitat include one or more of the following:
 - a. Presence of water (often providing cooler temperatures and higher humidity than the surrounding areas);
 - b. Clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, and/or riparian vegetation;
 - c. Canyon wall containing crevices, ledges, or caves; and
 - d. High percent of ground litter and woody debris.

Mexican spotted owl critical habitat occurs within portions of each of the proposed four units (Table 28). This suitable habitat is in association with the Buck Basin and Four Peaks Protected Activity Centers, both of which are located on the Tonto Basin Ranger District. The critical habitat is within the Basin and Range-West Ecological Management Unit. Approximately 34,000 acres (Tonto National Forest Geographical Information System (GIS) data) of suitable habitat lie within the action area, specifically along the eastern allotment boundary. However, of the 34,000 designated acres, roughly 4,000 acres or less, primarily along Four Peaks, contain the primary constituent elements listed above. Furthermore, the mixed-conifer and pine-oak woodlands are

generally in locations not accessible to livestock due to steep terrain. Livestock tend to concentrate on flatter areas especially if they are fairly open. Holechek (2004) reports that cattle tend to use ten to 30 percent slopes, thirty percent less often than zero to ten percent slopes, and 30 to 60 percent slopes sixty percent less often than flats. Slopes over 60 percent are seldom used (Holechek, 2004).

Unit	Pasture
Dos S	Pine Creek
Cline	Ballantine
	Cline
	Mud Spring
Cottonwood West	North
Cottonwood East	Cane Springs North
	Alder Creek

 Table 28: Units and Pastures with Designated MSO Critical Habitat

Conservation Measures

The following species conservation measures were obtained from the *Management Practices and Mitigation Measures* section in chapter 1 of this document and from livestock management tools included in the proposed action in chapter 2. These measures are used in the determination of effects of the proposed action on the species.

- The proposed action includes a rotational grazing strategy that provides annual and seasonal rest. This management strategy allows for plant growth and reproduction throughout the allotment. In addition to rest built into grazing strategies, conservative use levels for upland and riparian areas provide for residual vegetation to ensure maintenance of adequate prey species.
- Conservative forage utilization standards (30 40 percent) are designed to maintain adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration.
- The proposed action includes the development of additional water storage, pipeline, and troughs which will facilitate livestock distribution and provide water outside of riparian areas.

Effects Analysis

Livestock grazing and management in the action area will not directly affect any of the PCEs related to upland forest structure, as upland tree species are not palatable to livestock. Indirectly, livestock management practices (rotational grazing, salting, herding) and conservative utilization levels (30 - 40 percent) can reduce fine fuels in mixed conifer and pine oak woodlands, thereby decreasing the risk of stand replacing catastrophic wildfire.

Livestock grazing can directly impact PCEs related to maintenance of adequate prey species; in particular, adequate levels of residual plant cover to maintain fruits, seeds, and allow plant for plant regeneration. Grazing, in general, removes plant biomass from the system and may compact the soil. These changes may influence prey availability and prey habitat conditions. The proposed action is to manage the Sunflower Allotment under a rotational grazing strategy that provides annual and/or seasonal rest within pastures, allowing for plant growth and reproduction. In addition to rest built into grazing strategies, conservative use levels set for the allotment also provide for residual herbaceous biomass which is critical within key foraging habitat such as

pinyon-juniper woodlands and ponderosa pine forests primarily along the eastern Cline Unit and northern the northern Cottonwood Units. Managing for conservative use will achieve management objectives and maintain or improve the long-term productivity of the site (Society for Range Management, 1989). As mentioned in the monitoring section above, consistent patterns of utilization in excess of 40 percent on key species in key areas will be used as a basis to modify management practices or take administrative actions necessary to reduce utilization in subsequent grazing seasons.

Additionally, livestock grazing can directly and indirectly impact several of the PCEs related to canyon habitat. Three of the key riparian reaches selected for monitoring occur within designated critical habitat; Picadilla Creek, Tejanos Spring, and Brush Basin. Riparian monitoring and utilization guidelines, as outlined in chapter 1 of this document, will facilitate in obtaining multiple age classes of riparian obligate woody species. A healthy riparian ecosystem contributes to channel stability by increasing resistance, thereby reducing flood peaks, trapping sediment and increasing groundwater recharge, which may also benefit the establishment of riparian habitat stringers associated with canyon habitat (Briggs, 1996).

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.

Determination of Effects

Based upon the following, it is our determination that the proposed action on the Sunflower Allotment, *may affect, not likely to adversely affect*, Mexican spotted owl designated critical habitat:

- Livestock grazing intensity will be managed at conservative utilization levels (30 40 percent) which will ensure residual herbaceous biomass in key foraging areas for maintenance of adequate prey species. Consistent patterns of utilization in excess of 40 percent on key species in key areas will be used as a basis to modify management practices or take administrative actions necessary to reduce utilization in subsequent grazing seasons.
- Conservative utilization levels within riparian habitat will facilitate the development of a multiple age class structure in riparian obligate woody species, and increase herbaceous cover. Once riparian utilization guidelines are met, cattle will be moved from the riparian area or to the next scheduled pasture, even though forage may still be available in the uplands.
- Conservative utilization levels in mixed conifer, pine-oak, and pinyon-juniper woodlands will reduce fine fuels thereby decreasing the risk of catastrophic wildfire.

Sonoran Desert Tortoise

The Sonoran population of desert tortoise primarily inhabits rocky slopes and bajadas of Mojave and Sonoran desert scrub habitats throughout much of southern and western Arizona at elevations ranging from about 500 to 5,300 feet (Lutch, 2000; Van Devender, 2002). Sonoran desert tortoises (SDT) are absent or they occur at very low densities in the intermountain valley floors, with surveys indicating that individuals can occur up to one mile from the nearest slope (Averill-

Murray and Averill-Murray 2005). Individuals that occur in these intermountain valley floor habitats are almost always restricted to washes with caliche caves, but these individuals also spend time in the alluvial slopes above the washes (Averill-Murray and Averill-Murray, 2005; Riedle *et al.*, 2008).

Portions of this allotment, particularly the Adams and Otero Pastures of the Dos S Unit contain some of the highest quality tortoise habitat on the entire Forest, with tortoise densities over 50 per square mile. The Sugarloaf study site was established by AGFD in 1991, and is combined with the Four Peaks study site (immediately east of State Route 87), and is approximately 2,149 acres in size. This area incorporates the mark-recapture survey area, and the home ranges of the 13 juvenile desert tortoises tracked using radio-telemetry (C. Jones, personal communication February 28, 2013).

AGFD has marked a total of 181 tortoises at the Sugarloaf site, since its establishment. The population is healthy (free of clinical signs of disease), and stable (with an estimate survival rate of 98 percent) (C. Jones, personal communication February 28, 2013).

The Four Peaks long-term monitoring plot was surveyed in 1992, 1995, and 2001. Murray and Schwalbe (1993) reported that the Four Peaks population is the densest reported in the Sonoran Desert. This population has also remained stable, since it was established in 1991 (C. Jones, personal communication February 28, 2013).

Conservation Measures

The following species conservation measures were obtained from the *Management Practices and Mitigation Measures* section in chapter 1 of this document, from livestock management tools included in the proposed action in chapter 2, and those measures provided through consultation with USFWS. These measures are used in the determination of effects of the proposed action on the species.

- The proposed action includes a rotational grazing strategy that provides annual and seasonal rest. This management strategy will allow for plant growth and reproduction throughout the allotment. Additionally, conservative utilization guidelines will ensure adequate residual vegetation to support tortoise forage requirements.
- Improvements proposed within Sonoran desert tortoise habitat, will require preconstruction surveys and monitoring to ensure that individual tortoises are not present within the action area.
- New troughs, supplements, and/or salt will not be located within .25 miles of the Sonoran desert tortoises' preferred habitat, which includes rocky, boulder-covered hills and mountains in Sonoran desert scrub habitat. This will help ensure that livestock congregation areas (near water) are outside of tortoise foraging areas.
- Existing vehicular travel routes, trails, and/or channel crossing will be used to reduce soil, vegetation, and human disturbance to tortoise.
- Reduce soil and vegetation disturbance when conducting ranch activities. When practicable, livestock will be moved using established trails, roads, travel routes, and channel crossings.

- Implement grazing management practices to achieve or make "significant²⁴" progress toward meeting desired conditions within tortoise habitat.
- Coordinate with AGFD and incorporate their Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects into the aspects of the proposed action that include construction of grazing and rangeland infrastructure.

Effects Analysis

In February 2015 a multiagency cooperative effort developed a *Candidate Conservation Agreement (CCA) for the Sonoran Desert Tortoise*. The CCA was created to provide effective conservation of this candidate species in Arizona. The final CCA was signed May 27, 2015 (USFWS, 2015).

Primary threats to SDT populations in Arizona are habitat destruction, fragmentation, and degradation. Causes of these threats include, but are not limited to: human-constructed barriers to movement, invasive nonnative plant establishment, off-highway vehicle use, livestock grazing, and altered fire regimes. According to the CCA, livestock grazing is not currently thought to affect SDT populations in Arizona, given that there is little overlap in the habitat shared with livestock, and livestock management practices such as; managing for conservative use, balancing stocking levels with range capacity, and livestock distribution practices (salting, water) allow for improvement in overall ecosystem health.

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

The proposed action includes non-use in the Adams and Otero pastures of the Dos S Unit. These two pastures contain the highest density of SDT and the majority of the tortoises' preferred habitat. Non-use will remove any potential for direct or indirect effects to SDT individuals and/or populations. Additionally, the proposed action includes non-use within the Desert Unit. Although not the preferred habitat, SDT are known to occur in the unit, therefore, non-use will removed any direct or indirect effects within that unit as well.

For the remainder of the units/pastures that contain SDT habitat and/or have known occurrences, the proposed utilization levels, management practices (rotational grazing, rest), monitoring, mitigation measures, and conservation measures are intended to minimize any direct or indirect effects to individual SDT and/or their habitat.

Determination of Effects

Based on the following, it is our determination that the proposed action on the Sunflower allotment, *may affect individual Sonoran desert tortoise, but will not result in a trend toward federal listing or loss of viability.*

²⁴ The term "significant" in this context is from the USFWS concurrence letter and relates to the Endangered Species Act, not NEPA.

- The proposed action is to continue non-use within known high density SDT populations, thereby removing any direct and/or indirect effects to individuals or populations.
- Conservative utilization levels throughout the remainder of the allotment, where habitat overlap may occur, will insure adequate residual forage remains to support SDT.
- The proposed action includes numerous mitigation and conservation measures to remove and/or minimize direct or indirect effects of livestock grazing on SDT.

Alternative 1 - Direct and Indirect Effects

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

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

With the exclusion of livestock grazing, it is expected that there will be an increase in upland herbaceous and shrub density, cover, and diversity benefitting wildlife species. Overall watershed and soil conditions across the allotment will continue to improve. Upland habitat for game species such as deer and javelina will generally increase in vigor and density. Small game and nongame species will generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity. Improvements in these resource conditions will be expected to occur more quickly than they will under implementation of either of the grazing alternatives.

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

The 'No Grazing' alternative will result in a "No Effect" determination for Gila topminnow and desert pupfish in Mud and Hidden Water Springs, and the Sonoran Desert tortoise (candidate). Furthermore, none of the primary constituent elements associated with Mexican spotted owl critical habitat will be affected by livestock, as no livestock grazing or livestock management activities will occur within or near their respective habitats. This alternative will promote improved riparian habitat, water quality, aquatic habitat, and upland conditions. Although other factors such as; flooding regime, drought, and recreational impacts play a role in the quality of the habitat for species on the allotment, it is anticipated that removal of grazing from these areas will

result in greater improvement of upland and riparian areas to that of the other alternatives. General habitat conditions for sensitive species will also improve with discontinuation of livestock grazing.

Implementation of the 'No Grazing' alternative will provide the greatest benefit to TES/Special Status Species, MIS, and general wildlife species. All wildlife populations in the action area, including threatened, endangered, and sensitive species dependent on riparian habitat will benefit from improved habitat conditions.

Implementation of alternative 1 will begin to reverse some of the impacts resulting from past overgrazing practices on allotment.

Alternative 2 - Direct and Indirect Effects

This alternative will provide non-use within the Otero, Ranger Station, Sycamore Creek Riparian, and Adams—west of SR 87—pastures within the Dos S Unit, and the Desert Unit. Non-use within these units/pastures should benefit riparian dependent species within Sycamore Creek, Mesquite Wash, and Log Corral Canyon, and their tributaries through improved riparian conditions. Similarly, upland species will benefit from improvement in upland resources. Additionally, the proposed exclosure fence above and below Hidden Water Spring in Cane Spring Canyon will benefit Gila topminnow, desert pupfish, and lowland leopard frog populations known to occur there. Furthermore, non-use will benefit Sonoran Desert tortoise populations and habitat known to occur in the Adams and Otero pastures and remove conflict between heavy recreational pressure and livestock grazing practices. The effects of non-use within these pastures will be similar to that described under the "No Grazing" alternative.

For the remaining units/pastures with riparian habitat, including the designated key reaches, adherence to the proposed riparian utilization guidelines and mitigation measures should maintain or increase existing riparian vegetation, although at a slower rate than under the "No Grazing" alternative.

Watershed and soil conditions are expected to remain stable or improve through the proposed management tools, water developments, herbaceous and browse utilization guidelines, and mitigation measures.

Recruitment of woody and herbaceous riparian species and improvement in structural and age class diversity within riparian areas proposed for non-use, as well as that portion of Cane Spring Canyon excluded from livestock access, is expected to be similar to what was described under the "No Grazing" alternative. Riparian habitat within the pastures proposed for use is expected to be maintained or improve through adherence to utilization guidelines, the proposed water developments, management tools, and mitigation measures. It is expected that, over time, structural and age class diversity in these riparian areas will continue to improve under this alternative, although to a lesser degree than under Alternative 1.

Overall, it is expected that watershed and soil conditions across the allotment will continue to improve under the proposed action, although improvement will be slower than the 'No Grazing' alternative, in those units/pastures proposed for use.

Upland habitat capability for game species such as deer and quail will likely continue to improve with an increase in herbaceous vigor and density due to the management tools, water developments, utilization guidelines, and mitigation measures included in the proposed action. Improvements to upland habitat are expected to be slower under this alternative than the "No Grazing" alternative. Small game and non-game species will generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity, although at slower rates than Alternative 1.

Improvement in game and non-game upland and riparian habitat within the proposed non-use pastures is expected to be similar to what was described under the "No Grazing" alternative.

Sensitive Wildlife, Plants, and Fish

Sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: (a) significant current or predicted downward trends in population numbers or density, or (b) significant current or predicted downward trends in habitat capability that will reduce a species' existing distribution (FSM 2670.5(19))." It is the policy of the Forest Service regarding sensitive species to:

- 1) Assist states in achieving their goals for conservation of endemic species;
- 2) As part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species;
- 3) Avoid or minimize impacts to species whose viability has been identified as a concern;
- 4) If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (the line officer, with project approval authority, makes the decision to allow or disallow impacts, but the decision must not result in loss of species viability or create significant trends toward Federal listing); and
- 5) Establish management objectives in cooperation with the state when projects on National Forest System lands may have a significant effect on sensitive species population numbers or distributions. Establish objectives for Federal candidate species, in cooperation with the U.S. Fish and Wildlife Service and state of Arizona (FSM 2670.32).

The most current and available data on species, available habitat, survey history, biologists knowledge and experience, the most recent Regional Forester's (2013), the Tonto National Forest sensitive species list (2015), and a review of the Arizona Game and Fish Departments (AGFD) Heritage Data Management System (HDMS) and HabiMap were used to determine if any listed species, or their habitats may be affected by the proposed action. These species are listed in Table 29. All of the Region 3 sensitive species were considered and analyzed for this project and are available in the Biological Evaluation in the project record.

Common Name	Scientific Name	Determination
Sonoran Desert Tortoise ²⁵	Gopherus morafkai	May affect individual Sonoran desert tortoise, but will not result in a trend toward federal listing or loss of viability.
Bezy's Night Lizard	Xantusia bezyi	No effect on individuals or population viability of this species.
Lowland Leopard Frog	Lithobates yavapaiensis	May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability for this species.
Desert Sucker	Catostomus clarki	No effect on individuals or population viability of this species.
Mapleleaf False Snapdragon	Mabrya acerifolia	No effect on individuals or population viability of this species.
Hohokam Agave	Agave murpheyi	May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability for this species.

 Table 29: Sensitive Species in Sunflower Allotment

Bezy's Night Lizard

The Bezy's night lizard is one of three species of night lizards known to occur in Arizona. Night lizards are reclusive and secretive, reproducing, feeding, and living most of its life under cover. This species is known to occur in central Arizona, occupying elevations ranging from 2,400 - 5,800 feet within the Arizona Upland Sonoran Desert scrub and Interior chaparral communities. They are typically found in rugged, rocky slopes and boulder fields and granite outcroppings, under leaves, agave stalks, and vegetative debris (AGFD, 2003).

Lower elevation populations become active in early April and remain so until late summer, while higher elevation populations may not become active until May. Their secretive nature makes it difficult to determine their daily activity patterns, but laboratory studies have shown that this species is diurnal. Their home range is restricted to their cover sites and the location immediately adjacent to it. Predators include snakes, predatory birds, and larger lizards (Brennan and Holycross, 2006).

They feed on beetles, flies, spiders, ants, moths, and a variety of other insects. It waits for prey items to wander into the cover area and seldom searches actively.

²⁵ Sonoran Desert tortoise is listed as a Candidate species under the Endangered Species Act, as well as a Forest Service Sensitive species. The analysis of this species is included in the Threatened, Endangered, Proposed, and Candidate species section above, and therefore, will not be included (re-evaluated) in the Sensitive species section. Analysis of this species can be found in the biological evaluation and biological assessment, available in the project record.

Status within the Action Area

Heritage Database records indicate that this species has been observed in several locations within both Sonoran Desert scrub and interior chaparral habitat.

Analysis of Effects

Livestock grazing and/or associated management activities are not known as a threat to this species. This is likely due to the fact that livestock typically aren't able to access this species preferred habitat; rocky slopes and boulder outcroppings, as well as its limited dispersal range. However, this species is also known to occur under vegetation and debris, so there may be some habitat overlap. The proposed rotational grazing system and utilization guidelines will ensure that there is enough residual vegetation to provide adequate cover for this species.

Determination of Effects

It is our determination based on the known habitat preference of this species, its limited range, and no forage species overlap, that the proposed action will have *no effect on individuals or population viability of this species*.

Lowland Leopard Frog

Lowland leopard frogs are habitat generalists that inhabit various natural and man-made aquatic systems. The species is mostly restricted to permanent waters with aquatic and herbaceous vegetation, but it sometimes also inhabits semi-permanent aquatic systems, where it survives by retreating into mud cracks and other protective features when surface waters are absent (AGFD 2006a).

Population trends for lowland leopard frogs vary across their geographic range. Populations appear to be stable in central Arizona, whereas they have declined substantially in southeastern Arizona. Sredl (1997) commented that the lowland leopard frog is the most stable native ranid in Arizona, and its status in central Arizona seems good. The primary threats to lowland leopard frogs are habitat alteration and fragmentation, decline of perennial water sources, water pollution, grazing, and the introduction of various fish, crayfish, and frogs (mainly bullfrogs) (AGFD 2006a). Populations on the Tonto National Forest are also susceptible to climatic events such as severe floods and droughts.

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

Status within the Action Area

Lowland leopard frogs have been recorded in multiple locations on the allotment including; Mesquite Wash, Sycamore Creek, Log Corral Canyon, Cottonwood Creek, Mud Springs, and Hidden Water Spring (HDMS 2011). This species likely occurs within other riparian habitat on the allotment.
Conservation Measures

The following species conservation measures were obtained from the Management Practices and Mitigation Measures section in chapter 1 of this document and from livestock management tools included in the proposed action in chapter 2. These measures are used in the determination of effects of the proposed action on the species.

- Mud Springs, including the four "potholes" and concrete drinker are fenced off to exclude livestock use. Fence will be functional prior to any livestock entering the Picadilla pasture of the Dos S unit.
- Existing exclosure fence around Hidden Water Spring, located in the proposed Cottonwood West Unit/South Pasture, will be maintained to standard to exclude livestock access.
- Conservative upland utilization levels will ensure maintenance of herbaceous cover, thereby increasing infiltration rates and reducing erosion and sediment loss which will help maintain water quality within the springs.
- An exclosure fence will be constructed within Cane Springs Canyon above and below Hidden Water Spring to exclude livestock and allow riparian vegetation to improve.
- All existing and new developed springs will be fenced to exclude livestock access. A trough(s) will be located outside of the exclosure to provide water for wildlife and livestock.
- Livestock will not be trailed through riparian areas.
- Salt and/or mineral supplements will be placed at least .25 miles from riparian areas.
- New spring developments will be constructed with the spring box designed so that residual flow is left at spring head to prevent dewatering.

Analysis of Effects

The proposed non-use within the Adams, Sycamore Creek, and Otero Pastures of the Dos S Unit will remove any direct and indirect effects of livestock grazing on lowland leopard frogs within Mesquite Wash, Sycamore Creek, and Log Corral Canyon. Additionally, individuals/populations occupying Mud and Hidden Water Springs will continue to be protected by livestock exclosure fences. Furthermore, conservative riparian utilization guidelines are expected to maintain or improve leopard frog habitat over the term of the permit. The proposed action will require that all new and existing spring developments be fenced to exclude livestock; thereby protecting riparian habitat. Individuals which occur within riparian habitats not excluded from livestock may be directly affected and/or reproductive efforts and egg masses laid during the winter breeding season may experience some direct mortality through trampling; however these impacts are expected to be minimal.

Determination of Effects

Based on the above discussion it is our determination that implementing the proposed grazing strategy *may impact individuals, but is not likely to result in a trend toward federal listing or loss of viability for these species.*

Desert Sucker

Suckers are primarily herbivorous and feed by scraping diatoms and algae from stones using their cartilage-sheathed jaws. Some studies have indicated that desert suckers exhibit little seasonal movement and are resistant to downstream displacement despite floods. Preferred temperature is believed to be 17.5 degrees Celsius within modal bounds ranging from 10.0 - 21.0 degrees

Celsius, although they have been found to survive temperatures exceeding 32.0 degrees Celsius (AGFD, 2002).

Spawning is generally in late winter and early spring where adults congregate in large numbers on riffles, in a manner similar to other species of *Catostomus*. Spawning generally consists of one large female and several smaller males. Adhesive eggs are deposited in a shallow depression made in the gravel. Eggs hatch in a few days. Young tend to congregate along the banks in quiet water in tremendous numbers and then progressively move into the mainstream as they increase in size. Juveniles are mature by their second year of life at a length of about 4-5 inches (AZGFD 2002).

Found in rapids and flowing pools of streams and rivers primarily over bottoms of gravel-rubble with sandy silt in the interstices. Adults live in pools, moving at night to swift riffles and runs to feed. Young inhabit riffles throughout the day, feeding on midge larvae.

Status within the Action Area

Within the action area, this species is only known to occur within deeper, perennial sections of Sycamore Creek.

Analysis of Effects

The proposed action includes non-use within Sycamore Creek within the allotment boundary. Continued improvement of this riparian habitat is expected under the proposed action.

Determination of Effects

It is our determination based on the proposed non-use within the only known habitat in the action area that the proposed action will have *no effect on individuals or population viability of this species*.

Mapleleaf False Snapdragon

The mapleleaf false snapdragon is a small, perennial vine/forb that produces greenish-white flowers. The mat forming plants grow trailing on the ground to a length of about 10 inches. Geographic distribution of the mapleleaf false snapdragon is very restricted as the species is only known to occur in Pinal, Maricopa, and Gila Counties, Arizona. This species is a narrow endemic that has specific habitat requirements because it only grows on rock overhangs, shaded cliffs, and rock ledges from 1,800 to 3,350 feet elevation. The stems of this plant often hang down from moist rock ledges (AGFD, 2005; Lutch, 2000). The species flowers from March through May.

Natural history of the maple leaf false snapdragon is poorly known because of its limited distribution, inaccessibility to potential habitat, and low population sizes. Population trend data are not available, but it has been noted that individuals are fairly common given the right habitat conditions (Lutch, 2000). The primary threat to maple leaf false snapdragon is habitat degradation caused by blasting.

Status within the Action Area

No known formal surveys have been conducted for mapleleaf false snapdragon in or near the action area; however, potential habitat for this species occurs throughout portions of the allotment within this species elevational range.

Analysis of Effects

Due to this species specific habitat requirement, the proposed livestock grazing activities will likely not impact this species.

Determination of Effects

It is our determination that the proposed action will have *no effect on individuals or population viability of this species.*

Hohokam Agave

The Hohokam agave is a perennial succulent that is found in elevations ranging from 1,500 to 3,200 feet, from central Arizona to Sonora, Mexico. The leaves are 20 - 31.5 inches long and 2 - 8 inches wide, forming a dense rosette. Flowers are a waxy cream-green color with brownish or purplish tips. Inflorescence with stalk varies from 9.8 - 13 feet tall, always producing bulbils. Plants produce stalks in winter, flowers are formed but quickly abort, thus the primary means of reproduction is through the bulbils taking root once the stalk falls to the ground (AGFD, 2003). Primary means of reproduction is through rhizomatous off-sets called "pups".

Hohokam agaves are typically found in desert scrub on benches or alluvial terraces above major drainages, often associated with archaeological sites, having been cultivated by the Hohokam. They are also found near rock piles, which help accumulate water and nutrients, while also protecting them from rodents.

Threats to this species include recreation activities, grazing by livestock, illegal collection, predation by rodents, with the greatest threat being habitat loss due to development and urban sprawl.

Status within the Action Area

This species has been documented to occur within the Pine Creek Pasture of the Dos S Unit on the terrace above Sycamore Creek. Although not documented, this species likely occurs in other locations along the Sycamore Creek drainage.

Analysis of Effects

The proposed non-use within the Adams (west), Sycamore Creek, and Otero Pastures of the Dos S Unit will remove any direct and indirect effects of livestock grazing on this species if present. For the remaining units/pastures, within this species elevational range, which are proposed for grazing, there may be some direct livestock impact through grazing. However, the primary reproductive strategy for this species, being rhizomatous should allow for population expansion.

Determination of Effects

It is our determination based on possible effects to the Hohokam agave that the proposed action *may impact individuals, but is not likely to result in a trend toward federal listing or loss of viability for these species.*

Management Indicator Species and Migratory Birds

Management indicator species (MIS) were selected during the Tonto National Forest planning process to adequately monitor implementation of project actions on wildlife habitat and species diversity. These indicator species reflect general habitat conditions or habitat components that are of value to these and other species with similar habitat needs. Habitats for a large number of the Forest MIS occur on the Sunflower allotment. Because most MIS are not rare species and the allotment contains a wide variety of vegetation types, it is assumed that at least some individuals of each MIS are present on the allotment. The ten MIS species that were selected for this allotment were done so based on the premise that livestock grazing and management can have an effect on habitat components (ground cover, species diversity, etc.) that can impact forestwide habitat and population trends. Those MIS listed in Table 30, have been fully analyzed, and are available in the project record.

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

Table 30: Habitat Type Associated with Management Indicator Species

Executive Order 13186, January 10, 2001, directs federal agencies to support migratory bird conservation and to "ensure environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern". Important Bird Areas (IBA) are sites that provide essential habitat for one or more species of bird, including sites for breeding, wintering, and/or migrating birds. No designated IBA's occur within the action area. The Salt and Verde Riparian Ecosystem IBA is located within the project area, just southwest of the action area. The IBA begins on the Salt River, just downstream of Stewart Mountain Dam, and continues westward to the confluence with the Verde River.

Special Status Species are those given status by agencies responsible for managing plants, wildlife, and their associated habitat because of declines in the species' population or habitat. Birds are given provisions under the Migratory Bird Treaty Act (MBTA). A MBTA analysis was completed and is available in the project record.

General Effects Associated with Grazing Authorization

Livestock grazing can affect wildlife species or habitats in several ways. Presence of cattle can cause compaction of soils, which may result in increased runoff and reduced rainfall infiltration. Grazing may also reduce vegetation and litter cover. The maintenance of residual biomass, to ensure plant vigor and ground cover on grazed rangelands, is critical for wildlife habitat and watershed protection throughout the year. Resource recovery following periods of drought, appear to be promoted by the presence of litter that traps seeds and lowers evaporative losses (Milchunas, 2006). It is essential for managers and livestock permittees to recognize the importance of responding to drought through reduced stocking or de-stocking during drought. The Tonto Drought Policy will assist resource managers in minimizing livestock grazing impacts during drought.

Precipitation patterns are an important consideration for both long and short-term goals. Rainfall on the allotment varies and may be highly erratic both within and between years. Growing seasons on the allotment tend to be bimodal.

Riparian and wetland communities represent a very small percentage of the land area in the southwest but are areas of high plant and animal diversity and productivity (Milchunas, 2006). Riparian areas and wetlands provide water and cover to animals that may be more associated with adjacent upland communities, including livestock, as well as many species that are riparian obligate species for all or part of their life cycles. These areas are probably more important to animals associated with uplands in arid and semiarid regions because of the refuge they provide from the harsh environment. Livestock grazing in riparian areas has the potential to reduce the establishment of seedling riparian obligate woody species, thus affecting the age class and vertical structure of riparian areas. Streamside vegetation is an important component in the establishment of bank formation and channel morphology, as well as reducing sediment load from upland erosion. There is potential for these productive areas to be impacted by livestock to a relatively greater degree than adjacent, less productive upland communities, however, there is also the potential for more rapid recovery (Milchunas, 2006).

Riparian and upland areas provide important terrestrial and aquatic habitat to wildlife species. Excessive grazing and trampling impacts destabilize and break down stream banks, which results in negative effects to aquatic wildlife. These effects may be realized through modification of stream morphology and function, increased siltation, and reduction of woody and herbaceous vegetation. During scouring floods, fish populations are more vulnerable to removal without stable banks and associated vegetation in place.

Congregation of livestock and livestock management practices, such as herding, may have direct effects to wildlife and/or habitat. Effects may include removal of vegetation, dust accumulation, noise, avoidance areas, and soil compaction. Upland vegetation density and composition may

remain stable, if livestock grazing and associated activities are 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 (Trimble and Mendel, 1995). One of the most important factors influencing riparian conditions is utilization (Mosley *et al.*, 1999; Clary and Kruse, 2003).

Congregation of livestock (herding, stock tank areas, trailering, loading/unloading, maintenance of livestock facilities, branding) may have indirect effects to wildlife or associated habitat when considering grazing alternatives. Effects may include removal of vegetation, dust accumulation, noise, avoidance areas, 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.

Hoof action by livestock can impact soils through compaction, especially when soils are wet. Compacted soils in the uplands have lower rates of water infiltration and may result in increased runoff and soil loss resulting in indirect negative effects to riparian aquatic and terrestrial species. As a result, wildlife habitat components may be affected by increased runoff and soil loss, especially if riparian and upland conditions are not properly functioning.

Utilization of woody and herbaceous vegetation by livestock may result in increased stream temperatures, reduced ground cover and organic litter, which may indirectly affect aquatic and terrestrial wildlife through increased surface runoff and potentially reducing the establishment of additional vegetative cover in the uplands and riparian areas. In addition, habitat available to prey species in the uplands and riparian area may be reduced by livestock grazing, resulting in reduced numbers of prey species and/or increased predation upon those species. Water quality may also be indirectly affected by livestock use in the uplands as a result of decreased infiltration of surface water and livestock fecal accumulation.

Alternative 1 – Direct and Indirect Effects

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

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

With the exclusion of livestock grazing, it is expected that there will be an increase in upland herbaceous and shrub density, cover, and diversity benefitting wildlife species. Overall watershed and soil conditions across the allotment will continue to improve. Upland habitat for game species such as deer and javelina will generally increase in vigor and density. Small game and nongame species will generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity. Improvements in these resource conditions will be expected to occur more quickly than they will under implementation of either of the grazing alternatives.

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

Habitat conditions for all MIS species will be expected to improve with cessation of livestock grazing on the allotment. With an improvement in soil and vegetation condition, increases in high-quality wildlife habitat will likely occur, over time, in all life zones. Improvements to terrestrial habitat are as described under the general wildlife discussion above. The elimination of livestock from perennial and intermittent streams should result in overall improvements in water quality. As compared to the grazing alternative, an improvement in water quality and aquatic conditions will be anticipated with the elimination of bank trampling and trailing from livestock in riparian areas. An increase in riparian understory density and improvement in vertical structure will benefit Bell's vireo and common black hawk respectively.

Alternative 2 – Direct and Indirect Effects

This alternative will provide non-use within the Otero, Ranger Station, Sycamore Creek Riparian, and Adams—west of SR 87—pastures within the Dos S Unit, and the Desert Unit. Non-use within these units/pastures should benefit riparian dependent species within Sycamore Creek, Mesquite Wash, and Log Corral Canyon, and their tributaries through improved riparian conditions. Similarly, upland species will benefit from improvement in upland resources. Additionally, the proposed exclosure fence above and below Hidden Water Spring in Cane Spring Canyon will benefit Gila topminnow, desert pupfish, and lowland leopard frog populations known to occur there. Furthermore, non-use will benefit Sonoran Desert tortoise populations and habitat known to occur in the Adams and Otero pastures and remove conflict between heavy recreational pressure and livestock grazing practices. The effects of non-use within these pastures will be similar to that described under the "No Grazing" alternative.

For the remaining units/pastures with riparian habitat, including the designated key reaches, adherence to the proposed riparian utilization guidelines and mitigation measures should maintain or increase existing riparian vegetation, although at a slower rate than under the "No Grazing" alternative.

Watershed and soil conditions are expected to remain stable or improve through the proposed management tools, water developments, herbaceous and browse utilization guidelines, and mitigation measures.

Recruitment of woody and herbaceous riparian species and improvement in structural and age class diversity within riparian areas proposed for non-use, as well as that portion of Cane Spring Canyon excluded from livestock access, is expected to be similar to what was described under the "No Grazing" alternative. Riparian habitat within the pastures proposed for use is expected to be maintained or improve through adherence to utilization guidelines, the proposed water developments, management tools, and mitigation measures. It is expected that, over time, structural and age class diversity in these riparian areas will continue to improve under this alternative, although to a lesser degree than under Alternative 1.

Overall, it is expected that watershed and soil conditions across the allotment will continue to improve under the proposed action, although improvement will be slower than the 'No Grazing' alternative, in those units/pastures proposed for use.

Upland habitat capability for game species such as deer and quail will likely continue to improve with an increase in herbaceous vigor and density due to the management tools, water developments, utilization guidelines, and mitigation measures included in the proposed action. Improvements to upland habitat are expected to be slower under this alternative than the "No Grazing" alternative. Small game and non-game species will generally increase over time with an increase in herbaceous cover and probable increase in grass species diversity, although at slower rates than Alternative 1.

Improvement in game and non-game upland and riparian habitat within the proposed non-use pastures is expected to be similar to what was described under the "No Grazing" alternative.

In riparian areas proposed for non-use, habitat conditions for riparian (Bell's vireo and common black hawk) and aquatic species (macroinvertebrates) are expected to be similar to what was described under the "No Grazing" alternative. The key habitat components for these two MIS species include dense stands of understory (shrubs and trees) and large contiguous blocks of riparian habitat, none of which occur outside of the Sycamore Creek riparian corridor. The riparian areas within the action area proposed for use, including the key reaches, are intermittent streams incapable of supporting the riparian habitat necessary for these two species.

With an improvement in soils and vegetation, MIS habitat is expected to improve over time, although at a slower rate and to a lesser degree than Alternative 1. Species that are indicators of chaparral vegetation type (rufous-sided towhee/black-chinned sparrow), and desert scrub species (black-throated sparrow, brown towhee) will likely experience a smaller habitat gain under this alternative than under the 'No Grazing' alternative. Additionally, habitat for species indicative of good ground cover, such as the ash throated flycatcher, will likely improve, however at a slower rate than under Alternative 1.

Cumulative Effects to Special Status Species

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

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

Cumulative effects to watershed condition class and cumulative effects to special status species (TES, sensitive, MIS, MBTA) are closely associated with each other. The Watershed and Soils Specialist reports summary of cumulative effects for the allotment in the action area and their associated 6th code watersheds is a valuable tool for analysis of cumulative effects to wildlife. Implementation of Alternative 1 and 2 will result in positive cumulative effects for two of the watersheds associated with the action area, as range vegetation conditions and soil conditions will improve over the 10-year project period. This improvement, however, will be immeasurable overall, without implementation of other restoration activities in the watershed, thus watershed condition class is expected to remain the same.

Motorized and nonmotorized recreation, and illegal cross country travel, negatively impact wildlife resources and or habitat through removal, destruction or degradation of herbaceous/woody vegetation and aquatic emergent vegetation and associated stream habitats. Traffic impacts to wildlife may be realized by avoidance of the area by some wildlife due to dust and/or presence of vehicles and people, wildlife/vehicle collisions, and poaching from vehicles. Secondary roads may have similar impacts to wildlife, although traffic volume and speed will generally be lower, impacts to wildlife will still exist, but at reduced levels.

Illegal cross country travel also has negative effects to wildlife and habitat through proliferation of wildcat trails, use of motor vehicles through washes, riparian corridors, and uplands. Wildlife habitat becomes fragmented and often damaged for the long term as a result of illegal, cross country, motorized travel.

The Sunflower Allotment is adjacent to nine other livestock grazing allotments, and two additional ranger districts; Cave Creek and Tonto Basin. The nine allotments include; Bartlett on Cave Creek and Tonto Basin, Three Bar, Roosevelt, and 7/K all on Tonto Basin, and Diamond, Goldfield, Superstition, and Reavis on the Mesa Ranger District. Of these, the only other grazing allotment within the 6th code watersheds listed that may have cumulative downstream effects on stream channels and riparian areas within the project area is Diamond. The Diamond Allotment is grazed but has current NEPA, so additional impacts should be minimal.

Climate change has the potential for additional impacts. According to the Arizona Drought Monitor Report for January 2015 (ADWR, 2015), the area containing the Sunflower Allotment will be classified as being within moderate drought. According to NOAA National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein, 2006). The Federal Advisory Committee Draft Climate Assessment Report is projecting higher temperatures and lower precipitation for the southwestern US (Garfin *et al.*, 2013). New modeling efforts for the North American monsoons indicate that the amount of monsoon moisture will change little, however, the monsoons will be delayed and most of the precipitation will come late in the season (September-October) (Cook and Seager, 2013).

Some stream reaches, such as Cottonwood Creek, Rock Creek, Boulder Creek and lower Picadilla Creek, that were considered riparian reaches in the 2000 NEPA assessment for the Sunflower Allotment, no longer seem to have potential to support riparian vegetation due to a combination of long term drought, impacts from OHVs, and historical grazing.

In general, the presence of people and associated noise and disturbance of habitat in dispersed areas and on nonmotorized trails has negative effects on wildlife. Impacts to wildlife include: total avoidance of areas that regularly receive high recreational use, habitat destruction or modification, and avoidance of critical riparian areas where yearlong recreation use occurs.

Maintenance of roads and trails may also have a temporary negative effect on wildlife. Workers, heavy equipment, and noise may lead to wildlife avoidance during maintenance activities. On the Sunflower Allotment, road maintenance affects to wildlife are expected to be minimal due to the infrequent maintenance cycle (annual) of Forest Service Roads 402 and 143, which are the only maintained roads on the allotment.

Wildfire and suppression activities can negatively affect wildlife and associated habitat by direct loss of habitat to fire or suppression activities (brush removal, line construction, black-line construction, aerial application of retardant, drafting from streams), and indirect effects such as fire support aircraft noise, sedimentation in aquatic systems, and avoidance of areas with fire suppression activities.

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

Range records indicate that there has been a population of trespass horses along the Lower Salt River (river), southwest of the allotment, since the 1930s. These horses presumably originated from the neighboring Fort McDowell Indian Reservation and/or Salt River Pima Maricopa Indian Community, both of which border the Mesa Ranger District to the west/northwest. Although the horses are typically found along the river, within the boundary of the retired Goldfield Allotment, on occasion, they are observed east of the Bush Highway within the southernmost portion of the Desert Unit. Grazing by feral livestock can have negative impacts on wildlife, through competition of forage resources and through removal of cover and nesting habitat.

Recreation and Wilderness

The Sunflower Allotment consists of a variety of natural settings, each with specific features and unique characteristics enjoyed by recreationists from all over the country. The Four Peaks Wilderness Area is popular for hikers, photographers, horseback riders, and anyone wanting a good look at the beauty of the natural outdoors. Ranging from 1,600 feet to more than 7,000 feet in elevation, this wilderness area experiences a range of weather seasons and biological environments.

Recreationists visit the Mesa Ranger District dispersed camping areas for a wide variety of recreation opportunities including hiking, camping, horseback riding, mountain biking, picnicking, wildlife viewing, hunting, target shooting, off-highway vehicle (OHV) use, and scenic driving. Other features that add value to this recreation setting include spectacular views, amazing geology, archaeological sites and ruins, rare wildlife, and historic buildings.

Highway 87 runs through the middle of the allotment, providing thousands of people with access to Forest Service roads, trails, and even lakes. One of Arizona's busiest and closest lakes to Phoenix, Saguaro Lake, lies just outside the southern border of the Sunflower Allotment, along with Canyon and Apache Lakes. This greatly impacts the variety of users that choose to recreate within the allotment.

Affected Environment

Four Peaks Wilderness Area

Approximately 80 percent of the Four Peaks Wilderness Area lies within the Sunflower Allotment. Saguaro, Canyon, and Apache Lakes border the south side of the wilderness area, while dispersed recreation areas occupy the remaining boundaries. Magnificent cliffs on the south side of the Four Peaks Wilderness area prevent many recreationists from venturing into the area. However, three trailheads to the north and west encourage hikers and horseback recreationists to explore the wilderness trails in the spring and fall seasons. The Four Peaks Wilderness area receives several feet of snowfall every winter season, increasing visitation by recreationists. With Forest Service Roads 143 and 401 being the only main roads that access the wilderness area, winter visitation mainly consists of photographers and other low-impact recreationists. There is currently only one authorized guiding service for horseback within this wilderness area.

With a heavily used OHV area to the west of the Four Peaks Wilderness area, multiple perimeter fences have been damaged and breached by OHV riders, resulting in ground disturbances and vegetation damage within the wilderness area. Target shooting pits near the wilderness boundary have also resulted in damage to signs, cacti, and other vegetation.

Dispersed Recreation

The nonwilderness areas of the Sunflower Allotment are primarily used for dispersed recreation. This consists of OHV use, overnight camping, target shooting, hunting, and wildlife observing. Overnight camping areas commonly have abandoned fire rings and garbage left behind from the user. Wildlife observers have little impact on the land as they tend to stay close to roads and trails, if not remaining in their vehicle. Hunters also have little impact on the land, and their use is monitored by the Arizona Game and Fish Department. There are currently 11 outfitting and guiding companies authorized in Management Area 3I to conduct hiking, horseback, OHV, and/or mountain biking tours. These companies consume less than half of the maximum service day allocations set in the Tonto Forest Land Management Plan.

The Desert Unit and Dos S Unit (Adams Pasture West) are commonly known as The Rolls, a popular OHV and target shooting area for the Phoenix metro area, and Sycamore Creek recreation areas. Designated Forest Roads are marked and mapped with designated parking areas available to park trailers and less-capable vehicles. However, The Rolls and Sycamore Creek are losing vegetation and healthy soil due to a system of user-made roads that are increasing daily. Once a road has developed a rut or other inconvenient feature, OHV recreationists create another route parallel to it to get around the feature. This has caused the surface area of roads and trails to increase, diminishing the amount of healthy vegetation in the area. A satellite picture of the areas shows a "spider effect" of roads and trails being created around designated Forest Roads. Some of these trails were created by cutting fences to get to an area previously closed to OHV traffic. The high numbers of recreationists present in The Rolls and Sycamore Creek recreation areas have also caused widening of roads and trails to accommodate for two-way traffic.

These user-made roads and trails have also increased the area's surface water run-off. Butcher Jones Wash is a common route for recreation that runs south through The Rolls and dumps into Saguaro Lake. Along the beach of Saguaro Lake is a developed recreation site, popular for picnicking and hiking, and serves as an access point for The Rolls. In 2012 through 2014, heavy monsoonal rains caused abnormal amounts of run-off to flood Butcher Jones Recreation Site, which had to be temporarily closed due to road damage and facility flooding.

User-made target shooting pits are also very common in The Rolls and Sycamore Creek recreation areas. Recreationists haul large household items to the Forest, such as couches, refrigerators, old television sets, and other household items, and use them for target shooting practice. These items and their broken pieces are then left behind as litter, along with bullets and empty shell casings. The Mesa Ranger District holds an annual volunteer cleanup in the Four Peaks Dispersed Recreation Area to help clean up target shooting pits and encourage future users to pack out their targets.

Target shooting can also cause the start of a wildland fire. In 2012, nine wildfires started within the area of a heavily used target shooting pit on the Mesa Ranger District. Two of those wildfires were determined to be caused by target shooting, and one of those wildfires grew to more than 17,000 acres. Every year during the extremely dry season (approximately May through July), fire restrictions go into effect on the Tonto National Forest, limiting the use of target shooting, campfires, and other activities involving fire or sparks. Despite these restrictions, small (less than five acres) wildland fires are commonly found and managed in dispersed recreation areas throughout the summer season.

The Rolls and Sycamore Creek recreation areas are the first Forest areas accessible from Phoenix on Highway 87. This leads to public dumping at the staging areas and along Forest roads just off

the highway. Other dispersed recreation areas further north on Highway 87, such as Mesquite Wash, are also common for trash dumping.

Recreation Management

In the Tonto Forest Land Management Plan, Management Area 3D (Four Peaks Wilderness) is to be managed for wilderness values, wildlife habitats and natural ecological processes while allowing livestock grazing and recreation opportunities that are compatible with maintaining these values and processes. All wilderness boundaries are to be signed, posted, and barricaded to prevent trespass. In the Four Peaks Wilderness, OHV use is prohibited.

In Management Area 3I (General Management Area), the emphasis is to manage for a variety of renewable natural resources with primary emphasis on improvement of wildlife habitat, livestock forage production, and dispersed recreation. One percent of the area is to be managed under the primitive²⁶ recreation opportunity class (ROS), 42 percent is under the semiprimitive nonmotorized²⁷ ROS, 36 percent is under the semiprimitive motorized ROS, and 21 percent is under the roaded natural²⁸ ROS. Overall, this means Management Area 3I should be managed to have a natural-appearing environment with low to moderate interaction between users. Onsite controls and resource modifications are subtle and should harmonize with the natural environment.

Recreation in Management Areas 3E and 3H (Bush Highway Research Natural Area and Proposed Sycamore Creek Natural Area) is currently being managed similar to Management Area 3I. The Tonto Forest Land Management Plan currently directs to prohibit OHV use in these areas and manage for low intensity dispersed recreation. However, Management Areas 3E and 3H are abundant with OHV recreational use, overnight camping, and target shooting.

Environmental Consequences

Alternative 1 - Direct and Indirect Effects

Alternative 1 calls for no action/no grazing in the Sunflower Allotment. Based on current use of minimal to no grazing, this alternative should not affect recreational use on the Mesa Ranger District. The removal of grazing fences and cattle guards may go unnoticed by recreationists in both wilderness and nonwilderness areas.

²⁶Area is characterized by essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induce restrictions and control. Motorized use within the area is not permitted.

²⁷Area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restriction may be present, but are subtle. Motorized used is not permitted.

²⁸Area is characterized by predominantly natural- appearing environments with moderate evidences of sight and sounds of man. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

Alternative 2 - Direct and Indirect Effects

Alternative 2 proposes the grazing the Sunflower Allotment, excluding the Otero, Ranger Station, Sycamore Creek Riparian, and Adams—west of SR87—pastures within the Dos S Unit and the Desert Unit. Placing these pastures into and the Desert Unit in non-use should not affect the recreational uses and activities occurring there. The addition of cattle to the remaining units may affect Forest users. This alternative will increase the number of recreationists/cattle encounters in both the wilderness and nonwilderness areas, and it is unpredictable whether the majority of recreationists will embrace the presence of cattle or object to it. Recreationists may be visually impacted by cattle grazing near them, but only temporarily as the herds move regularly and are on a rotational schedule between the different pastures. Areas with the most visual impact will be near water sources²⁹. Additional cattle in the Sunflower Allotment may encourage recreationists to be more responsible in the natural environment. Viewing a herd graze near a populated recreation area may prevent users from leaving litter on the ground, shooting in unsafe areas, and wandering off designated roads and trails. However, there may be a few recreationists that find cattle interesting, and attempt to antagonize the cattle when the rancher is not present.

Alternative 2 also includes the installation of several water tanks, troughs, pipeline, and fencing throughout the allotment. The installation of stock tanks and watering troughs may be useful for horseback and hunting recreationists. However, the addition of pipeline and fencing often becomes a challenge for target shooters to shoot at, while OHV users may damage it in an attempt to enter unauthorized areas. Fencing and pipeline installed and maintained with this alternative will not close off designated roads and trails or otherwise restrict access to the Forest by recreationists. Step-overs, walk-throughs, or gates will be placed where fencing crosses designated trails.

There is only one outfitting and guiding operation currently authorized in this wilderness, and non-wilderness outfitting and guiding operations in the Sunflower Allotment are at less than half the maximum use allowed by the Forest Plan. Thus, Alternative 2 should not affect outfitting and guiding operations or their current impacts to the Forest. In the future, if the Forest authorizes additional outfitting and guiding operations in this area, there may be an increase in visual sightings of cattle during tours. Guides may have to slow down or pause their tours to allow cattle to cross the road or trail, but the presence of cattle should not affect daily operations of additional outfitting and guiding companies. It is unpredictable whether visitors will view this as a photo opportunity or a nuisance.

Invasive Species

Affected Environment

Eighty-eight different weed infestations have been mapped within the boundaries of the Sunflower Grazing Allotment30. The great majority of these were mapped during surveys for

²⁹ Allotment improvements will follow the Congressional Grazing Guidelines, House Report 101-405, Appendix A

³⁰ A complete list of the invasive species within the Sunflower Allotment can be found in the Invasive Species Report in the project record.

highway construction projects along State Route 87. These sites are within the right-of-way fences and not accessible to livestock, although weeds could easily spread beyond the fences into the grazing allotment. These weed species are: Bermuda grass (*Cynodon dactylon*), Saharan mustard (*Brassica tournefortii*), black mustard (*Brassica nigra*), globe chamomile (*Oncosiphon piluliferum*), fountain grass (*Pennisetum setaceum*), buffelgrass (*Pennisetum ciliare*), Jerusalem thorn (*Parkinsonia aculeata*), Russian thistle (*Salsola kali*), and saltcedar (*Tamarix spp*). Extensive fountain grass infestations (totaling 35 acres) have been mapped along the edge of Saguaro Lake, in a high-use recreation area, which is not open to livestock grazing, but is adjacent to the allotment. Bermuda grass is classified as a "C" species on the Tonto National Forest; that is, it is very widespread and the Tonto National Forest's goal in management is to possibly maintain extent of this weed to its current size. Bermuda grass seed is a common alfalfa hay contaminant; also, Bermuda grass hay is commonly sold in feed stores.

Malta starthistle is a winter/spring season annual forb. It produces seed in April and continues to disperse seed through early summer months. This species grows along State Route (SR) 87 from the Fort McDowell Reservation north past the junction with SR 188. It could be found anywhere within the project area.

Fountain grass and buffelgrass are technically summer growers that put on vegetative growth and produce seed after summer monsoons, but they can be seen to produce seed nearly year-round. Both of these perennial grasses produce large biomass volumes that are highly flammable. Buffelgrass in particular carries an extremely hot fire (up to 1700 degrees Fahrenheit) through desert areas, killing native desert vegetation, which is not adapted to withstand wildfire. The impact of buffelgrass on arid ecosystem function can be substantial because creek and canyon bottoms typically act as a blockade to the spread of fire, even when dry, because the soils lining the creek do not support the growth of dense, fire-fueling grasses. Anecdotal evidence indicates that buffelgrass thrives along creek lines in dry environments (Miller *et al.*, 2010). Thus, a feature that should prevent the spread of fire can actually transport it.

Saharan and black mustard are winter/spring annual forbs, usually producing seed and curing by March. Saharan mustard grows in Saguaro Lake recreation sites and along SR 87. It is a common invader of disturbed sites at elevations below 3,000 feet. Black mustard is less common, but has been documented growing along State Routes 87 and 188, and was found in seeded safety zones after the Willow Fire of 2004.

Globe chamomile is an early winter annual forb that is spreading rapidly in desert areas from the greater Phoenix metro area. It germinates during the winter, using soil moisture that will otherwise be available for native annual plants. This forb was recently planted on the Dos S SR 87 project by an Arizona Department of Transportation (ADOT) contractor. While steps were taken to eliminate these infestations, they will probably be found along Forest Road 143 and could be carried by vehicle traffic or prevailing winds farther east into the project area.

Russian thistle, or tumbleweed, often invades disturbed sites. Given the opportunity, native vegetation may naturally re-take tumbleweed sites.

Saltcedar is a tree that is normally found in riparian areas or wetter spots near roads. Saltcedar drops its leaves during cold winters, but it can flower and produce seed year-round. Saltcedar, like native riparian trees, uses large amounts of soil water. Saltcedar is more deeply rooted than native riparian trees so can withstand longer periods of drought and crowd out native trees.

Weed Sites within Sunflower Allotment

Table 31 displays a list of the mapped invasive species with in the pasture for the Sunflower allotment.

Unit Name	Species	Acreage
Cottonwood	crimson fountaingrass	0.596671
Desert	crimson fountaingrass	13.10012
Dos S	Globe chamomile	1.521456
Dos S	Asian mustard	3.807027
Dos S	Bermudagrass	0.099959
Dos S	buffelgrass	37.79301
Dos S	crimson fountaingrass	1131.085
Dos S	five-stamen tamarisk	0.241338
Dos S	Jerusalem thorn	0.734959
Dos S	Johnsongrass	120.357
Dos S	Maltese star-thistle	3.171797
Dos S	Russian thistle	0.510246
Dos S	saltcedar	0.270116
Dos S	stinknet	3.91379

Table 31: Invasive Species Mapped in Sunflower Allotment

There are most probably more infestations of these weed species and perhaps others within the pastures of the Sunflower Allotment, but they have not been identified and mapped to date.

Environmental Consequences

Alternative 1

Since livestock grazing will not be authorized under this alternative, there will be no direct or indirect effects associated with grazing authorization. Thus there will be no cumulative effects for invasive species management related to the actions of this project.

Alternative 2

By following the guidelines established in the Environment Assessment for Integrated Treatment of Noxious or Invasive Weeds as detailed in the decision notice and finding of no significant impact, pages three through five (August 2012), there will be no effects to invasive species populations related to the authorization of grazing within the Sunflower Allotment. As such, there will be no cumulative effect to invasive species as there are not direct or indirect effect related to this alternative.

Fire and Fuels

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

Affected Environment

Vegetative communities found within the Sunflower Allotment include riparian, Sonoran desert, semi-desert grassland, interior chaparral, pinyon-juniper chaparral, and ponderosa pine. The natural fire regimes for each of these vegetative communities' ranges from frequent, low severity to very long –interval, high severity, stand replacement fires. Fire records indicate that since 1970, the majority of this allotment has burned. Most fires of the time period occurred outside of the Sonoran desert and were usually greater than 5,000 acres. In 1995 the Lone Fire burned 61,000 acres in the Four Peaks Wilderness and in 2005 The Edge Complex (72,000 acres), Three Fire (19,000 acres, and Four Fire (3,000) burned significant portions of the allotment on the east side of State Route 87. Numerous other fires that were greater than 100 acres have burned within the allotment boundaries but did not substantially alter the vegetative types. Most recently the Browns fire in the Four Peak Wilderness burned approximately 150 acres within this allotment (total fire size was 900 acres).

This area also has a high recreational use which includes, OHV, camping, and recreational shooting. The seasonal increase in red brome (*Bromus madritensis* subsp. *Rubens*) creates a fine fuel bed that lends itself to fire starts and fast moving fires. These fires are mainly human caused, with the majority originating in the impact zone of a target shooting area. There are also issues with campers abandoning campfires, that are not out, which can escape and reach the fine fuels leading to larger wildfires.

Fire Regime Type

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

• I - 0-35 year frequency and low severity (most commonly associated with surface fires) to mixed severity (in which less than 75 percent of the dominant overstory vegetation is replaced).

- II 0-35 year frequency and high severity (stand replacement: greater than 75 percent of the overstory vegetation is replaced).
- III 35-100+ year frequency and mixed severity.
- IV 35-100+ year frequency and high severity.
- V 100-200+ year frequency and any severity.

Fire Regime Condition Class

Fire Regime Condition Class (FRCC) measures the degree of departure from reference conditions, possibly resulting in changes to key ecosystem components, such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity and pattern; and other associated disturbances, such as insect and disease mortality, grazing and drought.

The three fire regime condition classes are based on deviation from the central tendency: Class 1 represents ecosystems with low (less than 33 percent) departure from a defined reference period; Class 2 indicates ecosystems with moderate (33 to 66 percent) departure; and Class 3 indicates ecosystems with high (greater than 66 percent) departure from reference conditions (Hann and Bunnell, 2001; Hardy *et al.*, 2001; Schmidt *et al.*, 2002). The central tendency is a composite estimate of the reference condition vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated natural disturbances. Departure can include, but is not limited to, invasive species (weeds and insects), disease, "high graded" forest composition and structure (i.e., large fire tolerant trees have been removed and small fire-intolerant trees have been left within a frequent surface fire regime), or repeated annual grazing that reduces grassy fuels across relatively large areas to levels that will not carry a surface fire.

Sonoran desert

This vegetation type is the most predominate in the Sunflower Allotment. It generally occurs below 3500 feet elevation and is historically resistant to large fires. This vegetation type falls into fire regime group V, characterized by in frequent fires. Fire size and severity is highly variable due to the low productivity of the vegetation and resulting low fine fuel levels (Brooks and Chambers, 2011). This vegetation type has, however, been altered with the invasion of red brome. This grass has significantly contributed to the amount of fine fuels. High rainfall years result in greater increases in nonnative annual grass biomass (fine fuels) and can result in large fires (Rogers and Vint 1987; Schmid and Rogers 1988). This area also has substantial human use and the majority of fires started in this vegetative type are human caused (Alford et al., 2005), which contributes to more fires than historically present. Livestock grazing has been shown to reduce these fine fuels (Hann et al., 2003). Grazing does not currently take place in this allotment. This allotment has had several large fires (greater than 300 acres) in the last 10 years with the most significant being the Edge Complex Fire of 2005. The majority of this vegetative type is considered to be in FRCC 2 due to the change in vegetative types and its more frequent fire intervals than historically occurred.

Semi-desert Grasslands

This vegetation type is typically found in the foothills where the Sonoran desert transitions to mountain landforms. This vegetation type falls into fire regime group II, characterized by

frequent (zero to 35 years) stand replacement fires. The mean fire interval is about eight years with a high variation due to drought, which reduces fire frequency and moist periods that increase fire frequency. Grazing of the grassy fuels by livestock may also influence fire mosaic patterns in this vegetation type (Hann et al., 2003). This vegetation type is currently in FRCC 1, almost FRCC 1, and moving towards FRCC 2 as the fire interval increases.

Interior Chaparral

This vegetation type is classified as having a moderately long (35-100 years) fire return interval, characterized by intense burning that generally replaces the stand 90 percent of the time. Chaparral stands tend to become more flammable with age, mainly due to the amount of dead woody material that accumulates in the individual plants as they mature. The majority of the chaparral component in the Sunflower Grazing Allotment was burned in the Edge Complex Fire of 2005 and has returned to a normal fire interval, where periodic stand replacement fires are the norm, and been reset to FRCC 1.

Pinyon-juniper Chaparral

This vegetation type typically occurs in the transition between the chaparral and the Ponderosa pine mixed-conifer communities. These woodlands are classified as fire regime III, with a 35-100 year return interval and mixed severity fires (Hann *et al.*, 2003). A fire often moves into the pinyon-juniper chaparral from adjacent fuel types (pine, chaparral), however the ability for that fire to continue spreading is often dependent on the availability of understory grasses. A large portion of this vegetative type was affected by the Edge Complex Fire of 2005, and has been reset to FRCC1.

Ponderosa Pine

This vegetation type is found in the higher elevations of this allotment, around Pine Mountain and the Four Peaks Wilderness. This Vegetation type is classified as a frequent-low severity fire regime (Hann *et al.*, 2003). Research indicates that prior to European settlement, low to moderate intensity surface fires burned across this area every two to ten years (Kaib *et al.*, 2000). The majority of this vegetative type was not affected by the Edge Complex Fire of 2005. Fire suppression efforts have kept fire from burning at regular intervals over significant portions of this vegetative type. This deviation from the natural fire regime is considered a relatively high departure from normal conditions (FRCC 3) for this vegetation type.

Environmental Consequences

Alternative 1 – Direct and Indirect Effects

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

In the desert vegetation types, no livestock grazing will allow fine fuels to buildup and create a continuous carpet of fuel. This can negatively impact the Sonoran Desert by allowing fire to spread across larger areas at a higher severity than was traditionally present. Depending on locale, Mediterranean grass (*Schismus* spp.), buffelgrass (*Pennisetum ciliare*), fountain grass (*P*.

setaceum), and red brome cause the most concern (Brooks and Pyke, 2001). These species increase the biomass and continuity of fine fuels by their presence. These types of grasses were not historically present, and fires in the desert typically were confined to small continuous patches of brush and trees, but generally not able to carry through large areas of the desert. This creates a situation where we must utilize aggressive firefighting tactics to keep fires small in size.

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

Cumulative Effects

In the event that grazing is eliminated from the landscape in the allotment area the amount of fine fuels (grasses) should increase. The effect of higher fuel loading on fire behavior is faster burning with higher intensities. This will most likely have an effect on fire management decisions to be able to effectively suppress undesirable fire in the area, but also on soil, wildlife, and watershed conditions. This area has already had large fires in the last decade, the Edge Complex, Three, and Four fires of 2005, and its negative effects are visible on the landscape. This type of fire is expected to occur in the future as well. However, under the right conditions the lack of grazing can create the right fuel bed to allow management to allow lightning fires to burn across the landscape in a more natural pattern in the upper elevation vegetative types.

Alternative 2 – Direct and Indirect Effects

This alternative will allow grazing. This alternative will be similar to how the area was managed prior to the last decade. Grazing was allowed and prescribed fire was used on a regular basis to improve rangelands and wildlife habitat, as well as control the amount of fuels that could accumulate.

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

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

Cumulative Effects

Brooks and Pyke (2001) identified livestock grazing as one of a number of land use practices that can influence the interaction between invasive non-native plants and altered fire regimes in the Sonoran Desert. Past disturbances caused by fire and grazing have contributed to an increase of non-native species of plants in the majority of this allotment. Going forward, grazing can contribute (as long as timing and duration are proper) to a reduction in fuels growth/accumulation, reduced fire behavior and reduced fire severity. With lack of fine fuels to promote fire in the upper elevation vegetative types the brush and trees tend to fill in the space that was once covered in grasses. This creates a situation in which fire will burn in only the most extreme conditions causing larger more catastrophic results.

Heritage

Affected Environment

The Sunflower Allotment contains hundreds, perhaps thousands, of prehistoric archeological sites representing the occupation and agricultural modification and use of this area by people related to the Hohokam archeological tradition over a period of 8,000 to 10,000 years. It also contains hundreds of historic sites reflecting its use and occupation by Yavapai and Apache hunters, gatherers, and farmers, the U.S. military, Anglo and Hispanic ranchers and stockmen, miners and prospectors, the Works Progress Administration, the Civilian Conservation Corps, and the U.S. Forest Service.

Only a small fraction of the allotment has been intensively surveyed to produce an inventory of heritage resources. Known heritage properties include a wide range of features from the first Anglo structure on the Forest (Reno Military Road), to collapsed and buried pithouses. The great majority of these features, however, consist of collapsed stone masonry structures, various water control devices such as check dams and terraces, roasting pits for the processing of agave, and petroglyphs hammered into the surfaces of rock outcrops and boulders. There are also a few features associated with mining and ore processing. Many other prehistoric and historic archeological sites are represented by nothing more than a scatter of artifacts on the ground surface.

No traditional cultural properties, native plant gathering areas or tribal sacred sites are currently known to be located within the allotment.

From the 1870s to the early 1920s grazing of what would become the Sunflower Allotment was heavy and unregulated. This resulted in an initial reduction of vegetative cover which may have affected heritage resources by soil loss, erosion, and trampling. Since the establishment of this allotment and implementation of grazing management, the known heritage resource inventoried there have stabilized and in many cases improved in condition as vegetative cover has returned.

Environmental Consequences

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

Effects Common to Both Alternatives

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. Permit numbers by themselves do not cause adverse effects to heritage resources. They result from the timing, duration, frequency, and intensity of livestock use and can be completely independent of permitted numbers. Changes in grazing strategy are likewise not considered to have an effect provided that whatever new strategy is implemented does not alter these conditions. Adverse effects can be foreseen if a proposed grazing strategy were to introduce livestock into an area not known to have been grazed historically. They may also be expected when a grazing strategy proposes shifting to a more intensive system where higher permitted numbers or high intensity/short duration schedules will concentrate livestock into confined areas where either the absolute or relative stock density will cause a significant increase in surface disturbances due to trampling that will 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.

There may be a potential to disturb archeological sites, if any range improvements are to be removed. Otherwise, continued nonuse for resource protection will have no effect on Heritage resources.

Cumulative Effects

Archaeological sites are, by their very nature, previously affected, reduced by the transformation processes of erosion and decay from their original pristine state. Any effect to such sites, therefore, is cumulative. Many have also been affected by historic and recent human activity, including management activities undertaken by the Forest and resource use and extraction projects undertaken prior to the implementation of Section 106 of the National Historic Preservation Act. Such actions that are known to have affected archaeological sites on the Tonto National Forest include unrestricted livestock grazing, timber harvesting, road and trail construction, and a wide variety of recreational activities. There were also the decades of essentially unrestricted vandalism and looting. All of these activities have the potential to cause permanent damage to the structures, artifacts, and cultural deposits making up archaeological sites of unrestricted motorized cross-country travel have already been discussed in the current conditions.

Illegal activities such as vandalism and looting by pothunters clearly affect cultural and historical and tribally significant resources. Since these activities are illegal, they cannot be predicted and so in the strictest sense are not foreseeable in any legal sense. Still, since these activities have been reduced in recent years but not entirely eradicated, they can be expected to continue at some level. They can be reduced by monitoring and law enforcement.

Reasonably foreseeable actions that can affect cultural and historical and Tribally significant resources represent a continuation of the land use practices of the past: livestock grazing, fuels reduction and forest thinning, timber harvesting, mining, watershed improvements, recreation management (obliteration of social trails and dispersed campsites, construction and designation of trails and campsites), lands special use permits (new issuances and maintenance on existing structures), new road construction, and personal use activities such as fuelwood harvesting that often entail cross-country vehicular access. While these activities can directly and indirectly affect cultural and historical and Tribally significant resources as well as cause destruction or modification to their environmental contexts, these actions are planned to minimize (and when possible, to eliminate) effects to these properties and have measures designed to mitigate disturbance that may occur from project implementation. By applying the standards and protection measures in the Protocol and those spelled out in chapter 2 of this document, it is not expected that the proposed action will result in any increase in cumulative effects associated with cultural resources within the project area.

Air Quality

Affected Environment

Air quality for the analysis area is monitored by Arizona Department of Environmental Quality under direction from the *Clean Air Act* and the Environmental Protection Agency, who provide National Ambient Air Quality Standards (NAAQS). By these standards, a portion of the analysis area is in a nonattainment area or maintenance area (Area A) for regulated air pollution³¹.

Environmental Consequences

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). These effects can be mitigated through proper site preparation and construction techniques and through site restoration following ground-disturbing activities.

Alternative 1 - Direct and Indirect Effects

Effects from particulate matter will be minimized under a no grazing alternative without livestock gathering and trailing; however, use of roads in the area will still occur and construction of improvements for wildlife or recreational benefit could still occur on the allotment.

Alternative 2 – Direct and Indirect Effects

This alternative, which will authorize grazing, may have an effect associated with particulate matter. These effects could occur during livestock gathering (heavy trailing, increased vehicle movement) and during construction of range improvements. However, the effects associated with this alternative are expected to have a minimal effect on air quality.

Cumulative Effects

Air quality would still be affected by activities on other active grazing allotments in the analysis area, by outflow from the Phoenix metropolitan area, by agricultural activities west of the project area, and by continued recreation activities in the project area and just outside the project area.

Climate

Affected Environment

Climate on the allotment 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 the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center data, there has been a marked upward trend in the globally averaged annual mean surface temperature since the mid-1970s (Shein, 2006). The Federal Advisory Committee Draft

³¹ http://www.azdeq.gov/environ/air/vei/images/areaa.html

Climate Assessment Report is projecting higher temperatures and lower precipitation for the Southwestern United States (Garfin *et al.*, 2013). New modeling efforts for the North American monsoons indicate that the amount of monsoon moisture will change little; however, the monsoons will be delayed and most of the precipitation will come late in the season during September through October (Cook and Seager, 2013).

The period of record for Mesa is 1896 to present (WRCC, 2013), and the average annual precipitation is 9.49 inches (NOAA 2013). Of the last 14 years (2003 to 2014), the data indicate eight years had below average precipitation (NOAA, 2015). Average high and low temperatures for Mesa, was 43 degrees Fahrenheit in January and 81 degrees Fahrenheit in July during a 14 year period (observing the coolest month January and warmest month July), according to NOAA. Observing temperature averages from years 2000-2014: January experienced its lowest average at 38.6 degrees Fahrenheit in year 2013 and July experienced its highest average at 83.8 degrees Fahrenheit in year 2003.

Environmental Consequences

According to the EPA, 20 percent of methane in the world comes from "livestock" (which includes cattle). There are approximately 1.5 billion cattle on Earth. Only 10 percent of the world's cattle are in the USA. The USA is less than 2 percent of the surface of the Earth. The entire National Forest System is 193 million acres which is only 8.4 percent of the USA. The Tonto National Forest is less than two percent of the entire National Forest System, and the Sunflower Allotment is only 5 percent of the Tonto National Forest. It is impractical to analyze the global contribution of CH_4 to climate change from less than 525 cattle on such an insignificant percentage of the earth. It has been calculated that methane loss by ruminants only accounts for a very low percentage of total global methane, even less than that contributed by termites (Holter and Young, 1992).

It will be difficult to separate effects of livestock emissions from those produced by other human activities, such as passenger vehicles and off-road vehicles traveling on roads in the analysis area, industrial activities such as mining, and outflow from major metropolitan areas such as Phoenix, Arizona, which lies approximately 30 miles south of the analysis area.

Livestock grazing may or may not affect climate by altering the abundance or type of carbonsequestering 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 analysis area.

Climatic fluctuations, on the other hand, can have a profound effect on livestock grazing. Implementing an adaptive management strategy will be critical for responding to these fluctuations by adjusting stocking rates, as needed, in periods of below average or above average precipitation to meet desired conditions for all resources.

Removal of livestock from the allotments through selection of a no grazing alternative will reduce emissions slightly; however, it will be difficult to measure this change. Emissions will continue to be generated from neighboring allotments in the analysis area. Eliminating grazing pressure on vegetation may also have a slight benefit for carbon sequestration; again, this will be difficult to measure on such a small scale.

Since it is nearly impossible to determine measurable effects of authorizing grazing on the Sunflower Allotment on climate change, there are no direct or indirect effects to climate change to analyze for this project. Thus, there will be no cumulative effects to analyze.

Socioeconomics

Affected Environment

The Sunflower Allotment is within two Arizona Counties: Gila and Maricopa (Figure 14). However, more than 95 percent of the allotment resides within Maricopa County, which will be the basis for this analysis.



Figure 14: Map of Sunflower Allotment in Relationship to Arizona Counties

Demographics

The Economic Profile System-Human Dimensions Toolkit (EPS-HDT) was used to provide detailed socioeconomic reports for this project. This toolkit was designed by Headwaters Economics, an independent, nonprofit research group whose mission is to improve community development and land management decisions in the West. The Bureau of Land Management and Forest Service have made significant financial and intellectual contributions to the operation and content of EPS-HDT. EPS-HDT uses published statistics from federal data sources, including Bureau of Economic Analysis and Bureau of the Census, U.S. Department of Commerce; and Bureau of Labor Statistics, U.S. Department of Labor.

Using the Economic Profile System Analyst (EPSA) tool developed by Headwaters Economics, a socioeconomic profile was produced for Maricopa County. According to 2013 data, the population of Maricopa County was 4,009,412 (Headwaters Economics, 2015a)

However, the population of the Phoenix census county division³² (CCD) is 3,031,183 (Headwaters Economics, 2015b), which means that less than one quarter of the population for Maricopa County is outside the Phoenix CCD sphere of influence (Figure 15^{33}).

³² According to the Census Bureau, a census county division is, "A subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities. Used for presenting decennial census statistics in those states that do not have well-defined and stable minor civil divisions that serve as local governments" (source:

http://factfinder.census.gov/help/en/census_county_division_ccd.htm, accessed 06/15/2013) ³³ Information from

http://www2.census.gov/geo/maps/general_ref/cousub_outline/GARM2010/GARM2010_AZ.pdf; accessed 06/15/2015.



Figure 15: Map of Phoenix CCD

As is the case in many western states, counties within Arizona have a higher percentage of federally managed land than the national average, which is 28.8 percent (Headwaters Economics, 2015c). This is also true of Maricopa County, where nearly 53 percent of the land base is under federal land ownership (Table 32).

Table 32: Federal Land within Maricopa County (2013)
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Federal Land Agency	Percentage of Maricopa County
Forest Service	11.0
Bureau of Land Management	29.1
National Park Service	n/a
Military	12.7
Other Federal Land Agencies	0.1

Employment Related to Natural Resource Management

Agriculture is one of several industries that have the potential for being associated with the commodity use of public lands. Collectively, timber, mining, and agriculture make up less than one percent of the total private employment (Table 33) (Headwaters Economics, 2015d).

Employment sector	Percent of total private employment
Timber	0.33
Fossil fuels (oil, gas, & coal)	0.01
Other mining	0.03
Agriculture	0.27

Table 33: Employment Related to Forest Service for Maricopa County (2013)

Federal Land Payments to Counties

Another way that federal lands contribute to local economies, particularly local governments, is through federal land payments, which are distributed to state and local governments by the geography of origin. State and local government cannot tax federally owned lands the way they would if the land were privately owned. Therefore there are a number of federal programs that exist to compensate county governments for the presence of federal lands. These programs can represent a substantial portion of local government revenue in rural counties with large federal land holdings or based on the permitted use.

There are two main methods that Forest Service uses to pay counties: Payments in lieu of taxes (PILT), and Forest Service revenue sharing. Payments are funded by federal appropriations (e.g., PILT) and from receipts received by federal agencies from activities on federal public lands (e.g., timber, grazing, and minerals). The PILT payments compensate county governments for non-taxable federal lands within their borders. PILT is based on a maximum per-acre payment reduced by the sum of all revenue sharing payments and subject to a population cap. Forest Service Revenue Sharing is a payment based on Forest Service receipts and must be used for county roads and local schools. Payments include the Secure Rural Schools and Community Self-Determination Act.

From 1986 to 2014, Forest Service revenue sharing payments grew from \$141,588 to \$494,090, an increase of 249 percent (Headwaters Economics, 2015e). In fiscal year 2014, PILT made up the largest percent of federal land payments in Maricopa County, 80.8 percent (Headwaters Economics, 2015e).

Economic Sectors

Table 34 shows employment by industry for Maricopa County for 2013 (Headwaters Economics, 2015a). Of the industries listed in the tables, agriculture, mining, manufacturing (including forest products), and government employment are traditionally sectors that are associated with Forest Service management.

		Percent of Total
	Industry	Employment
Non-serv	vices related	11.4
	Farming	0.3
	Forestry, fishing, & related activities	0.1
	Mining (including fossil fuels)	0.4
	Construction	5.4
	Manufacturing	5.2
Services	related	79.0
	Utilities	0.3

Table 34: Employment by Industry for Maricopa County (2013)

	Percent of Total
Industry	Employment
Wholesale trade	3.9
Retail trade	10.6
Transportation and warehousing	3.1
Information	1.7
Finance and insurance	7.7
Real estate and rental and leasing	7.1
Professional and technical services	6.7
Management of companies and enterprises	1.2
Administrative and waste services	9.2
Educational services	2.3
Health care and social assistance	10.6
Arts, entertainment, and recreation	2.2
Accommodation and food services	7.3
Other services, except public administration	5.1
Government	9.7

Environmental Consequences

This analysis determines the effects of grazing reauthorization for the Sunflower Allotment on Maricopa County based on implementation of the two alternatives: No Action (no authorization of grazing with the allotment) and the proposed action.

Assumptions and Methodology

When it comes to the economic contribution of the Tonto National Forest to Maricopa County, there are several mechanisms to take into consideration, including federal land payments, PILT, and Forest Service revenue sharing. For the county area, in 2012 less than one percent of the total revenue (approximately \$2,287,000 million) comes from federal land sources.

Decisions related to authorization of grazing on the Tonto National Forest, including the Sunflower Allotment, are not expected to affect economic trends in Maricopa County. This is because the contributions associated with the grazing management, and other forms of income related to land management, are such a small percent of the overall economic contributions to the county.

It is understood that some individuals may be greatly affected by the authorization of grazing in the Sunflower Allotment, especially those whose business is either tied directly to the permittee or other aspects of range management. Without that level of quantitative data, the intensity that individuals may be affected cannot be determined. Because the potential effects from grazing in the Sunflower Allotment are so negligible, it is assumed that the two alternatives being analyzed will not have any effect, either negative or positive, on economic trends for Maricopa County.

Alternative 1 – Direct and Indirect Effects

No grazing authorization will happen within the Sunflower Allotment under this alternative. As indicated in the assumptions section of this report, the effects from this alternative on the social and economic trends of Maricopa County are negligible and cannot be quantitatively or qualitatively analyzed. Therefore, there is no effect on socioeconomics under this alternative.

Cumulative Effects

Because the direct and indirect effects are negligible in relationship to public land management contributions to Maricopa for this or any range projects, there are no cumulative effects associated with social and economic trends.

Alternative 2 – Direct and Indirect Effects

This alternative will authorize grazing on the Sunflower Allotment as described In Chapter 2 of the EA. As indicated in the assumptions section of this report, the effects from this alternative on the social and economic trends of Maricopa County are negligible and cannot be quantitatively or qualitatively analyzed. Therefore, there is no effect on socioeconomics under this alternative.

Cumulative Effects

Because the direct and indirect effects are negligible in relationship to public land management contributions to Maricopa for this or any range projects, there are no cumulative effects associated with social and economic trends.

Finding of No Significant Impact

The responsible official for authorizing grazing within the Sunflower Allotment, the Mesa District Ranger, is responsible for evaluating the effects of the project relative to the definition of significance established by the CEQ Regulations (*40 CFR 1508.13*). This Final Environmental Assessment for Sunflower Allotment Grazing Analysis (Final EA), including the incorporated reports and comment response report in the project record, have been reviewed and considered by the responsible official in determining that the proposed action (Alternative 2) will not have a significant effect on the quality of the human environment. As a result, no environmental impact statement will be prepared. The rationale for this finding is as follows, organized by sub-section of the CEQ definition of significance cited above.

Context

For the proposed action and the no grazing alternative the context of the environmental effects is based on the environmental analysis in this Final EA. In terms of scale and scope of grazing authorization for the Sunflower Allotment, the allotment is approximately 36 percent of the acreage in the entire Mesa Ranger District (approximately 430,000 acres). However, the Otero, Ranger Station, Sycamore Creek Riparian, and Adams—west of SR 87—pastures within the Dos S Unit, and the Desert Unit will be placed into non-use, further decreasing the area affected by the proposed action by approximately 98,500. For context, the Sunflower Allotment is only approximately 5 percent of the Tonto National Forest.

There are three active allotments on Mesa Ranger District (Cross F, Diamond, and Millsite) that are permitted for 1,400 cow/calf pairs and yearlings³⁴. Of the 1,400 permitted numbers, 272 cow/calf pairs were authorized on the aforementioned allotments in 2015. Across the entire Tonto National Forest, there are approximately 296, 274 permitted total animal unit months³⁵ (AUMs). As detailed in the description of Alternative 2 in chapter 2, a maximum of 6,300 AUMs will be permitted within the Sunflower Allotment, approximately 2 percent of the total for the forest.

Intensity

Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis, chapter 3 of this Final EA, and the references in the project record. The effects of authorizing grazing within the Sunflower Allotment have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits. This finding of no significant impact is based on the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b).

³⁴ Mesa also has four other allotments: Goldfield which is "closed" or withdrawn from grazing and Reavis, Superstition, and Tortilla which are inactive and currently have no permitted use.

³⁵ The amount of forage needed by an "animal unit" (AU) grazing for one month. The quantity of forage needed, based on the cow's weight, and the animal unit is defined as one mature 1,000 pound cow and her suckling calf. It is assumed that such a cow nursing her calf will consume 26 pounds of dry matter of forage per day.

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

Both beneficial and adverse effects were analyzed in chapter 3, summarized here: For upland vegetation, within the non-use areas, an increase in plant density and composition is expected. In areas grazed, flexibility given to resource managers to adjust the timing, intensity, frequency, and duration of livestock grazing in any pasture, at any time will ensure that plants are not used beyond levels that will provide for recovery, improved vigor, and recruitment of desirable species. In addition, vegetation on the allotment will likely increase in desirable forage plant densities and litter. Additionally, there will be an increase in plant species composition and improved vigor of forage plants within the allotment. The overall forage production (biomass) will also increase. Based on this, soils condition will be maintained, and possibly improve in the non-use areas. In terms of fire suppression and fuel loading, grazing will assist in controlling the growth of fine fuels such as grasses and forbs, which contribute to fire spread after these fuels have dried out.

For forest visitors looking for a "natural" recreational experience, the presence of livestock and range improvements may have an adverse effect. Adverse effects to heritage resources may happen if there is increased trampling from localized concentration or in uses that are above previous or existing levels.

Finally, the decision is not biased by the beneficial effects of Alternative 2.

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

As part of chapter 3, there was an air quality and climate effects analysis, along with consideration of water quality as part of the hydrology, riparian, and watershed analysis. The proposed action will not affect water quality based on current assessment data, which was either inconclusive or found that impairment was due to factors outside of grazing authorization, such as dissolved oxygen. In terms of air quality and effects to the climate, the proposed action may have localized, nearly unmeasurable effects. However, there will be no effects on air quality or climate in general, resulting in no significant effects on public health or safely.

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

As detailed in the heritage resources section of chapter 3, the Sunflower Allotment contains hundreds, perhaps thousands, of prehistoric archeological sites representing the occupation and agricultural modification and use of this area by people related to the Hohokam archeological tradition over a period of 8,000 to 10,000 years. It also contains hundreds of historic sites reflecting its use and occupation by Yavapai and Apache hunters, gatherers, and farmers, the U.S. military, Anglo and Hispanic ranchers and stockmen, miners and prospectors, the Works Progress Administration, the Civilian

Conservation Corps, and the U.S. Forest Service. Some of the known sites consist of collapsed stone masonry structures, various water control devices such as check dams and terraces, roasting pits for the processing of agave, and petroglyphs hammered into the surfaces of rock outcrops and boulders. There are also a few features associated with mining and ore processing. Many other prehistoric and historic archeological sites are represented by nothing more than a scatter of artifacts on the ground surface. No traditional cultural properties, native plant gathering areas or tribal sacred sites are currently known to be located within the allotment.

Since the establishment of this allotment and implementation of grazing management, the known heritage resource inventoried there have stabilized and in many cases improved in condition as vegetative cover has returned.

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

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

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

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

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

The decision to authorize grazing on the Sunflower Allotment as detailed in the description of Alternative 2 in chapter 2 does not establish a precedent for future actions with significant effects. Future actions will be evaluated through an environmental analyses process, in compliance with 40 CFR 1500-1508 and 36 CFR 220. Future range projects will be evaluated individually as to environmental effects and project feasibility. Furthermore, as detailed in several of the incorporated reports in the project record, this project is consistent with the Tonto National Forest Plan of 1985, as amended.

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

The cumulative effects are disclosed for each resource area in chapter 3 of this Final EA³⁶. These effects evaluated the combined effects of the project with past, present and reasonable foreseeable future actions. Based on the information contained in this Final EA and the information identified during public review of the EA, there are no cumulatively significant impacts.

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

The proposed action, as detailed in chapter 2, will have no significant adverse effect on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places. As detailed in the Heritage Resources Report in the project record, and summarized in chapter 3 of this Final EA, mitigation of impacts to heritage resources is best accomplished by avoidance of these properties by the placement and construction of all range improvements. It can also be achieved by minimizing opportunities for the localized concentration of animals, improving distribution across the allotment and across each pasture, and by reducing the intensity of grazing for the allotment as a whole. In instances where proposed improvements will involve any potential for ground disturbance, such as stock tanks and other water developments, a 100 percent archaeological survey will be conducted for areas which have no previous survey coverage, or have outdated surveys, which do not conform to current standards. Other, more specific mitigation requirements may be identified as each of these improvements is developed and a heritage inventory is made of their areas of potential effect. Such protective measures are developed in accordance with the goals of the project, taking into account site vulnerability as well as the methods of project

³⁶ For a few resources, there were no direct or indirect effects associated with grazing authorization, thus there was no need for a cumulative effects section for these areas in chapter 3 of this document.
implementation. All inventoried heritage sites are treated as eligible for the National Register of Historic Places with the exception only of those that have been formally determined to be not eligible in consultation with the State Historical Preservation Office (SHPO). Archeological clearance must be approved with all necessary consultation with SHPO and the potentially interested Tribes prior to issuing any decision regarding the construction, modification, or removal of all improvements. This approach, based on long-term consultation with SHPO and on Region 3 policy as embodied in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities* between the USDA Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation, signed December 24, 2003, and specifically, Appendix H, the *Standard Consultation Protocol for Rangeland Management* developed pursuant to Stipulation IV.A of the *Programmatic Agreement* is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

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

The action will not adversely affect any endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species act of 1973. The Biological Assessment concluded that this action will have a "no effect" determination on Mexican spotted owl (MSO), a "not likely to adversely affect" determination for MSO critical habitat; a "may affect individual Sonoran desert tortoise, but will not result in a trend toward federal listing or loss of viability" for the Sonoran desert tortoise (candidate species), and requested additional conservation measures for this species; a "no effect" determination for both the Gila topminnow and the desert pupfish. The USFWS issued their concurrence (AESO/SE 02EAAZ00-2015-I-0436concurrence #) on these findings on June 24, 2015, which is part of the project record. Conservation measures provided by the USFWS as part of the concurrence process for this project can be found in both chapters 2 and 3.

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

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

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