United States Department of Agriculture

Hicks-Pikes Peak Allotment Grazing Authorization

Preliminary Environmental Assessment

Forest Service Tonto National Forest, Globe Ranger District July 2019

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Existing and Desired Conditions and Need for Proposal

Allotment Description and Location

The Hicks-Pikes Peak Allotment is located on the Globe Ranger District, eight miles north and northwest of Globe, Arizona in Gila County (Figure 1). It encompasses a total area of 66,838 acres spread out over 21 pastures. Pastures range from over 10,000 acres to less than 500 acres. The Salt River forms part of the allotment's northern boundary, and Pinal Creek flows through the allotment from south to north. In total, there are 56 miles of creeks and washes flowing through Hicks-Pikes Peak. Topographical features range from nearly level valley and elevated plains to very steep mountains and escarpments. About 70 percent of the allotment is composed of nearly level to moderately steep slopes ranging from zero to 40 percent. Elevations range from about 2,200 feet to 5,351 feet. The mean annual precipitation at the nearby town of Globe is about 16 inches (elevation 3550 feet). The precipitation on the allotment, based on Terrestrial Ecosystems gradient analysis, ranges from approximately 13 inches at the lower elevations to 22 inches at the higher elevations.

A large part of this range is composed of decomposed granite soil, which is extremely susceptible to erosion. The vegetation communities in the allotment are primarily Sonoran desert scrub in lower elevations (as low as 2,200 feet), semi-desert grasslands and chaparral in middle elevations, and pinyon-juniper-oak woodlands in high elevations (as high as 5,351 feet).

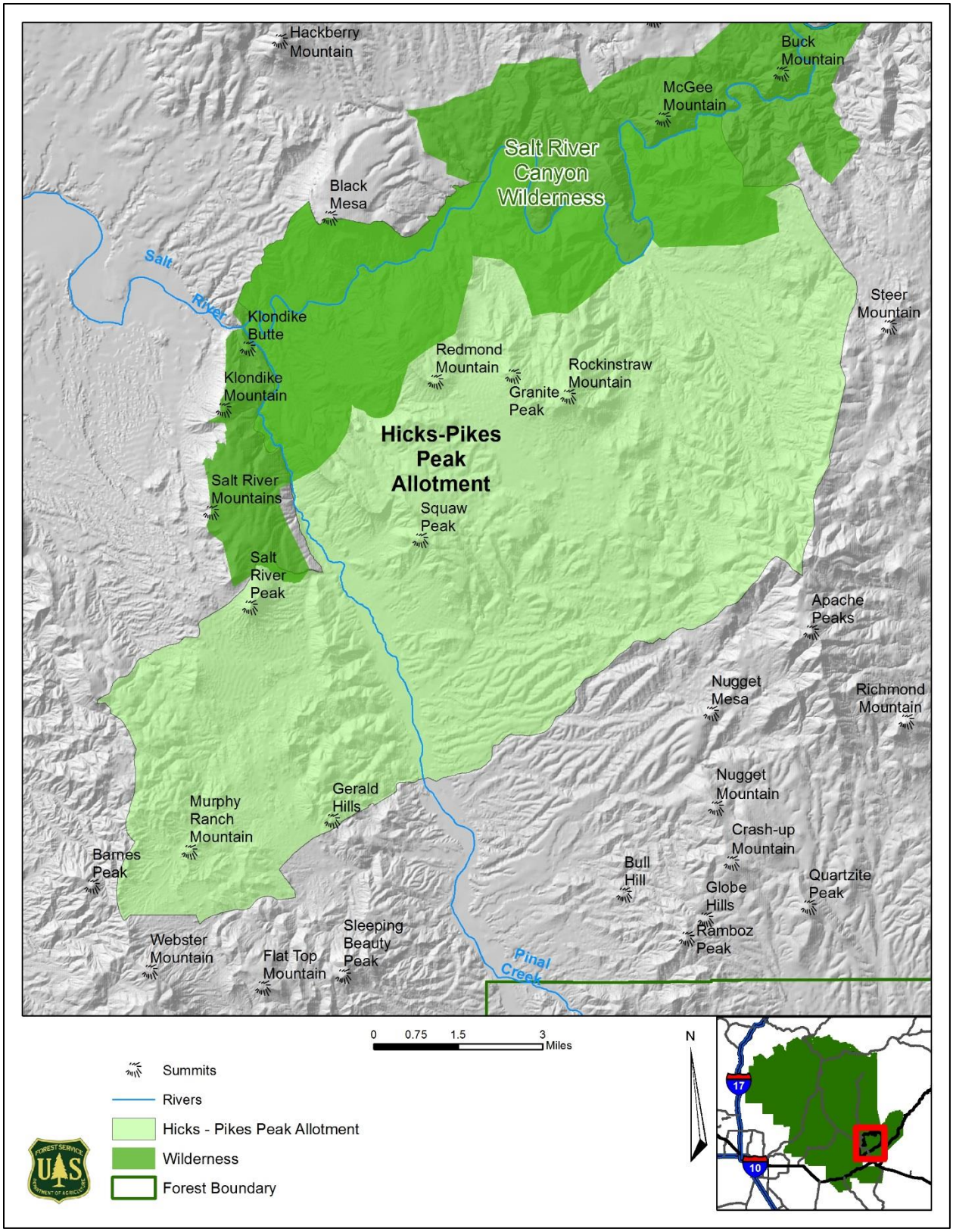

Figure 1: Map of Hicks-Pikes Peak Allotment Location

Allotment Management History

Livestock grazing, under various permittees, has occurred over the last one hundred years on the Hicks-Pikes Peak Allotment. More recently, H&E Ranch, Inc. was the range permittee from 1982 until 2006. H&E Ranch, Inc. split livestock into three groups which were rotated between a set of pastures, spending approximately one to three months in each pasture. In 2002, an extreme drought necessitated livestock removal across the Tonto National Forest. This culminated in full removal of livestock from the Hicks-Pikes Peak Allotment by 2003 until 2004. Rockin Four Ranch, LLC bought the base property for the allotment in 2006, and was issued a permit to graze the same year. This permit holder (permittee) has operated the allotment since that time.

Current Grazing Management

The permittee incorporates a rotational grazing strategy to allow rest on grazed plants. Grazing utilization and intensity are monitored during the grazing year. This is evaluated by estimating the amount of a grazed plant left intact, vigor of plants, precipitation, and growth stage of key species. There is a utilization limit, which was scientifically derived and concurred on in consultation with United States Fish and Wildlife Service, of 30 to 40 percent for upland grasses, 50 percent for desirable browse species, 50 percent for woody riparian species, and 30 percent for herbaceous riparian species. Livestock numbers have slowly increased, but averaged between 290 to 670, since 2006. This range falls within conservative estimates based on acreage and estimated forage production[1].

In 2018, a decision memo was signed which split the Ortega pasture into two pastures, East Ortega and West Ortega, by constructing a pasture division fence. Additionally, a drift fence was constructed on East Ortega pasture to keep livestock from accessing riparian habitat along the Salt River. These fences allowed grazing to resume in East Ortega pasture under the current grazing authorization, from September through December 2018. Lower Shute and West Ortega pastures are not part of the current grazing management rotation.

Existing Range Improvements

Range improvements have been added to the allotment over time. As improvements were added, maintenance responsibility was then added to term grazing permit. The current status of improvements varies and are evaluated depending on various factors such as accessibility, water production, and changes to management strategies. Several improvements, currently included in the permit, are no longer maintained often due to changes in management strategies. All existing improvements are located in Appendix D.

The Forest Service requires all improvements listed in the Term Grazing Permit to be maintained to standards agreed upon by the permittee and the Forest Service through a permit modification or Annual Operating Instructions. Improvements on Forest Service lands are property of United States Government, unless through a cooperative agreement. The Hicks-Pikes Peak permittee does not hold any of these cooperative agreements.

[1] More information can be found in the Existing and Desired Condition Section under Vegetation.

Existing and Desired Conditions

Existing conditions describe the current management strategy and environmental conditions within the project area. Desired conditions describe how the resource should function after the project is implemented.

Desired conditions are defined by the Tonto National Forest Land and Resource Management Plan (Forest Plan) guidance and the best available scientific information[2]. The Forest Plan identifies management prescriptions and management emphasis for particular management areas across the Tonto National Forest. The Hicks-Pikes Peak Allotment is entirely within Management Areas 2F and 2B. Management emphasis for area 2F, the Globe Ranger District, is to "manage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, water quality maintenance, livestock forage production, and dispersed recreation. Watersheds will be managed so as to improve them to a satisfactory or better condition. Improve and manage the included riparian areas (as defined by FSM 2526) to benefit riparian dependent resources" (Forest Plan, page 85).

Management Area 2B encompasses the Salt River Canyon Wilderness. "The primary emphasis for this area is the preservation of naturally occurring flora, fauna, aesthetics and ecological processes while providing a very high quality white water river running experience. Special consideration will be given to nesting bald eagle home range requirements. Watershed protection is also an important emphasis, and the stream shall be maintained in a free flowing condition with water quality maintained or improved. Other activities that are authorized by the Wilderness Act will be conducted so as to minimize their impact on wilderness character. The portion of this management area from near the Highway 288 bridge upstream to the Fort Apache Reservation boundary was studied by the Forest Service for inclusion in the National Wild and Scenic Rivers System at the direction of the U.S. Congress. Present management emphasis will not preclude future Congressional designation of this river." (Forest Plan, page 76)

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

Vegetation

Existing Conditions

The vegetation communities in the allotment are primarily Sonoran desert scrub in lower elevations (as low as 2,200 feet), semi-desert grasslands and chaparral in middle elevations, and pinyon-juniper-oak woodlands in high elevations (as high as 5,351 feet) (Figure 2).

[2] The Forest Plan can be found on the Tonto National Forest website and in the project record. It is incorporated by reference.

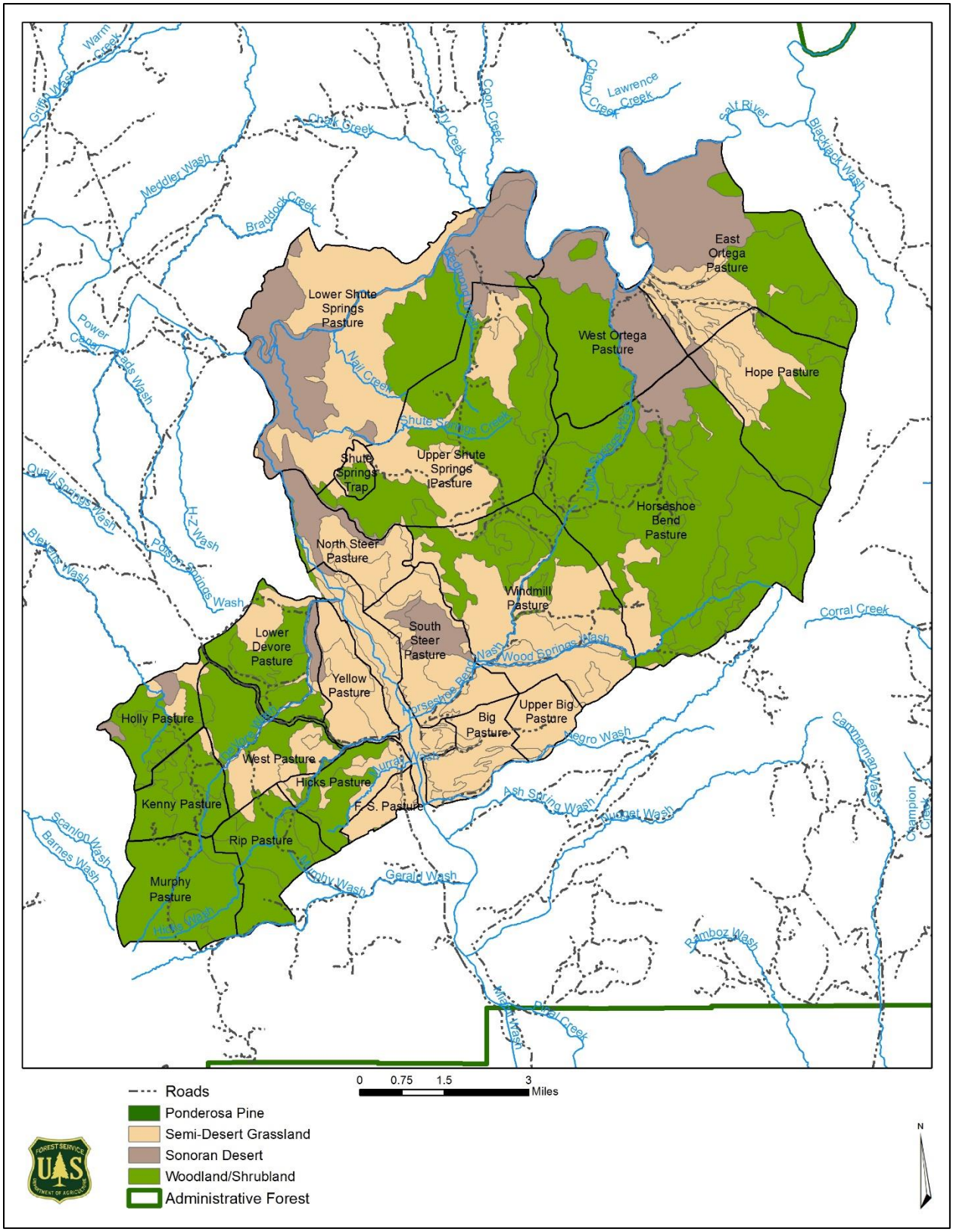

Figure 2: Broad Vegetation Communities on the Hicks-Pikes Peak Allotment

In Table 1 vegetation types have been grouped by pasture. Broad vegetation groups are groupings of climax plant communities named for characteristic and diagnostic plants that distinguish one plant community from another (USDA, Terrestrial Ecosystem Survey Handbook, 1985. pp. 4-25 to 4-27). There may be a large degree of variability within the broad vegetation groups. The vegetative types were developed from Terrestrial Ecosystem Survey Terrestrial Ecosystem Unit Inventory (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. The vegetation map and Table 1 serve as a basis for identification of coarse-filter vegetation types.

Table 1: Broad Vegetation Groups by Pasture[3]

Pasture Name	Broad Vegetation Groups	Acres
Big Pasture		
	Riparian Vegetation	171
	Semi-Desert Grasslands	1,090
F. S. Pasture		
	Sonoran Desert Scrub	449
	Turbinella Oak Chaparral	22
Hicks Pasture		
	Juniper Savannas	294
	Riparian Vegetation	30
	Sonoran Desert Scrub	932
	Turbinella Oak Chaparral	105
Holly Pasture		
	Juniper Savannas	467
	Semi-Desert Grasslands	661
	Sonoran Desert Scrub	55
	Turbinella Oak Chaparral	119
	Woodlands (Juniper and Pinyon/Juniper)	112
Hope Pasture		
	Juniper Savannas	158
	Riparian Vegetation	144
	Semi-Desert Grasslands	503
	Sonoran Desert Scrub	623
	Turbinella Oak Chaparral	2,181
	Woodlands (Juniper and Pinyon/Juniper)	35
Horseshoe Bend Pasture		
	Juniper Savannas	1,585
	Riparian Vegetation	92
	Semi-Desert Grasslands	322
	Sonoran Desert Scrub	391
	Turbinella Oak Chaparral	5,536

[3] TEUI data are currently being digitized. When this has been finished, this table will be updated to reflect the splitting of Ortega pasture and Lower Shutte pasture. The updated table will include major vegetation groups, percent cover, and litter. This is anticipated to be available before the Final EA is released.

Pasture Name	Broad Vegetation Groups	Acres
	Woodlands (Juniper and Pinyon/Juniper)	2,210
Kenny Pasture		
	Juniper Savannas	121
	Riparian Vegetation	11
	Semi-Desert Grasslands	488
	Turbinella Oak Chaparral	774
	Woodlands (Juniper and Pinyon/Juniper)	74
Lower Devore Pasture		
	Juniper Savannas	0
	Riparian Vegetation	116
	Semi-Desert Grasslands	303
	Sonoran Desert Scrub	958
	Turbinella Oak Chaparral	694
	Woodlands (Juniper and Pinyon/Juniper)	26
Murphy Pasture		
	Juniper Savannas	106
	Riparian Vegetation	2
	Turbinella Oak Chaparral	1,391
	Woodlands (Juniper and Pinyon/Juniper)	876
North Steer Pasture		
	Juniper Savannas	0
	Riparian Vegetation	52
	Semi-Desert Grasslands	378
	Sonoran Desert Scrub	1,151
	Turbinella Oak Chaparral	1
	Woodlands (Juniper and Pinyon/Juniper)	5
Ortega Pasture		
	Juniper Savannas	1,688
	Riparian Vegetation	669
	Semi-Desert Grasslands	787
	Sonoran Desert Scrub	4,972
	Turbinella Oak Chaparral	1,128
	Woodlands (Juniper and Pinyon/Juniper)	77
Private Land		
	Juniper Savannas	63
	Riparian Vegetation	829
	Semi-Desert Grasslands	390
	Sonoran Desert Scrub	325
	Turbinella Oak Chaparral	33
Rip Pasture		
	Juniper Savannas	97
	Riparian Vegetation	51
	Sonoran Desert Scrub	162
	Turbinella Oak Chaparral	1,050
	Woodlands (Juniper and Pinyon/Juniper)	496
Shute Springs Pasture		
	Juniper Savannas	1,770
	Riparian Vegetation	673

Pasture Name	Broad Vegetation Groups	Acres
	Semi-Desert Grasslands	2,340
	Sonoran Desert Scrub	6,996
	Turbinella Oak Chaparral	2,906
	Woodlands (Juniper and Pinyon/Juniper)	1,031
Shute Springs Trap		
	Juniper Savannas	113
	Semi-Desert Grasslands	11
	Turbinella Oak Chaparral	154
	Woodlands (Juniper and Pinyon/Juniper)	36
South Steer Pasture		
	Juniper Savannas	15
	Riparian Vegetation	192
	Semi-Desert Grasslands	1,386
	Sonoran Desert Scrub	685
	Turbinella Oak Chaparral	13
Upper Big Pasture		
	Riparian Vegetation	32
	Semi-Desert Grasslands	800
West Pasture		
	Juniper Savannas	35
	Riparian Vegetation	70
	Semi-Desert Grasslands	39
	Sonoran Desert Scrub	395
	Turbinella Oak Chaparral	1,463
	Woodlands (Juniper and Pinyon/Juniper)	79
Windmill Pasture		
	Juniper Savannas	1,457
	Riparian Vegetation	167
	Semi-Desert Grasslands	2,483
	Sonoran Desert Scrub	149
	Turbinella Oak Chaparral	965
	Woodlands (Juniper and Pinyon/Juniper)	428
Yellow Pasture		
	Riparian Vegetation	28
	Sonoran Desert Scrub	1,300
	Turbinella Oak Chaparral	0
Total		**66,838**

Production Utilization Studies

Production utilization studies are conducted as a snap shot in time of the area's carrying capacity. These utilization studies map patterns and patches of livestock grazing, radiating from available water sources. According to Forest Service (Production Utilization Surveys, 1988), "diversity of available forage, species preferences, and livestock behavior create disparities between areas of production and areas of utilization", which are identified through these maps. Analyses of carrying capacity made during these studies are calculated with allowable use standards, but are used best for planning and administration, not

for a final determination of estimated grazing capacity. The outcome is shown as animal unit months (AUMs) by pasture, based on current conditions.

In 1985, a production utilization study was conducted throughout the entire allotment. At that time, the allotment was under continuous yearlong grazing with low forage cover and decreased soil stability, based on long term monitoring data. These conditions, when reviewed by Forest Service personnel, recommended allowable livestock grazing use to be set at 20 percent key perennial grasses and 30 percent key browse. These recommendations were made, but never implemented, on the allotment. Allowable use was measured in areas where livestock had access and was not measured on highly erodible soils or areas with no palatable perennial forage.

This 1985 study determined that the majority of the allotment was stocked at higher levels than are sustainable for forage plants. At that time, utilization on key species was found to be between 60 and 80 percent. Livestock were not moved to areas of lower utilization and instead congregated in easily accessible areas before moving to others. This lack of livestock distribution was noted by the difference in vegetation between easily and tougher areas to access, due largely to excessive stocking and continuous yearlong grazing. Pasture structure did not allow for reasonable livestock rotations and new fences were recommended to offset these results. Lower Shute pasture had a distribution problem due to the available water sources in the canyon bottoms of Shute canyon and the Salt River. The conclusion and recommendation of that study determined that for an allotment under a rotational management strategy with two out of three years' rest, back to back, capacity could be 629 head of cattle with 522 head natural increase.

Livestock numbers have slowly increased, but averaged between 290 to 670, since 2006. The Natural Resource Conservation Service (Womack 2017), outlines several assumptions used and determined an estimated livestock capacity for Hicks-Pikes Peak Allotment[4]. If we assume that half of the allotment has slopes accessible to livestock, (approximately 33,000 acres), and a 1,000 pound cows and her calf consume roughly 2.5 percent of its body weight per day, each accessible acre would need to produce 215 pounds of forage per day to feed one cow and her calf. Allowing for 30 percent grazing use on upland grass crop would mean that, on average, each acre would need to produce 717 pounds of forage in a year. Further calculations show 800 cows and their calves could be supported at this rate on the allotment. Many shrub dominated or grass and shrub vegetation zones, which Hicks Pikes Peak Allotment is in, produce an average of 700 to 1,000 pounds of vegetation annually based on "very conservative production" figures (Womack 2017). This calculation shows that even using conservative forage production figures, the permitted livestock numbers can be supported even under conservative grazing utilization of 30 percent.

Parker Three-Step Monitoring Sites

Parker Three-Step permanent monitoring sites (Clusters) and pace transects were established on the allotment in the late 1950s. This monitoring method is designed to measure long term vegetation condition, vegetation trend and cover, plant relative abundance and composition, soil stability, and soil

[4] The complete calculation can be found in Womack's comment letter in the project record and is incorporated by reference.

trend. Vegetation trend refers to vegetative conditions based on available forage for livestock. Relative species abundance refers to how common or rare a species is relative to other species in a given location or community. This is calculated by weighted percentage of species hits and nearest plant frequency. Clusters provide useful data analysis of species relative composition (Ruyle & Dyess, 2010) and have clearly shown a notable change in vegetative composition over time. This is generally consistent with a regional shift in vegetation composition (Grover & Musick, 1990). This regional shift has been thought to be a function of domestic grazing, fire suppression, and climate change.

Overall, Cluster monitoring has shown the allotment has exhibited a loss of forage cover and reduction in soil stability, while species richness has slowly increased. Curly mesquite is a short sod forming grass that is able to quickly respond to rain events, greening up faster than other perennial species. Curly mesquite has a high grazing tolerance providing important livestock forage and, with proper rest, it will allow for maximum production. Due to its quick response to rain events, it does not do well in drought conditions. Roots of curly mesquite are shallower than bunchgrasses, which can reach deeper into the soil in search of water. In the past, curly mesquite dominated the landscape but has markedly declined over time.

In 1984, much of the allotment had lost curly mesquite cover and a slight increase of woody plant recruitment such as false mesquite, Wrights buckwheat, and snakeweed was evident. Snakeweed tends to fluctuate throughout years and isn’t necessarily tied to plant diversity.

The last Cluster reading, in 2009, indicated diversity is slowly increasing with bunchgrasses and woody plants. Although diversity is increasing, vegetative cover remains lacking. Vegetative cover is important for soil protection. Grasses remain present at the site, but utilization appears to have shifted from grasses to a mixture of grasses and woody plants.

Reading the Range Monitoring Sites

In 2007, six key areas were established across the allotment as Reading the Range monitoring sites (Figure 3). Reading the Range monitoring involves gathering data on herbaceous and half shrub vegetative cover, utilization monitoring, forage production, frequency, browse monitoring, onsite precipitation data, and characterization of soils. The intent of this data collection is to assist rangeland managers in making timely decisions relative to livestock management. Long term vegetative trend can be extrapolated from these data into the future. Protocols for Reading the Range were established collaboratively between the United States Department of Agriculture-Forest Service and Natural Resource Conservation Service, University of Arizona, University of Arizona’s Gila County Cooperative Extension, and local livestock ranchers.

Overall, enough data has been collected to establish a plant trend. Perennial grasses have begun to establish, but it is too soon to see an upward or positive trend. Curly mesquite remains the dominant species. Increases in palatable woody shrubs such as false mesquite and shrubby buckwheat are occurring, but not enough to dominate the site. In areas dominated by brush and woody plants, little change is predicted over time, and is expected to stay this way until a major influence such as fire occurs on the landscape. Forage production highlights an uneven establishment of plants, as seen in monitoring data. The highest forage production, adjusted for livestock use, was seen in Windmill pasture at just under 250 pounds per acre.

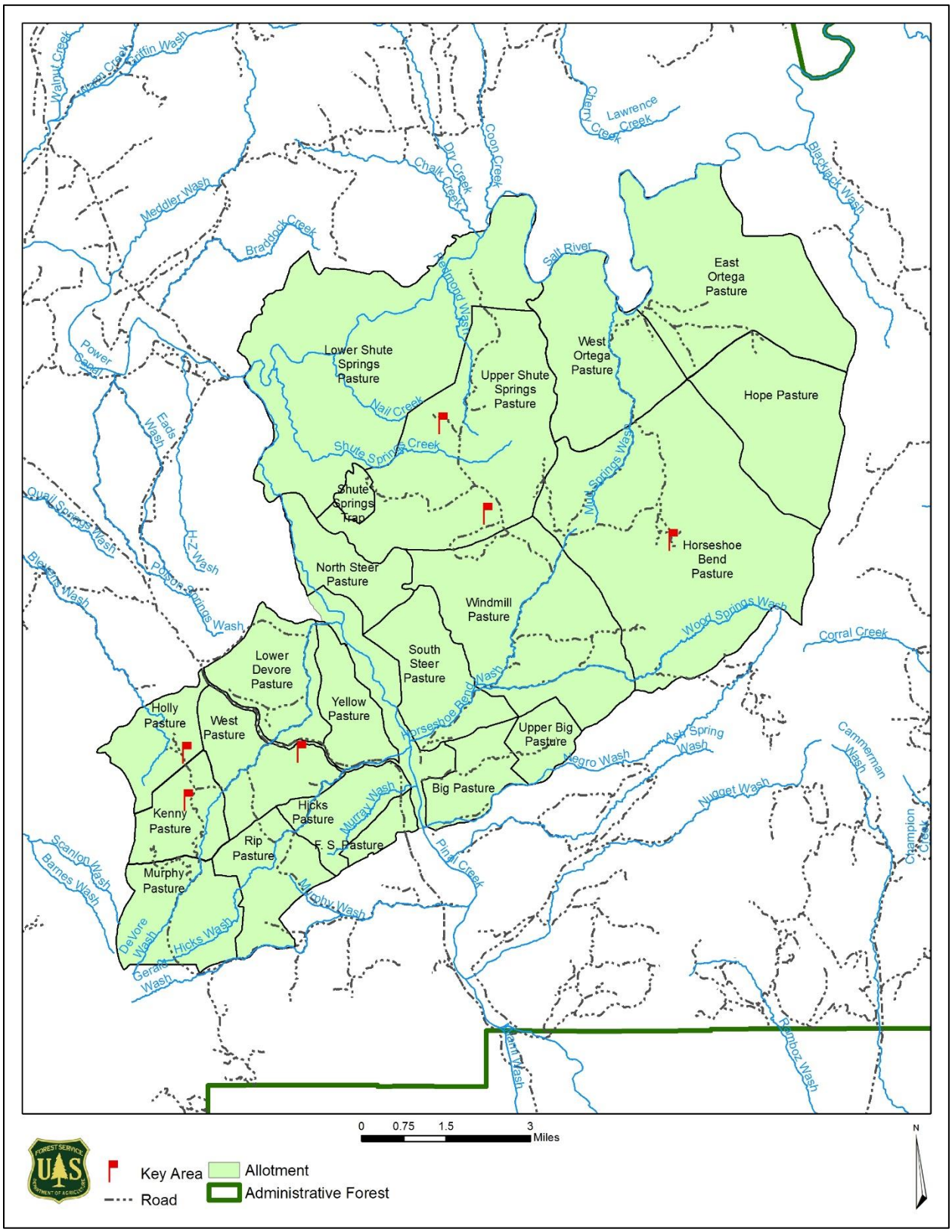

Figure 3: Map Showing Key Areas Established on the Hicks-Pikes Peak Allotment

Rangeland Health Evaluations

In 2008, Natural Resource Conservation Service (NRCS) worked with the Forest Service and permittee to establish a quantitative assessment of rangeland health on Hicks Pikes Peak Allotment to assist in awarding an environmental quality improvement contract for assistance in rangeland projects to further improve soil and site stability, hydrologic function, and biotic integrity categories throughout the allotment. This assessment rates seventeen indicators, each with a corresponding departure from expected rating. For this process, NRCS identified an ecological site, closely related to each location that an evaluation was completed. This ecological site offered an approximate baseline in which to establish a departure from expected rating.

Three sites were observed, and it was determined all lacked bunchgrasses that typically grow in the spring and summer months, which would typically be expected on this allotment. It was noted, these plants were seen during the surveys, but in low amounts. Root exposure due to erosion of soil from the surface, causing a pedestalling of the roots was evident but not extensive. Often this is due to a change in vegetation type. Heavy historic livestock grazing was identified as a potential cause for the change in vegetation.

Inspections

Inspections on Hicks Pike's Peak range from range improvement inspections, mid-season utilization, and physical observations or ocular descriptions to livestock brand identification. Most relevant to this analysis is mid-season utilization and ocular descriptions. Mid-season utilization requires measurements of grasses (i.e. sideoats grama) or brush plants (i.e. jojoba). Data is gathered at selected areas throughout a pasture in which livestock are or have currently been grazing. Locations must be in places where livestock use occurs and sites are at least half a mile from water, congregated areas, and salting locations. Locations vary yearly depending on water availability, livestock distribution, and other factors. Depending on pasture forage, data on grasses or brush plants or both will be gathered. Grass measurements rely on heights of un-grazed and grazed key species, or species grazed by livestock, as outlined in "Utilization Studies and Residual Measurements" (USDOI 1999). These measurements are independent of the pasture's annual production. Measurements determine average plant utilization for a pasture, during mid-season grazing. Most sites on the Hicks Pike's Peak Allotment measure curly mesquite, a short sod forming grass. Other key species are bunch grasses, such as sideoats grama, creating a bunch formation on soil surface. These data ensure utilization levels, identified in the Term Grazing Permit, are being met.

Concerns expressed in 2012 and 2013 inspections in Hicks pasture indicated high levels of utilization, especially on an old reclaimed roadbed and distance to water. The roadbed does not reflect vegetation in the pasture, but is an area to watch to ensure proper reclamation. An inspection in 2013 in Holly pasture outlined a difference between a ten year rested pasture and a grazed pasture. The rested pasture exhibited several different types of perennial bunchgrasses with more vigor than species seen on grazed pastures. A riparian area is split by a fence line, falling between the rested and grazed pasture. This riparian area contained more water dependent herbaceous plants and palatable woody riparian species on the rested side. Holly pasture, on the grazed side, had more woody species, annual grasses and forbs.

In 2014 and 2015, allotment wide rangeland mid-season inspections were completed and the apparent trend did not identify any areas of concern. All midseason utilization data was within grazing standards. It was noted that soil and vegetation point in time trend was stable, but lack of perennial grasses and past hedging on woody species was visible. A majority of existing improvements visited during inspections were full of water and supporting livestock.

Overall since 2010, patterns of grazing utilization have been manageable and within set use standards. Vegetation observed appears to agree with Reading the Range, Parker 3-Step Cluster and rangeland health evaluation data.

Desired Conditions

According to the Forest Plan, the Tonto National Forest should manage vegetation types such as: chaparral, semi-desert grasslands, and desert scrub to meet the needs of both livestock and wildlife (pp. 66-68). The overall goal of vegetation management in relation to rangeland management is to maintain 30 percent ground cover where the current level of development allows and where opportunities exist while providing for multiple use of the range for domestic livestock grazing (Forest Plan p. 68-1). Table 2 shows the specific desired conditions for the Hicks-Pikes Peak Allotment.

In order to optimize production and utilization of forage allocated for livestock, as well as reach the management goal of 30 percent ground cover, it is our objective to balance permitted grazing use with available forage allocated for use by domestic livestock. To determine if and where management goals are being reached, evaluations are made on the ground. This is done by identifying key forage monitoring areas. The desired condition for these key species would be for maintenance of satisfactory conditions and improvement of less than satisfactory conditions 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.

Table 2: Specific Desired Conditions for the Allotment

Forest Direction	Specific Desired Condition	How to measure Desired Condition
Maintain or obtain a minimum of 30 percent effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas.	Maintain or improve, as compared to local TEUI native species cover, litter and vigor through both short term and long term monitoring in key areas. Grazing will be managed so Allowable Use thresholds are not exceeded, at minimum, during a pasture's grazing period.	Utilize short and long term monitoring protocol to capture native plant ground cover, vigor, litter, and herbaceous perennial grass utilization.
Coordinate with range to achieve utilization in riparian areas that will not exceed 20 percent current annual growth by volume of woody species.	Utilization in riparian areas will not exceed 50 percent of terminal leaders of trees and shrubs under 6 feet tall.	Riparian utilization will be measured, at minimum, while livestock are in pasture.
Livestock are authorized only on areas specified in term grazing permit.	Manage livestock grazing on appropriate pastures through managed grazing methods.	Livestock will be kept on the allotment.

Soils

Existing Conditions

The Hicks-Pikes Peak Allotment contains variable soil types due to the type of parent material, landforms, and natural processes which form them. The allotment is underlain by a wide variety of geologic types. Granite dominates covering about 42 percent of the allotment. Volcanic formations, mostly rhyolite and dacite tuff, cover about 15 percent while sedimentary rocks, including the Apache Group, cover approximately 29 percent. Recent alluvium occurring along drainages covers percent and diabase covers 6 percent of the allotment (Arizona Geological Survey, 2002). All soils within the allotment are in the Low Sun Mild (LSM) Terrestrial Ecosystem Unit Inventory climatic gradient (Terrestrial Ecosystem Survey Handbook, Appendix B).

The dominant soil subgroups are: Torrifluvents and Ustifluvents (recent soils along drainages); Ustic Haplargids LSM, 2 (desert soils with well developed profiles), the most common soil associated with the Sonoran Desert vegetation; Aridic Haplustalfs LSM, 3 (moderately deep to deep well developed soils) and Lithic Haplustalfs LSM, 3 (shallow soils) associated with semi-arid grasslands; and Typic Haplustalfs LSM, 4 and Lithic Haplustalfs LSM, 4 associated with either chaparral or woodland vegetation. The soils associated with chaparral vegetation tend to be coarser textured than soils associated with woodland vegetation. Semi-desert grassland soils on gentle slopes tend to be fine textured.

Slope

Topographical features range from nearly level alluvial fans to rugged steep slopes and canyons. Slope ranges are those assigned to the Terrestrial Ecosystem Unit Inventory map units. Slopes of up to 40 percent are considered suitable for livestock grazing. Division of slope classification for livestock utilization analysis is a way of ensuring adequate forage production is available and within reach of

livestock. Livestock tend to eat vegetation closer to water sources and on flatter ground first before moving further away from water and up steeper slopes. Although cattle can climb steep slopes, and will to chase their favorite plants, we measure use and production on less steep ground since we expect lighter and not representative use on areas above 60 percent slope. According to Holechek (1988), grazing areas with slopes greater than 60 percent receive little to no use by cattle.

Table 3: Acres by Allotment pasture[5] and Percent Slope

Pasture	0-15%	15-40%	40-80%	Over 80%	Total
Big Pasture	502	605	154	0	1,261
F. S. Pasture	57	233	179	1	471
Hicks Pasture	148	553	627	34	1,361
Holly Pasture	258	740	400	16	1,414
Hope Pasture	601	1,870	1,120	52	3,643
Horseshoe Bend Pasture	2,117	4,453	3,378	186	10,135
Kenny Pasture	236	756	463	14	1,468
Lower Devore Pasture	665	912	455	65	2,096
Murphy Pasture	692	1,219	457	6	2,374
North Steer Pasture	232	673	598	84	1,586
Ortega Pasture	1,775	3,501	3,560	485	9,321
Private	1,204	334	101	3	1,641
Rip Pasture	851	762	239	3	1,855
Shute Springs Pasture	3,615	7,106	4,407	588	15,715
Shute Springs Trap	66	146	71	30	314
South Steer Pasture	740	1,138	406	8	2,291
Upper Big Pasture	135	514	182	0	831
West Pasture	939	860	278	3	2,081
Windmill Pasture	1,579	2,737	1,278	54	5,648
Yellow Pasture	117	533	650	27	1,328
Total	**16,528**	**29,646**	**19,001**	**1,661**	**66,836**
Percent	**25%**	**44%**	**28%**	**3%**	**100%**

Soil Condition

Soil condition was evaluated by using a combination of field inspections, information from the Terrestrial Ecosystem Unit Inventory, survey digital elevation models, aerial photo interpretation, and topographic maps. The soil condition represents an approximation of the allotment. Interpretations were based on historical livestock use patterns and slope characteristics.

It was observed in the field that zero to 15 percent slopes had high impacts. Fifteen to 40 percent slopes had mostly moderate to high impacts except rocky areas where impacts were low. Most slopes steeper than 40 percent had low impacts. Historical accounts[6] from 1929 to 1932 document Allotment overuse and deteriorating range conditions, noting advanced erosion in some areas including most granitic soils. This indicates that areas with less than satisfactory soil condition could be the remaining consequences of

[5] Some allotment pastures have been split since data were calculated. Split pasture data will be available in the Final EA.
[6] These historical accounts can be found in the project record.

past management practices[7]. Table 4 lists a summary of current soil conditions for the Hicks-Pikes Peak Allotment.

Table 4: Soil Condition of Allotment Pastures[8] in Acres

Pasture	Satisfactory	Impaired	Unsatisfactory	Unstable	Private	Total
Big Pasture	392	52	817	0	0	1,261
F. S. Pasture	349	122	0	0	0	471
Hicks Pasture	1,180	106	75	0	0	1,361
Holly Pasture	702	658	55	0	0	1,414
Hope Pasture	1,621	1,439	548	35	0	3,643
Horseshoe Bend Pasture	4,222	1,670	2,550	1,693	0	10,135
Kenny Pasture	984	471	13	0	0	1,468
Lower Devore Pasture	502	314	1,281	0	0	2,096
Murphy Pasture	1,684	688	2	0	0	2,374
North Steer Pasture	781	425	343	0	37	1,587
Ortega Pasture	4,346	1,506	2,215	1,254	0	9,321
Pvt/No Grazing	89	41	76	0	1,436	1,641
Rip Pasture	559	216	1,081	0	0	1,855
Shute Springs Pasture	9,379	2,406	3,597	333	0	15,716
Shute Springs Trap	271	36	6	0	0	314
South Steer Pasture	523	260	1,508	0	0	2,291
Upper Big Pasture	278	353	201	0	0	831
West Pasture	379	222	1,480	0	0	2,081
Windmill Pasture	1,763	2,660	1,225	0	0	5,648
Yellow Pasture	1,058	132	122	0	16	1,328
Total	31,062	13,777	17,195	3,316	1,489	66,838

Soil quality assessment (soil condition) monitoring is necessary to determine watershed condition and long-term soil productivity (FSH 2509.18-99-1). Soil condition monitoring is completed during the Terrestrial Ecosystem Unit Inventory mapping process. It is an evaluation of soil quality based on an interpretation of factors which affect vital soil functions. These functions are: the soils' ability to hold and release water (hydrologic function), the ability of the soil to resist erosion and degradation (soil stability), and the soils' ability to accept, hold and release nutrients (nutrient cycling).

Excessive soil compaction can impede the root growth of plants. With more limited root growth, this can decrease the plant's ability to take up nutrients and water. In dry years, soil compaction can lead to stunted, drought stressed plants due to decreased root growth. The "A" horizon of the soil is also important to evaluate. This soil layer, also known as the "top soil", is the layer many plants' roots grow in and provides most of the nutrients the plants need to grow. The process of recycling nutrients in the soil to plants is called nutrient cycling.

[7] This is discussed further in the Water Resources section of this chapter.
[8] Some allotment pastures have been split since data were calculated. Split pasture data will be available in the Final EA.

Soils are evaluated and assigned a soil condition category, (i.e. satisfactory, impaired, unsatisfactory, or unstable), which is a reflection of soil function (Table 5).

Table 5: Soil Condition Classes of the Hicks-Pikes Peak Allotment

Soil Condition Class	Acres	Percent	Description
Satisfactory	31,062	48	These soils are generally found on steeper slopes or areas that are very rocky and inaccessible for cattle. Generally, these soils have not been heavily impacted and have high effective vegetative ground cover. Plant species' density and diversity are high.
Impaired	13,777	21	Most of these soils occur on slopes ranging from 15 to 40 percent or on rocky flats. Specifically, these 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. Vegetation diversity and species composition is relatively low. Few perennial grasses are present, which can limit the supply of organic matter and nutrients, through litter buildup, to the soil below. Vegetation has shifted towards more annual forbs and annual grasses with poor distribution of litter in the interspaces.
Unsatisfactory	17,195	26	These soils have high amounts of surface compaction and poor soil porosity and root distribution resulting in moderate to high amounts of sheet, rill, and gully erosion, very poor diversity, density, and composition of perennial grasses with little litter cover. Gully erosion is most conspicuous on granitic soils under chaparral vegetation. The lack of perennial grasses and litter cover is limiting the ability of these soils to rebuild their supply of organic matter. For these soils to recover, the compaction layers must be allowed to achieve normal compaction (i.e. a bulk density within 15 percent of normal) by limiting hoof impact, especially when soils are wet. A buildup of organic matter, from both surface litter and a dense network of plant roots, primarily perennial grasses, is also critical for recovery. Much of the unsatisfactory soil condition appears to have been caused by historical grazing impacts, however, current management practices could also be slowing or preventing recovery.
Unstable	1,489	5	These areas have a high erosion risk and occur on steep to very steep slopes.

Watershed Condition Framework (Soils)

The Watershed Condition Framework is the state of the physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions supporting aquatic ecosystems. Watershed condition reflects a range of variability from natural pristine (functioning properly) to degraded (severely altered state or impaired).This framework also establishes a nationally consistent

reconnaissance-level approach for classifying watershed condition, using a comprehensive set of 12 indicators; included in the indicators is soils, which is a part of these indicators (**Error! Reference source not found.**)

Determining natural soil condition includes evaluating erosion, nutrients, productivity, and the physical, chemical, and biological characteristics of the soil. Soil condition is related to watershed condition because of significant water supply benefits associated with developing forest soils that promote infiltration and high-quality water. Forest soils, with litter layers, high organic content, and large macro-pore fraction, promote rapid infiltration and minimize erosive overland flow. In other ecosystems, soil supplies air, water, nutrients, and mechanical support for the sustenance of plants. It also receives and processes rainfall and controls how much of that rainfall becomes surface runoff, how much is stored for slow, sustained delivery to stream channels, and how much is stored and used for soil processes. Management activities, such as intensive grazing, logging, recreational activity, and other disturbances, can lead to reduced soil structure, soil compaction, and damage to or loss of vegetative cover.

Soils Condition Indicators are as follows:

- Good (1) Functioning Properly - Minor or no alteration to reference soil condition, including erosion, productivity, and chemical characteristics is evident.
- Fair (2) Functioning at Risk - Moderate amount of alteration to reference soil condition is evident. Overall soil disturbance is characterized as moderate.
- Poor (3) Impaired Function - Significant alteration to reference soil condition is evident. Overall soil disturbance is characterized as extensive.

Table 6 shows indicators as they relate to attributes.

Table 6: Watershed Condition Framework as Related to Soils

Attributes	Good (1) Functioning Properly	Fair (2) Functioning at Risk	Poor (3) Impaired Function
Soil productivity	Soil nutrient and hydrologic cycling processes are functioning at near site-potential levels, and the ability of the soil to maintain resource values and sustain outputs is high in the majority of the watershed.	Soil nutrient and hydrologic cycling processes are impaired and the ability of the soil to maintain resource values and sustain outputs is compromised in 5 to 25 percent of the watershed.	Soil nutrient and hydrologic cycling processes are impaired and the ability of the soil to maintain resource values and sustain outputs is compromised in more than 25 percent of the watershed.
Soil erosion	Evidence of accelerated surface erosion is generally absent over the majority of the watershed.	Evidence of accelerated surface erosion occurs over less than 10 percent of the watershed, or rills and gullies are present but are generally small,	Evidence of accelerated surface erosion occurs over more than 10 percent of the watershed, or rills and gullies are actively expanding, well

Attributes	Good (1) Functioning Properly	Fair (2) Functioning at Risk	Poor (3) Impaired Function
		disconnected, poorly defined, and not connected into any pattern.	defined, continuous, and connected in a definite pattern.
Soil contamination	No substantial areas of soil contamination in the watershed exist. When atmospheric deposition is a source of contamination, sulfur and/or nitrogen deposition is more than 10 percent below the terrestrial critical load.	Limited areas of soil contamination may be present, but they do not have a substantial effect on overall soil quality. When atmospheric deposition is a source of contamination, sulfur and/or nitrogen deposition is 0 to 10 percent below the terrestrial critical load.	Extensive areas of soil contamination may be present. When atmospheric deposition is a source of contamination, sulfur and/or nitrogen deposition is above the terrestrial critical load.

Soils in all pastures on the Hicks-Pikes Peak Allotment had the following results within the watershed condition framework[9]:

- Soil productivity and soil erosion were found to be poor (3) – impaired functioning.
    - Soil nutrient and hydrologic cycling processes are impaired and the ability of the soil to maintain resource values and sustain outputs is compromised in more than 25 percent of the watershed.
    - Evidence of accelerated surface erosion occurs over more than ten percent of the watershed, or rills and gullies are actively expanding, well- defined, continuous, and connected in a definite pattern.
- Soil contamination were found to be good (1) – functioning properly.
    - No substantial areas of soil contamination in the watershed exist. When atmospheric deposition is a source of contamination, sulfur and/or nitrogen deposition is more than 10 percent below the terrestrial critical load.
- Overall soil condition was found to be fair (2) – functioning at risk.
    - Moderate amount of alteration to reference soil condition is evident. Overall soil disturbance is characterized as moderate

Desired Conditions

Recovery times for soils in desert ecosystems can be extremely slow. This is attributed to the fact that deserts are generally considered to have both low resistance and resilience to disturbance, though, it is expected that resistance and resilience to disturbance can vary among deserts and among ecosystems in

[9] Used R3 Soil Condition Class Rating Guide for both Soil Productivity and Soil Erosion with the following breaks: 0-5% = Good, 5-25% = Fair, and > 25 = Poor for the sum of Unsatisfactory and Impaired soils. The base map used for Soil Condition was developed for the Tonto Forest Plan revision and is based on 2007 information. This map will be revised in the future.

general (Belnap 2002). Rates of recovery will differ depending on several factors such as magnitude of past soil loss, inherent soil properties, current vegetation ground cover, and the type of ecosystem.

According to Forest Service Manual 2550.2, the desired conditions for soils are to "maintain or restore soil quality on National Forest System lands. Manage resource uses and soil resources on NFS lands to sustain ecological processes and condition so that desired ecosystem services are provided in perpetuity." Further, the Forest Plan indicates that projects should improve soil productivity (p. 19).

Ecological land units are assigned a soil condition category which is an indication of the status of soil functions. Soil condition categories reflect soil disturbances resulting from both planned and unplanned events. Current management activities provide opportunities to maintain or improve soil functions that are critical in sustaining soil productivity (Forest Service 2012).

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

Table 7: Soils Desired Conditions

Forest Direction	Specific Desired Condition	How to measure Desired Condition
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.	Maintain soils currently in satisfactory condition and to manage for upward trend of the soils that are in impaired condition within grazing management practices.	Utilize short and long term monitoring protocol to capture native plant ground cover, vigor, litter, and herbaceous perennial grass utilization. Rates of recovery will differ depending on several factors such as magnitude of past soil loss, inherent soil properties, and type of ecosystem.

Water Resources

The Hicks-Pikes Peak Allotment is located along the Salt River to the north, the Apache Peaks to the east, Pinal Creek and Granite Basin to the west, and a variety of hills, washes, and basins to the south. The project area lies within or partly within twelve sixth code subwatersheds.

There are approximately 64 miles of perennial and intermittent streams within the project area that support approximately 2,720 acres of existing or potential riparian vegetation mapped as part of the regional Riparian Mapping Project (RMAP) (Triepke, et al, 2013). These areas represent about four percent of the allotment. There are an additional 280 miles of named and unnamed streams (delineated as blue lines on USGS 1:24,000 scale topographic maps) within the allotment. These unnamed streams are the ephemeral tributaries to the perennial and intermittent streams and are primarily headwater streams

dominated by upland vegetation and ephemeral channels dominated by upland and drier riparian vegetation. They provide important functions 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 (2017) defines ephemeral, intermittent and perennial streams as follows:

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

Historic Conditions

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, mining, and grazing.

Historic over-grazing has had the most extensive effect on watersheds, stream channels and riparian areas. Cattle were introduced in the late 1870s following the Civil War and the subjugation of the Apaches to reservations. By 1891, one and a half million cattle had been brought to Arizona (Allen 1989). The range was severely overstocked. The trails formed by livestock on the uplands and next to the stream channels were the beginnings of gullys. Trampling and compaction in the uplands caused deterioration of the vegetation and soils. Vegetation along stream channels was removed by cattle. In 1892-93 a severe drought occurred that caused the death of many cattle and had a further negative effect on an already deteriorated range (Allen 1989). 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 1949, Dobyns 1981).

Mining activity had additional effects on the watersheds. In 1875, silver was discovered in nearby Richmond Basin. Subsequently, the Mack Morris Mine was established and a ten-stamp mill was installed on Pinal Creek to reduce its ore (Dobyns 1981). There were also smelters and mills in operation in Globe and Miami. In the early 1880s, when the production of copper surpassed silver and gold, three water jacket furnaces were built on Pinal Creek (Dobyns 1981). All these mining operations required huge amounts of wood for fuel and building purposes which resulted in severe removal of timber in the surrounding areas (Dobyns 1981), including the Hicks-Pikes Peak Allotment area. Pinal Creek, within the allotment, was also subjected to placer mining (Dobyns 1981).

When rains came, there was little ground cover left to slow the water. In February 1891 two large floods occurred in the watershed south of Globe, Arizona, and had a devastating effect on the channels in the

local Pinal Creek watershed (Dobyns 1981). Overland flow and subsequent erosion of the uplands overwhelmed streams. Soil surface layers and large areas of floodplain were washed away. Stream channels downcut, widened, and lost connectivity with the underground water table, leaving the wide, unstable, dry channels existing today.

Range inspection reports for this project area indicate that all of the allotments had been severely over-grazed by the 1940s[10]. Cattle concentrated in the riparian channel bottoms, flat areas, and near water. There were few off-channel waters so the cattle depended on springs, streams, and the Salt River for water. Many of the springs were fenced and used as traps, causing severe erosion and loss of vegetation. A 1944 Forest Service range inspection includes a lengthy report that contains information about several of the channels on the neighboring Radium Allotment to the south. The report states that older stockmen claimed the dry washes, at one time, supported sodded-over bottoms and the small gravelly streams ran nearly yearlong. By 1944, the channels were getting washed out by periodic floods because the lack of upland vegetation and cattle trailing down channels were causing damage. The condition of Negro Wash, which also occurs on the neighboring Radium Allotment, was “deplorable”. It was depleted of perennial grasses, though some bunch grasses were present (possibly deergrass).

Precipitation

Climate in the project area is characterized by a bimodal precipitation pattern with about 60 percent occurring as frontal systems in the winter from December to March and about 40 percent occurring as monsoons in the summer from July to September. Summer storms can be more intense than winter storms but are generally of shorter duration and smaller aerial extent. August is typically the wettest month and May and June are the driest.

Average annual precipitation over the entire allotment is estimated at about 17.5 inches. Average annual precipitation in the allotment is estimated to range from 15 inches along parts of the Salt River and Pinal Creek to as much as 27 inches on the Apache Peaks[11].

The nearest climate stations to the project area with current data are Miami and Roosevelt 1WNW. The period of record for Miami is 1914 to present and the average annual precipitation is 18.8 inches (WRCC 2017). The data indicate five of the last ten years (2006-2015) had below average precipitation, with 2006 and 2011 the driest with less than 70 percent of average, three years (2010, 2013 and 2015) were above average, and two years had missing data (WRCC 2017).

The period of record for Roosevelt 1WNW is 1905 to present and the average annual precipitation is 15.7 inches (WRCC 2017). The data indicate four of the last ten years (2006-2015) have had below average precipitation, with 2009 being less than 70 percent of average. Two years (2008 and 2010) had above average precipitation, and three years were missing data (WRCC 2017). For the same years, the

[10] These Forest Service Range Management Planning (2210) files are located at the Tonto National Forest Supervisor’s Office in Phoenix, Arizona.
[11] These estimates are derived from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) database using the time period of 1981to 2010 (Oregon State University, 2014).

temperature was above average five of the years, average three of the years, and missing data two of the years (WRCC 2017).

Identifying average precipitation for different elevations helps formulate a standardized unit of measure for change in moisture over a 12-month period. A standardized precipitation index (SPI) helps inform land managers and permittees of a deviation in precipitation from what is expected as normal. The Southwest Region of the Forest Service recommends grazing allotments should be evaluated for drought conditions when an SPI of negative 1.00 or less is reached over a preceding 12-month period (USDA Forest Service Southwest Region, 2006). Over the last few years, in conjunction with permittees and University of Arizona, the Tonto National Forest has participated in drought workshops. These workshops developed a set of tools and guides, structured to help permittees and land managers plan and prepare for drought.

The SPI Explorer Tool (University of Arizona, 2017) allows users to set a location and time period to determine precipitation and an associated 12-month SPI. Two locations were chosen to quantify, over a 12-month period, the precipitation and SPI in the last ten years. The first location was chosen within Kenny pasture, in the southwestern area of the allotment. The second location was chosen within the Windmill pasture, near the center of the allotment.

In Kenny pasture, over the last 10 years, the three driest years were: 2009 (9.71 inches, -1.69 SPI), 2017 (9.77 inches, -1.67 SPI), and 2011 (11.59 inches, -1.17 SPI). These three years were the only times the SPI was less than -1.00. The SPI was between -1.0 and 0 (less than average precipitation) in four other year during this ten year period. Over the last ten years, the three wettest years were: 2008 (20.78 inches, 0.77 SPI), 2010 (19.55 inches, 0.55 SPI), and 2015 (17.17 inches, 0.09 SPI). Average rainfall since 1895 is 17.19 inches.

The driest conditions in the Windmill pasture over the last ten years were similar to the Kenny pasture with the three driest years were occurring in: 2009 (9.77 inches, -1.82 SPI), 2017 (10.82 inches, -1.53 SPI), and 2011 (11.52 inches, -1.34 SPI). Unlike Kenny pasture, there was a total of four years with a -1.00 SPI or smaller. Overall, this location was below average precipitation for seven years out of ten years. Over the same ten year period the three wettest years, and the only years above average, were 2015, 2013, 2008. Average rainfall since 1895 is 17.97 inches.

Recent Flood Events

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 to 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).

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 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.

In late January 2008, a weather system off the west coast moved into Arizona that tapped tropical moisture from the south. It brought high precipitation along the Mogollon Rim and the Upper Gila River watershed that caused flooding (Stall and Lader 2008). Stream gages within and near the project area recorded high flows (Table 8). 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). Stream gages within and near the project area recorded record high flows. Given the initial condition of the stream channels 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.

Table 8: Peak Flow Data for Gages Within and Near the Project Area (USGS 2011a).

Gage	Date	Flow (cfs)	Comment
Salt River near Chrysotile	1-28-2008	55,300	6th highest flow of record
	1-22-2010	37,000	15th highest flow of record
Salt River near Roosevelt	1-28-2008	81,300	9th highest flow at the time
	1-22-2010	88,300	8th highest flow of record
Cherry Creek near Globe	1-28-2008	10,300	3rd highest flow at the time
	1-22-2010	17,700	highest flow of record
Pinal Creek at Inspiration Dam	1-28-2008	2,520	5th highest flow at the time
	1-22-2010	5,330	2nd highest flow of record

Water Quality and Quantity

Existing Conditions

Presently, of 374.14 miles of stream channels, including those named on the USGS topographic maps and unnamed streams identified as supporting riparian vegetation on the National Wetland Inventory maps, there are approximately 70 miles of stream channels that support obligate riparian vegetation. The Salt River is the largest stream that flows through the allotment. Based on Forest Service reports and historic conditions, the extent of riparian vegetation has been reduced (Croxen 1926, Haskett 1935, Heffernan 2008).

On the Hicks-Pikes Peak Allotment, most of the stream channels evaluated in the field are in unstable or impaired condition. Riparian areas and springs have been relied upon as the primary source of livestock water for many years causing stream channels and adjacent riparian areas to receive concentrated grazing pressure.

Key Reaches

A stream reach is defined as any length of stream between two points. Key reaches, similar to upland key areas (Interagency Technical Team 1996), are stream channels, springs, or riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key species.

Key reaches are designated monitoring areas defined by Burton *et al*. (2011) as the location where monitoring occurs. The seven riparian areas identified in Table 9 have the potential to improve within a relatively short time period (10 years) and have been identified as key reaches for this analysis. Not all areas with perennial or intermittent water are chosen as key reaches. For example, one commenter requested that we include the lower end of Shute Springs Creek as it nears the Salt River as a key reach for the Hicks-Pikes Peak Allotment. However, this area does not appear to support riparian vegetation. Additionally, it becomes very canyon bound above the Salt River, making it less accessible to livestock, and may not be responsive to management. Table 9 displays the key reaches, some of which were rated using a condition assessment developed on the Tonto National Forest (Mason and Johnson, 2000), and whether they currently have enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool.

Table 9: List of key reaches within pastures in the Hicks Pikes Peak Allotment and summary of conditions.

Pasture	Key Reach	Stream Condition	Manage by Monitoring
Holly	Bluff Spring	Not assessed	Yes
Kenny	Devore Wash	Impaired	No
Rip	Hicks Wash	Severely Impaired	No
East Ortega	Salt River	Not assessed	Yes
West Ortega	Salt River	Not assessed	Yes
Lower Shute Springs	Salt River	Not assessed	Yes
Horseshoe Bend	Sycamore Canyon	Unstable	No
Horseshoe Bend	Mud Springs Wash	Unstable	No

Existing and desired conditions of these key reaches are discussed by pasture below. Existing conditions for each stream reach may include condition assessment (Mason and Johnson 1999), stream type (Rosgen 1996), or monitoring data. Key reaches are approximate locations for monitoring.

The Tonto National Forest Geographic Information System (GIS) perennial stream layer identifies Pinal Creek, the Salt River and short reaches of Mud Springs Wash, below Jump-off Spring, and Sycamore Canyon below Sycamore Spring, as perennial on this allotment. Much of the water on this allotment is provided by springs and wells located in drainages.

The availability of developed water sources, away from riparian areas, within a pasture can affect the amount of time cattle may spend in these areas. The water sources for each pasture that contains a key reach are described, including state file numbers for those which the Tonto National Forest has water rights or claims. Many of the water developments have been inventoried and data is available in Table 26 in Appendix B by state file number.

Salt River

The Salt River originates at the confluence of the White River and the Black River on the boundary of the White Mountain Apache and San Carlos Indian Reservations. The Salt River forms the boundary between the Forest and the White Mountain Apache Indian Reservation. About a half mile past Yankee Joe Canyon it passes the Reservation boundary and flows entirely on the Tonto National Forest.

Valley widths vary from narrow (less than 50 feet) to broad (300 feet) with occasional sections reaching 600 feet. High energy flows are common in the canyon. In some locations, the Salt River is narrowly confined by rock walls with no potential to support riparian vegetation. However, some reaches have banks capable of supporting stands of riparian vegetation. Where these riparian reaches are accessible, they are considered key reaches for this project and are further described by allotment and pasture.

The history and amount of livestock use along the river is generally not known. Boating trips were conducted by the district in May 1999 (from Gleason Flat to the State Route 288 Bridge) and April 2011 (from the second camp on the reservation to the State Route 288 Bridge) to document the existing condition, accessibility by cattle, and livestock grazing use. Inspection notes were written by Kristen McBride (Riparian Monitoring Coordinator) in 1999 and by Jamie Wages (Range Staff, Globe) in 2011. Their data, along with some limited monitoring and site visit data, were used in this report.

Although the Salt River is divided into reaches by pasture, there are no fences across the river to prevent cattle from accessing the river in adjacent pastures. Once in the river, cattle may access up and down stream until reaching natural barriers.

Holly Pasture

This pasture is watered by two springs (state file numbers 36-19009 and 36-18999) and one well (state file number 55-601074).

Bluff Spring.

Bluff Spring is located in Blevens Wash. The site was last visited in 2006. A short reach of the channel was dominated by a dense patch of deergrass with a few cottonwood and Goodding's willow trees. The deergrass was over five feet in height. Seep willow and sedges were also present. The concrete trough in the channel was dry. It was speculated that the cattle were watering at Laurel Spring, a quarter mile to the south in a tributary, and Bluff Spring received little use.

Kenny Pasture

This pasture is watered by four springs (state file numbers 36-19002, 36-25344), which all occur in drainages.

Devore Wash.

Devore Wash originates in Granite Basin and flows north approximately 8.2 miles through the west side of the allotment to its confluence with Pinal Creek. Forest Road 225 lies in the wash for about 1.3 miles from State Route 188 upstream, through the West Pasture. Forest Road 225 leaves the wash near the pasture boundary. Devore Wash flows about 1.4 miles through the Kenny Pasture and is the primary source of water in this pasture. It is mostly perennial, supported by springs, and flows in a narrow valley bottom less than 50 feet wide. The channel is a Rosgen F type stream, wide and shallow, lacking channel or floodplain features, and predominantly comprised of sand and gravel sized sediments[12].

Murphy Spring is located just south of the southern pasture boundary in the Murphy Pasture. The trough, which is shared by the two pastures, is located next to the creek. This spring supplies perennial flow in the

[12] The characteristics of the Rosgen classification system are described in Appendix A.

upper reach of Devore Wash in this pasture. The dominant riparian tree size classes are saplings and poles of cottonwood, Goodding's willow and sycamore. There are less frequent old trees and seedlings. Deergrass is absent near the spring, but occurs downstream where the channel becomes dryer. Sedges and rushes are also present.

Downstream of this quarter mile reach, the channel becomes intermittent for about half a mile. The intermittent reach supports most of the riparian species observed in the wetter reaches, but with lesser cover and density. Below this, the channel again becomes perennial and supports much the same vegetation as near the spring, but with a higher cover of deergrass. There were also short reaches of no impact where the channel became deep & narrow with deergrass forming banks.

Visits between 2004 and 2007 to monitor use near the spring showed light use on the few seedlings and there was no deergrass to monitor. In 2009, use was estimated on the whole reach. Use on the vegetation was variable, but trailing and trampling were excessive. Cattle were concentrated in the narrow riparian area, and in the wettest areas, channel and floodplain features were obliterated.

This stream has high potential, but is vulnerable because of the narrow valley which concentrates use. Reaches around the wetter areas could be expected to increase in riparian species diversity and cover, and extend up and downstream with time.

Rip Pasture

This pasture is watered by two springs (state file numbers 36-24029, 36-18962) and one well (state file number 55-601075).

Hicks Wash.

Hicks Wash originates in the Murphy Pasture and lies entirely within the allotment except for a quarter mile at the confluence with Pinal Creek, which is on private land. It flows to the south of and parallel with Devore Wash, approximately 1.8 miles through this pasture. Forest Road 1120 lies in the lower half mile of the wash, which is dry, and exits at Rockhouse Trail Spring. In 2010, the old cottonwood at the spring had fallen over and there were a few seedlings present. There are some pole and large size cottonwoods upstream from the spring near an old dam. Upstream from the dam the channel becomes dry.

Moving upstream from the dry reach, the valley narrows and the channel becomes more defined. Rip Spring is located just upstream of the western pasture boundary and provides intermittent flow to the wash for approximately a half mile below the pasture boundary. The channel is an "F" type in severely impaired condition due to lack of vegetation and excessive sediment in the channel. It supports spotty sapling and pole size cottonwoods, seep willow, and desert baccharis where water is forced to the surface by bedrock. There is one large patch of coyote willow. The herbaceous component is lacking and consists of less than half a dozen deergrass plants. There was very little use on the vegetation, but trailing along the channel was excessive and was preventing the channel from forming banks.

Ortega Pasture

This pasture is watered by seven springs (state file numbers 36-19004, 36-19000, 36-24032, and 36-25341), two stock tanks (state file numbers 38-25144 and 38-25143), and one well (state file number 55-600960). However, this pasture has not been used for grazing for more than ten years.

Salt River.
With current range infrastructure, if this pasture were grazed, cattle would have access to the river and could cross at low flows in this pasture at the Cherry Creek confluence and Horseshoe Bend.

Lower Shute Springs Pasture

The only water in this pasture is the Salt River. However, this pasture has also not been used for grazing for more than ten years.

Salt River.
With current range infrastructure, if this pasture were grazed, cattle would have access to the river at Redmond Flats, Redmond Wash, and Shute Springs Creek. Signs of cattle were observed in the Redmond Wash area in April 2011.

Horseshoe Bend Pasture

This pasture is well watered by four stock tanks (state file numbers 38-23830, 38-23828, 38-23831, and 38-23834), five wells (state file numbers 55-601070, 55-600959, 55-600958, 55-600957), and 14 springs (state file numbers 36-24028, 36-18998, 36-24038, 36-18997, 33-94723, 36-19003, 36-19008, 36-105425, 36-25341). Some of the springs in this pasture occur in pairs and the Forest water right claims only cover one spring of the pair.

Sycamore Canyon.
Sycamore Canyon originates northwest of Apache Peaks and flows north for approximately 6.6 miles to its confluence with the Salt River at Horseshoe Bend in the Ortega Pasture. It is one of three main tributaries that enters the Salt River at Horseshoe Bend from the south, the other two being Grapevine Canyon and Mud Springs Wash. Just over half of the three miles through this pasture are ephemeral, with the lower mile and a quarter being perennial or perennial-interrupted flow supplied by springs. The last quarter mile drops into a steep narrow canyon. The floodplain of Sycamore Canyon is encumbered by Forest Road 219 for approximately two miles which leaves the floodplain at Sycamore Spring. The road is causing sedimentation and impacts to riparian vegetation.

The reach above the spring is a wide, shallow, Rosgen “F” type with no channel features. The riparian vegetation consists mainly of thick stands of seep willow, with occasional willows and cottonwoods. In some years there is a thick carpet of seedlings.

Below the spring, the channel contains bedrock and boulders. In 2008, the channel was a Rosgen “C” type. There was a small section that was somewhat inaccessible to cattle that supported thick deergrass, sycamore, cottonwood, willow, and seep willow. In 2012, the channel was highly trampled and is now a Rosgen “F” type with no channel features. Gravel size sediment fills the entire channel. This may be partly due to the recent floods. The site is dominated by occasional pole size and larger willows, cottonwoods, sycamores, and seep willow.

The deergrass is absent from both reaches, and there is no herbaceous vegetation and little regeneration of woody species. There was a high amount of breakage on the seep willows. Both reaches were visited several times and showed moderate to high use on seedlings and heavy trailing and trampling in 1992, 2000, 2008, 2009, 2010, and 2012. There was no use in 2001.

Downstream from the spring, the channel dries and supports much the same vegetation as above, with lower density.

Mud Springs Wash.

Mud Springs Wash originates south of Rockinstraw Mountain, flows around it to the east and then north to its confluence with the Salt River at Horseshoe Bend, approximately five miles. The upper half of the wash, in the Horseshoe Bend Pasture, is mostly ephemeral and contains springs that support perennial flow and riparian vegetation.

Near the boundary of the Horseshoe Bend Pasture and the Ortega Pasture, Lower Mud Spring supports a substantial riparian area. In June 2007, when the spring was inventoried, vegetation included sycamore, willow, seep willow, deergrass, and sedges. Cattle were present and the channel and banks were highly trampled. In 2008, there was no herbaceous vegetation and seep willow and other baccharis species dominated. The soil near the spring was impacted by cattle. In 2012, there were no herbaceous species, no regeneration of woody species, and the channel and floodplain were dominated by seep willow with some desert broom. Both species are unpalatable but showed 100 percent use and high breakage of branches. Spotty pole size cottonwoods and willows occur in the channel. Most of the channel consists of gravel size sediment, but there is soil near the spring which was highly impacted. The channel is a Rosgen “F” type in unstable condition due to lack of vegetation and channel features. ATV tracks are also evident in the channel.

Water from the spring is piped downstream to a trough near the road, which supplies water to both the Horseshoe and Ortega Pastures. The drinker was full in 2012 and remains full in 2017.

Wild and Scenic Rivers

The portion of the upper Salt River that flows through the allotment has been classified as potentially eligible for inclusion into the National Wild and Scenic Rivers System (USDA 1993). The Upper Salt River flows through remarkable canyons and is nationally known for its white water rafting. The segment of the Salt River within the allotment is proposed for classification as a Wild River. It begins at the west boundary of the Fort Apache Indian Reservation and extends to the southwest boundary of the Salt River Canyon Wilderness. Outstandingly Remarkable Values (ORVs) identified include scenic, geologic, wildlife, recreational, and ecological values. Criteria established to describe these ORVs are provided in Appendix B. Forest Handbook direction is to manage potential wild and scenic rivers to protect their indicated ORVs (Forest Service Handbook 1909.12, Chapter 80). The current Forest Plan revision process will reassess streams and rivers on the forest that are considered potentially eligible for designation as Wild and Scenic Rivers. The final plan will include recommendations for designation.

Water Quality

The Arizona Department of Environmental Quality (ADEQ) evaluates the water quality status of waters within the state in a Clean Water Act Assessment Report that is prepared every two years. The most recent assessment was completed in 2017 (ADEQ, 2017). Three water bodies within the project area have been monitored by ADEQ:

- Salt River from Canyon Creek to Cherry Creek. Designated uses for this section include aquatic and wildlife-warm water fisheries, full body contact recreation, fish consumption, agricultural irrigation, and agricultural livestock watering.
- Salt River from Pinal Creek to Roosevelt Lake. Designated uses for this section include aquatic and wildlife-warm water fisheries, full body contact recreation, fish consumption, agricultural irrigation, and agricultural livestock watering.
- Pinal Creek from lower Pinal Creek WTP discharge to Salt River. Designated uses for this section include aquatic and wildlife-warm water fisheries, partial body contact recreation and fish consumption.

The Salt River from Canyon Creek to Cherry Creek was rated as impaired for Selenium that violates the aquatic and wildlife warm water fishery standard in the 2012/2014 and 2016 assessment report (ADEQ, 2017). This reach of the Salt River is considered a low priority for development of a Total Maximum Daily Load (TMDL) analysis for determining the source of the impairment and recommended treatments to bring the reach into compliance with state standards.

The Salt River from Pinal Creek to Roosevelt Lake, just downstream of the allotment boundary, was rated as impaired in the 2012/ 2014 Assessment Report (ADEQ, 2015) due to exceedances of the suspended sediment, nitrogen, and phosphorus criterion for aquatic and wildlife-warm water fisheries and the *E. coli* criterion for full body contact recreation. The 2016 Assessment report recommends delisting suspended sediment, nitrogen, and phosphorous from the impaired waters list. However, it also recommends continuing the Impaired designation for *E. coli.* This reach is identified as a medium priority for conducting a TMDL study. (ADEQ 2017). This TMDL study will describe where the suspected sources of the *E. coli* are originating from, how much these sources are contributing, and what corrective actions are needed to reduce the contribution of this contaminant to acceptable levels. The Forest Service would be a cooperator in this process. All other uses in this reach are rated as Attaining (not impaired).

Lower Pinal Creek was first listed as Impaired by ADEQ in 1988 for copper, manganese, zinc, and low pH (ADEQ 2011a). Subsequently, a water treatment plant was constructed on Pinal Creek at State Route 188, groundwater is pumped from the creek to intercept a plume of polluted groundwater (resulting from historic mining activities) migrating through the alluvium beneath the creek, the water is then treated and a portion of it is returned to the creek. Pinal Creek was delisted in 2002 (ADEQ 2011a). Designated uses of the creek were changed from aquatic and wildlife warm water to an aquatic and wildlife effluent-dominated stream between the 2012 and 2014 assessments to the most recent draft 2016 assessment[13]. The reach of the creek from the treatment plant to the Salt River was assessed as Attaining Some Uses in the 2012 and 2014 assessment but is assessed as inconclusive in the Draft 2016 assessment due to an exceedance of the copper standard that violates the partial body contact and the aquatic and wildlife effluent dominated stream standard.

[13] Designated uses for non-ephemeral, unlisted tributaries above 5000 feet are aquatic and wildlife-cold water fisheries, full body contact recreation and fish consumption. Designated uses for non-ephemeral, unlisted tributaries below 5000 feet are aquatic and wildlife-warm water fisheries, full body contact recreation and fish consumption. Designated uses for ephemeral, unlisted tributaries are aquatic and wildlife-ephemeral water fisheries and partial body contact recreation (A.A.C. R18-11-105).

Desired Conditions

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

Water quality, including groundwater, meets or exceeds applicable state water quality standards, fully supports designated beneficial uses, meets the ecological needs of native aquatic and riparian associated plant and animal species, and meets the needs of downstream water users. Streambeds contain less than 30 percent fines (e.g., sand, silt, clay) in riffle habitat (a rocky or shallow part of a stream or river with rough water) in cold water streams and less than 50 percent fines reach wide (generally a ¼ mile) in warm water streams for aquatic species.

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.

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

- Maintain residual herbaceous vegetation along the greenline or streambank;
- Minimize the annual impacts to seedling and sapling riparian woody species; and
- Limit physical impacts to alterable streambanks and greenlines.

The most important long-term desired conditions are to:

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

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

Watersheds

Existing Conditions

In 2010, a national effort was completed by the Forest Service to assess the condition of all 6th code watersheds on National Forest System land (Potyondy and Geier, 2011). Sixth code watersheds are typically 10,000 to 40,000 acres in size (Figure 4).

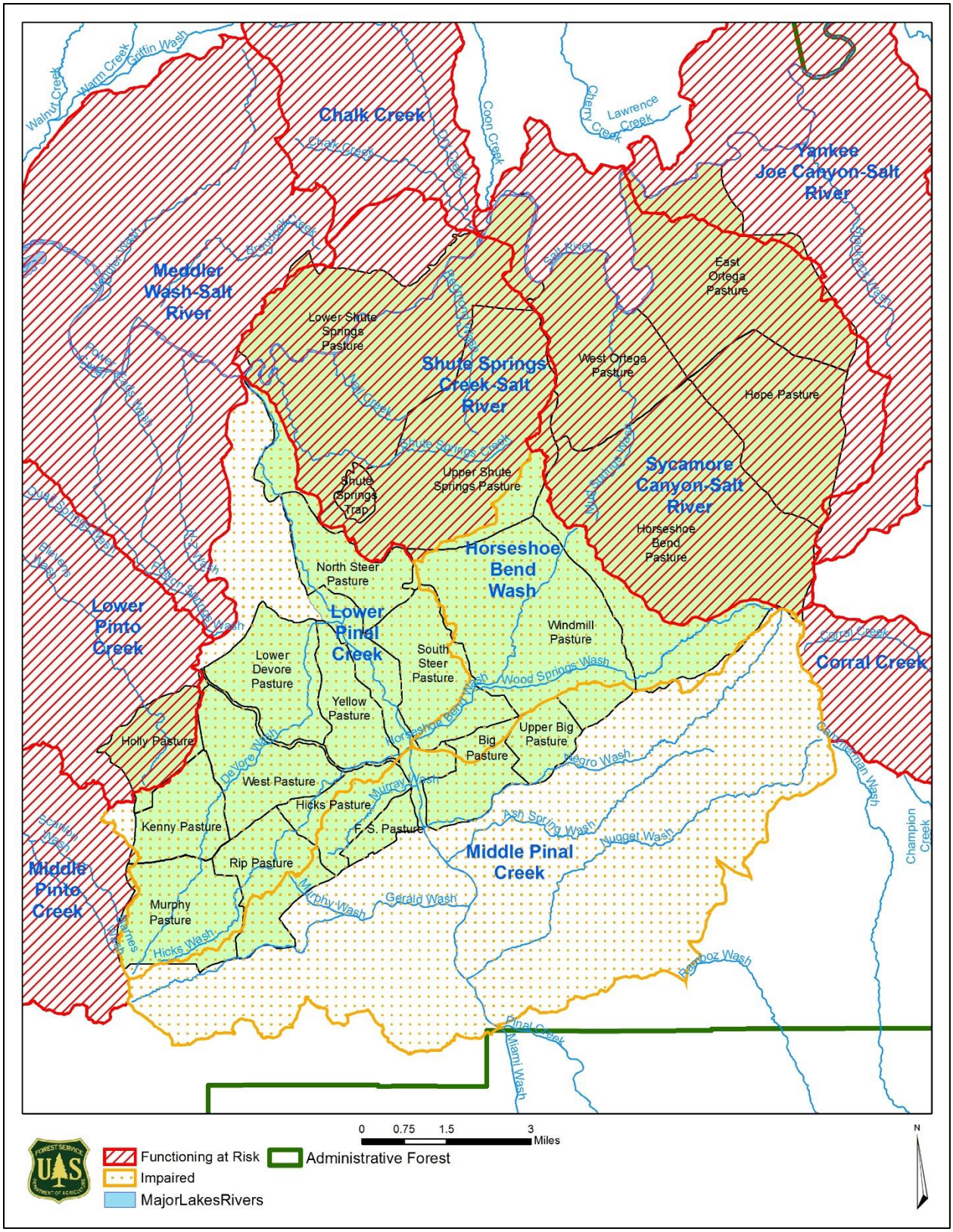

Figure 4: Location and Condition of Sixth Code Watersheds within and Adjacent to the Project Area

Twelve indicators were assessed including: water quality, water quantity, aquatic habitat, aquatic biota, riparian vegetation, road and trail network, soil, fire regime or wildfire effects, rangeland vegetation, terrestrial invasive species, forest cover, and forest health. Each indicator has its own definition of Functioning, Functioning at risk, and Impaired, and was assessed a point value based on its condition. Each 6th code watershed was given an overall rating of Functioning, Functioning at risk, or Impaired based on the indicator scores. Eleven 6th code watersheds lie at least partially within the Hicks Pikes Peak Allotment boundary (Table 10) and (Figure 4). The Sycamore Canyon-Salt River watershed has the greatest proportion of the project area within a 6th code watershed.

Table 10: Sixth Code Watersheds Located in the Hicks-Pikes Peak Allotment

Watershed Name	Watershed Acres Within Allotment	Watershed Condition
Yankee Joe Canyon-Salt River	988	Functioning at Risk
Sycamore Canyon-Salt River	20,668	Functioning at Risk
Shute Springs Creek-Salt River	13,992	Functioning at Risk
Horseshoe Bend Wash	8,920	Impaired
Middle Pinal Creek	4,974	Impaired
Lower Pinal Creek	15,828	Impaired
Lower Pinto Creek	1,280	Functioning at Risk
Middle Pinto Creek	114	Functioning at Risk
Meddler Wash-Salt River	60	Functioning at Risk
Corral Creek	12	Functioning at Risk
Chalk Creek	3	Functioning at Risk

Poor indicator conditions contributing to Functioning at Risk and Impaired ratings for many of the watersheds include: poor riparian condition, presence of exotic and/or invasive aquatic species, infrequent road maintenance, and poor soil condition.

Desired Conditions

According to the Forest Plan, the Tonto National Forest should manage watersheds so as to improve them to a satisfactory or better condition. As the Watershed Condition Framework is currently the Forest Service's accepted measure of watershed condition, satisfactory equates to a rating of "functioning properly". Watersheds should also support multiple uses (e.g., grazing, recreation) with no long-term decline in ecological conditions and provide high-quality water for downstream communities dependent on them.

A properly functioning watershed: 1) exhibits high geomorphic, hydrologic, and biotic integrity relative to their potential condition.; 2) supports the magnitude, frequency, timing and duration of runoff within a natural range of variability; 3) maintains the movement of water and sediment from the surrounding uplands through the channel system in a manner that sustains the health and function of the channel and riparian corridors; 4) exhibits resiliency to human activities and natural disturbances; and 5) maintains or improves water quality and riparian and aquatic species habitat.

Table 11: Desired Conditions for Water Resources and Watersheds

Forest Direction	Specific Desired Condition	How to Measure Desired Condition
Maintain residual herbaceous vegetation along the greenline or streambank. Minimize the annual impacts to seedling and sapling riparian woody species. Increase the proportion of obligate and facultative riparian species. Increase the density of vertical and horizontal canopy cover of woody riparian tree species. Maintain or increase canopy cover of herbaceous species to at least 50 percent (or five percent to 25 percent for reaches now at trace to one percent).	Maintain or improve herbaceous and riparian woody species in the eight key reaches within Hicks Pikes Peak allotment (Table 8).	Measure riparian utilization, including stubble height and woody utilization, during the grazing season. Review riparian photopoint monitoring for changes in herbaceous and riparian woody species. Conduct riparian condition monitoring according to the USFS National Riparian Protocol (Merritt et al 2018) at least once every two years for all key reaches.
Limit physical impacts to alterable streambanks and greenlines. Optimize the establishment of floodplains and streambanks; and improve stream channel function and stability. Decrease the greenline to greenline width. Optimize riparian tree and shrub establishment, especially following episodic, regional winter storms.	Streambanks along the eight key reaches are stable, not compacted, and sediment contribution to key reaches is within the natural range of variability.	Use Stream Reach Inventory and Channel Stability Evaluation (Pfankuch 1975) (or similar protocol) to monitor streambank stability at least once every two years for all key reaches.
Water quality meets or exceeds applicable state water quality standards, fully supports designated beneficial uses, meets the ecological needs of native aquatic and riparian associated plant and animal	Water quality in the three water bodies monitored by ADEQ, or any additional water bodies monitored by ADEQ during the duration of the authorization, meet or exceed state water quality standards.	Field data collection of water quality parameters as conducted by ADEQ.

Forest Direction	Specific Desired Condition	How to Measure Desired Condition
species, and meets the needs of downstream water users.		
Manage watersheds to improve them to satisfactory or better condition	The allotments' watersheds will be managed to improve them to functioning properly.	Change (improvement or decline) in watershed condition class will be reassessed following significant natural events (i.e., fire or flood) or after completion of projects identified in a watershed restoration action plan that were designed to improve or maintain watershed condition. Riparian areas and uplands, which encompass the land area of the watersheds, will be monitored/measured according to the direction as stated above and in Table 2.

Purpose Of and Need for Action

The Hicks-Pikes Peak Allotment is a priority for completing grazing allotment planning in conformance with the requirements of the *National Environmental Policy Act* on the Globe Ranger District. Completing this effort on time and to standard is essential. The Tonto National Forest Land Management Plan (Forest Plan) identifies the Hicks-Pikes Peak Allotment as suitable for domestic livestock. The purpose of this action is to consider livestock grazing opportunities on public lands where consistent with management objectives. In addition, per Forest Service Handbook 2209.13, Chapter 90, section 92.22, the purpose of this action is to authorize livestock grazing in a manner consistent with direction to move ecosystems towards their desired conditions.

Authorization is needed on this allotment because:

- Where consistent with other multiple use goals and objectives, there is Congressional intent to allow grazing on suitable lands (*Multiple Use Sustained Yield Act of 1960, Wilderness Act of*

1964, *Forest and Rangeland Renewable Resources Planning Act of 1974*, *Federal Land Policy and Management Act of 1976*, *National Forest Management Act of 1976*).

- This allotment contains lands identified as suitable for domestic livestock grazing in the Forest Plan, and continued domestic livestock grazing is consistent with its goals, objectives, standards, and guidelines (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 (Forest Service Manual 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. (Forest Service Manual 2202.1).

Alternatives

Proposed Action

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

Authorization

The Globe Ranger District of the Tonto National Forest proposes to continue to authorize livestock grazing on the Hicks-Pikes Peak Allotment under the following terms:

Proposed yearly maximum authorized use will vary between 650 to 800 adult cattle year-long. Adult cattle may include cows with calves, non-lactating cows, or bulls. Additionally, 700 to 1100 weaned calves up to 18 months of age (yearlings) would be authorized for up to any 7 months within a 12 month period. Yearlings can be any cattle that meet the above criteria, regardless if they are born on the allotment or purchased elsewhere. Table 11 shows the proposed term grazing permitted number of cattle for the Hicks Pikes Peak Allotment.

Table 11: Proposed Term Grazing Livestock Numbers

Class of Livestock	Begin Date	End Date	Permitted Number of Livestock
Adult cattle (cows with calves, non-lactating cows, or bulls)	March 1	February 28	800
Yearlings (cattle weaned calves and up to 18 months of age)	November 1	May 31	1100

Initial stocking levels would begin with currently authorized livestock numbers which are 326 adult cows grazed yearlong and 511 yearlings grazed for any 7 months within a 12 month period. As range improvements are installed, or as conditions on the allotment allow, authorized numbers may be increased up to the proposed maximum stocking numbers as listed in Table 11. Any annual adjustments would be planned and authorized by the Globe District Ranger, not to exceed the maximum permitted number of livestock. Factors affecting annual authorized livestock numbers may include precipitation, pasture rotation, forage production, current range conditions (i.e. forage and growing conditions), water availability, resource monitoring and permittee needs[14].

The northern allotment boundary currently follows the Salt River and extends across the Salt River near Pinal Creek, which partially makes up Lower Shute pasture, and continues to the allotment boundary with the Sedow Allotment. On most of this edge, the Salt River is not a sufficient boundary, which would allow cattle to easily cross the river during low flows. Where

[14] More information can be found in the Monitoring and Response to Monitoring sections of this chapter.

the allotment extends across the Salt River, it would be ineffective to fence these areas due to the variation in Salt River stream flows. If cattle were to cross the Salt River during low flows, it would mean cattle would easily find access to neighboring allotments off the Globe Ranger District. Hicks-Pikes Peak livestock would not be authorized to cross the Salt River and a drift fence would be installed to keep cattle off of the river. An existing fence would keep cattle from accessing Pinal Creek.

Grazing System

Grazing will occur through a rotational system, either deferred or rest-rotation grazing, which will allow plants the opportunity for growth or regrowth. Until necessary range improvements, such as fences and water developments, are installed on the allotment, grazing would continue under the current modified deferred grazing strategy. As new pastures are defined with new fences, and water developments are constructed, incorporating rest into each years' grazing plan will become possible. Figure 5 shows what the resulting pasture configuration would look like. Adult cattle will be managed in two different herds and yearlings will be managed in a third herd. Bulls may also be separated and run independently for part of the year.

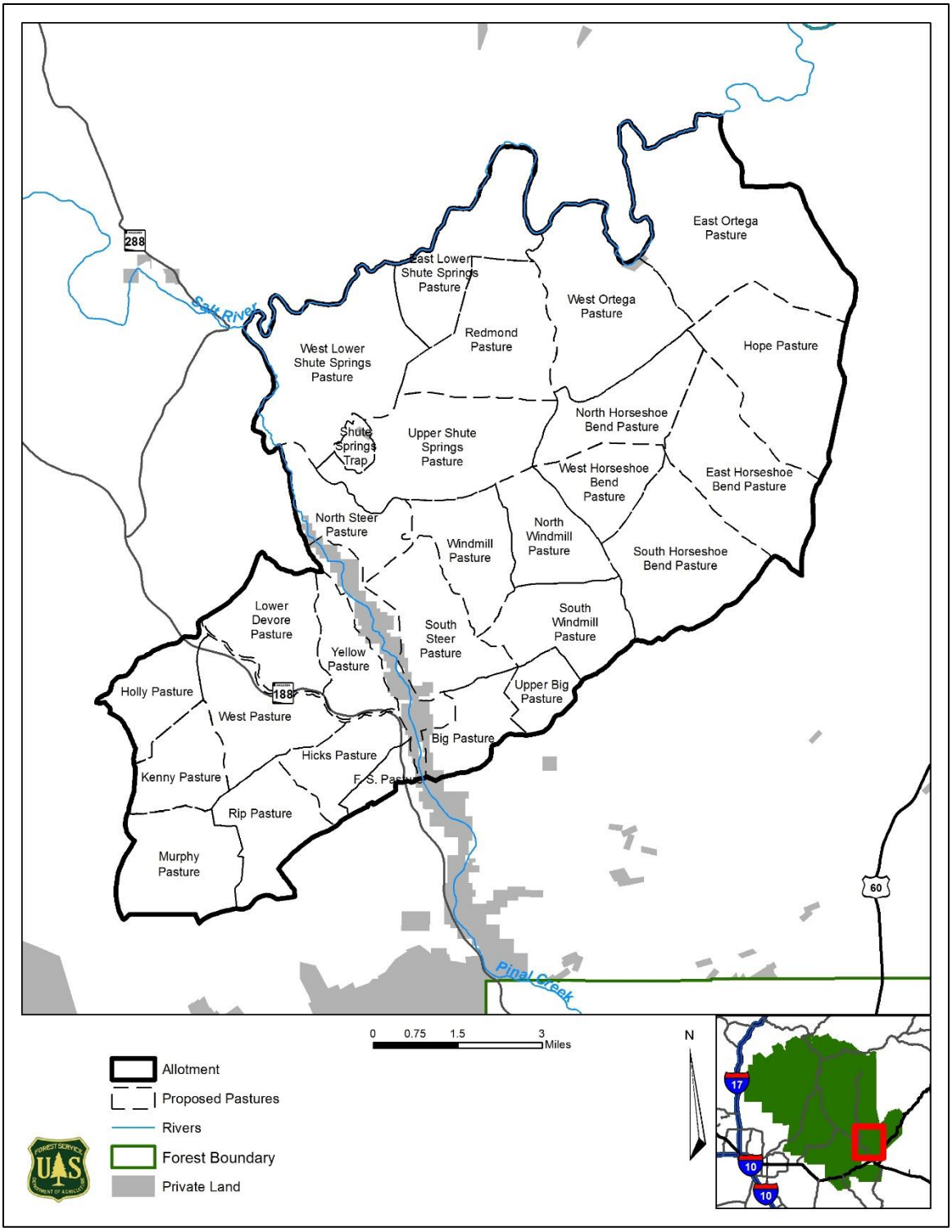

Figure 5: Proposed Pasture Configuration

Until fencing is established in each Unit, cattle would be rotated through three units, as described below.

- **Ortega Unit**: One adult cattle herd would graze in North Horseshoe Bend, East Horseshoe Bend, Hope, East Ortega, and West Ortega pastures. West Ortega pasture would not be grazed until a drift fence is constructed to prevent livestock from accessing the Salt River (see proposed structural range improvement F2). Pastures may be grazed with up to 300 head of livestock.
    - West Ortega pasture will be grazed between July 1 and April 15 with up to 300 head of livestock. East Ortega pasture will be grazed between June 1st and April 15th.
    - When West Ortega pasture is constructed, this smaller pasture would allow rotational or deferred grazing, and the potential to split the herd.
- **Windmill Unit:** One adult cattle herd would graze in North Windmill, South Windmill, South Horseshoe Bend, West Horseshoe Bend, Upper Shute, East Lower Shute, West Lower Shute, and Redmond pastures. Both Lower Shute pastures would not be grazed until a drift fence is constructed to prevent livestock from accessing the Salt River (see proposed structural range improvement AF4). Pastures may be grazed with up to 250 head of livestock.
    - Windmill pasture will eventually be split into three pastures: North, South, and Main pastures.
    - Horseshoe Bend pasture will be split into East, West, North, South pastures.
    - Upper Shute will be split into two, with the other pasture named Redmond.
    - Lower Shute pasture would eventually be split into two pastures; East Lower Shute and West Lower Shute. Both Lower Shute pastures will be grazed between August 1st to April 15th.
    - As Lower Shute pasture is split, these smaller pastures would allow rotational or deferred grazing, and potential to split the herd.
- **Pikes Peak Unit**: Adult cattle herd would graze in Holly, Rip, Kenny, West, Lower Devore, Murphy, and Hicks pastures. Pastures may be grazed with up to 250 head of livestock.
- **Pinal Unit**: Up to 1,100 yearlings would graze in North Steer, South Steer, Upper Big, Yellow, Windmill, and Lower Big pastures. Bulls may be separated from the Hicks or Pikes Peak Unit and graze in the Pinal Unit as pastures are available.
    - Up to 1100 head of livestock would graze in the Pinal Unit from November through May 1. Grazing will occur between November and May 31 with up to 700 head of yearlings.
    - Bulls may be separated from other Units and placed in pastures, when available, but will not exceed 1100 head of livestock limit within this unit.
    - Livestock will not access Pinal Creek.

Annual operating instructions will specify pasture rotation schedules each year and include timing, livestock numbers, and duration. A rotation schedule will be developed with the permittee and incorporated into the allotment management plan to provide an estimate of grazing schedules. This schedule can be altered annually and authorized in the Annual Operating Instructions by the District Ranger.

Vegetation Utilization

Grazing will be managed to achieve long-term goals in pasture key areas and ensure allowable vegetation use thresholds are not exceeded (Table 12).

Table 12: Allowable Vegetation Use Thresholds

Vegetation	Use Threshold
Upland herbaceous	30-40 percent of current year's growth
Upland browse	50 percent of current year's growth
Riparian herbaceous	Limited to 40 percent of plant species biomass and maintain 6 to 8 inches of stubble height of species like deergrass
Riparian woody	Limited to 50 percent of leaders browsed on upper one third of plants up to 6 feet tall

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 used for determining percent of leaders browsed is an expedient and repeatable sampling technique. Mathematical relationships between the number of twigs browsed and the percent of current annual growth removed have been established in previous studies (Stickney 1966).

Range Improvements

Existing Structural Improvements

Existing range improvements on the Hicks Pikes Peak allotment are listed in Appendix D and depicted along with proposed improvements in (Figure 6). Maintenance of these improvements would be assigned to the grazing permit holder and will be maintained to standards in the Forest Service Structural Range Improvement Handbook (Forest Service Handbook 2209.22 R3). Additional maintenance standard details will be included in the Allotment Management Plan. Not all improvements were constructed or maintained to current standards. As improvements are reconstructed, they will be rebuilt to new standards (i.e. wire spacing). Existing improvements would not need to be modified until reconstruction is needed. Occasional off-system road travel to inspect or maintain these improvements would be authorized. Where no road exists to reach a specific improvement, a route has been designated for this use. Off-road vehicle use by the grazing permit holder is discussed further in the Livestock Management Practices and Mitigation for Other Resources section.

Proposed Structural Improvements

Structural range improvements would 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.

It is not necessary for the proposed additional water developments to be completed in a specific order or timeframe. The following improvements are identified to be installed within the first two

years following a decision on this project. These improvements would have heritage resource surveys completed before a decision is signed. (Table 13 and Figure 6).

Table 13: Proposed Structural Range Improvements to be implemented within the First Two Years

Identifier	Description	Pasture
W1	Extend an above ground water line running from an existing Storm Canyon Well #3509 with approximately 2 ¼ miles and with 2 troughs on Forest Service. Reconstruct Storm Canyon Well.	Ortega
W2	An above ground water line running from existing Lower Mud Spring with approximately 1.5 miles of above ground water line with 1 trough, 1 storage tank and a corral.	Ortega
F2	Install a drift fence near the Salt River to provide a barrier to keep cattle from accessing the river.	West Ortega

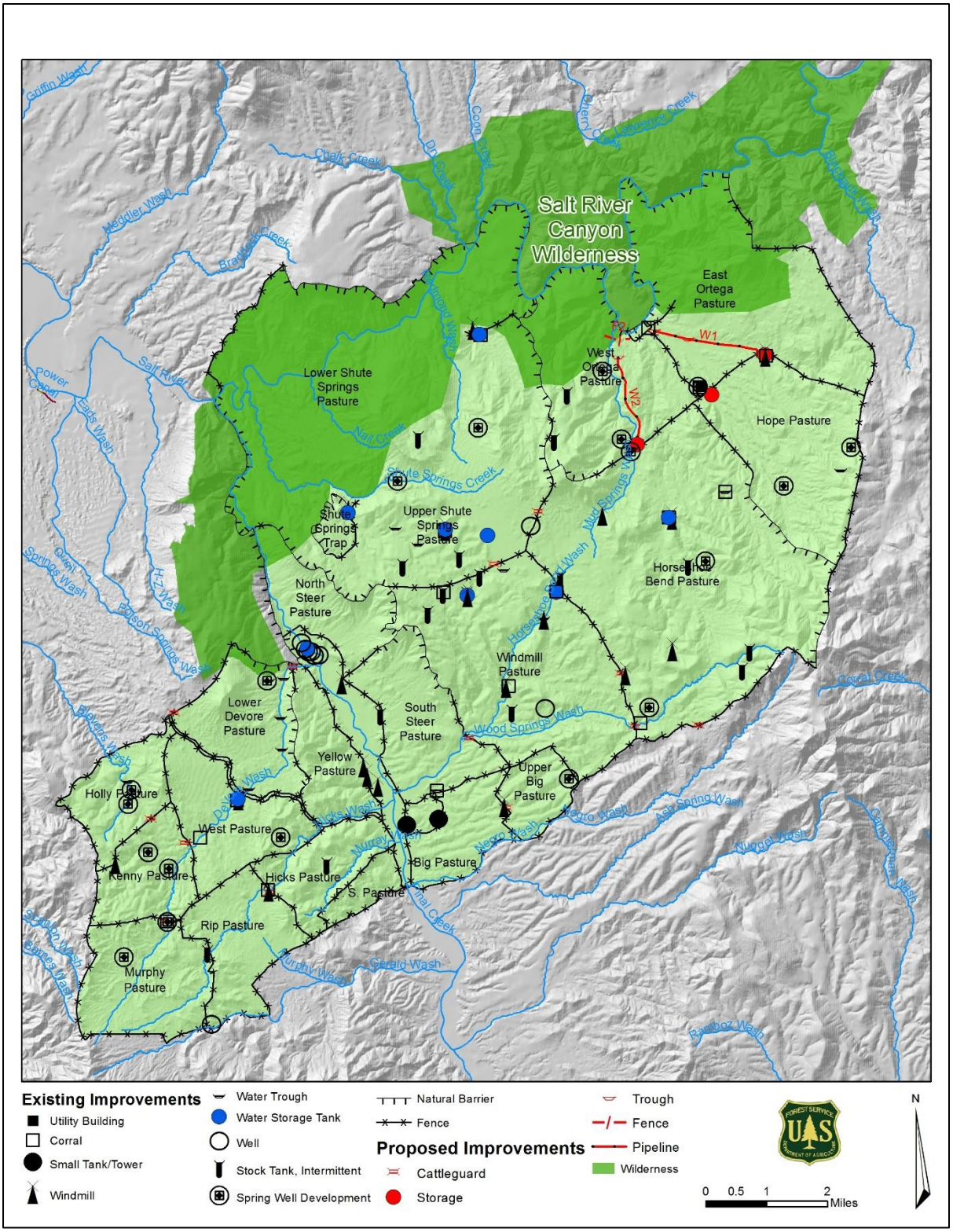

Figure 6: Range Improvements to be Installed within the First Two Years (in red)

Additional Infrastructure

In addition to the structural range improvements listed above, additional infrastructure may be constructed, if needed, in the future. The effects of adding any additional infrastructure such as fencing or waters to achieve resource objectives in the future are disclosed in and tiered to this environmental analysis. No additional analysis for these improvements would be required, with the exception of appropriate Heritage clearances, if the improvements fall within the sideboards listed below. Heritage clearances for both the improvement and the access to the improvement would be obtained before implementation of any future improvements.

Sideboards for Additional Infrastructure

Improvements may be authorized as necessary to achieve desired conditions without additional environmental analysis within the following specifications:

- All new range improvements within the Salt River Canyon Wilderness will be constructed beyond the Foreground (Figure 8) of the Upper Salt River.
- New range improvements in the Salt River Canyon Wilderness will be constructed with non-reflective materials.
- In areas with a visual quality objective (VQO) of preservation, or retention, new pipelines will be buried or placed out of sight of a casual forest observer where practicable.
- When traveling off road to range improvements outside of the Salt River Canyon Wilderness, the permittee will use a variety of routes, especially as they exit system roads, so as not to create new unauthorized routes that may be mistaken by other motorized users as authorized routes.
- Motor vehicle and or ATV/UTV access to range improvement sites would be on existing roads where practicable. Off-road vehicle use by pickup, trailer, ATV, UTV, or motorcycle needed to transport materials or machinery to maintain or inspect structural range improvements (fences, corrals, pipelines, wells, windmills, storage tanks, water delivery systems, troughs, earthen tanks) assigned in Part 3 of the term grazing permit as the permit holder's responsibility for maintenance is authorized. Existing routes or the shortest, most direct route to the improvement must be used and new route construction (i.e. blading a path) is not allowed without additional authorization. Cross-country motorized travel is not allowed when conditions are such that cross-country travel would cause unacceptable natural and/or heritage resource damage.
- Disturbance to obligate riparian vegetation should be minimized including but not limited to willows, cottonwoods, and sycamores.
- Spring developments would not dewater the spring and must maintain a residual flow for riparian obligate vegetation and wildlife species.
- Natural spring developments and their surrounding riparian vegetation are important winter stop over areas for Migratory Birds and provide important habitat for many riparian dependent species. Exclosure fences built in the vicinity of these areas should be built between at least one quarter and one half acres around the natural spring to maintain the riparian vegetation, where possible, and comply with Forest Service Policy (Forest Service Handbook 2526.03).
- District Ranger would authorize construction of any new range improvements through a permit modification.
- Existing improvements, as identified in Appendix D, may be maintained or removed from the allotment prior to installation of new improvements.

Table 14 through Table 16 and Figure 7 identify additional infrastructure that may be installed in the future, beyond the two years following a decision for this project. These projects, as depicted in Figure 7, are not the exact location and only identify a general location for additional infrastructure.

Table 14: Proposed Additional Infrastructure - Fencing

Identifier	Description	Pasture
AF2, AF6	Fence to split pasture into East and West Lower Shute pastures. A minimum tools analysis would be completed to authorize fence construction in designated wilderness areas.	Lower Shute
AF4	Install a drift fence near the Salt River and Pinal Creek to provide a barrier to keep cattle from accessing the river. A minimum tools analysis would be completed to authorize fence construction in designated wilderness areas.	Lower Shute
AF5	Fence to split pasture into four individual pastures: North, South, East, and West Horseshoe Bend pastures.	Horseshoe Bend
AF7	Fence to split pasture into Upper Shute and Redmond pastures.	Upper Shute
AF8, AF9	Fence to split pasture into Main, North, and South Windmill pastures.	Windmill

Table 15: Proposed Additional Infrastructure - Cattleguards

Identifier	Description	Pasture
AF2, AF6	Fence to split pasture into separate pastures.	Lower Shute
CG1, CG13, CG16	Cattleguard	Kenny/West, Kenny/Holly, Kenny/Murphy
CG3	Cattleguard	Hope/Ortega
CG5	Cattleguard	Upper Big/Big
CG7	Cattleguard	Windmill new pasture split
CG9	Cattleguard	Upper Shute Spring new pasture split
CG10	Cattleguard	Upper Shute Springs/Ortega
CG8, CG11, CG12, CG18	Cattleguard	Windmill/Upper Shute Springs Windmill/Horseshoe Bend
CG14	Cattleguard	South Steer/Horseshoe Bend
CG15	Cattleguard	Rip/Hicks
CG17, CG20	Cattleguard	Lower Devore/Yellow

Identifier	Description	Pasture
		Lower Devore allotment boundary
CG2, CG4, CG6, CG19	Cattleguard	Horseshoe new pasture splits, Horseshoe Bend/Ortega, Horseshoe Bend Allotment Boundary

Table 16: Proposed Improvements - Water Developments (Springs, troughs, storage tanks) and Corrals

Identifier	Description	Pasture
AW10	Install a corral	Yellow
AW11	An above ground water line, trough, and corral.	Big
AW12	An above ground water line running from Cement Spring to a new trough.	Upper Big
AW13	An above ground water line running from Procopio Spring to a new trough and storage tank.	Windmill
AW14	An above ground water line running from Apache Spring to a new trough.	Horseshoe Bend
AW15	An above ground water line running from Little Brewster Spring to a new trough and storage tank	Horseshoe Bend
AW16	In Section 26, extend a water line and install a new trough.	Horseshoe Bend
AW17	In Section 36, extend a water line and install a new trough.	Horseshoe Bend
AW18	Add another water line and new trough	Horseshoe Bend
AW19	An above ground water line running from Brush Spring to a new trough and storage tank	Horseshoe Bend
AW20	In Section 23, extend a water line and install a new trough.	Hope
AW21	In Section 11, extend a water line and install a new trough.	Hope
AW22	An above ground water line running from Grapevine Spring to a new trough and storage tank.	Hope
AW24	An above ground water line running from Lower Grapevine Spring to a new trough and storage tank	Ortega
AW25	Extend a water line and install a trough from Horse Spring.	Horseshoe Bend
AW26	Install an above ground water line along Forest Road 219 to a new trough.	Horseshoe Bend
AW27	Install an above ground waterline to a new trough and storage tank.	Horseshoe Bend, Upper Shute
AW29	Install a new storage tank at Wood Spring.	Windmill
AW30	Install an above ground waterline to a new trough and storage tank	Upper Shute
AW31	Add an additional above ground waterline from AW30 and two troughs.	Upper Shute

Identifier	Description	Pasture
AW32	Install a new storage tank and trough from Shute Springs.	Upper Shute
AW33, AW34	Install a new above ground water line and troughs.	Upper Shute, Lower Shute
AW5	Install a corral, storage tank, trough with an above ground water line, and drill a well near Murphy Spring.	Murphy
AW6, AW7, AW8, AW9	Install a new above ground water line and troughs.	Rip, Hicks, Yellow

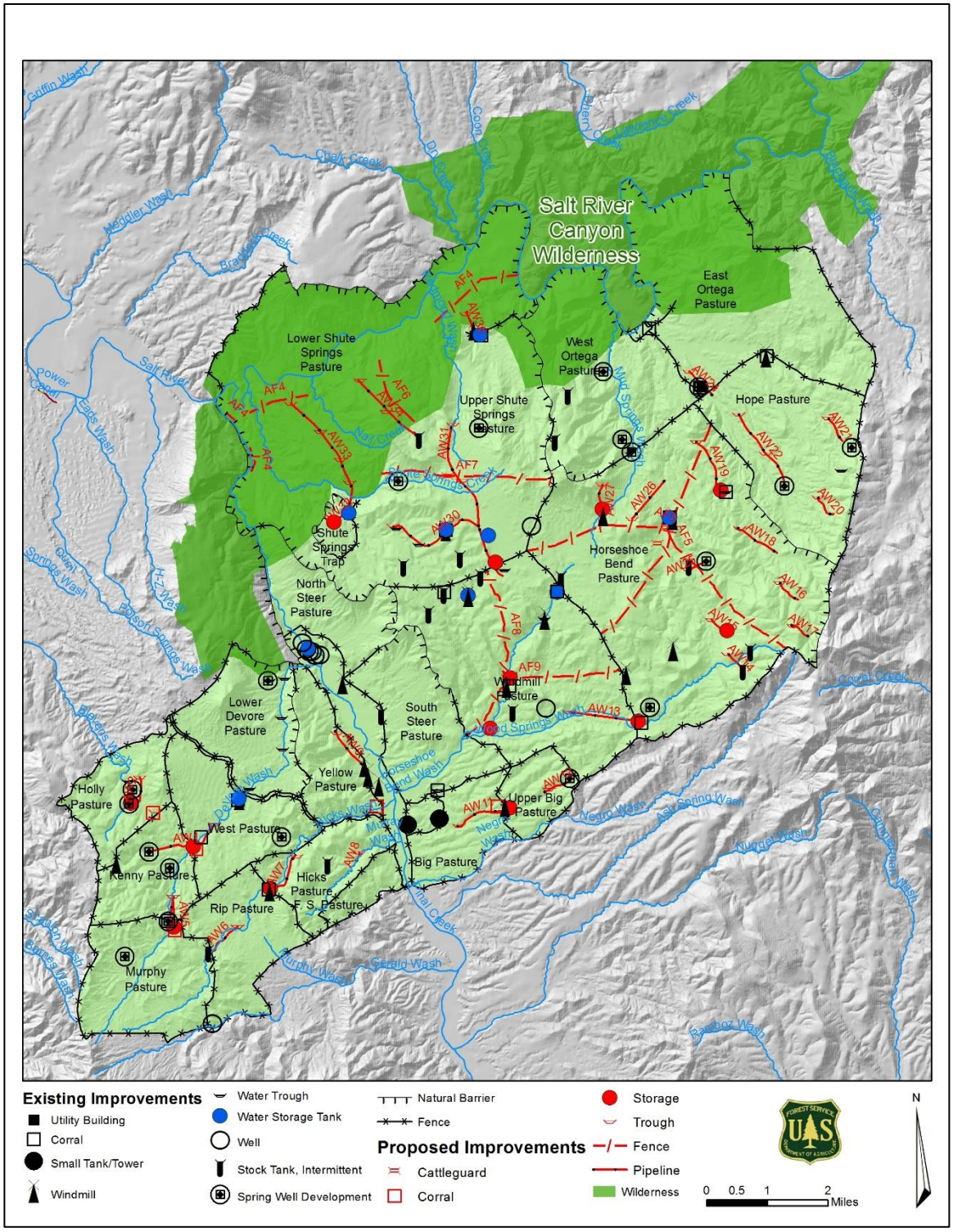

Figure 7: Possible Locations of Additional Future Infrastructure (in red)

Range Improvement Design Features and Specifications

All existing and new improvements will follow these design features. These design features are taken from the Forest Service Structural Range Improvement Handbook (Forest Service Handbook 2209.22 R3) or other Forest Service policy and Best Management Practices.

Springs

- All spring source facilities and headboxes should be adequately protected (i.e. buried or encased) or fenced.
- Headboxes will be constructed of concrete, metal, treated wood or other durable material. Initial pipeline, inside the box, should be fitted with a tee to prevent debris from entering the pipe.
- Horizontal wells must contain a shut off valve and reducer. Entire exterior of the well can be earth covered to prevent freezing. Care should be taken to ensure sufficient water remains at the spring source to support riparian and aquatic resources dependent on the spring.

Pipelines

- Diameter of pipe should be large enough to carry the flow of the water development but not less than 1 inch.
- Inlet and outlet pipe are protected by anchoring to trough with a single post next to the vertical pipe and a brace or pole supporting the horizontal pipe. Inlet and outlet pipeline will be buried as much as possible for their protection.
- All above ground pipeline supported structures will be maintained to keep pipe at gradient and prevent sagging.
- Pipelines with air and drain valves will be covered with fine screen to prevent rodents and dirt from entering pipeline. Screens must be replaced as needed.
- Pipeline leaks will be repaired or damaged section will be replaced with materials similar to materials from original construction.
- Pipelines with valve cover boxes will be kept covered and repaired when needed.
- Sufficient water should remain at the spring source to provide for riparian and aquatic resources supported by the spring.
- Riparian and aquatic resources supported by springs should be protected from grazing by fencing.

Troughs and Storage tanks

- Troughs will be kept at heights that make them useable to livestock. Steel troughs should be kept off of the ground. Troughs which become elevated or uneven from trampling or erosion are periodically backfilled to maintain a useable height, authorization may be needed.
- Troughs and storage tanks should have float valves to maximize the volume of water remaining at the spring source to support aquatic and riparian habitat.
- Excess water in trough will be contained in an overflow pipe at least 50 feet away or nearest drainage. End of overflow pipe must be protected from trampling by livestock.
- New water developments will be constructed in uplands, at least 400 feet away from riparian areas, to encourage livestock use out of the bottoms.
- All existing or future water developments that have open tops (i.e. troughs, open top storage tanks) must have escape and access ramps. All escape ramps will be built of expanded metal or similar materials and extend to bottom of trough and sides. Ramp will be firmly secured to trough rim so it will not be knocked loose by animals. Access ramps will be constructed of durable material such as concrete or metal. Slope will not exceed 45 degrees. Further design specifications may be required from “Water for Wildlife” by Taylor and Tuttle 2007.
- Where practical, leave water in troughs for wildlife when not in use by cattle.

- Troughs, storage tanks, and pipelines will be drained and cleaned periodically to prevent moss and debris buildup and damage from freezing.
- Poles, posts, and trough framing materials used in water development construction will be maintained, repaired, or replaced as needed.

Stock Tanks

- Stock tanks will be kept clear of debris, floating logs, dead animals, etc. Spillways will be cleaned and maintained to prevent washing out or becoming plugged. Rodent damage and damaging vegetation on dams will be reported to Forest officer. Other specific requirements will be outlined through a letter.

Fences

- All broken wire will be spliced and repaired and re-stretched to keep tension. Wire splices will be made with 12 gauge size tie wire or type of wire used in initial construction.
- Broken or rotted posts, braces or stays will be replaced where needed to maintain wire tension.
- Top wire on all range fences should be kept at 42 inches in height, and bottom wire should be smooth and 18 inches above ground. General maintenance will adhere to original construction, unless required by Forest Official. Reconstruction will be to these outlined standards.

Gates

- Wire gate tension should be sufficient to prevent gate from sagging and still be easily opened and closed. Gate loops are made of smooth wire, not barbed wire.
- All new corral authorizations will include site specific construction specifications.

Corrals

- Broken or rotten sections of corrals will be replaced as needed to maintain useable condition.

General

- All improvement components (e.g., rusted out troughs, broken sections of pipe, wire etc.) replaced during maintenance or reconstruction will be removed from Forest and properly disposed of.

Monitoring

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

Monitoring activities may be carried out by the grazing permit holder (permittee) or the Forest Service either during or at the end of grazing season. Monitoring will consist of implementation and effectiveness monitoring in key areas such as: allotment inspections, noxious weed treatments, riparian monitoring, photo-points, utilization height and weight, reading the range, and parker three-step.

Implementation monitoring

This type of short term monitoring determines whether standards and management practices, outlined in desired conditions, are currently implemented. For this type of monitoring to be successfully gathered, indicators should be collected at least yearly and include such things as inspection reports, forage utilization measurements in key areas, livestock counts, and facilities and improvements inspections. Monitoring would be collected in established key areas, but may also include monitoring outside of key areas.

Effectiveness monitoring

Effectiveness monitoring tracks long-term condition and trend of upland and riparian vegetation, soil, and watersheds. Once data are analyzed, it will identify if management practices are effective toward meeting desired conditions. Examples of effectiveness monitoring indicators include, but are not limited to pace transects, pace quadrat frequency, dry weight rank, ground cover, Parker 3-step, repeat photography, and Common Non-forested Vegetation Sampling Procedures which measures; frequency, fetch, dry-weight rank, production, and utilization.

Monitoring would occur at established permanent monitoring points. Effectiveness monitoring should occur at least once over the ten-year term of the grazing authorization or more frequently, if deemed necessary.

Riparian Utilization Monitoring

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

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

Noxious Weed Monitoring

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

Key Areas

A key area is a portion of rangeland or riparian selected because of its representation of pasture, location, grazing or browsing value, or livestock use. It serves as a monitoring and evaluation point for range condition, trend, or degree of grazing use.

Key areas are further defined by seasonality of monitoring: short term or long term. Short term, or annual monitoring, identifies yearly adjustments to livestock grazing, climate, or other factors. Long term data, gathered on five to ten year intervals, measures change in plant community composition, cover, structure, soil conditions, frequency, and management of grazing through trend. Riparian long term data gathers vegetation and stream channel geomorphology condition and trend. These data are gathered on five to ten year intervals, preferably by riparian specialists.

A key area should be an area representative of the range or riparian areas 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.

Key Areas for all types of monitoring except riparian area monitoring will normally be one quarter mile from water, located on productive soils on level to intermediate slopes and be readily accessible to grazing. Within key areas, an appropriate key species is selected to monitor average allowable use (Forest Plan p. 42-1). Desired conditions contain measurable goals that will be measured at key areas. 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.

Monitoring Direction

- Data collection procedures and interpretation would consider guidance contained in the *Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands* (Smith et al. 2005), Interagency Technical Reference 1734-3 “Utilization Studies and Residual Measurements” and “Sampling Vegetation Attributes” (1996) (Technical Guide) and the Forest Service Region 3 Rangeland Analysis and Management Training Guide (June 1997) (Training Guide), “Guide to Rangeland Monitoring and Assessment (Smith et al 2012).
- Guidance in monitoring techniques will follow accepted Forest Service protocols set by the monitoring handbook.
- Both qualitative and quantitative monitoring methods would be used in accordance with the Technical Guide and Training Guide.
- Utilization measurements are made following procedures found in the Technical Guide, or the most current acceptable method, and with consideration of the *Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands*. This document will also provide guidance for utilization data collection and interpretation.
- Key areas are described in “sampling vegetation attributes” (1996) as indicator areas that are able to reflect what is happening on a larger area as a result of on-the-ground management actions.

- Riparian components in key reaches would be monitored using riparian utilization measurements (implementation monitoring) following methods in the Technical Guide or the most current acceptable method.

Response to Monitoring

Within the scope of the grazing authorization decision, the forest would adjust management in response to monitoring data, in combination with other factors such as weather patterns, likelihood of plant regrowth, and previous years' utilization levels. Authorized number of livestock may be adjusted but would not exceed the number authorized in the grazing decision. The grazing decision and associated allotment management plan is implemented through the term grazing permit and annual operating instructions (AOI). Necessary annual adjustments to grazing management on the allotment will be implemented through the AOI, which will adjust use to be consistent with current vegetation productivity and resource conditions. The AOI may change season of use and pasture rest periods, and will also include mitigation measures and Best Management Practices[15] 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.

[15] Additional information about additional Best Management Practices can be found in the Livestock Management Practices and Mitigations for Other Resources section of this Proposed Action.

Administrative Actions to Adjust Grazing Management

There are several types of administrative actions that could be used to modify grazing management within the allotment. If monitoring indicates that desired resource conditions are not being achieved in the desired time frame or in areas of this allotment, there are tools, or administrative actions that would be used to modify livestock management. Although there are many factors which may cause a desired condition to not be met, the following tables show how livestock management may be modified if livestock grazing is determined to be the probable cause why these desired conditions are not being met (Table 17 through Table 21). These tables list examples of administrative actions included in this proposed action that may be taken to respond to certain resource conditions.

Table 17: Management Indicators for Species, Vigor, Cover, Litter

Desired Condition	If	Then	Follow up
Maintain or improve, as compared to local TEUI, native species cover, litter and vigor	Initial reduction in vigor, cover, litter	Monitor range readiness before livestock authorization in following year.	Document. If necessary, conduct rangeland health evaluations. Install vegetation cages or exclosures to further identify local vegetation conditions.
	Drought models predict reduced precipitation amounts due to change in weather pattern and Standard Precipitation Index below -1.	Monitor range readiness	Work with permittee to develop further drought response strategies. Document and conduct rangeland health as needed.
	Reduction in vigor, cover, litter due to prescribed or wild fires.	Monitor for range readiness and work with district office to identify attributes.	Monitor for attributes to authorize grazing.
	Continued reduction in vigor, cover, litter at one key area due to distribution	Use salting and herding to move livestock to unused or lightly used portions of pasture.	Document and monitor range readiness.

Table 18: Management Indicators for Soils, Water Quality/Quantity, and Watersheds.

Desired Condition	If	Then	Follow up
Maintain soils currently in satisfactory condition and to manage for upward trend of the soils that are in impaired condition within grazing management practices.	When soils are assessed, a soil condition category indicates a reduction of soil quality such as hydrologic, nutrient cycling or stability.	Rest pasture for a growing season or move cattle away from critical area by salting, herding until further monitoring is conducted.	Schedule to monitor for soil condition trend within a couple years. After follow-up monitoring, conclude if supplemental analysis is needed to adjust management.
Water quality in the three water bodies monitored by ADEQ, or any additional water bodies monitored by ADEQ during the duration of the authorization, meet or exceed state water quality standards	Livestock have accessed Pinal Creek during pasture grazing period.	Move cattle away from Pinal Creek with salting and herding.	Monitor livestock access to Pinal Creek.
	Livestock continue to access Pinal Creek due to insufficient fencing or lack of water sources.	Reconstruct existing fence, establish locations for new drift fencing or water locations.	Obtain the appropriate SHPO clearances.
	Water quality standards for other streams in project area are listed as Impaired.	Working with ADEQ, determine source of contamination.	Work with ADEQ to develop TMDL for any new water quality concerns that arise in the project area.
Manage watersheds to improve to a satisfactory or better condition. As the Watershed Condition Framework is currently the Forest Service's accepted measure of watershed condition, satisfactory equates to a rating of "functioning properly".	Riparian utilization standards are exceeded in key reaches, or insufficient riparian vegetation is present to allow for meaningful (statistically valid) riparian monitoring	Livestock should be removed from the pasture. Areas with insufficient riparian vegetation to allow meaningful monitoring should be rested until sufficient riparian vegetation is established for statistically valid monitoring to occur.	Monitor to ensure effectiveness using National Riparian Protocol and Use Stream Reach Inventory and Channel Stability Evaluation or a similar protocol.

Table 19: Management Indicators for Riparian Key Areas.

Desired Condition	If	Then	Follow up
Riparian utilization will not exceed 50% of terminal leaders of trees and shrubs under 6 feet tall, not exceed more than 40% of biomass of herbaceous species, maintain a residual stubble height of 6-8 inches of emergent vegetation. Streambanks along the eight key reaches are stable, not compacted, and sediment contribution to key reaches within Hicks Pikes Peak allotment are within the natural range of variability.	Initial over-use during grazing season.	Move to next scheduled pasture. Or use salting and herding to reduce pressure on riparian area.	Measure range readiness prior to livestock authorization. If cattle remain in pasture, continue measuring key reach for further utilization.
	Continued over-use on same reach, especially after salting and herding.	Rest pasture, reduce livestock numbers, or change season of use.	Monitor to ensure effectiveness using National Riparian Protocol and Use Stream Reach Inventory and Channel Stability Evaluation or a similar protocol.
	Continued over-use on same reach, when water sources are located in riparian areas or drainages.	Identify new locations for improvements outside of riparian areas or change season of use.	Obtain appropriate site specific clearances for new water locations outside of riparian areas.
	Continued over-use on same reach in well-watered pasture.	Identify locations for exclosure fencing, reduce livestock numbers, or utilize a cool season grazing strategy.	Obtain appropriate SHPO concurrence. Monitor for affected plant recovery.
	Utilization levels are below allowable use threshold.	Extend use in pasture.	Keep log of pasture extensions and determine if increase in livestock numbers are supported. Monitor riparian area and channel stability using National Riparian Protocol and Use Stream Reach Inventory and Channel Stability Evaluation or a similar protocol.

Maintain or improve herbaceous and riparian woody species in the eight key reaches within Hicks Pikes Peak allotment.	Winter and spring precipitation result in conditions ideal for recruitment of seedling riparian species.	Consider resting areas of dense recruitment for two growing seasons to allow newly recruited vegetation to grow above the reach of grazing cattle.	Document areas of dense recruitment and monitor growth to assess when they have grown beyond the reach of livestock. Use National Riparian Protocol, Proper Functioning Condition assessment or similar protocols.

Table 20: Management Indicators for Upland Utilization

Desired Condition	If	Then	Follow up
Upland utilization does not exceed allowable use threshold	Utilization levels are below threshold on at least two key areas.	Extend use in pasture	Keep log of extensions and determine if increase in livestock numbers are supported.
	Initial over-use during grazing season on at least one monitoring area	Move to next scheduled pasture or use salting and herding to move livestock to less grazed areas.	Measure range readiness prior to livestock authorization.
	Continued over-use in pasture on at least two key areas	Rest or defer pasture.	Measure range readiness prior to livestock authorization.
	Continued over-use in pasture with accessible but ungrazed areas.	Use more strategic salting and herding or consider adding additional waters, close off waters, or fences to encourage distribution. Reduce livestock numbers or utilize a cool season grazing strategy	Monitor for native plant recovery.

Desired Condition	If	Then	Follow up
	Continued over-use in pasture with no other accessible ungrazed areas	Reduce Livestock numbers or utilize a cool season grazing strategy	Monitor for native plant recovery.

Table 21: Management Indicators for Managed Grazing Methods

Desired Condition	If	Then	Follow up
Livestock are managed on appropriate pastures through managed grazing methods	Increased precipitation and/or favorable precipitation outlook with maintained or positive trends in other desired conditions	Consider increase of livestock numbers.	Issue a new Bill of Collection for additional livestock.
	Livestock are not in authorized pasture but on allotment due to insufficient fencing	Forest Service will require interior pasture fence in question to be reconstructed or add additional fencing.	Follow up with inspection of fencing.
	Livestock are not in authorized pasture but on allotment due to gates left open.	Livestock immediately gathered and placed back in authorized pasture. Identify if new gates are needed (i.e. easier to close, metal gates). Ensure gates have proper signs. Consider replacing with cattle guard or similar.	Follow up with pasture inspection or project authorization letter.
	Livestock are not on authorized allotment, due to insufficient fencing or gates left open.	Livestock immediately gathered and placed back in authorized pasture.	Bill for unauthorized use.

Desired Condition	If	Then	Follow up
	Livestock are affecting the protection of historic properties.	Relocation of range improvement or salting location.	Archeology will monitor impacts to relocation.
	Livestock are affecting the protection of historic properties and relocation of improvements is not plausible.	Fence out livestock from historic properties and relocate range improvement if needed.	Archeology will monitor impacts to fencing.

Livestock Management Practices and Mitigations for Other Resources

Livestock Management

For grazing throughout Tonto National Forest General Management Areas and the Salt River Wilderness Management Area, practices to minimize impacts to other resources include:

- Permittee will furnish sufficient riders or herders for proper distribution, protection, and management of cattle on the allotment.
- Salt and mineral supplement will be used to distribute cattle. All supplements should not be placed any closer than one quarter mile from natural water sources, recreation sites, designated trails, and within or adjacent to identified/known heritage sites.
- Cattle should be drifted instead of trailed wherever possible. Do not trail through riparian areas as much as possible.
- When entering next scheduled pasture, all livestock shall be removed from previous pasture within two weeks of starting move unless otherwise approved.
- Forest Service and/or Permittee will monitor livestock utilization and move cattle when triggers are met.
- Permittee would ensure all infrastructures are in functioning condition, as described above, prior to entering the next scheduled pasture.
- Permittee may be asked to provide the Forest Service with Actual Use records and/or Improvement Maintenance records.

Drought Preparation

Drought is inevitable in the desert Southwest. Regional Forest Service policy (USDA Forest Service, 2006) sets a threshold of negative 1.00 SPI which triggers an evaluation of drought conditions. Once this is triggered, an interdisciplinary allotment evaluation is conducted to identify drought effects on an individual plant and landscape basis. Factors to consider in the evaluation include:

- Local precipitation data: rain gauge data, departures from normal;
- Current range management status: monitoring for desired conditions;
- Stocking levels: current authorized livestock numbers, grazing strategy;
- Available water sources: status of hauling water, stock tank levels, condition of improvements, well or spring production, presence of valuable riparian vegetation at the water source.

When an allotment's 12 month SPI becomes positive, vegetation resources will be evaluated for indicators of drought recovery. Factors, such as the following, are evaluated:

- Recovery of vegetation: improved plant vigor, restoring litter production, restoring forage production;
- Implementation of grazing: focus on recovery through incremental restocking and pasture rest.

Early communication is important. Work with permittee to develop a drought preparedness guidelines to be included in the Allotment Management Plan. These guidelines will help frame

initial communications related to the first signs of management impacts due to drought. Guidelines should address potential drought impacts to livestock and vegetation, identify known issues, and strategically plan for different scenarios while actively monitoring.

Off-Road Travel

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

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

Vehicle use to gather or move livestock off-road would not be authorized. Cross-country motorized travel would not be allowed when conditions are such that cross-country travel would cause unacceptable natural and/or heritage resource damage. Off-road use of heavy equipment (i.e. backhoe, dozer, loader, etc.) may be authorized for range improvement development as needed. Cross-country travel to construct new range improvements and other off-road travel by the permit holder will be analyzed in the environmental analysis for this project. Before new improvements are approved, Heritage clearance would be obtained, including the route to access the development.

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

Wilderness

Management Area 2B emphasizes 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 (Forest Service Manual 2323.26a).

Section 4(d)(4)(2) in Forest Service Manual 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 Salt River Canyon 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.

Heritage Resources Management

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 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 State Historic Preservation Office (SHPO).

All construction, reconstruction, removal, maintenance and repair of improvements will comply with current Forest direction to protect heritage resources. Archeological clearance must be approved with all necessary consultation with SHPO and the potentially interested Tribes prior to issuing any decision regarding the construction, of all improvements, reconstruction of improvements outside of the existing footprint, or repair and maintenance of improvements away from existing roads or pre-established access. 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 (SHPO) of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation,* signed December 24, 2003 (Programmatic Agreement), specifically Appendix H, the *Standard Consultation Protocol for Rangeland Management* (the Protocol) of the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities* (the Protocol) developed pursuant to Stipulation IV.A of the Programmatic Agreement—is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

Protection measures identified under the Protocol include:

- Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing use.
- Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing.
- Periodic monitoring to assess site condition and to ensure that protection measures are effective.

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

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

No Grazing Alternative

Authorization

Forest Service Policy requires the Forest Service to identify no grazing as the no-action alternative (Forest Service Handbook 2209.13). Under this alternative, livestock grazing would be eliminated from the Forest Service administered lands within the Hicks-Pikes Peak Allotment. The existing grazing permit would be cancelled, following guidance in 36 CFR 222.4 and Forest Service Manual 2231.62.

The Globe Ranger District would eliminate livestock grazing on Hicks-Pikes Peak Allotment. Authorized livestock numbers would be reduced by 65 head of adult cattle and 100 yearlings each year until all livestock are removed. This would take approximately five years to remove all livestock based on current permitted numbers.

Factors affecting annual livestock numbers may include precipitation, pasture rotation, forage production, current range conditions (i.e. forage and growing conditions), water availability, resource monitoring (see monitoring section below) and permittee needs. Further details for annual adjustments are in Administrative Actions below.

Livestock will not graze in Lower Shute or Ortega pastures where the Salt River is not a sufficient boundary, where the northern allotment boundary currently follows the Salt River and extends across the Salt River near Pinal Creek, making up Lower Shute pasture.

After all livestock are removed from allotment, it would be closed. An amendment to the Tonto Forest Plan would be initiated to formally complete closure. Allotment would not be used for any temporary grazing purpose, with or without a grazing application.

Range Improvements

No new range improvement projects would be authorized. According to Forest Service Manual, Southwest Region Supplement 2240.3(2), "The Government holds title to all range improvements." All maintenance requirements and agreements for upkeep of rangeland improvement projects (e.g. wells, windmills, troughs, and fences) would be eliminated, after 5 years, with the livestock permittee. Throughout the five years livestock are to be removed from allotment, an agreement with permittee will identify which improvements are necessary for management of remaining herd. An interdisciplinary team would identify those improvements that will remain functional on allotment for other purposes (i.e. recreational horseback riders, hikers, or wildlife). Likely these improvements will consist of dirt stock tanks and developed springs. Permittee will be required to remove those improvements directly needed for livestock grazing, such as corrals and mechanical well pumps. These specifics will be developed and outlined in an Allotment Management Plan. Remaining improvements such as interior fences and other infrastructure may be removed, as funding or workforce allows, mitigating potential adverse impacts to wildlife and public users. Where applicable, boundary fence maintenance responsibilities would be transferred to the neighboring permittee.

Monitoring

While cattle are removed off allotment over five years, all monitoring standards identified in Proposed Action, would be applicable.

Once livestock are removed, standard long term monitoring procedures would continue to be implemented as they have on the allotment following corresponding agency protocols. Allotment will continue to be monitored for improvement range conditions.

Management Practices and Resource Mitigations

While livestock are being removed from the allotment, all standards identified in Proposed Action, would be applicable. Once livestock are removed, these standards would no longer be managed.

Once livestock are removed from allotment, an Allotment Management Plan will be drafted to identify further management of area without grazing.

Alternatives Not Analyzed in Detail

Seasonal Grazing Alternative

A cool season only or seasonal grazing only alternative was suggested by commenters during the public scoping period. Commenters suggest a seasonal grazing alternative would address grazing pressures associated with "its large amount of hot Sonoran Desert lands, its unfenced riparian areas, and its generally poor resource conditions…" A definition of "cool season" or "seasonal

basis" was not provided. However, the following Seasonal Grazing Alternative was considered assuming a grazing season of October 1 to March 31 and is described further under the Seasonality heading below:

Authorization

The Globe Ranger District of the Tonto National Forest would continue to authorize livestock grazing on the Hicks-Pikes Peak Allotment under the following terms:

Authorized use would vary between 650 to 800 adult cattle seasonally. Adult cattle may include cows with calves, non-lactating cows, or bulls. Additionally, 700 to 1100 weaned calves up to 18 months of age (yearlings) would be authorized for up to any 5 months within a 7 month period. Yearlings can be any cattle that meet the above criteria, regardless if they are born on the allotment or purchased elsewhere. Table 22 shows the proposed permitted number of cattle for the Hicks Pikes Peak Allotment.

Table 22: Proposed Maximum Permitted Use

Class of Livestock	Begin Date	End Date	Number of Authorized Livestock
Adult cattle (cows with calves, non-lactating cows, or bulls)	October 1	March 31	650 to 800
Yearlings (cattle weaned calves and up to 18 months of age)	October 1	March 31	700 to 1100

Initial stocking levels would begin with currently authorized livestock numbers which are 326 adult cows grazed yearlong and 511 yearlings grazed for any 5 months within a 7 month period. As range improvements are installed, or as conditions on the ground allow, authorized numbers may be increased up to the proposed maximum stocking numbers as listed in Table 22. Any annual adjustments would be planned and authorized by the Globe District Ranger, not to exceed the maximum number of livestock. Factors affecting annual authorized livestock numbers may include precipitation, pasture rotation, forage production, current range conditions (i.e. forage and growing conditions), water availability, resource monitoring (see monitoring section below) and permittee needs.

Seasonality

Native plant species are directly impacted by temperature and precipitation. Their impacts are often visible when drought occurs or lack of germination after a fire. This is an adaptive strategy of the plant to climatic dynamics required for continued growth or seed establishment. In order to manage for native species cover, litter and vigor it is important to allow herbaceous plants an ability to establish or continue to grow. Hicks Pikes Peak allotment has distinctively two separate growing seasons, with much of the native perennial grasses actively growing during summer. The grazing season would be set to reflect the average fall and winter seasons, October 1 through March 31. Grazing may be extended under circumstances identified in administrative actions.

The remaining elements of authorization in this alternative would be identical to the Proposed Action.

Grazing System

Grazing will occur through a rotational system as in the Proposed Action. Adult cattle would be managed in two different herds and yearlings will be managed in a third herd. Bulls may also be separated and run independently for part of the season.

Annual operating instructions would specify pasture rotation schedules each year and include timing, livestock numbers, and duration. A rotation schedule will be developed with the permittee and incorporated into the allotment management plan to provide an estimate of grazing schedules. This schedule can be altered annually and authorized in the Annual Operating Instructions by the District Ranger.

Range Improvements

The proposed range improvements for this alternative would be identical to those proposed in the Proposed Action. Range improvements would allow for rotational grazing which would still occur under a Seasonal Grazing Alternative.

Monitoring, Response to Monitoring, and Livestock Management and Mitigation Measures

These elements of this alternative would be identical to those proposed in the Proposed Action. Additionally, seasonal grazing was incorporated as a management tool into the Proposed Action.

Reasons for Dismissing This Alternative

The Seasonal Grazing Alternative was dismissed from detailed analysis for the following reasons:

1. This alternative is redundant with the Proposed Action. The adaptive nature of the Proposed Action, including the rotational grazing strategy and utilization limits, would allow grazing to be managed seasonally if that need is identified. As such, it is not necessary to consider seasonal grazing as a freestanding alternative.

2. The effects would be similar to the Proposed Action. As the actions of the Seasonal Grazing Alternative are redundant with the Proposed Action, the effects of the Seasonal Grazing Alternative are considered within the effects of the Proposed Action, as well. However, as any difference between these two alternatives would be most noticeable on riparian areas, the Seasonable Grazing Alternative was analyzed separately within the Hydrology, Riparian, and Watershed Resources section of this EA. Both alternatives were found to have the same or similar effects to these resources.

Affected Environment and Environmental Consequences

This section summarizes the effects from authorizing grazing on the Hicks-Pikes Peak Allotment.

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

Range and Vegetation

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

Affected Environment

Earlier sections of this document detail the existing conditions of vegetation and range resources on the Hicks-Pikes Peak Allotment. Since the late 1960s perennial native plant diversity and abundance has decreased through the Allotment due to historic grazing pressures and climate change. In some locations, native bunchgrasses grow in protected areas such as cactus or shrubs, while other locations show a marked decrease in sod forming native grasses. Throughout all monitored pastures, curly mesquite, a sod forming grass, dominates the herbaceous ground cover. Curly mesquite is not often heavily grazed due to its short stature. Overall, native perennial plant composition has shifted to shrubs. A chronic constant impact (i.e. continuous grazing) of livestock on plant leaves reduces the plant's ability to grow and reproduce (D. D. Briske and Gillen 2008).

Environmental Consequences

Direct and Indirect Effects of the Proposed Action

Authorization and Grazing System

Further dividing the livestock herd into smaller groups should reduce grazing pressure on native perennial plants throughout pastures. Smaller herds will reduce trampling, trailing and bedding areas. Within well-watered pastures, separate herds will be further spread out over the pastures landscape, further increasing livestock distribution and reducing grazing impacts on range and soil resources. Increasing livestock distribution would encourage cattle to use underutilized areas

of the allotment. These are areas less preferred by livestock but contain available forage. This in turn encourages more even plant recovery across a pasture.

A rotational grazing system such as that proposed in the Proposed Action, would allow for livestock grazing flexibility, which would in turn allow for increased native plant recovery by promoting more leaf growth. As more grass leaf growth is promoted, it also creates older plants, which are not preferred by livestock. Younger grass plants attract cattle more than older plants. Similarly, if plants are grazed at different times of the year, they will be at different growth stages, which may affect livestock selectivity, and increase native species diversity and abundance. A rotational system that promotes native plant diversity and abundance may also shift livestock grazing patterns, adding to further livestock distribution on the landscape. If desired conditions are not being met, as indicated by monitoring results, administrative actions would be used to adjust grazing management[16].

Once a significant number of shrubs become established in an area, shrub driven processes begin to predominate (Laycock 1991). If this process occurs within semi desert grasslands within the Allotment, management of native grass species would become even more important (Figure 2). Approximately 23,000 acres of semi desert grassland occurs on the Allotment. As this transition to shrub dominated system likely continues, soil continues to be exposed to erosion. If native plants are given the opportunity to reproduce, without constant grazing pressure, litter will likely be maintained or increase, further protecting vulnerable soils from eroding. Setting an allowable use level for shrubs and native perennial grasses, along with a rotational grazing system would allow native plants to continue to reproduce, likely encouraging further grass establishment and protecting half shrubs. Half shrubs refer to vegetation that is partly woody, especially at ground level. They provide an additional food source for livestock. These shrubs do not have an allowable use standard, but are monitored through factors such as plant vigor and landscape appearance monitoring methods.

Most rangeland grasses can have 35 percent to 45 percent of their leaves and stems removed every year and still remain healthy and productive so that plants can photosynthesize and manufacture energy to produce more leaves, stems, and seeds (Holechek 1988). The Proposed Action would authorize up to 40 percent utilization for upland herbaceous plants, well within this conservative use standard (Table 12). Although percent vegetation utilization is a useful indicator, it should not be used as the sole measurement (Ruyle, Steve; Stewart, and Williams 2016) (Holechek 2000), but should be combined with other data such as amount of plant litter, landscape appearance, and standing crop (Holechek 1998). Holechek advocates for stubble height rather than percent utilization in New Mexico. Ruyle, Steve; Stewart, and Williams (2016) states the management objective should be maintenance or improvement of plant composition. All of these factors would be monitored and considered under the Proposed Action.

The responses to monitoring discussed in the Proposed Action allow adaptability of livestock management. If monitoring indicates that desired resource conditions are not being achieved in

[16] More information can be found in the Response to Monitoring section of the Proposed Action.

the desired time frame or on areas of this allotment, livestock management would be adjusted. By maintaining or increasing perennial native plant vigor, litter and cover through a response to monitoring actions, livestock would be managed at suitable levels. Therefore grazing authorization would not have a significant effect of range and vegetation resources. Monitoring data may also identify circumstances in which livestock numbers may be increased within authorized numbers. This further encourages management for native perennial plant reproduction and growth, since maintenance or improvement of these species would allow for increased livestock numbers. Since any increase in livestock numbers would be tied to meeting specific desired conditions, this action would not have a significant effect on range or vegetation resources.

Annual grasses and forbs are common on the Allotment after a flush of moisture and warm temperatures, commonly in the early spring. These plants are green for a narrow window, in which livestock prefer these over perennial grasses or shrubs. Cattle would have to be placed in these pastures quickly to take advantage of annual production. Flexibility in grazing rotations would allow for these quick changes. Annual vegetation produces few shallow roots, which are of little value to preventing soil erosion on their own. However, perennial plant roots offer a network of fibers to connect soil and help reduce future erosion. Although annual grass and forbs roots may not be the best scenario for soil protection, annuals account for most of the liter that covers the soil. Functional protection of soil erosion would continue to be dependent on annual grass and forb litter and perennial root growth. Although no grazing level is set on annual grasses and forbs, livestock management will likely not be flexible enough to take advantage of all annual vegetation, leaving some for soil protection through liter. If perennial native vegetation can be maintained or increased, this would further increase annual grass and forbs litter. When favorable climatic conditions and response to monitoring actions are implemented, perennial native plant vigor, cover and litter will help protect soil.

Range Improvements

Adding additional water developments within Ortega pasture will allow for slightly more increased cattle distribution and reliable water sources. Much of the existing water sources are located on more easily accessible portions of the allotment and within areas that allow for gravity flow of water without additional pumping needs. In the short term, vegetation would be impacted by installation of the proposed pipelines and troughs by removal of some vegetation within the project footprint, before and during installation. Trampling or defoliation of established vegetation during installation is likely. Other potential impacts may include the expansion of invasive species into disturbed areas. Pipe would be laid on top of the ground using a horse or vehicle on an established route. Above ground pipe would be weaved through and around existing vegetation causing minimal impacts. Levels of moderately higher livestock use would be expected to occur in areas within one quarter mile from trough locations.

Ortega pasture division fences would increase flexibility in grazing pastures. Each new pasture will have one new water development, offering slightly more distribution. New pastures will not be utilizing the Salt River, taking pressure off this resource and redirecting that livestock use to these new water developments. Vegetation would be directly impacted by clearing a path for installation of division fence. Fence would be built with equipment to clear brush within 10 feet

of fence line and deliver material. Occasional access for fence maintenance would be by UTV or pickup truck. Vegetation removal may be necessary to maintain integrity of division fence. After initial installation and or occasional maintenance, very little vegetation impacts will occur. Impacts would occur from livestock and wildlife that may use the fence line as a travel corridor. Livestock grazing and trampling may increase in this localized area.

Adding vaulted cattle guards to the Allotment would impact use of the roadway for a couple of days during installation. All work would occur within the roadbed which would not impact vegetation. A gate would be installed off of the roadway for use to move livestock or for occasional equipment use. Road use may be interrupted for a short period of time when vaulted cattleguards are installed. Long term maintenance of these cattle guards may fall to either the permittee or the Forest Service. Every few years, vaulted cattle guards would need to be cleaned to remove sediment.

Adding above ground cattleguards would require less than a day and no pit would need to be dug for a vault. All mechanics of this cattleguard are above ground. If these cattle guards need to be cleaned to remove sediment, the maintenance would be low and would take a short amount of time. These above ground types may also be moved around to be utilized in the best location, likely where livestock are grazing. Likely, maintenance of these cattleguards would be part of the permittee's responsibility. Both types of cattle guards would benefit range resources by reducing the occurrence of gates being left open and help to keep livestock in their authorized pasture or allotment.

Additional water developments and fences would have similar direct impacts as those installed within the first two years. 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 benefiting range and vegetation resources. Typically, even during dry years, reliable water sources and water distribution throughout the allotment are the limiting factors, not forage availability.

If additional improvements follow outlined additional infrastructure standards, best management practices, and design features, all improvements will move allotment toward desired conditions. The establishment of range improvement sideboards will create consistency throughout the allotment and offer transparency and efficiency in the public process and with the permittee on range improvement construction and maintenance responsibilities. Any site specific standards that may arise would be included in a modification to the Annual Operating Instructions.

Monitoring

The purpose of monitoring is to determine if management is being properly implemented and whether actions are effective at achieving or moving toward desired conditions. The physical exercise of some monitoring techniques may result in the crushing or disturbance of some individual plants while accessing the monitoring site. However, this disturbance would be extremely localized and minor, being the same as any recreational user accessing that area of the

forest. Monitoring would have a beneficial effect to vegetation, allowing management to continuously be adjusted in response to current conditions.

Direct and Indirect Effects of the No Grazing Alternative

Authorization and Grazing System

Removal of livestock, eliminates all managed grazing pressure on vegetation throughout the Allotment. All pastures in the Allotment are strongly affected by highly variable factors, such as precipitation. Lower elevation pastures have a small presence of native perennial grasses, indicating a seed source exists. Curly mesquite is a sod forming grass that dominates much of the monitored sites on Hicks Pikes Peak Allotment. Bunch grasses are present but in smaller quantities. Half shrubs such as false mesquite and buckwheat have increased, but not enough to dominate site. In periods of adequate rainfall, grass establishment would occur without impact of livestock grazing. Newly established grass plants would be subjected to continued precipitation, allowing a higher possibility of dense root mass and above ground biomass. Without grazing pressure, and adequate precipitation, native perennial plants would recover.

As increases to native vegetation may occur, litter would likely increase, protecting more soil surface. If livestock grazing is removed, the incorporation of manure would not occur, which may affect fertilization to assist in recruitment of native plants. Conversely, under favorable climatic conditions, native grass and half shrubs will establish and eventually increase litter production, likely removing the importance of manure for fertilization.

As grass litter breaks down and protects the soil, it decomposes and would become an important factor in soil development. Over decades, soil characteristics may change due to the removal of livestock grazing. Soil containing organic matter holds water longer and slows the erosion process. Without managed grazing, an extensive amount of time, and a favorable climate, all litter would breakdown and add to top most soil horizon, increasing potential for more grass and half shrub establishment. Vegetation conditions may have reached a tipping point, however, where lower elevations may continue to move toward shrub (i.e. mesquite, cat claw) dominated systems with grass as a minor component. If that occurs, removal of grazing likely will not see much change to vegetation. Wild ungulates would still impact herbaceous and browse plant species. However, these impacts are expected to be minimal.

Chaparral communities (approximately 13,600 acres of the Allotment) have low amounts of native perennial grasses. These areas would see little change from livestock removal, due to density of existing chaparral vegetation. Without managed grazing, preferred browse species may improve in vigor.

Under this alternative, upland vegetation would improve the most in short-term productivity, vigor, species composition, and formation of new stems compared to the Proposed Action. Plants that would benefit most from no grazing are grass and forb species. Current year’s leaf growth is important for photosynthesis. It is the most digestible part of the plant and is the portion generally removed by grazing animals. Conversely, production, vigor and species composition may

decrease relative to the Proposed Action over time due to the accumulation of old plant material around palatable plants causing them to be undesirable to wildlife and livestock.

Monitoring

Under this alternative this allotment could, in the future, be used as a reference area to neighboring allotments with similar vegetation when analyzing the effects of grazing. Removal of cattle from the Allotment would allow for range specialists to focus monitoring attention to other areas of the forest. Occasional monitoring would occur to determine if desired conditions are being achieved, but without grazing it will be long term trend monitoring. If reports occur of neighboring cattle accessing allotment, an inspection will determine appropriate response.

Range Improvements

As range improvements are removed from allotment, those water developments with water rights would be updated to remove livestock as a use. Those improvements chosen to not be removed would require Forest Service to maintain them to identified standards, which may pose a challenge. Personnel would be required to inspect improvements regularly for any required maintenance. Boundary fencing maintenance would be assigned to neighboring permittees, likely increasing their management responsibilities.

Cumulative Effects of Both Alternatives

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 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 such as land use. Response to monitoring actions and strategies are increasingly important in arid and semi-arid regions in order to respond to fluctuations in precipitation instigated by climate change. Response to monitoring actions included in the Proposed Action allow grazing management to be modified due to many factors, including climatic factors, which will avoid any significant cumulative effects. These responses to monitoring and strategies outlined for drought preparation, both within the Proposed Action and within Forest Service policy, would offset drastic changes to livestock management. During preparation of an allotment management plan, all of these strategies would be considered in detail.

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

OHV use and unauthorized route proliferation have increased. Unmanaged OHV use can have an impact on the vegetation resource. Impacts include destruction and loss of vegetation through the creation of unauthorized routes, soil loss and compaction, and the facilitation in the spread of noxious weeds either directly in transport or in disturbing soil. Portions of the cumulative effects area are locally impacted by non-native weed species. The Tonto National Forest is currently in the process of designating a system of roads, motorized trails, and areas for motor vehicle use under the Final Travel Management Rule. When that final decision is signed and a motor vehicle use map is published, cross country travel by the public will no longer be permitted, reducing these impacts to vegetation resources. Until the Tonto National Forest's Travel Management Plan can be implemented, effects of current management are expected to continue at the current rate. Since these effects are not anticipated to rise above current conditions, no significant cumulative effects would be expected when added to either alternative.

There are several projects in the planning process that are located nearby the Hicks Pikes Peak Allotment. Upcoming grazing allotment authorization analysis for Chrysotile, Poison Springs, Dagger, and Black Mesa Allotments will not affect implementation of the Hicks-Pikes Peak Allotment decision. Nor will consideration of an additional range improvements project currently under consideration for the Haystack Butte and Sedow Allotments. Under the No Grazing Alternative, the neighboring allotment boundaries would need to be monitored to ensure livestock are not encroaching onto Hicks Pikes Peak Allotment if grazing is authorized with those other projects. This monitoring would likely be done on horseback, OHV, or in a vehicle depending on the location. This may have minimal impacts, but not significant when added to existing levels of impact.

The Highway Tanks Tribal Forest Protection Act project will overlap with a small portion of the Hicks-Pikes Peak Allotment. That project is in early development and proposes to improve vegetation and watersheds on a large area of the Globe Ranger District and the adjacent San Carlos Indian Reservation. Fire treatments within that project may affect a small portion of vegetation in the Ortega and Hope pastures. Under the Proposed Action, livestock use of these pastures may be temporarily impacted with any requirements to rest pastures preceding or post fire. As the purpose of that project is to improve vegetation and watershed conditions, cumulative effects would be beneficial to pasture conditions on the Hicks-Pikes Peak Allotment.

Hydrology, Riparian, and Watershed Resources

Affected Environment

Chapter 1 details the existing conditions for Water Resources, Water Quality, and Watersheds on the Hicks-Pikes Peak Allotment. The current condition of the key reaches referenced in this analysis can be found in Table 9 the have the potential to improve within the time period of this project (ten years).

Environmental Consequences

The criteria used to evaluate alternatives will be based on the likelihood of moving toward or attaining desired conditions identified for this project and in the Forest Plan (USDA 1985; amended 1996) for the key reaches.

For the riparian areas and stream channels within these allotments, recovery and attainment of desired conditions will depend primarily on the effectiveness of the mitigation measures. These measures are listed in earlier sections of this document.

Direct and Indirect Effects from Authorization

Effects of Grazing in Riparian Areas

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

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. An extensive search by Belsky et al. (1999) of peer-reviewed literature and experimental studies found no positive environmental impacts from cattle grazing in riparian areas of the western US. Cattle tend to congregate in many riparian areas. They favor riparian forage and water availability, shade in warm months, and gentle topography. Excessive grazing, trampling and trailing impacts can destabilize and break down stream banks, cause mechanical damage to shrubs and small trees, reduce or eliminate woody seedlings and saplings, expose soils, eliminate or shift native herbaceous species to weedy or exotic species with reduced root systems, and cause widening or incision of stream channels (Trimble and Mendel 1995, Clary and Kruse 2003). These changes may lead to loss of stream stability and function (Rosgen 1996).

Stream channel profile, stream bank stability, streamside vegetation, channel bottom embeddedness, stream sediments and stream temperature are all aquatic species habitat features that can be directly or indirectly affected by livestock grazing practices. Maintaining native obligate riparian plants is extremely important to many streams because of their resistance to the erosive energy of flowing water (Clary and Kruse 2003). Herbaceous riparian vegetation is especially important for stabilizing stream banks, point bars, 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).

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

Proposed Action

The riparian utilization guidelines are intended to maintain or increase existing riparian vegetation. The proposed action would mitigate 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 improve. This mitigation measure should be effective for the key reaches in Table 9 (existing condition) labeled as Yes in the column Manage by Monitoring.

However, the utilization guidelines were not intended for riparian areas that have the potential to support riparian vegetation, but do not, or support very low cover or density of riparian vegetation. Clary and Webster (1989) recommend that grazing riparian areas in early seral condition be deferred until riparian vegetation re-establishes and ecological status improves.

Because the riparian vegetation on the channels labeled as No in the column Manage by Monitoring in Table 9 (existing condition) is low in density or in early seral condition, riparian utilization measurements may not effectively identify the threshold of unacceptable impact that would trigger moving cattle from the riparian area or pasture, or use levels may be reached quickly. These channels do have the potential to support riparian tree seedlings and an herbaceous understory based on photo points and comparison areas and should be rested until riparian vegetation has become re-established. At that time they would then be managed using riparian utilization measurements (implementation monitoring).

Seasonal Grazing Alternative

Effects of this alternative would be similar to those discussed for the proposed action. Riparian use guidelines are the same in each alternative. Cool season grazing provides a tendency for cattle to move farther from water, resulting in better distribution and less intensity of grazing. These effects may make implementation of riparian use guidelines easier to achieve and could potentially result in longer periods of use in pastures with key reaches.

No Grazing

Riparian areas are generally regarded as having high inherent potential for recovery from disturbance (Milchunas 2006). Stream channel and riparian area recovery are considered optimal when the direct effects of livestock grazing are eliminated (Clary and Kruse 2003). The amount of time required for riparian recovery after severe degradation can vary from several years to decades (Clary and Kruse 2003). Recovery is dependent on the size and existing condition of the

watershed, stream channel and riparian area (flow regime, channel gradient, dominant channel substrate, watershed area, type and extent of riparian vegetation), future management, climate and natural disturbances (Kindschy 1987, 1994). The most rapid recovery can be expected in channels with small watersheds, perennial flow or sub-surface flow, an existing source of riparian vegetation, and availability of fine sediments.

Effects of Grazing to Stream Channels

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

Proposed Action

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. Since all pastures are proposed for grazing, this alternative would have greater negative indirect effects to riparian areas than the No Grazing Alternative. If management prescriptions are followed and cattle are moved when use guidelines are met, the negative, indirect effects of grazing will be minimized.

Seasonal Grazing Alternative

Impacts would again be similar to the proposed action. 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. Since all pastures are proposed for grazing, this alternative would have greater negative indirect effects to riparian areas than the No Grazing Alternative. If management prescriptions are followed and cattle are moved when use guidelines are met, the negative, indirect effects of grazing will be minimized.

No Grazing Alternative

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

Direct and Indirect Effects of Range Improvements

Fences

Permanent or temporary fencing of riparian areas to exclude grazing would eliminate the direct effects of livestock use on riparian vegetation and the stream channel, allowing for the most rapid rate of vegetative response. Temporary electric fencing could be an effective means of managing a riparian area while grazing a pasture. Permanent or temporary fencing of riparian areas to

exclude grazing would eliminate the direct effects of livestock use on riparian vegetation and the stream channel, allowing for the most rapid rate of vegetative response. Temporary electric fencing could be an effective means of managing a riparian area while grazing a pasture.

Proposed Action

Under the Proposed Action, several fences are proposed to split existing pastures. Construction of fences, will not adversely impact riparian areas or stream channels. The key reach in Blevins Wash may be difficult to manage successfully by monitoring due to its small size and vulnerability. If it is found that it cannot be successfully managed by monitoring, it is proposed to exclude this reach with fencing. If excluded from grazing, the effects would be the same as for the No Grazing Alternative. By fencing these riparian areas, there may be more concentrated use at the remaining waters in a pasture. However, in most cases, water will be provided from the riparian area to outside the fenced areas. In these cases, the impacts to the riparian areas are discussed in the water developments heading in this analysis. Fences to split pastures may allow better distribution of cattle.

Seasonal Grazing Alternative

Because fencing proposed for this alternative is the same as those in the proposed action impacts of this alternative would be similar to the Proposed Action.

No Grazing Alternative

No new fences are proposed under the No Grazing Alternative. Therefore, there would be no effects.

Water Developments

The riparian vegetation, especially the herbaceous component, often has very low species diversity with low cover and density. Recovery of herbaceous vegetation is critical for recovery of the stream channel. The success that alternative waters may have in limiting livestock watering in riparian areas is a function of season, topography, vegetation, weather, and behavioral differences among animals (George et al. 2011). Using water developments to attract cattle away from riparian areas works best on gentle slopes and becomes less effective as slope increases (George et al. 2011).

Removing water from streams and springs will also reduce water available for riparian vegetation and may cause mortality, diminish the density, or cause a shift to more xeric vegetation, and reduce the likelihood of stream channel and riparian area recovery. Effects of any new water developments will be minimized by use of the groundwater policy and Best Management Practices (BMPs). Any water use will not exceed the amount claimed on water rights filings. All new water rights filings and well registrations will be in the name of the United States per FSM 2541.22b (USDA 2007).

Alternative water sources could lead to better cattle distribution (Holechek 1997). However, placing new waters in areas that have received little use may cause new areas of heavy use (McAuliffe 1997).

With continued drought and higher temperatures, small water sources may dry up leaving less water for cattle and wildlife. Piping water away from riparian areas for use by cattle may reduce water available for riparian vegetation, and in combination with a dryer climate may cause mortality of riparian vegetation (Serrat-Capdevila et al. 2007).

Proposed Action

New developments would place troughs (drinkers) away from riparian areas. Wells would be drilled away from drainages. Stock tanks would be developed in areas with few or unreliable waters. Piping water away from riparian areas for use by livestock could draw cattle away from riparian areas thereby reducing use and time spent in riparian areas, but does not assure that livestock use will be incidental (George et al. 2011). Much of available livestock water occurs in stream channels. The stream channels are not in stable condition.

Construction of pipelines, storage tanks and wells, will not adversely impact riparian areas or stream channels. Most troughs (or drinkers) will be located outside the riparian area which could have the positive effect of drawing cattle away from riparian vegetation and stream channels (Table 23). The storage tanks and troughs will be supplied by wells and springs. As discussed above, removing water from springs will reduce water available for riparian vegetation and may cause mortality or reduce the likelihood of stream channel and riparian area recovery. The impacts would be less or negligible if water is taken from wells located away from streams and springs.

Table 23: Proposed new water developments.

Storage Tanks	Wells	Troughs	Spring Developments	Pipelines
17	1	40	1	32

Troughs proposed within or near a riparian area would have a detrimental effect on the riparian area by drawing cattle to the riparian vegetation (Table 24). Wells located in or near stream channels have the potential to pump surface water, reducing the amount of water for riparian vegetation.

Table 24: Proposed troughs and wells located in or near riparian areas

Pasture	Stream Name	Comments
Kenny	Devore Wash	trough in channel
Rip	Hicks Wash	trough near channel
Murphy	Devore Wash	well near Murphy Spring

Supplying water in new areas may cause heavy use in those areas.

Seasonal Grazing Alternative

Because water developments proposed for this alternative are the same as those in the Proposed Action, impacts of this alternative would also be similar to the Proposed Action.

No Grazing Alternative

No new water developments are proposed under the No Grazing Alternative. Therefore, there would be no effects.

Direct and Indirect Effects of Livestock Management Practices

Effects of Use of Salt or Low Moisture Blocks

Using attractants such as salt or low moisture blocks could lead to better cattle distribution. However, the use of attractants to draw cattle away from riparian areas works best on gentle slopes and becomes less effective as slope increases (George et al. 2011). Under the Proposed Action and the Seasonal Grazing Alternative, the use of these attractants may be used as a management tool to increase cattle distribution or attract cattle away from other areas such as riparian areas. Salting (away from stream channels) is an important management practices which would help limit use in riparian areas. Under the No Grazing Alternative, no cattle would be authorized, and therefore no attractants would be used.

Effects of Herding

Herding can reduce the amount of time cattle spend in riparian areas and use on riparian vegetation (George et al. 2011). Under the Proposed Action, herding cattle away from riparian areas to other areas of the pasture would protect riparian areas from over use. However, herding is sometimes accomplished by trailing cattle through a stream channel, which can impact the vegetation physically by trampling and cause high alteration of streambanks. Additionally, herding cattle away from riparian areas will possibly allow the cattle to remain in the pasture longer since it would take longer to reach riparian vegetation use thresholds. Under the Seasonal Grazing Alternative, effects would be similar to the Proposed Action. Herding cattle away from riparian areas may be simpler under this alternative because they may be less likely to seek these areas to escape the summer heat. Under the No Grazing Alternative, no cattle would be authorized, and therefore no herding would occur. However, it is possible herding would be authorized to remove cattle from the Allotment which would have similar effects to the Proposed Action but for a much shorter period of time.

Direct and Indirect Effects on Watershed Condition Assessment Ratings

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

The following watersheds have too small an area within the project area to affect the watershed rating:, Lower Pinto Creek, Yankee Joe Canyon-Salt River, Middle Pinto Creek, Meddler Wash-Salt River, Corral Creek, Chalk Creek, and Middle Pinal Creek.

Under the No Grazing Alternative, or with successful mitigation measures under the Proposed Action or the Seasonal Grazing Alternative the riparian vegetation condition and large woody debris ratings could improve one condition class, but would not improve the overall rating on the Horseshoe Bend Wash and Sycamore Canyon-Salt River watersheds.

Under the No Grazing Alternative or with successful mitigation measures under the Proposed Action and Seasonal Grazing Alternatives the riparian vegetation condition and large woody debris ratings could improve one condition class, which would improve the overall rating for Shute Springs Creek-Salt River from functioning at risk to functioning properly and Lower Pinal Creek from Impaired to Functioning at risk.

Channel shape and function 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.

Consistency with Riparian Area Management Direction

Proposed Action

This alternative should meet the intent of Forest Plan direction to protect, manage, and restore riparian areas if the described mitigation measures are successful. The mitigation measures have a high probability of success for the key reaches in Table 9 labeled “Yes” in the Manage by Monitoring column. If the key reaches in Table 9 labeled No in the Manage by Monitoring column are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they will also have a high probability of success. Stream channels that are used for trailing cattle would be unlikely to meet the intent of the Forest Plan.

Seasonal Grazing Alternative

This alternative should meet the intent of Forest Plan direction to protect, manage, and restore riparian areas if the described mitigation measures are successful. The mitigation measures have a high probability of success for the key reaches in Table 9 labeled “Yes” in the Manage by Monitoring column. If the key reaches labeled “No” in the Manage by Monitoring column are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they will also have a high probability of success. Stream channels that are used for trailing cattle would be unlikely to meet the intent of the Forest Plan.

No Grazing Alternative

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

Cumulative Effects Common to All Alternatives

The existing condition of streams and riparian areas on these allotments is the result of the cumulative effects of historic and recent management, natural disturbances, and the interaction between these two agents of change. This discussion includes the 6th code watersheds listed in Table 10 and begins with the settlement of lands in the vicinity of Globe and the surrounding area in the 1870s.

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

Mining also had a large impact, especially in the eastern part of the project area. In 1875, silver was discovered in Richmond Basin. Subsequently, the Mack Morris Mine was established and a ten-stamp mill was installed on Pinal Creek to reduce its ore (Dobyns 1981). There were also smelters and mills in operation in Globe and Miami. In the early 1880s, when the production of copper surpassed silver and gold, three water jacket furnaces were built on Pinal Creek (Dobyns 1981). All these mining operations required huge amounts of wood for fuel and building purposes which resulted in severe depauperation of timber in the surrounding areas (Dobyns 1981), including the Hicks-Pikes Peak Allotment. Pinal Creek was also subjected to placer mining (Dobyns 1981). There are several small, dispersed mines (active and inactive) and mining related activities within the project area.

Salt cedar has replaced native riparian woody species in many places on the Salt River. Because of its tolerance for a large range of habitats, it can frequently out-compete native riparian woody species, reducing riparian diversity.

Recreation activities, such as camping, can impact beaches and riparian vegetation along the Salt River. Recreationists within the wilderness area are required to carry out their solid waste, but if not done may contribute to *E. coli* in the river (see recreation report).

There is a public sand and gravel pit on Hicks Wash near SR 88. This activity contributes sediment to the system and prevents the channel from functioning properly at the site.

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

Other activities and management actions that have occurred within the watersheds include road development, lack of road maintenance, off-road vehicle use (authorized and unauthorized), fire suppression, juniper treatments, vegetative maintenance beneath power lines, sand and gravel removal pits, prescribed fire, and wildfires. These activities can cause short and/or long-term sedimentation into stream channels.

Climate change presents additional considerations. According to the most recent Arizona Drought Monitor Report for January 2018 (ADWR 2018), Arizona is experiencing a long term severe and sustained drought that began in the early 1990’s. The most recent quarterly report displays southeast Gila County as experiencing moderate to severe long term drought conditions (ADWR,

2018) 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). Region 3 of the Forest Service has implemented a drought policy as a manual supplement (USDA Forest Service, 2006). This policy is implemented when the Standardized Precipitation Index (SPI) for a particular Arizona Climate Division (as defined by NOAA) reaches a value of minus 1 or less (larger negative number) for the preceding 12 month period.

Proposed Action

The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions (cumulative effects discussed above), are likely to result in attainment of desired conditions for the riparian areas labeled Yes in the Manage by Monitoring column of Table 9 but at a slower rate than the No Grazing Alternative. If the key reaches labeled No are rested until they regain sufficient accessible, palatable riparian vegetation to use the annual use monitoring guidelines to manage them, they too are likely to attain desired conditions at a slower rate than the No Grazing Alternative. If they are grazed before they regain sufficient accessible, palatable riparian vegetation, it is unlikely they will improve or attain desired conditions.

With continued drought and higher temperatures, in combination with piping water away from riparian areas for use by cattle, it is possible that some of the smaller springs may dry up. There may be mortality of riparian vegetation even on some larger springs.

Seasonal Grazing Alternative

Cumulative effects of this alternative would be similar to the proposed action.

No Action

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 and water developments should allow the most rapid rates of recovery. Where riparian vegetation is meeting desired conditions this alternative would provide the most protection for maintaining those conditions.

Soil Resources

Affected Environment

Earlier sections of this document detail the existing conditions for soils on the Hicks-Pikes Peak Allotment.

Environmental Consequences

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

Assumptions and Methodology

Soil condition is an evaluation of soil quality based on an interpretation of factors which effect vital soil functions. These functions are: The ability of the soil to hold and release water (hydrologic function), the ability of the soil to resist erosion and degradation (soil stability), and the ability of the soil to accept, hold and release nutrients (nutrient cycling). Soils are evaluated and assigned a soil condition category which is a reflection of the status of soil function[17]. Field validating every delineation for purposes of collecting on-site specific information would not be practical. Some of the soil condition classes are based on theoretical approaches and methods generally accepted in the scientific community. Consequently, the soil condition classes should be used as a coarse-filter technique to assign gross range condition classes per vegetation type.

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

Direct and Indirect Effects of Both Alternatives

Authorization

Soil Condition

Hoof action of cattle can cause direct impacts by compacting soils. Grazing can, under certain conditions, increase planting of grass seeds and seedling emergence (Winkle 1991). 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). Therefore, the quickest and most likely recovery from soil compaction due to past grazing activities would occur with complete protection from grazing. The soil conditions that are currently less than satisfactory are largely attributable to the combined effects of historic grazing and current management. Soil condition is expected to improve on the allotment under current

[17] More information can be found in the Soils section of Chapter 1.

management. However, measureable soil improvement happens slowly, and will likely take more than the ten year time frame of this project under either alternative.

If the allowable use guidelines that are prescribed in the Proposed Action are not exceeded, soil condition in areas of impaired and unsatisfactory soil condition class should continue to improve (47 percent of Hicks-Pikes Peak Allotment soils). However, the improvement is not likely to be as fast as would occur under the No Grazing Alternative. Even with good management, flatter areas will still have a tendency to receive heavy use since these areas are favored by livestock. Key areas, established to monitor cattle use, are normally on flatter, more open areas. If monitoring of grazing intensity of these areas shows acceptable use, other parts of a pasture can be expected to have acceptable levels of impacts.

Cattle indirectly impact soils by removing vegetation resulting in a loss of protective cover including litter. The loss of vegetation and litter reduces infiltration and exposes the soils to raindrop impact and overland flow thus leading to soil crusting and increased erosion. The reduced cover can also result in a loss of soil organic matter and a reduction in soil microbes which play a significant role in nutrient cycling. Soils that are lower in organic matter have poorer structure which also affects infiltration and root growth. As long as these vegetation use thresholds are adhered to, enough litter would be allowed to remain on the forest floor to mitigate these effects on the Hicks-Pikes Peak Allotment. The Proposed Action includes monitoring and management practices to respond to monitoring which would ensure allowable vegetation use thresholds are not exceeded. In the No Grazing Alternative, this monitoring would not be necessary and would not occur. Liter would accumulate at natural rates. However, with no vegetation removed by cattle and less monitoring, existing seed of invasive vegetation such as invasive grasses could also grow unchecked or unnoticed under the No Grazing Alternative.

Biological (cryptogamic) crusts (biological crusts) play an important role in some ecosystems, especially Sonoran Deserts, and to a somewhat lesser extent, other ecosystems in the analysis area. Biological crusts bind and protect soil from both water and wind erosion. Grazing can have detrimental effects on the amount of biological crusts that are retained (Beymer, 1992). Biological crusts on sandy soils are less susceptible to disturbance when moist or wet; on clay soils, when crusts are dry. In general, light to moderate stocking in early-to mid-wet season is recommended (Forest Service 2001). Grazing may slow or prevent the recovery of biological crusts. Since the Proposed Action proposes light to moderate stocking in early-to mid-wet season, this alternative is anticipated to have a minimal effect on biological crusts on the Hicks Pike Peak Allotment. The No Grazing Alternative would generally have a beneficial effect on biological crusts. However, some disturbance would still occur as cattle are removed from the Allotment and as range improvements are removed.

Slope

Soils most likely to have impaired or unsatisfactory soils occur on flatter areas or on gentler slopes. Because of the tendency of cattle to use flatter, especially if they are fairly open, these are also the areas most likely to be used by livestock. These flatter areas are likely to continue to receive a substantial amount of use under the Proposed Action to the degree that cattle are allowed to access them.

Slope is one factor which can predict where cattle may congregate. Holechek reports that cattle tend to use ten to 30 percent slopes thirty percent less often than zero to ten percent slopes and 30 to 60 percent slopes sixty percent less often than flats. Slopes over 60 percent are seldom used (Holechek, 1992). As shown in Table 3, approximately 25 percent (16,528 acres) of the Hicks-Pikes Peak Allotment has a slope of 15 percent or under. These areas would receive the highest use to the degree that cattle would be allowed to access them. However, the Proposed Action includes fencing and water improvements in the pastures associated with the highest amount of these acres, (Horseshoe Bend, Windmill, Ortega, and Lower Shute Pastures). These improvements are designed to exclude cattle or better disperse cattle, reducing the effects to these low slope areas. Improvements are also more concentrated in the Proposed Action in areas within the 15 to 40 percent slope range, which covers approximately 44 percent of the allotment (29,646 acres). These improvements would also reduce effects to these areas. The remaining 31 percent of the allotment, (68,497 acres) is mapped as 40 percent slope or greater. Trailing by cattle on steeper slopes can physically displace soils, leading to erosion. As cattle will be least likely to use these areas, minimal effect is anticipated under the Proposed Action. Under the No Grazing Alternative, cattle would be removed from the Allotment which would remove effects from cattle on all areas.

Range Improvements

The effects of installing or removing range improvements (fence construction, tank construction or improvement, etc.) would be a minor, localized, short-term disturbance to soils. Range improvements can have slight, localized, short-term impacts to soils during construction. Building fences and developing waters will indirectly benefit soils by improving distribution of cattle resulting in a net positive effect across the Allotment. 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. Under the No Grazing Alternative, existing improvements would be removed or assigned to neighboring permittees to maintain. For improvements that are assigned to neighboring permittees, soils would be affected to the same degree that they would under the Proposed Action.

Livestock Management Practices

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

of a designated wilderness area. However, this use would occur on a very limited basis, dispersed in time and space, and areas of high erosion risk and traveling when the soil is wet can be avoided. As such, risks to soils from this activity would be expected to be minor and short-term. Under the No Grazing Alternative, the neighboring permittee would be authorized to use a motor vehicle to inspect, repair or remove range improvements if assigned to them for maintenance responsibility, having similar effects to soils in those relevant areas as the Proposed Action. However, there would be no effects to soils from the permittee managing cattle using a motor vehicle under the No Grazing Alternative.

Cumulative Effects

Cumulative effects include the direct and indirect effects of the proposed action and alternatives when added to all past, present, and reasonably foreseeable future actions. Past grazing actions have resulted in soil erosion and compaction while current management has, in some cases, prevented or slowed recovery of soil condition. Cattle treading on soils has the potential to effect soil bulk density (compaction), increase erosion, and create animal trails. Compaction of soils reduces the infiltration and percolation of rain, increasing runoff and thereby increasing erosion. Erosion and subsequent sedimentation increases may also be experienced from the removal of vegetation due to heavy grazing. The areas with unsatisfactory soil condition, (26 percent of the Allotment), and the impaired soil condition, (21 percent of the Allotment), occur on the flattest parts of the Allotment. These conditions were most likely caused from grazing practices over the last century and are reflected in the existing condition. Past grazing actions have resulted in soil erosion and compaction while current management has, in some cases, prevented or slowed recovery. Even with no grazing, it is very unlikely that any measurable or unfavorable foreseeable changes (regarding soils) would occur over the period of time allowed for grazing.

Improperly maintained roads can cause soil erosion where runoff from roads is allowed to concentrate. Roads can be a source of concentrated runoff which can lead to localized soil erosion downslope from roads. Unauthorized cross-country motor vehicle travel can negatively impact soils and vegetation through direct impacts on soils and removal or degradation of herbaceous or woody vegetation. Until the Tonto National Forest's Travel Management Plan can be implemented, effects of unauthorized cross-country motor vehicle travel are expected to continue including on the Hikes Pike Peak Allotment. Because no or minimal direct and indirect effects to soils are anticipated from grazing authorization on the Hikes Pike Peak Allotment, no significant cumulative effects are expected when added to the effects of existing motor vehicle management.

Higher temperatures and lower precipitation are predicted for the southwestern United States (Garfin et al. 2013). Other activities and management actions that have occurred in the past or are presently occurring in the analysis area are as follows. Effects from all past and present activities are reflected in the existing condition.

- Introduction of non-native invasive plants
- Wildfire
- Recreational camping
- Introduction and spread of noxious weeds

Cumulative Effects from Proposed Action

The direct and indirect effects of the Proposed Action, when combined with other past, present or reasonably foreseeable actions as listed above, are likely to result in attainment of desired conditions for soils and vegetation but at a slower rate than for the No Grazing Alternative. The soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, heavy recreation use in certain areas, and heavy off-road vehicle use in certain areas. In some high use areas, no improvement is expected. Warming and drying of the climate could increase the risk of wildfire especially in fire-dependent ecosystems. Climate change presents additional considerations for grazing. While the changes that may occur are difficult to predict, livestock management practices included in the Proposed Action should allow grazing management to respond to climate variations by adjusting cattle numbers and duration and season of grazing in response to these environmental factors. Additionally, as discussed in the Proposed Action, Regional Forest Service policy provides further direction for addressing drought on rangelands. Implementing the proposed action is not anticipated to have significant effects to soils and vegetation when combined with overlapping effects from past, present, and reasonably foreseeable actions.

Cumulative Effects from No Grazing

The direct and indirect effects of this alternative, when combined with other past, present or reasonably foreseeable actions as listed above, will generally be beneficial to soils and vegetation and provide the best potential for attaining the desired conditions more quickly than the Proposed Action. Removing grazing from the Hike Pike Peak Allotment would allow impaired and unsatisfactory soils, often affected by compaction, to recover. The soil conditions that are currently less than satisfactory are largely attributable to the cumulative effects of historic grazing, heavy recreation use in certain areas, and wildfires. Grazing can affect the recovery of certain species within chaparral communities impacted by fire. No grazing would benefit these communities. Even with continuous rest, the rate of recovery is expected to be slow for most areas. Climate change presents additional considerations. Warming and drying of the climate could increase the risk of wildfire especially in fire-dependent ecosystems.

Recreation Resources

Hicks Pikes-Peak Allotment is composed of parts of two Management Areas, as delineated in the Forest Plan, with differing recreational uses; Management Area 2F, the Globe Ranger District General Management Area (non-wilderness area), and Management Area 2B, the Salt River Canyon Wilderness Area (wilderness area).

Non-Wilderness Management Area

Affected Environment

The Forest Plan includes direction to manage this area for “dispersed recreation” (p.85). The portion of the Hicks Pikes-Peak Allotment in this management area hosts a variety of recreational activities including off-highway vehicle (OHV) use, scenic driving, camping, horseback riding, mountain biking, picnicking, hiking, wildlife viewing, hunting, and target shooting.

The Forest Plan assigns a Visual Quality Objective (VQO) for the purpose of maintaining or enhancing the scenic qualities of forest landscapes. Visual Quality Objective Classes represent different degrees of acceptable alterations to national forest landscapes[18]. Visual Quality Objective Classes that apply to the non-wilderness management area range from "Retention" to "Maximum Modification" with 8% Retention, 24% Partial Retention, 34% Modification, and 34% Maximum Modification (Forest Plan p.85). Within the Hick-Pikes Peak Allotment, the most stringent Visual Quality Objective Classes in the non-wilderness management area is "Partial Retention", which provides "that in general man's activities may be evident but remain subordinate to the characteristic landscape."

Environmental Consequences

Direct and Indirect Effects of the Proposed Action

The Proposed Action would increase the amount of visible range improvements that recreational users experience. Some of these improvements, water troughs for instance, may be visible to those participating in horseback riding and hunting activities. Increasing the amount of visible range improvements will negatively affect the Visual Quality of the area, but it is likely that, while these improvements will be evident, they will "remain subordinate to the characteristic landscape", in keeping with the Forest Plan. Therefore there would be no significant effect to visual quality in the non-wilderness management area from the Proposed Action.

Direct and Indirect Effects of the No Grazing Alternative

For the portion of the Allotment in non-wilderness management area, the No Grazing Alternative, would allow for the removal of many of the existing range improvements and consequently enhance the Visual Quality of the area. This would have a beneficial effect on activities such as scenic driving, mountain biking, hiking, horseback riding, and camping. Even if existing range improvements are not removed, no new improvements would be built and the existing improvements would "remain subordinate to the characteristic landscape", in keeping with the Forest Plan. Therefore there would be no significant effect to visual quality in the non-wilderness management area from the No Grazing Alternative.

Wilderness Area

Affected Environment

The 32,100 acres of land that comprise the Salt River Canyon Wilderness, were incorporated into the National Wilderness Preservation System in the *Arizona Wilderness Act of 1984*. Although backpackers sometimes access the river by hiking down side creeks, there are no system trails in the Salt River Canyon Wilderness, so recreational access is primarily accomplished by white-water boating. Characteristics that add value to this recreation setting include challenging river rapids, spectacular scenery, dramatic geology, natural salt deposits, archaeological sites, lush stream and river vegetation, and perennial side streams.

[18] More information on Visual Quality Objective Classes can be found in Appendix B.

The Tonto National Forest Salt River Canyon Wilderness Implementation Plan (Implementation Plan) was developed to assist management within this area. This document was never amended into the Forest Plan as a whole. However, it provides site-specific management guidance to the benefit the resource. The Implementation Plan states that a Limits of Acceptable Change concept "will be used to assess acceptable conditions in the Wilderness, establish a program of monitoring conditions, and evaluate management effectiveness" and that "management of the recreation resource will be consistent with the specified Wilderness Opportunity Spectrum Class." The Implementation Plan sets the Limits of Acceptable Change standards for the Wilderness segment of the Upper Salt River. The plan directs management personnel to inventory and evaluate Limits of Acceptable Change indicators on a continuing basis using the Tonto National Forest Campsite Inventory and Analysis Form. Recreation personnel have gathered campsite inventory data since 1991. At present, in the Salt River Canyon Wilderness, the Limits of Acceptable Changes are in keeping with the desired conditions for recreation.

At the time of its inclusion into the National Wilderness Preservation System, forest users could travel by boat on the Salt River through the project area and see nothing constructed by man other than the road and range improvements within the private inholding at Horseshoe Bend. This remains true, and the Wilderness character of the Salt River Canyon Wilderness has remained intact.

Environmental Consequences

Three main concerns were identified concerning grazing authorization and range improvements within the wilderness management area. Project activities would need to maintain the wilderness character of the Salt River Canyon Wilderness, maintain the Wild and Scenic River eligibility and the outstandingly remarkable values of the Upper Salt River, and to manage the Visual Quality Objective for "Preservation".

Maintaining Wilderness Character

The *Wilderness Act of 1964* established a "National Wilderness Preservation System to be composed of federally owned areas designated by Congress as 'wilderness areas', and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness." (WILDERNESS ACT Public Law 88-577 (16 U.S. C. 1131-1136), 1964).

The *Wilderness Act* defines wilderness as "in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man and where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and

unconfined type of recreation" (WILDERNESS ACT Public Law 88-577 (16 U.S. C. 1131-1136), 1964).

Special provisions are made within the *Wilderness Act* pertaining to grazing. "the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture." (Section 4(d)(4)(2)) Additionally, "as stated in the Forest Service regulations (36 CFR 293.7), grazing in wilderness areas ordinarily will be controlled under the general regulations governing grazing of livestock on National Forests. This includes the establishment of normal range allotments and allotment management plans. Furthermore, wilderness designation should not prevent the maintenance of existing fences or other livestock management improvements, nor the construction and maintenance of new fences or improvements which are consistent with allotment management plans and/or which are necessary for the protection of the range" (FSM 2323.22).

For the wilderness management area, the Forest Plan states, "The primary emphasis for this area is the preservation of naturally occurring flora and fauna, and esthetic values while providing a very high quality white-water river-running experience."(p.77) Livestock grazing has been authorized within the project area, including within the designated Wilderness Area since before the Wilderness was designated. Currently, the portion of the Salt River Canyon Wilderness in the project area has maintained its outstanding opportunities for solitude and primitive and unconfined type of recreation, and its resulting Wilderness character. The Upper Salt River continues to enjoy a national reputation as a very high quality white-water river-running experience. The vast majority of forest users traveling through the project area are able to perceive the Wilderness as "retaining its primeval character and influence, without permanent improvements or human habitation" in that it "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable".

Direct and Indirect Effects of the Proposed Action

Under the Proposed Action, range improvements would be constructed in the Salt River Canyon Wilderness and negatively affect the Forest's ability to retain the "primeval character and influence" of the Wilderness. By placing permanent improvements within the viewshed of forest recreational users, as defined by the foreground layer of the Upper Salt River Viewshed Map, (Figure 8). (which was created by with a computer viewshed model using points in the middle of the river every 1/16 of a mile with a viewer height of 5 feet), proposed range improvement 2F will place 1,998 feet of newly constructed fence in the foreground view of recreational users on the river. This visual effect is somewhat mitigated by its proximity to Forest Road 219, and range improvements on the private land, which are also visible in the area.

Any *additional* proposed range improvements would be constructed according to the sideboards listed in the Proposed Action. This means they will be constructed beyond the viewshed of the Upper Salt River and constructed with non-reflective materials. While they may affect the wilderness character of the Salt River Canyon Wilderness, they will largely go unperceived by the majority of Wilderness users and consequently should only have a small effect on their opportunity for a primitive and unconfined type of recreation, or the high quality of their white-water river-running experience.

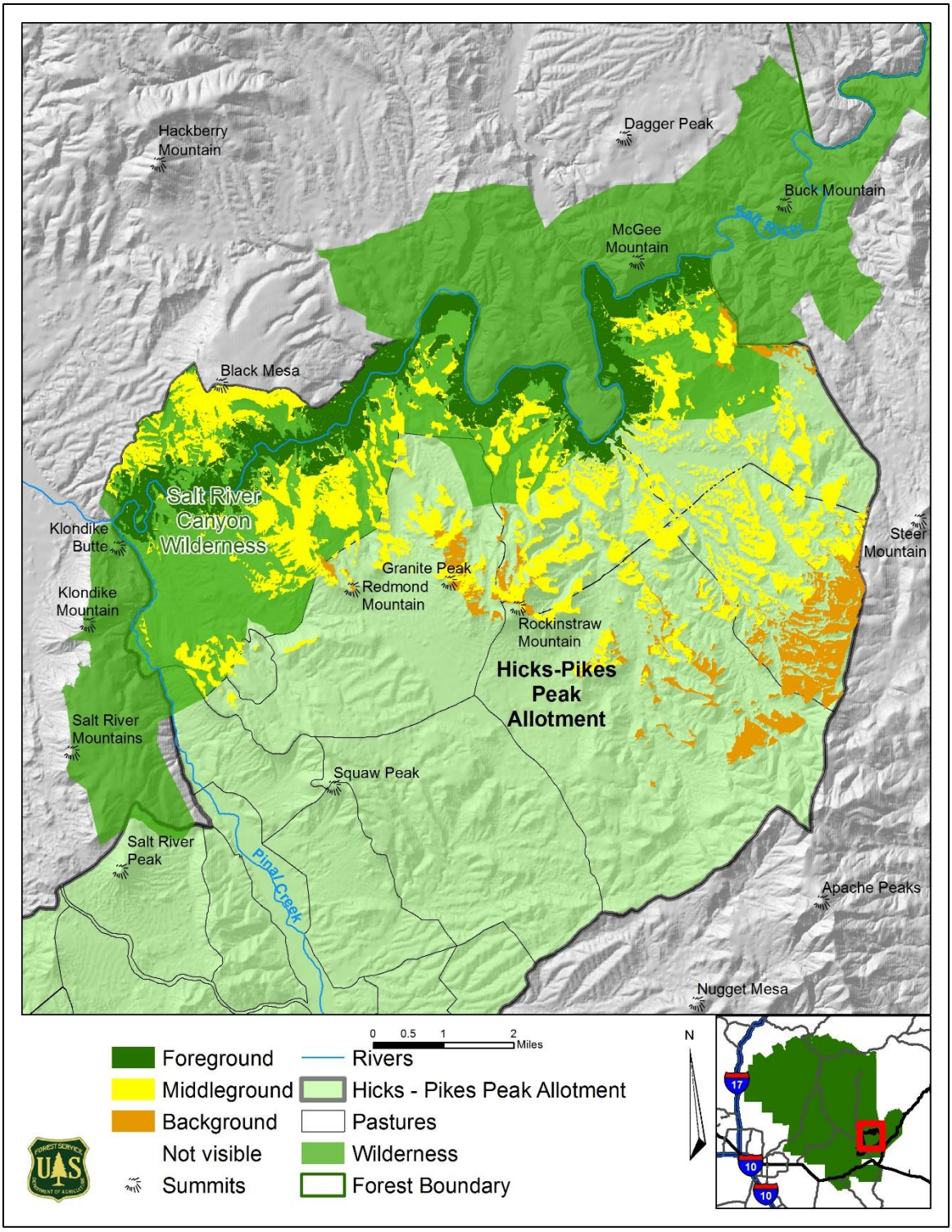

Figure 8: Map of the Viewshed of the Salt River Canyon Wilderness and the Hicks-Pikes Peak Allotment from the Upper Salt River

Direct and Indirect Effects of the No Grazing Alternative

The No Grazing Alternative would enhance wilderness character by allowing for the removal of a few existing range improvements. This alternative would allow the Forest to continue to provide a very high quality white-water river-running experience, and contribute to the Forest's ability to maintain the preservation of the wilderness character the Salt River Canyon Wilderness had at the time of its designation in 1984.

Maintaining Wild and Scenic River Eligibility and the Outstandingly Remarkable Values of the Upper Salt River.

The Forest Plan instructs: "The portion of this management area from near the Highway 288 Bridge upstream to the Fort Apache Reservation boundary was studied by the Forest Service for inclusion in the National Wild and Scenic Rivers System at the direction of the US Congress. Present management emphasis will not preclude future Congressional designation of this river." (p.77)

The *Wild and Scenic River Study Report and Environmental Impact Statement* found the segment of river in the project area to have Outstandingly Remarkable Values (ORVs) for Scenic, Recreational, Ecological, Wildlife and Geological Values, and recommended, "Wild designation of 22 miles of the Salt River as a component of the National Wild and Scenic Rivers System" for this segment of the Upper Salt River Corridor. This segment of river, from Lower Corral Canyon to the Highway 288 Bridge, remains eligible for inclusion in the National Wild and Scenic Rivers System as a "Wild River Area" (the most stringent designation, the two eligible sections upstream being 'Scenic River Area' and 'Recreational River Area').

Under "Interim Protection Measures for Eligible or Suitable Rivers" Forest Service Handbook 1909.12 directs "Responsible Officials shall apply these measures on National Forest System lands"… "Forest Service-identified eligible and suitable rivers must be protected sufficiently to maintain free flow and outstandingly remarkable values unless a determination of ineligibility or non-suitability is made." (FSH 1909.12, Sec.83.4) Under "River Termini and Area Boundaries" the river study area is defined; "Consider the entire river system, including the interrelationship between the main stem and its tributaries and their associated ecosystems which may contain outstandingly remarkable values. At a minimum, a river study area includes the length of the identified river segment (sec. 82.62) and the land within one-quarter mile of each river bank's ordinary high water mark along the river segment. The river corridor to be studied may be wider to include areas beyond the minimum one-quarter mile from a bank's high water mark that may be needed to protect river-related outstandingly remarkable values, other important river resources or facilitate management of the river area." (FSH 1909.12, Sec.82.61)

Forest Service direction is also provided for managing livestock use within these river corridors. For eligible wild rivers, "Domestic livestock grazing should be managed to protect identified river values. Existing structures may be maintained. New facilities may be developed to facilitate livestock management so long as they maintain the values for which a river was found eligible or suitable, including the area's essentially primitive character." (FSH 1909.12(84.3)(10)) Similar direction is also provided for eligible Scenic and Recreational river segments.

Direct and Indirect Effects of the Proposed Action

Under the Proposed Action, range improvements would be constructed in the one quarter mile river study area in the Salt River Canyon Wilderness and negatively affect the Forest's ability to preserve the scenic and recreational Outstandingly Remarkable Values. The proposed range improvement 2F will place 1,998 feet (less than one third of a mile) of newly constructed fence in the wilderness, in the foreground view of recreational users on the river. This visual effect is somewhat mitigated by its proximity to forest road 219, and the private land range improvements which are also visible in the area.

Any *additional* proposed range improvements would be constructed according to the sideboards listed in the Proposed Action. Therefore, they would be constructed beyond the viewshed of the Upper Salt River, as defined by the foreground layer of the Upper Salt River Viewshed Map, (Figure 8). This will place them beyond the one quarter mile river study area where they will not impact the river study area, so they should not greatly impact the Outstandingly Remarkable Values or the rivers eligibility as a "Wild River Area".

Direct and Indirect Effects of the No Grazing Alternative

The No Grazing Alternative would not add any additional improvements to be built within the river corridor and would allow the Forest to continue to protect the Scenic and Recreational *Outstandingly Remarkable Values* in the project area.

Manage the Visual Quality Objective for "Preservation"

For the wilderness management area, the Forest Plan tasks the Forest to, "Manage for the VQO of Preservation". (p.77) A Visual Quality Objective of "Preservation", the most stringent designation, is defined as "A Visual Quality Objective that provides for ecological changes only". In contrast, the next most stringent designation, "Retention", is defined as "A Visual Quality Objective that in general means man's activities are not evident to the casual forest visitor".

Direct and Indirect Effects of the Proposed Action

Under the Proposed Action, range improvements would be constructed in the Salt River Canyon Wilderness and proposed range improvement 2F will place 1,998 feet (less than one third of a mile) of newly constructed fence in the foreground view of recreational users on the river. This will impact the Forest's ability to manage this area for a Visual Quality Objective of Preservation. This impact would be somewhat mitigated by the fact that this fence will be connected to the existing visible fence on the private inholding at Horseshoe Bend.

If the *additional* proposed range improvements are constructed according to the sideboards listed in the Proposed Action then they will be constructed beyond the viewshed of the Upper Salt River, and while they will negatively affect the Forest's ability to manage the Salt River Canyon Wilderness for a Visual Quality Objective of Preservation, they will generally not be evident to the casual forest visitor, and will help the Forest to manage to a Visual Quality Objective of Retention, other than where proposed range improvement F2 is visible. This visual effect is somewhat mitigated by its proximity to forest road 219, and the private land range improvements, which are also visible in the area.

Direct and Indirect Effects of the No Grazing Alternative

The No Grazing Alternative would allow the Forest to continue to manage the project area for the Visual Quality Objective of Preservation, perhaps enhancing it by removal of the few existing range improvements.

Cumulative Effects to Recreation

The Forest Service issues permits to four commercial outfitters whose services include taking groups to raft down the Upper Salt River. The outfitter's clients are from all over the United States, with the majority coming from the four corners region. These small businesses book half-day, full-day, and multi-day overnight trips on the Upper Salt River. Bookings vary yearly with the snowpack and water level. In 2010, a year with normal snowpack, the outfitters sold 8,098 user days (one person on the river for one day), grossing a total of $774,935.

From March 1 to May 15 the Forest Service requires a permit for private boaters (people with their own boats who wish to organize their own trips) to boat through the Salt River Canyon Wilderness. Private boaters may pay the $10 application fee to be included in the yearly random drawing for special recreation permits. There are four of these permits available, for trips of up to fifteen people, for each of the 76 days of the permitted season, or 304 available permits. There is a one-time fee of $125 for each permit. In 2010, 1,792 people applied, and 282 permits were issued, to boat through the Salt River Canyon Wilderness, generating $53,170 in permit fees.

Private boater application data shows that boaters come from as far away as Massachusetts and Alaska. Most applicants are from urban areas, in the southwest. Sizable populations from the Northwest, California, and Texas also apply. While it is known that, through spending on gas, food, lodging and other items, river recreationists contribute to local jobs and revenue, no study has been conducted to determine the amount of revenue that boaters provide to the communities near the Upper Salt River. Given that almost all of the commercial and private boaters are from outside the Globe/Miami area, boating on the Upper Salt River is certainly one of this local community's largest source of ecotourism. While those floating on the river may see an approximately 2,000 foot (approximately one third of a mile) fence during a part of their trip, the encounter would be brief and would not significantly affect their overall experience. The fence would be constructed to keep cattle from accessing the Upper Salt River while they are in the adjacent pastures. It would be made of non-reflective surfaces, and would likely have vegetation growing around it at many points to further mitigate the visual impacts. Since the overall user experience would not be significantly affected, it would be unlikely to affect either the private user or revenue for the small businesses and local economy.

Commercial and private boaters on the Upper Salt River must practice leave no trace camping and have a number of special regulations that they must follow. These include containing their fires in a firepan so as not to leave a mark on the beach and carrying and using a human waste removal system. As cattle would not be allowed to access the beach, there would be no cumulative effects from grazing authorization to beach cleanliness.

Fire and Fuels

Affected Environment

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

Environmental Consequences

Assumptions and Methodology

The Proposed Action and the No Grazing Alternative were evaluated by considering the effects of livestock grazing to the fire regime and fire regime condition class for each vegetation type within the Allotment. The effects of range improvements and livestock management practices was also considered.

Fire Regime

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

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

Fire Regime Condition Class

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

are not limited to) fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, and introduced insects and disease (Schmidt *et al*. 2002).

The following three fire regime condition classes[19] are based on deviation from the central tendency. The central tendency is a composite estimate of the reference condition vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated natural disturbances.

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

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

Sonoran Desert Vegetation Type

Sonoran desert comprises approximately 10,000 acres of the Allotment. Very little research exists on fire ecology of the upland Sonoran Desert. However, given the recent history of large fires that have occurred throughout the desert portions of the Tonto National Forest, it is apparent that more dominant plant species (giant saguaro and foothill paloverde) associated with this ecosystem are very intolerant of fire (Narog et al 1995). Post fire studies indicate mortality rates may approach 80 to100 percent in mature stands of saguaro and paloverde (Wilson et al 1996).

The introduction and expansion of non-native plant species, especially grasses, has changed the characteristics of the fuel bed. This vegetation type has been altered with the invasion of red brome (*Bromus rubens*). This grass has greatly contributed to the amount of fine fuels. High rainfall years result in increases in nonnative annual grass biomass (fine fuels) and can result in large fires (Rogers and Vint 1987; Schmid and Rogers 1988). Livestock grazing has been shown to reduce these fine fuels (Hann *et al*. 2003). The Sonoran Desert vegetation type most closely identifies with fire regime group III, infrequent (35 to100 years) mixed severity fires. The mean fire interval is about 75 years with high variation due to year-to-year variation in shrub mortality and grass and forb production related to drought and moisture cycles combined with variation in ignitions and associated fire weather.

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

Direct and Indirect Effects of the Proposed Action

Under the Proposed Action, fire activity should stay at its current level due to grazing of non-native grasses. Grazing reduces non-native fuel loads only when fuels are green and palatable.

Historic livestock grazing and other land management activities significantly modified existing vegetation. The ability for fire to spread and affect large areas across the landscape was significantly reduced. Continued grazing reduces fine fuels and limits fire spread in many vegetation types. Managed grazing, such as is proposed in the Proposed Action, where use is regulated to acceptable levels resulting in healthy grass stands can produce expected/ repeatable fire effects. Consistent herbaceous cover can produce fast moving fires (short duration) that limit brush and tree re-establishment, reduce ladder fuels (torching), and ensure fire moves as a ground fire versus a crown fire. Grass cover can compete against conifer regeneration when the reproduction is not wanted, either because of timing or stocking issues. Understory vegetation can benefit by repeated fire at regular intervals.

Direct and Indirect Effects of the No Grazing Alternative

Non-native grasses would grow without grazing pressure and would increase the possibility of high intensity fire in this vegetation type, which is not fire-adapted. If fire frequency increases, opportunity exists for a vegetative type conversion, as non-native plant species would out compete native, non-fire adapted plants. The fire regime may move from III (mixed severity) to II (high severity). Mean fire interval may move from 75 years to a more frequent interval. Larger fires would produce more smoke, which may impact human populations and designated smoke-sensitive areas.

Semi-desert Grassland

Semi-desert grasslands are limited on the Hicks-Pikes Peak allotment (approximately 10,000 acres) in the foothills where Sonoran Desert transitions to mountain landforms. This vegetation type falls into fire regime group II, characterized by frequent (0 to 35 years) stand replacement fires. The mean fire interval is about ten years with a high variation due to drought, which reduces fire frequency and moist periods that increase fire frequency. Grazing of grassy fuels by livestock may also influence fire mosaic patterns in this vegetation type (Hann *et al* 2003). There have been only a few large fires in this vegetation type over the past forty years on Hicks-Pikes Peak Allotment; one being the 2009 Salt River fire (195 acres), so the mean fire return interval over the entire landscape is too infrequent to meet reference conditions.

Direct and Indirect Effects of the Proposed Action

Fire activity in this vegetation type should remain at current levels if current grazing management continues. Cattle grazing and drought would affect the amount of available vegetation for wildland fire to carry across the landscape.

Lack of fire would extend the mean fire interval beyond 10 years which may alter the fire regime of this ecosystem and allow for an increase in woody plants altering the vegetation type. Continuation of current management may move this vegetation type towards a Fire Regime Condition Class 3 (FRCC3).

Direct and Indirect Effects of the No Grazing Alternative

Mean fire return interval may return to normal in approximately 10 years with no grazing and normal precipitation. Invasive plant species may be pushed back due to increased fire interval. Larger and more frequent fires due to increased fuel availability would produce more smoke which may impact human populations and designated smoke-sensitive areas. With normal precipitation there may be an increase in fire ignitions due to no cattle grazing increasing fuel loading and the higher probability of lightning ignitions and forest visitor ignitions.

Juniper Savanna

The natural fire regime is most likely similar to Inter-Mountain Basins Juniper Savanna (Landfire Biophysical Setting 2511150, 2008) which has a Landfire Fire Regime Group of III (35 to 200 year frequency and mixed severity) and a mean fire interval of 64 years for all fires. Stand replacement fires in this biophysical setting have an average mean fire interval of 345 years. More open areas in the Juniper Savanna may have a Landfire Fire Regime Group II (0 to 35 year frequency and high surface severity) similar to that listed for Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (Landfire Biophysical Setting 1511210, 2007) with an average mean fire interval of 8 years and replacement fire interval of 9.5 years. Alligator Juniper Savanna vegetation type is similar to the description of the Madrean Juniper Savanna (Landfire Biophysical Setting 2511160, 2007) which states the fire regime of this ecological system is not known as well with models placing it in Fire Regime Group III (35 to 200+ year frequency and mixed severity). There are essentially no data about fire frequency, fire history or fire behavior. Fire occurrence was determined primarily by fire occurrence in the surrounding matrix vegetation, and was ignited by lightning during early summer. Average mean fire interval for all fires in the Madrean Juniper Savanna is 46 years and stand replacement fire intervals are 137 years. Fires are typically low-severity (Fire Regime I).

Direct and Indirect Effects of the Proposed Action

Fire activity should remain at its current level due to grazing and soil compaction inhibiting growth of vegetation supportive of carrying wildfire while disallowing fire return interval to return to historic conditions.

Lack of fine fuels in the form of herbaceous growth would not allow fire to spread naturally, reducing the ability to return area to desired conditions. Fires would continue to be infrequent due to lack of fine fuels, but may be more severe at times due to homogenous canopy and increased woody fuel loading.

Fire Regime Condition Class would remain deviated from natural conditions, reducing the potential for frequent, low to moderate intensity fires necessary for restoration of fire adapted ecosystems.

Direct and Indirect Effects of the No Grazing Alternative

Current fire management techniques would continue; any wildfires within the project area would be managed using the appropriate management response. Potential for juniper encroachment combined with an increase in grass and shrub understory may allow for an increase in number of lightning caused wildfires as result of reduced soil compaction and trampling of vegetation by

cattle. Fire return interval may move to more desired conditions as wildfires would more resemble fire under natural conditions for this vegetation type's fire regime.

Juniper Woodland

Two vegetation types consisting of six different plant communities makes this grouping difficult to describe both the existing conditions and the desired future conditions. Species composition and stand structure vary by location primarily due to precipitation, elevation, temperature, soil type and successional phase.

- Alligator Juniper Woodland: This vegetation type was historically similar to the Alligator Juniper Savanna but the density of the tree overstory has greatly increased and, in most cases, the herbaceous cover has decreased. The desired conditions of these two types are the same however the means to obtain them are different. In the Alligator Juniper Woodland it will be necessary to reduce the tree overstory in order to obtain the desired condition of an open park-like setting.
- Pinyon-Juniper Woodland (persistent) is characterized by even-aged patches of pinyons and junipers that at the landscape level form multi-aged woodlands. Very old trees (>300 years old) are present. Tree density and canopy cover are high, shrubs are sparse to moderate, and herbaceous cover is low and discontinuous. Snags and older trees with dead limbs and/or tops are scattered across the landscape. Old growth generally occurs over large areas as stands or forests where old growth is concentrated. Old growth includes old trees, dead trees (snags), downed wood (coarse woody debris) and structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). The composition, structure, and function of vegetative conditions are resilient to the frequency, extent and severity of disturbances (e.g. insects, diseases, and fire) and climate variability. Insects and disease occur at endemic levels.
- Pinyon/Juniper/Oak Woodland: A single desired condition description is difficult for this type due to a large amount of natural variability. Some stands have an open aspect with a grassy understory while others have a closed canopy with little to no understory. Generally the goal is to increase the foliar canopy cover, basal cover, and vigor of desirable perennial grasses, forbs, and half-shrubs (listed as "Increaser" and "Decreaser" species) and increase the cover and vigor of shrubs classified as "A" browse species in the same handbook. In some areas devoid of herbaceous vegetation, desired conditions may not be obtainable without seeding. In areas with dense overstories, mechanical thinning may be required. It may be questioned if it is desirable or pragmatic to try and increase the stocking at all levels. The pure mathematics of space occupancy would infer there is a certain site capacity, when balancing the number of plants at different sizes in different layers. Exceeding optimum stocking will have negative effects on individual tree health and site resilience. In terms of wildfire, wider spacing among trees, less shrubs, and more grass species would lend the site to faster moving, shorter duration, low to moderate intensity fires. The natural fire regimes of Pinyon/Juniper/Oak Woodlands appear to be highly variable depending on the type.

Direct and Indirect Effects of the Proposed Action

Effects would be the same as direct and indirect effects for juniper savannahs.

Direct and Indirect Effects of the No Grazing Alternative

Effects would be the same as direct and indirect effects for juniper savannahs.

Turbinella Oak Chaparral

Fires are typically mixed severity with a moderate frequency (Fire Regime III). Some evergreen shrub types exhibit occasional high severity fires (Fire Regime IV). Re-establishing a natural fire regime of Landfire Fire Regime Group IV (35-200+ year frequency and replacement/high severity) as listed for Mogollon Chaparral (Landfire Biophysical Setting 2511040, 2008) would still mean stand replacement fire at extreme fire behavior. Average mean fire interval for Mogollon Chaparral is 75 years and many of the stands are at that stage now.

Direct and Indirect Effects of the Proposed Action

Due to the limited amount of tall perennial grasses, timing of grass burning is largely dependent upon the growth and subsequent curing of annual grasses and forbs. Implementation of successful burning is dependent upon spring precipitation to grow these plants, and coordinated grazing management to maintain them on site. The current management alternative is not likely to promote or accelerate vegetative treatments beyond what has occurred sporadically in the past.

Previous work on the Tonto and Prescott National Forests has been successful in treating this fuel type. Densities can be altered by brushing and thinning especially in urban interface areas and along project perimeters. Usually, it is not economical to mechanically treat wholesale areas of chaparral. Strategically placed fuel breaks would target the understories of brush and small trees, reducing ladder fuels. Prescribed fire can treat acres containing several fuel models as long as predicted behavior outputs are expected and mitigated. Besides fuels management objectives, prescribed burning would help move vegetation toward a more natural condition by treating dense chaparral.

Direct and Indirect Effects of the No Grazing Alternative

All vegetation types and conditions exceed historic levels in relation to their potential for large, high-intensity; stand replacing wildfires, increasing undesirable effects from potential wildfires. Tree crowns have become intermingled, creating a continuous chain of fuel capable of carrying fire from the forest floor into the crowns of the tallest trees. The no-action alternative would allow more chaparral acres to succeed to dense brush fields more susceptible to fire. These brush fields would be so thick that they are not navigable. Manzanita and turbinella oak would become dense and tall, sometimes over 12 feet in height.

Direct and Indirect Effects of Range Improvements

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

Water development is almost always advantageous to fire and fuels. Developed wells and stock tanks allow fire resources to use these developments to help suppress any unwanted fire. Water developments also tend to have greater use by livestock, which provides more fuel reduction and trails that break up fuel continuity in an area. Under the No Grazing Alternative, no new water developments would be built for livestock and existing improvements could be removed, decreasing water availability during fires.

Direct and Indirect Effects of Monitoring and Livestock Management Practices

Monitoring in the proposed project area is not likely to affect fire or fuels. Access into an area by vehicle or animal can create a road or trail that will break up the fuel continuity on the landscape. This creates a barrier to the spread of fire, and lessens the effect of fire on the landscape. However, this effect too would be mitigated by the best management practices stated in the Proposed Action. No effect from monitoring would occur under the No Grazing Alternative.

Cumulative Effects of the Proposed Action

Recreational uses, including OHVs and dispersed camping, can have the unintended consequence of accidental fire ignitions which can also change the vegetation makeup of the allotment. With active grazing, the severity of these accidental ignitions would decrease as fine fuels would be lessened. 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. Increased numbers of ignitions and larger, fast moving fires in the Sonoran desert vegetation type may exceed emergency response capabilities and may impact human populations and threaten structures and developments. Wildlife grazing may reduce some fuel loading. Noxious weed management may reduce fuel loading, reducing chances of fire.

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

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

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

Cumulative Effects of No Grazing

In the event that grazing is eliminated from the landscape in the allotment area, the amount of fine fuels (grasses) should increase. The effects of greater fuel loadings on fire behavior is faster burning fires with higher intensities. Burning conditions in this scenario tend to have more negative fire effects on soils and vegetation. This would most likely have an effect on fire management decisions to be able to effectively suppress undesirable fire in the area, but also on soil, wildlife, and watershed conditions. Cumulatively, there is an increased chance of fire under

the No Grazing Alternative due to the combination of fuels accumulation and visitor use, which can increase probability of fire ignitions.

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

Wildlife Resources

Affected Environment

A variety of species occur in the project area including game, non-game, and special status species. These are discussed by category in more detail below.

Environmental Consequences

In general, the quality of wildlife habitat is ultimately dependent on the quality of soil resources, upland watersheds, and vegetative conditions in uplands and riparian areas. The effects of the Proposed Action and the No Grazing Alternative on wildlife will focus on the effects on habitat condition for special status species, riparian and aquatic species, and general wildlife.

Direct and Indirect Effects of the Proposed Action

Threatened and Endangered Species and Critical Habitat

The southwestern willow flycatcher, western yellow-billed cuckoo, and narrow-headed gartersnake occur within the project action area. Critical habitat is present for these species and the razorback sucker. These species and critical habitats occur in aquatic and riparian habitats within the project area, along the Upper Salt River (river), and to a lesser degree, Pinal Creek.

A draft biological assessment of the Proposed Action has been prepared by the Globe Ranger District, and will be submitted to the U.S. Fish and Wildlife Service, Phoenix Office. Preliminary determinations are Southwestern willow flycatcher and critical habitat: “likely to adversely affect”, Yellow-billed cuckoo, Narrow-headed gartersnake, and razorback sucker: “not likely to adversely affect”. The proposed actions are not expected to result in a Jeopardy Biological Opinion or Adverse Modification of Critical habitat from the U.S. Fish and Wildlife Service.

Southwestern Willow flycatcher

This species and its designated critical habitat occurs along the river downstream, within, and upstream from the project area. There is also a small amount of suitable habitat and important movement and dispersal habitat along Pinal Creek. Upstream from the forest segment of Pinal Creek, there is high quality occupied habitat within primarily native vegetation on private lands. The riparian areas and adjacent uplands within the Ortega and Lower Shute Springs pastures have been excluded from grazing since approximately year 2000. Although the riparian and aquatic habitat along the river and Pinal Creek will continue to remain excluded from grazing,

approximately 22,000 acres of uplands draining into southwestern willow flycatcher (flycatcher) habitat would be authorized for grazing in the Proposed Action. Anticipated indirect effects from brown-headed cowbird parasitism and watershed effects will result in adverse effects to the flycatcher and its critical habitat.

Yellow-billed cuckoo

This species occupies similar habitat areas to the flycatcher in the project area. In this area, and others, habitat requirements for the two species overlap. Habitat patches on the allotment are smaller than those generally used by cuckoos in other areas, and surveys did not detect them in key habitat patches in 2017. Previously, cuckoos have been detected adjacent to the allotment incidentally while conducting flycatcher surveys. Cuckoos nest within a mile of the allotment on Coon Creek and within proposed critical habitat on private lands along Pinal Creek. We determined that any effects on cuckoos and their habitats from project actions to be small and unlikely to occur during the consultation period for the following reasons: 1) potentially suitable and suitable habitat patches within the project area will continue to be excluded from grazing, 2) habitat patches are small compared with known occupied habitats, 3) no cuckoos were found in allotment suitable habitats in 2017, and 4) there are suitable occupied habitats nearby within larger patches, more likely to be occupied.

Narrow-headed gartersnake

Proposed critical habitat for this species occurs within the project area along the river in similar habitat areas to those described for the flycatcher and cuckoo. While this species requires dynamic riverine processes including healthy riparian habitats and adjacent uplands for its life history processes, it is highly aquatic and its prey base is almost entirely native and select non-native fish. Grazing can affect gartersnakes and proposed critical habitat in the project area through grazing within riparian habitats along the river, including off channel riparian habitats, and within adjacent uplands. Grazing can also cause indirect watershed effects on the gartersnake and its fish prey, through increases in erosions and sedimentation delivered from uplands into the river. We determined that any effects on gartersnakes and their proposed critical habitats from project actions to be small, temporary, and unlikely to occur during the consultation period for the following reasons: 1) Gartersnakes are not reasonably certain to occur in this segment of proposed critical habitat due primarily to the presence of a large contingent of harmful non-native fish species, which eat gartersnakes and their fish prey. There is a corresponding lack of remaining gartersnake native prey species and only small numbers of non-native suitable prey species, 2) proposed critical habitat and a corridor of adjacent uplands will continue to be excluded from grazing. 3) grazing on adjacent uplands will occur within utilization thresholds and deferred rotation grazing, which seasonally rests portions of upland pastures annually. These practices leave residual vegetation on uplands (sediment traps) reducing sediments from entering aquatic and riparian habitats. 4) Most erosion and sedimentation occurring along the river is likely due to the remaining effects of past management practices including historic grazing, mining, and timbering. These practices occurred on the area's highly erosive granitic soils, and continue contributing to current erosion and sedimentation. 5) The river reaches flows of up to 16,000 cfs (2019) and above and regularly processes large amounts of sediment as part of naturally functioning river processes, and this would further minimize any potential effects.

Razorback Sucker designated critical habitat

Unoccupied razorback sucker designated critical habitat occurs along the Upper Salt River in habitat areas similar to the three previous discussed species. Critical habitat includes the rivers main channel and seasonally flooded riparian habitats used for spawning, feeding and rearing of various life cycle stages of suckers. Effects from grazing on sucker critical habitat could include altering, degrading or removing the physical features of channel and off channel riparian habitats. This could degrade or remove spawning, feeding, and rearing habitats, and increase nutrients and contaminants in the water element of critical habitat. Any grazing effects to these primary constituent elements of critical habitat are expected to be small and short–term because the 100 year floodplain and riparian habitats will continue to be excluded from grazing. Indirect watershed effects will be reduced by managing at or below upland allowable use thresholds, and seasonal deferment or rest of pastures from upland grazing. Effects from increases of erosion and sedimentation due to the proposed action are not anticipated to be measurable separately from existing effects from past grazing and other management activities, and that of naturally erosive granitic soils. Sediment is expected to be effectively processed by high flows of the river.

Bald and Golden Eagles

The Redmond and Pinal bald eagle breeding areas occur within the project area. The Redmond breeding area is located along the river on what is sometimes referred to as the Redmond Spires located roughly between Redmond Flat and Horseshoe Bend on cliffs (spires) on the south side of the river. Up to five separate cliff nests have been identified. The Pinal breeding area is located along Pinal Creek, and recently the river, and up to 7 separate cliff nests have previously been identified. In 2019, as of May 22, the Redmond bald eagle pair is still active, and the Pinal pair is active with one nestling. The Pinal pair is nesting along the river this year near where Pinal Creek enters the river. As of May 22, 2019 there are no known golden eagle nests within or near the project area boundaries (K. Jacobsen AGFD, personal communication 2109). To protect breeding and nesting eagles, the following mitigation measures and best management practices would be used:

- The Forest Service will coordinate with United States Fish and Wildlife Service (USFWS) and Arizona Game and Fish Department (AGFD) to ensure that golden eagle nest location data are updated annually or as new data are collected.
- Range management actions near golden eagle nest trees and/or cliff platforms would be designed to protect eagles from disturbance. Spatial and temporal buffers for the breeding season (January 1st to July 31th) will be determined on a site-specific and annual basis in coordination with USFWS and AGFD.
- New construction or maintenance of fences or water developments will not occur within one mile of an occupied golden eagle nest during the breeding season (January 1st to July 31th) unless the District Wildlife Biologist, AGFD and USFWS determine that disturbance from the action will not cause injury, loss in productivity or cause nest abandonment. These buffers and timing restrictions may be lessened or increased after consulting with AGFD and USFWS on a case by case basis.
- Drift fence segments AF4 along Pinal Creek, and the Redmond Flat drift fence would be constructed outside of eagle breeding seasons (August 1st to December 31) unless coordinated otherwise beforehand with AGFD and USFWS.

Forest Service Sensitive Species

Region 3 of the Forest Service produces a list of sensitive species for forests within the region. Species for the Tonto National Forest that may occur or have habitat in the action area include 14 plant species, four bat species, two bird species, one frog species, three fish species, and two invertebrates. There may be effects to individual plants and animals from authorizing grazing and livestock management activities on the Hicks Pikes Peak Allotment, but livestock grazing and related activities are not likely to result in a trend toward federal listing or loss of viability for any sensitive species in the action area.

Migratory and Breeding Birds

Continental and local declines in many bird populations have led to concern for the future of migratory and residential birds. The Arizona Working Group of Partners in Flight developed a Bird Conservation Plan as part of a national effort to address the concern for the future of these species. The Conservation Plan listed priority bird species by habitat type, and has been updated recently. The USFWS migratory bird department also tracks migratory birds by ecoregion. There are no designated Important Bird Areas in the project vicinity; therefore none of these areas would be affected by this project. Individual birds will be affected by project actions, but no populations of migratory birds are expected to be affected. Grazing and other related project actions are not expected to measurably affect dead and downed wood within the project area which is a habitat indicator for effects to these birds.

Management Indicator Species

There are 14 management indicator species within six indicator habitats within the project area. Small project level effects caused by grazing actions occur to four management indicator species. Grazing effects under the proposed action are too small to alter forestwide habitat or population trends for any management indicator species.

Authorizing grazing and associated livestock management activities may alter habitat structure, function, and composition for species in the above species groups in some locations, especially of accessible terrain, generally less than 40 percent slopes, and in locations near water. Habitat quality for some species will decrease, for others it will increase, and others may not be affected by grazing actions. Individuals of some species may be affected as a result of grazing actions, for example nestlings or eggs may be lost when livestock trample ground nesting bird nests, or spill nests of shrub nesting birds.

Potential effects will be reduced by implementing management practices and mitigation measures including grazing within allowable use vegetation thresholds, rest rotation and seasonal deferment of pastures, and exclusion of grazing from some riparian and aquatic habitats. Although habitat quality for some species can be anticipated to decline in some areas, overall, habitat quality for most species in the project area will be maintained, and in some areas it may improve due to better livestock distribution due to more pastures allowing for more rested or deferred pastures, more dependable and permanent water sources, allowing for increased adherence to vegetation thresholds and more residual vegetation for wildlife habitats and better range conditions. Overall, wildlife habitat quality in the project area should be maintained in most areas, will improve

slightly for some species in some locations, and will decline slightly for some species in some locations.

General Wildlife

General wildlife includes all terrestrial and aquatic wildlife and fish species associated with the project area that are not described separately. These are generally common species many of which inhabit more than one vegetation community.

The analysis area is contained within the Arizona Game and Fish Department's Game Management Area 24A. Big Game species that are known to occur within the analysis area include, Rocky Mountain bighorn sheep, mule and white tailed deer, javelina, black bear and mountain lion. Of these Arizona Game and Fish Department is most concerned with the declining populations and poor buck/doe/fawn ratio's for both mule and whitetail deer. They also have concerns about causes of bighorn sheep mortalities. The department recommends management actions that would increase forage availability, plant species diversity, and provide adequate fawn hiding cover requirements.

The primary non-avian small game animals are rabbits. Cottontail rabbits and jackrabbits both occur in the area, and there are potentially three species of cottontails. All of the major habitat types in the project area support one or more rabbit species. The desert vegetation is likely to support higher rabbit densities, while the chaparral types with over-mature, dense underbrush may limit rabbit numbers and the potential for harvest.

Gambel's quail and dove both occur in the area. Quail can be found in all biotic communities in the analysis area. The highest densities of quail are likely to found in the desert habitats near springs and other water sources. Cover is also important to quail. Habitats such as mesquite lined washes and arroyos can provide good quail habitat especially when species like desert hackberry are present. A lack of suitable ground cover in the herbaceous habitat layer may increase predation and reduce quail numbers. In the chaparral types, and to a lesser degree in the other habitat types, thick vegetation in the shrub midstory may limit potential for hunters to successfully harvest quail. Doves can be found throughout the desert habitats in the area. Habitat for upland game birds in the project area has been reduced to a low quality by heavy grazing of the herbaceous layer, and placement of livestock handling facilities in key habitats such as desert washes (Ephemeral streams), and at springs. Other land management uses such as fire suppression and more recently ATV use have also affected wildlife habitat quality.

Effects by Vegetation Community

Effects of the Proposed Action on wildlife and their habitats is summarized in each of the broad vegetation communities on the Hicks-Pikes Peak Allotment as well as riparian and aquatic communities (Figure 2).

Semi-desert grasslands

Historically, semi-desert grasslands occurred as perennial grass-scrub dominated landscapes positioned between desertscrub and woodland or chaparral. Today, most of these grassland sites have been largely degraded, invaded by woody plants, cacti, and their grasses replaced by shrubs.

Common wildlife species using these habitats include rabbits, rodents, coyote, and ground nesting birds, owls, prairie falcon, doves, snakes and lizards.

Potential effects from livestock grazing on grassland wildlife habitats and species include changes in structure and composition of habitat, increases in invasive plant species, removal of herbaceous vegetation, and increases in erosion. These changes result in reduced cover and forage resources for wildlife. Reduced cover can increase predation. Removing herbaceous vegetation can reduce insect abundance and insects are food for many grassland wildlife species. Many grassland wildlife species also eat seed, leaves, and other plant parts that are removed by cattle grazing and browsing. Nests, eggs, and young of ground nesting birds are also occasionally trampled by grazing livestock.

Potential grazing effects on grassland wildlife species can be reduced by grazing within allowable vegetation use thresholds, which provide residual vegetation for wildlife cover and food. Resting and seasonally deferring pastures from grazing can provide higher quality habitat areas for wildlife breeding, feeding, and other life history functions. Because of these management practices, and other factors, effects on grassland wildlife from livestock grazing can be anticipated to be limited to local effects on individuals of some species and short-term effects on habitat quality in some areas. Grazed areas may also improve wildlife habitat quality for some species that prefer areas with reduced cover. Livestock grazing, as described in the Proposed Action would not be expected to result in significant changes in grassland wildlife habitat quality in the project area if management practices and mitigation measures are implemented.

Sonoran Desert

Sonoran desert in the project area is within the Arizona Upland Subdivision and primarily within the Paloverde-cacti-mixed scrub series. Sonoran desert is a subtropical desert with two rainy seasons. It is characterized by having tree and tall shrub elements the most recognizable being Saguaro. Sonoran desert has unique wildlife species, but many Sonoran desert wildlife species also occur in surrounding vegetation types. Common in Sonoran desert scrub are rabbits and rodents like the kangaroo rats and pocket mice. Desert birds include the roadrunner and cactus wren and there are a variety of unique reptiles including the Gila monster and banded gecko. Desert mule deer and javelina occur where there is enough habitat structure.

Potential grazing effects are similar to desert grassland and can be summarized as indirect effects from altering vegetation structure and/or composition. Grazing strategies developed for other ecosystems may not be successful in Sonoran Desert with its seasonal droughts and unpredictable rainfall, and grazing effects vary with wildlife species and grazing strategy. (Hall et al. 2005).

Potential effects from grazing on Sonoran Desert wildlife may be best reduced through adaptive management of grazing in response to seasonal dry periods, longer droughts, and unpredictable rainfall events. Other factors that may reduce effects include grazing within utilization thresholds, and resting and seasonally deferring pastures to provide higher quality wildlife habitats. Grazed areas may also provide improved habitat quality for some species, have positive and negative effects, or grazing may not affect habitat quality for some species. It should be noted that allowable vegetation use thresholds applicable to other vegetation types may not reduce effects of

grazing on wildlife habitat quality, or other resources, as effectively in Sonoran desert vegetation. Based on implementing adaptive management, livestock management practices and mitigation measures, grazing, as described in the Proposed Action is not expected to result in significant effects on wildlife habitat quality in the project area, although individuals of some species may be affected and habitat quality may be reduced in some areas. Other areas have steep, complex terrain that will result in many areas being mostly or altogether inaccessible to livestock,

Woodland/Shrubland

These vegetation types cover over half of the project area at middle and higher elevations. At middle elevations, it is primarily chaparral, and at middle to higher elevations, it is juniper woodland. Combined, these broad vegetation communities cover a majority of the Globe Ranger District and most of the common wildlife species on the district and in the project area inhabit this type of vegetation. There are areas throughout portions of the project area where this vegetation transitions with desert grassland and, to a lesser extent, desert scrub. The most observable habitats are dense oakbrush chaparral, areas with stands of juniper, and mixtures of the two in many variations and they can be summarized as browse types. Common wildlife in these habitats include deer, javelina, bear, mountain lion, bobcats and many others. Common birds include the scrub jay, towhees, and several sparrow and other small bird species. There are a variety of common reptiles including rattlesnakes, fence lizards and other common lizards. Many of these species are common and occur in multiple habitats within the project area.

Potential grazing effects can be summarized as alteration of structure, function, and composition, of the vegetation midstory. Herbaceous vegetation has been reduced or eliminated in the spaces between shrubs primarily by historic grazing. Important wildlife browse plants have also been reduced substantially or eliminated in some locals.

Potential grazing effects in this broad vegetation type will be reduced by grazing within allowable vegetation use thresholds, which allow for plant growth, maintenance, or recovery and rest and/or seasonal deferment of pastures (Holechek 2011). Adaptive management in this type would be an important factor in improving wildlife habitats because many segments of this vegetation could be enhanced by vegetation treatments including prescribed fire and a variety of and brush and tree reduction treatment options. Wildlife habitats in this vegetation type are likely to remain in conditions similar to existing vegetation. Many of the existing habitat conditions are a result of historic grazing practices combined with other land management activities such as fire suppression, which can act together to reduce wildlife habitat quality for many common wildlife species. Grazing, as described in the Proposed Action, is not anticipated to measurably change existing wildlife habitat quality. In this type, habitat quality is likely to remain in its current condition until wildlife or range vegetation projects can be implemented or a wildfire in this type occurs.

Riparian habitat

The Upper Salt River and Pinal Creek have the most riparian habitats within the project area. Many springs occur within the project area, which either do support riparian vegetation or have potential to support riparian vegetation. Most remaining drainages within the project area occur as

desert washes (ephemeral streams) and a few may have remnant segments with intermittent flows.

Grazing effects to riparian wildlife habitat can be summarized as altering structure, function, and composition of riparian vegetation and/or altering reducing or eliminating floodplain features. Indirect effects to riparian habitats can occur from grazing on adjacent uplands and can be summarized as increased erosion and sedimentation, increased runoff, and increased depth to the water table. Indirect effects from grazing under the Proposed Action could potentially increase because approximately 20,000 acres of uplands that were previously excluded from grazing since approximately year 2000 will be authorized for grazing with the proposed action. These areas are adjacent to the Upper Salt River and Pinal Creek.

Potential effects from livestock grazing on riparian wildlife habitats will be minimized because the Upper Salt River and Pinal Creek riparian habitats themselves will continue to be excluded from grazing. Indirect effects on the river and Pinal Creek will be reduced by grazing within vegetation use thresholds and resting and/or seasonally deferring the Ortega and lower Shute Springs pastures. Effects from grazing on riparian habitats at springs will be reduced be implementing mitigation measures, which may include fencing springs. Grazing effects on ephemeral streams (desert washes) will be reduced by grazing within upland and riparian utilization thresholds, rest and deferred rotation grazing, and adaptive management. Because a large amount of upland habitats are being authorized for grazing along the upper Salt River and Pinal Creek, riparian habitat quality can be expected to decline somewhat. For most habitat areas and riparian wildlife species these effects can be anticipated to affect small habitat areas or individuals of a common wildlife species.

Aquatic Habitats

Aquatic habitats in the project area include The Upper Salt River, Pinal Creek, remnant intermittent segments of now ephemeral streams, and springs. Species that could be affected by grazing actions would include native and non-native fish, macroinvertebrates, and invertebrates.

Potential grazing effects would include increased sedimentation entering the water column and affecting fish amphibian, and invertebrate life cycles. Fecal contamination from livestock excrement could also affect nutrient cycling and increase pollutants such as *E. coli*.

Grazing exclusions of the Salt River and Pinal Creek would limit increased grazing effects on aquatic habitats. Mitigation measures protecting water sources and fencing springs where necessary would minimize effects on aquatic and riparian wildlife and plants at springs. In stream segments tributary to the Upper Salt River, grazing within upland and riparian utilization thresholds would reduce erosion and sedimentation locally. The Upper Salt River also reaches flow up to 15,000-30,000 cfs and transports sediments downstream on a regular basis. Management practices and mitigation measures along with functioning river hydrology can be expected to limit increases in sediment inputs from livestock grazing into aquatic wildlife habitats to small temporary increase to the baseline conditions.

Most grazing related effects to aquatic habitats in the project area occurred historically and some of those effects continue to affect aquatic habitats today. Finally, the major effect limiting aquatic habitat quality within the project area currently is that the Salt River is inhabited by many species of harmful non-native species of fish, and crayfish, which prevent or minimize the river from establishing populations of native fish and other aquatic or semi-aquatic species. That effect combined with the lack of remaining tributaries to the river with perennial or intermittent flows, prevents most aquatic species from colonizing any remaining aquatic habitats within the project area.

Direct and Indirect Effects of the No Grazing Alternative

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, however, 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).

Threatened and Endangered Species and Critical Habitat

This alternative would result in “No Effect” determinations for threatened and endangered species and their critical habitats. However, the Proposed Action would also continue grazing exclusions of the Salt River and Pinal Creek. Therefore, there would only be small differences in direct effects between the two alternatives. The largest difference between the two alternatives for these species and their habitats would be the change in indirect effects. Under the no grazing alternative approximately 22,000 acres of desert scrub uplands draining into the river and Pinal Creek would continue to be excluded from grazing, while these areas would be authorized for grazing under the Proposed Action. The No Grazing Alternative would continue to provide high quality riparian habitats, water quality, aquatic habitats, and upland watershed conditions on these 22,000 acres of uplands and tributaries. These drain into the Upper Salt River, which is habitat for four federally listed species. This alternative would continue to provide high habitat quality most for the flycatcher and cuckoo, and less for the gartersnake and sucker because they are currently affected by the presence harmful non-native fish present in the river. Neither the gartersnake nor the sucker is likely to be present in the project area currently, but the No Grazing Alternative would increase opportunities to reintroduce both species. It is anticipated that removal of grazing would result in higher habitat quality and increased probability of presence of these four listed species than the Proposed Action.

Forest Service Sensitive Species

Sensitive plants, amphibians, and invertebrates that are present can be consumed, trampled or destroyed by livestock and livestock management activities. This alternative would eliminate any effects on individual sensitive species from grazing actions. The No Grazing Alternative would result in “No Effect” determinations for any sensitive species present in the project area. Other sensitive species would not be affected by grazing from implementing either alternative because they occur in areas inaccessible to grazing or grazing does not affect their habitat quality.

Overall, discontinuation of livestock grazing is expected to improve sensitive species habitat quality, and individual abundance for most sensitive species present in the project area.

Management Indicator Species and Migratory and Breeding Birds

Habitat conditions for most management indicator species would be expected to improve with cessation of livestock grazing on the allotment. Some Key Habitat Components for a few Management Indicator Species would be affected for species that are indicators of habitats with openings, short cover, and open, or barren areas. Other Management Indicator Species with indicator habitats in the project area would not be affected by grazing actions. There would be no changes in forest-wide habitat and population trends for management indicator species as a result implementing the No Grazing Alternative.

There would be no measurable negative effects on migratory bird populations from implementing the No Grazing Alternative. There would be declining effects to individual migratory birds for five years while livestock were removed from the allotment. After five years, no unintentional take of individual migratory birds would occur as a result of grazing actions. This alternative would provide for the greatest improvement in habitat and abundance for migratory birds found throughout the project area, in areas where grazing is not already excluded.

General Wildlife

With discontinuation of livestock grazing, wildlife habitat conditions would likely improve for most habitat types and most species. Outside of the Upper Salt River and Pinal Creek, which will continue to be excluded from grazing under both alternatives, improvement of the remaining riparian and aquatic habitats in the project area would likely occur more rapidly with the No Grazing Alternative compared to the Proposed Action. Riparian areas would begin to recover from past and ongoing grazing. Recruitment of woody and herbaceous riparian species, including deergrass, would increase. It is expected that structural and age class diversity would improve resulting in increased potential for species that use riparian habitats to occur in more riparian habitats throughout the allotment.

With the exclusion of livestock grazing, it is expected that overall watershed and soil conditions across the allotment would improve, increasing cover and forage for wildlife and increasing overall wildlife habitat quality for many species. Palatable shrubs including mountain mahogany and buckbrush used by big game and other wildlife species would also increase. Small game and nongame species would generally increase over time with increases in herbaceous cover and probable increases in herbaceous plant species diversity. However, excluding grazing alone without additional habitat enhancement treatments would limit the extent that wildlife habitat quality could improve. Broad upland vegetation communities including woodland/shrubland vegetation and semi-desert grassland vegetation cover large portions of the allotment. These large areas can be expected to have only limited improvements in wildlife habitat quality, primarily in understory habitat layer, unless discontinuation of grazing is accompanied by large scale habitat enhancements to reduce shrubs, and in some cases trees, and add structural diversity to existing habitats. These could include a variety of fire treatments, mechanical brush treatments such as mastication, and in woodland, various types of thinning treatments to reduce tree densities. This would be the condition for both the No Grazing Alternative and the Proposed Action. However,

the No Grazing Alternative would provide more flexibility to implement successful treatment projects.

One possible effect of the No Grazing Alternative on wildlife would be the removal of or lack of maintenance of range water developments. Livestock permittees are responsible for developing and maintaining range water developments, which also provide water to some wildlife species when they are designed so wildlife have access to the water, and they have water in them. Under the No Grazing Alternative some of these improvements might fall into disrepair, while others would continue to be maintained by natural resource partner groups, or the Forest Service, for wildlife and/or recreation purposes. While some range water developments could be lost, riparian areas and springs, which have been relied upon for livestock water for many years would begin to recover providing additional water and riparian vegetation throughout the project area.

Cumulative Effects of the Proposed Action

Cumulative effects include the direct and indirect effects of the proposed action and the no grazing alternative when added to all past, present, and reasonably foreseeable future actions. The past, present and future actions for wildlife resources related to the proposed action are summarized below. This description and analysis is focused on special status species and their habitats.

Historic or past grazing actions, which can be summarized as primarily unmanaged grazing including year-around livestock use, heavy grazing in accessible riparian habitats, and high livestock numbers on the landscape for long periods of time. Major effects were removal of vegetation from riparian and upland habitats, subsequent increases in overland flows and erosion during storms and flood events, decreased ability of pre-settlement wildlife habitats to recover from these impacts, changes in the structure and composition of wildlife habitats, and resulting removal, deterioration, and changes in wildlife habitat quality and reduction and/or changes in wildlife species and abundance compared with pre-settlement conditions.

Historic mining removed and degraded riparian and aquatic habitats along Pinal Creek. These habitats were remediated by mining companies beginning in 2012 with recovery of vegetation and water quality components of riparian habitats. Pinal Creek habitats in the Lower Shute Springs Pasture now include important native riparian habitats supporting a variety of wildlife species and providing important connectivity between upstream populations of the southwestern willow flycatcher along Pinal Creek on Private lands and the large flycatcher population at Roosevelt Lake managed through a multi-agency Habitat Conservation Plan.

The Tamarisk beetle is an introduced insect that can be expected to arrive at riparian habitats in the project area and upstream and downstream riparian habitats within the next five years. It defoliates tamarisk plants and eliminates or reduces their suitability as flycatcher nesting habitats. The tamarisk beetle is considered a significant threat to the quality and quantity of flycatcher habitat and to the species recovery by the U.S Fish and Wildlife Service. The beetle will also reduce or eliminate habitat suitability of up to 50 other bird species that inhabit tamarisk vegetation.

The effects of climate change on wildlife resources in the project area can be summarized as more frequent and prolonged droughts, shorter snow seasons and less snow-pack, higher temperatures, ecosystems exceeding their ability to recover or exceeding their resilience thresholds, and increased extinction risks for animals and plants. Climate change is considered a significant threat to the flycatcher, its habitat, and its recovery.

Illegal cross country travel and motorized recreation on Forest Service roads can destroy and degrade riparian and uplands habitats within and adjacent to the project area. This activity has and can be anticipated to remove and degrade critical habitat for listed species within the project area, and has the potential to affect individuals of listed species. Use, maintenance, and having originally designed and located forest service roads in desert washes increases wildlife disturbance, increases erosion and sedimentation into more perennial streams including the Upper Salt River and Pinal Creek. Desert washes (ephemeral streams) have higher wildlife habitat values than surrounding uplands.

River based recreation activities include white water rafting, canoeing, and kayaking, camping, fishing and hunting, primarily along the Upper Salt River. Camping associated with these types of river activities has altered small areas of flycatcher critical habitat in the past and can be anticipated to alter small habitat areas in the future. Past actions have included trail building in flycatcher critical habitat, cutting and trimming tamarisk at campsites, and substantial littering at a few popular campsites. These activities can also disturb wildlife species along the river, for example, bighorn sheep.

Adjacent allotments upstream and downstream all have some types of grazing exclusions in place to protect riparian habitats along the Upper Salt River, habitats within the Salt Arm of Roosevelt Lake, and Tonto Creek. Exclosures prevent most direct effects from occurring to critical riparian and aquatic habitats and individuals of federally listed species in these areas. These exclosures minimize the largest effects on listed species and critical habitats in the areas. Grazing exclosures also minimize direct effects oo individual flycatchers, and other riparian birds. While grazing exclosures are expected to continue for the foreseeable future, since approximately 2005, there has been an apparent trend of increasing livestock numbers, and reducing the sizes of existing exclosures. These actions have increased the presence of livestock and livestock concentration areas closer to flycatcher habitats. These actions are likely to increase cowbirds near flycatcher nesting habitats, and can be anticipated to increase cowbird parasitism on individual flycatcher nests along the Upper Salt River and within the Salt Arm of Roosevelt Lake. These effects can be minimized by grazing outside of a period approximating the flycatcher breeding season. This can be accommodated in some pastures, but not all, resulting in some cumulative effects on individual flycatchers in these habitat areas. Livestock grazing is considered by the U.S. Fish and Wildlife Service to be an ongoing moderate threat to the flycatcher and its habitat.

There is one surface water diversion on Cherry Creek approximately two miles from the project area that may have negative effects on individual flycatchers, their habitats, and movements/connectivity among breeding patches. There is another diversion downstream from the project area on non-forest lands that provides water to a created flycatcher habitat area supporting several pairs of flycatchers annually.

Implementing the Proposed Action throughout most uplands and riparian habitats in the project area can be anticipated to maintain existing wildlife habitat quality or result in minor reductions in or slight improvements in habitat quality in certain areas. This is assuming that grazing occurs within allowable vegetation use thresholds, management practices and adaptive management described in this EA are followed. Within the Lower Shute Springs and Ortega pastures of the project area, approximately 22,000 acres of primarily Sonoran Desert and desert grassland habitats would be authorized for grazing adjacent to habitats where federally listed species are present. Adverse effects can be expected to occur to small segments of critical habitat for the southwestern willow flycatcher and individual flycatchers can be expected to be affected. While these are anticipated to be adverse effects under the *Endangered Species Act*, they would not be expected contribute to or trigger significant effects under the *National Environmental Policy Act*. These effects occur to a small number of flycatchers at local breeding patches within the project area, but would not be expected to measurably affect the flycatcher population within the Roosevelt Lake Management Unit of the flycatcher recovery plan or measurably reduce recovery plan numbers for this management unit. Similarly, while small segments of critical habitat can be anticipated to be affected, the Upper Salt River Segment of Critical habitat would not be anticipated to be significantly affected. Although the effects are adverse, they are not expected to result in jeopardy or adverse modification determinations in the Project Biological Opinion.

Cumulative Effects of the No Grazing Alternative

The direct and indirect effects of the No Grazing Alternative, when combined with other past, present, or reasonably foreseeable actions as listed above should result in higher overall habitat quality for most wildlife species in most habitat types within the project area when the direct and indirect effects of grazing and range improvements are eliminated. There would also be no grazing related effects on individual plants and animals or local populations. Some species with key habitat components that include grazed areas with low or sparse ground cover would have declining habitat quality from implementing the no gazing alternative. Habitat quality would increase fastest in riparian habitats, which support high diversity and abundance of wildlife species. Large upland plant communities would be the slowest to improve, and while herbaceous forage, cover, and palatable wildlife browse plants would increase, improvement in habitat structure at the vegetation community level would require habitat enhancements such as fire and mechanical treatments in addition to eliminating grazing. The No Grazing Alternative would provide the most options for successfully implementing wildlife and aquatic species habitat enhancements and for long term continuous habitat improvements. The Upper Salt River and Pinal Creek have existing grazing exclusions and therefore the No Grazing Alternative and the Proposed Action would both have minimal direct effects from livestock grazing. Indirect effects on these riparian wildlife habitats would also be reduced by implementing the No Grazing Alternative. Cumulative effects of the No Grazing Alternative would not contribute to significant effects on the environment.

Heritage Resources

Heritage Resources are a combination of archaeological, historic, and traditional cultural resources, including contemporary Tribal uses of natural, archaeological, and historic resources. The spatial boundary used to evaluate direct and indirect consequences of the project was the allotment boundary, since no cultural resources outside of this area will be affected by proposed project activities. The allotment covers approximately 65,137 acres.

For reasons that will be explained below, cultural resource inventory surveys in the Hicks–Pikes Peak Grazing project area focus on a) those areas in which standard range activities are most likely to have the potential to affect archaeological sites, and b) those areas where new range improvements are planned and expected to be implemented within the next two years. Approximately 0.007 percent (436.5 acres) of the project area have been completely surveyed to date for ground-disturbing activities. Previously conducted archaeological surveys have been undertaken both for compliance purposes (e.g. electrical transmission lines, grazing improvements) and for research by various academic institutions (Prescott College, Southern Illinois University, Museum of Northern Arizona, Arizona State University).

The Determination of Effect presented in this report takes into consideration the effect of the activities proposed in the Proposed Action on the archaeological sites, since no action within the allotment will not affect historic properties.

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

Cultural resource surveys conducted for this project will follow methodology identified in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities between the USDA Forest Service Region 3, the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation*, signed 12/24/03 (Programmatic Agreement). This agreement, specifically, *Appendix H, Standard Consultation Protocol for Rangeland Management* developed pursuant to Stipulation IV.A of the Programmatic Agreement, is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest[20].

In accordance with Appendix H, standard Section 106 process will be implemented on all range improvement and ground-disturbing management practices that are planned and have been identified at the time of this environmental analysis. In addition to the acreage identified for

[20] For more information on legal and regulatory compliance and Tribal consultation requirements, see the Heritage Resources Report in the project record.

improvements, analysis of impacts to Heritage resources from cattle grazing will also be undertaken. Field surveys should be conducted in areas where there are known or potential impacts to heritage resources or specific areas of concern in order to identify and assess site conditions. To determine survey needs for new improvements in GIS, point features (assumed by the archaeologist to be tanks and springs) were buffered at 50 meters; line features (assumed to be pipelines and fences) were buffered at 20 meters. Locations having the highest potential for cattle congregation were identified off of the topographic map and buffered at 50 meters. This was then cross-referenced with archeological site layers to determine locations of known or potential impacts to cultural resources. Total acres to be surveyed for the 2018 Hicks–Pikes Peak Allotment project is 1,048 acres.

Affected Environment

To date, eighty-five (85) archaeological sites have been identified in the Hicks–Pikes Peak Allotment. Of these sites, fifty-seven (57) contain evidence for prehistoric occupation, twenty-one (21) contain evidence for historic period occupation, and seven (7) contain evidence for both occupation types[21]. At least five of the prehistoric sites appear to be pithouses (individual and village). The remainder of the prehistoric sites located in the project area appear to consist of either the large architectural ruins, platform mounds, petroglyphs, or agricultural features. These sites contain material spanning a large time period, and most likely saw repeated use throughout their occupation. The historic record on the Hicks–Pikes Peak Allotment is also quite extensive. Historic site types include mines, roads, camps, habitation sites (i.e. homesteads and ranches), and a recreation site associated with the Civilian Conservation Corps.

Although none of these archeological sites are listed on the National Register of Historic Places (NRHP), thirty-one (31) are considered NRHP-eligible. Seven (7) have been assessed as not eligible for the NRHP, and forty-seven (47) have not been evaluated against NRHP significance criteria. Summary information on the archaeological sites, as well as maps showing the locations of the cultural resources, will be presented in an upcoming survey report. The Tonto National Forest Heritage Inventory Forms (on file with the Tonto National Forest) provide more detailed descriptions of each of the archaeological sites.

Environmental Consequences

Direct and Indirect Effects for the Proposed Action

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

[21] For more information on the historical uses of the Allotment, see the Heritage Resources Report in the project record.

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

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

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

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

No Grazing Alternative

Should an as-yet unidentified alternative included the use of no grazing within the allotment, then additional cultural resource surveys may be needed to address the ground disturbance that would result from the removal of range improvements (i.e. fences, tanks, and pipelines). Such projects have the potential to adversely affect significant cultural resources.

Cumulative Effects

Since site condition assessments for heritage resources are not available for any time prior to the introduction of European livestock species to the Southwest, some level of effect is assumed to have contributed to the current condition of all sites on the allotments. Given the non-renewable nature of heritage resources – prehistoric as well as historic archaeological sites -- any portion of a given site either damaged or removed diminishes its cultural and scientific value permanently. Therefore, all effects to heritage resources are considered cumulative. Provided that appropriate mitigation measures are implemented, it is not expected that any of the proposed project activities will result in additional adverse effects to the cultural resources referenced in this report. It is expected that there will be no change in the condition of the cultural resources over the existing condition.

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Appendix A – Summary of Data and Data Sources for Stream Channels and Riparian Areas

The data used to describe the stream channels and riparian areas in the project area are provided by a variety of sources discussed below. All of the following data are on file at the Tonto National Forest Supervisor's Office in Phoenix, Arizona.

2210 Forest Service Range Allotment Planning Files

These files are housed at the Globe Ranger District of the Tonto National Forest Service in Globe, Arizona. Information from these files was used to describe past management and condition of riparian areas. Much of this information is provided in the Range Report.

Aerial photos, GIS layers and maps

National Wetland Inventory (NWI) maps (USDI, 1991-1995), aerial photos and GIS layers of streams and water sources were used to provide allotment-wide information (1:24000-scale) on stream flow regime (perennial or intermittent) and riparian vegetation cover type. These maps were used to prioritize field visits.

The streams listed in Table 25 include named streams delineated on the Tonto National Forest Stream Route GIS layer and unnamed streams that support riparian vegetation[22]. Riparian vegetation is estimated from the National Wetland Inventory (NWI) maps classified as obligate, broadleaf, and deciduous (for example, cottonwood, willow or sycamore forests) or streams found on field visits to support riparian vegetation.

Table 25: Named Streams and Unnamed Streams that Support Riparian Vegetation within Hicks-Pikes Peak Allotment Pastures.

Pasture	Stream Name	Stream Miles (Perennial)	Stream Miles (Non-perennial)	Miles of Obligate Riparian Vegetation
Ortega	Storm Canyon	0	3.0	0
Ortega	Grapevine Canyon	0	1.1	0
Ortega	Sycamore Canyon	0	2.0	0.5
Ortega	Mud Springs Wash	1.0	1.5	0.1*
Ortega	unnamed tributary to Salt River	0	2.5	0.6
Ortega	Salt River	8.2	0	1.2
Lower Shute Springs	Redmond Wash	0	1.5	0
Lower Shute Springs	unnamed tributary to Salt River	0	1.8	1.8
Lower Shute Springs	Nail Creek	0	2.2	0

[22] Miles of obligate riparian vegetation is also taken from the NWI maps (USDI, 1991-1995). The asterisk (*) indicates the miles were adjusted per field data (or Google Earth for some reaches of the Salt River).

Pasture	Stream Name	Stream Miles (Perennial)	Stream Miles (Non-perennial)	Miles of Obligate Riparian Vegetation
Lower Shute Springs	Shute Springs Creek	0	3.4	0
Lower Shute Springs	Pinal Creek	2.8	0	2.8*
Lower Shute Springs	Salt River	10.0	0	3.4
Upper Shute Springs	Redmond Wash	0	2.0	0
Upper Shute Springs	Shute Springs Creek	0	2.6	0
Hope	Grapevine Canyon	0	3.6	0
Horseshoe Bend	Sycamore Canyon	0	4.5	0.6
Horseshoe Bend	Mud Springs Wash	0	2.3	0.2*
Horseshoe Bend	Wood Springs Wash	0	3.2	0
Upper Big	Negro Wash	0	0.5	0
Big	Negro Wash	0	1.1	0
Windmill	Wood Springs Wash	0	3.1	0
Windmill	Horseshoe Bend Wash	0	3.5	0
North Steer	Pinal Creek	1.4	0	1.4*
South Steer	Horseshoe Bend Wash	0	1.6	0
Lower Devore	Devore Wash	0	2.6	0
West	Devore Wash	0	1.3	0
West	Hicks Wash	0	0.7	0
Hicks	Hicks Wash	0	0.8	0
Hicks	Murray Wash	0	2.3	0
Rip	Hicks Wash	0	1.8	0.7*
Rip	Murphy Wash	0	0.4	0
Murphy	Devore Wash	0	2.4	0.1
Murphy	Hicks Wash	0	2.0	0.1*
Kenny	Devore Wash	0	1.4	1.4*
Holly	Blevens Wash	0	2.3	0.1*
	Total	**23.4**	**65.0**	**14.0**

Permanent Photopoints

There are two permanent photopoints located in riparian areas on the Hicks-Pikes Peak Allotment that have been repeated for multiple years. Both of these are located in Sycamore Canyon and were established in 1992. Both photopoints have shown no apparent change in trend. An upward trend would indicate an increase in the density or size of riparian vegetation and improvement of stream function in the photos over the time of monitoring.

Field Visits

Field visits are conducted for the purposes of monitoring riparian use, stream channel classification, condition assessment, and inspections and are documented by reports and photographs available in the project record. Stream reaches selected for field visits for this analysis were chosen based on the extent of riparian vegetation indicated on the NWI maps (USDI 1991-1995), and accessibility to livestock.

Reaches were classified according to the Rosgen (1996) system. Some stream reaches were rated using a condition assessment developed on the Tonto National Forest (Mason and Johnson, 2000). Condition assessment is based on stream channel stability. Channel stability is defined as the ability of a stream to carry the water and sediment of its watershed while maintaining its dimension, pattern, and profile, without aggrading or degrading, over time and in the present climate (Rosgen, 1996). The five condition rating classes are stable, slightly impaired, impaired, severely impaired, or unstable. Parameters used to assess stability include depositional pattern, riparian health rating (Thompson et al., 1998), stream channel width/depth ratio, channel stability rating (Pfankuch 1975), and bank erosion hazard index (Rosgen, 1996).

Stream Channel Type Description (Rosgen 1996)

- **“A” type streams** are steep (greater than four percent gradient), entrenched, and confined channels of the headwaters that contain little or no floodplains. They dissipate energy in cascading step/pools.
- **"B" type streams** are moderately entrenched, containing narrow floodplains, and have a moderate gradient (two to four percent).
- **“Bc” type streams** are moderately entrenched have narrow floodplains, like a “B”, and a low gradient, like a “C”. They are probably a step in the evolutionary sequence, C-G-F-C, between F and C when the channel is just beginning to gain back some floodplain.
- **“C" type streams** are not entrenched and have very wide floodplains able to dissipate flood flows and support extensive riparian areas. They have a low gradient (zero to two percent) and display the typical riffle/pool sequence of a meandering stream. "C" type streams are also sensitive to any disturbance, and riparian vegetation is very important for the stability of these streams.
- **"D" type streams** evolve from a more stable stream type due to some natural or management caused disturbance but widen rather than downcutting. They straighten, steepen, and become braided. Braided streams have more than one channel and may change main channels with each high flow. This results in a loss of riparian vegetation and an unstable floodplain. These stream types are extremely unstable and have low potential for natural recovery.
- **"F" type streams** are highly entrenched (downcut), with little or no floodplain to dissipate flood flows, consequently, high flows are concentrated in the stream channel rather than in overbank flow which results in streambank erosion and loss of riparian vegetation. They usually evolve from a more stable stream type due to some natural or management caused disturbance. "F" type streams have a high width/depth ratio (wide and shallow) and lack the stream power, or energy, necessary to move the sediment though the system, causing aggrading. These stream types are generally unstable and extremely sensitive to disturbance.
- The numbers 1-6 indicate the dominant sediment size, 1=bedrock, 2=boulder (256-2048mm), 3=cobble (64-256mm), 4=gravel (2-64mm), 5=sand (.062-2mm), and 6=silt (<.062mm).

Water Sources

The availability of alternative water within a pasture can determine the amount of time cattle may spend in riparian areas. Waters on the allotment were located using the water points layer in the Forest’s Geographic Information System (GIS). This layer contains springs, tanks, and wells for which the Tonto National Forest has water rights or claims, as well as other sources indicated on the USGS topographic maps. Several of the water developments have been inventoried (Table 26).

Numerous water rights claims, applications, and certificates exist on waters located within the project area. These filings are held by the Tonto National Forest, the permittee, or both the Tonto National Forest and the permittee. The databases maintained by the Arizona Department of Water Resources (ADWR) and the Tonto National Forest were consulted to determine water use claims on the allotment. ADWR also published a Preliminary Hydrographic Survey Report (HSR) on the upper Salt River in 1992. It describes all water uses in the upper Salt River Watershed. Uses associated with the project area are described in the report. No water rights in this area have yet been adjudicated by the State. The government holds title to all range improvements, including tanks and spring improvements (Forest Service Manual 2240.3). The Tonto National Forest holds water rights or claims for springs and stock tanks for stock watering for 4,144,825 gallons per year on the Hicks-Pikes Peak Allotment.

Table 26: Water Sources and Inventory Data for the Hicks-Pikes Peak Allotment

State File Number	Use Name	Date	Remarks
33-94336	Hicks Spring		
33-94719	Rip Spring	3/16/2005	Functioning; willow, cottonwood.
33-94720	Pinyon Spring		
33-94723	Hope Spring		
33-94834	Moonshine Spring	3/12/2005	Not functioning.
33-94835	Trap Mesa Spring		
33-94836	Willow Spring		
36-103274	Dragger Horse Spring		
36-105425	Sycamore Spring		
36-105546	Pinal Creek		
36-18997	Lower Cox Canyon Spring		
36-18998	Little Brewster Spring		
36-18999	Laurel Spring	12/20/2006	Functioning; hillside spring.
36-19000	Jump Off Spring	8/10/2007	Could not locate.
36-19001	Jumpoff Water Spring	8/6/2007	Could not locate.
36-19002	Indian Spring	11/7/2005	Functioning; cottonwood, Goodding's willow, ash, seep willow.
36-19003	Horse Spring		
36-19004	Grapevine Spring	4/27/2009	Willows, seep willow, cottonwood, hackberry.
36-19005	Granite Spring		
36-19007	Cold Water Spring	2/20/2010	Functioning; seep willow.
36-19007	Cold Water Spring	8/8/2007	Could not locate.
36-19008	Brush Spring		
36-19009	Bluff Spring	12/20/2006	Not functioning; continuous deer grass, some seep willow and sedges.
36-24028	Procopio Spring	6/22/2007	Needs repair.
36-24029	Rockhouse Trail Spring	3/12/2005	Not functioning; cottonwood.

State File Number	Use Name	Date	Remarks
36-24030	Thirty Nine Spring	7/9/2007	Could not locate.
36-24031	Trap Mesa Spring		
36-24032	Turnout Spring	4/27/2009	Willow, seep willow, mesquite, netleaf hackberry present in sandy wash.
36-24033	Willow Spring		
36-24034	Wood Spring	8/27/2007	Not functioning; mesquite, no riparian vegetation.
36-24035	Cement Spring		
36-24036	Granite Spring		
36-24037	Price Spring	8/7/2007	Could not locate.
36-24038	Upper Cox Canyon Spring		
36-25341	Lower Mud Spring	6/14/2007	Functioning.
36-25342	Moonshine Spring	3/12/2005	Not functioning.
36-25343	Murphy Spring	12/20/2006	Functioning; sedges seep willow, deer grass, mature cottonwood, walnut, ash, sycamore.
36-25344	Mexican Camp Spring	11/8/2005	Functioning; lots of deer grass, walnut, ash, Goodding's willow, cottonwood.
38-23828	Horse Spring Tank		
38-23829	Roy's Tank	5/21/2007	Functioning.
38-23830	Summit Tank	5/11/2007	Not functioning.
38-23831	Apache Tank #2	8/16/2007	Functioning.
38-23832	Shute Tank	2/2/2009	Functioning.
38-23833	Redmond Tank	2/20/2010	Functioning.
38-23834	Apache Tank	8/16/2007	Functioning.
38-23835	Big Pond Tank	5/21/2007	Functioning.
38-23836	Rip Spring Tank	4/26/2010	Functioning.
38-23849	Murray Tank		
38-23923	Rocky Tank	6/14/2007	Functioning.
38-25143	Rockinstraw Tank #2		
38-25144	Rockinstraw Tank		
38-25145	Big Boulder Tank	1/31/2009	Functioning.
38-25146	Kyles Tank	2/6/2009	Functioning.
38-25147	Shute Tank #2	2/2/2009	Functioning.
38-25148	Jackson Tank	5/21/2007	Functioning.
55-600950	Shute Spring Well	9/25/2003	Not functioning; fence down; walnut, willow, herbaceous.
55-600955	Redmond Well	2/20/2010	Functioning; in the wash; cottonwood, willow nearby.
55-600956	Shute Road Well	11/3/2003	Functioning; drinker has no wildlife escape ramp.

State File Number	Use Name	Date	Remarks
55-600957	Little Mud Well		
55-600958	Sycamore Well	5/31/2007	Windmill is inactive; sycamore, walnut, cottonwood in wash.
55-600959	New Water Well	11/22/2003	Functioning.
55-600960	Storm Canyon Well		
55-601045	Big Pasture Well		
55-601049	Summit Well	11/3/2003	Functioning?; drinker has no wildlife escape ramp.
55-601049	Summit Well	5/11/2007	Disconnected.
55-601050	Dago Horz Well	12/23/2004	Functioning?
55-601070	Upper Well	11/22/2003	Functioning.
55-601072	Pinal Well		
55-601073	Devore Wash Well	6/7/2007	Functioning; in the wash; thick willow.
55-601074	Scanlon Well		
55-601075	Rockhouse Well		
55-601078	Dago Well	12/23/2004	Functioning.
55-601079	Lower Well	11/22/2003	Functioning; drinker has no wildlife escape ramp.
55-601079	Lower Well	5/11/2007	Disconnected.
55-601080	Hicks Well		
55-805499	Hicks Spring Well		

Gaged Stream Flow

Streamflow is gaged by the US Geological Survey (USGS) at two sites on the Salt River, one site on Cherry Creek and one site on Pinal Creek within or near the project area. "Salt River near Chrysotile, Az", the most upstream gage, has a period of record of 1924 to present, and the drainage area is 2,849 square miles (USGS 2011b). The “Salt River near Roosevelt, Az” gage has a period of record of 1913 to present, and the drainage area is 4,306 square miles (USGS 2011b). The “Cherry Creek near Globe, Az” gage has a period of record of 1965 to present, and the drainage area is 200 square miles (USGS 2011b). The Pinal Creek at Inspiration Dam, near Globe, Az gage has a period of record of 1980 to present, and the drainage area is 195 square miles (USGS 2011b). The annual hydrograph for the Salt River gages is characterized by a peak in the mean monthly flows in the spring in response to snowmelt followed by a steady decline through June with another smaller peak in August in response to monsoon moisture. The annual hydrograph for the Cherry and Pinal Creeks gages is characterized by a peak in the mean monthly flows in the winter in response to winter storms followed by a steady decline through June with another smaller peak in August in response to monsoon moisture. Mean monthly flows for the period of record are shown in Table 27.

Table 27: Mean monthly flows for USGS gages in the project area (USGS 2011b).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Salt River near Chrysotile, Az											
651	898	1450	1630	864	296	224	417	334	381	269	470
Salt River near Roosevelt, Az											
1110	1390	1970	1930	989	348	322	592	445	411	369	734
Cherry Creek near Globe, Az											
79	90	82	25	11	6.6	9	15	13	18	17	55
Pinal Creek at Inspiration Dam, near Globe, Az											
30	26	13	7.9	6.3	4.8	6.4	7.8	6.4	7.6	6.4	9.0

Appendix B. Criteria for the Outstandingly Remarkable Values (ORVs) for the Salt River (NPS 2011)

1. **Scenery (S):** The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions. When analyzing scenic values, additional factors -- such as seasonal variations in vegetation, scale of cultural modifications, and the length of time negative intrusions are viewed -- may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment.

2. **Recreation (R):** Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing and boating.
    - Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the region of comparison.
    - The river may provide, or have the potential to provide, settings for national or regional usage or competitive events.

3. **Geology (G):** The river, or the area within the river corridor, contains one or more example of a geologic feature, process or phenomenon that is unique or rare within the region of comparison. The feature(s) may be in an unusually active stage of development, represent a "textbook" example, and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial, or other geologic structures).

4. **Wildlife (W):** Wildlife values may be judged on the relative merits of either terrestrial or aquatic wildlife populations or habitat or a combination of these conditions.
    - *Populations:* The river, or area within the river corridor, contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique, and/or populations of federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."
    - *Habitat:* The river, or area within the river corridor, provides exceptionally high quality habitat for wildlife of national or regional significance, and/or may provide unique habitat or a critical link in habitat conditions for federal or state listed (or candidate) threatened, endangered or sensitive species. Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of habitats is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."

Appendix C – Legal Locations of Hicks-Pikes Peak Allotment

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Appendix D – Hicks Pikes Peak Existing Improvements

Table 28: Existing Improvements – Fences

Improvement Number	Improvement Name	Year Constructed
224003	CABBAGE PATCH FENCE	03/01/1969
224031	SHUTE SPRING FENCE	03/01/1930
224032	REDMOND FLAT FENCE	03/01/1930
224033	PIKES PEAK FENCE	03/01/1930
224086	HICKS DAGGER BOUNDARY FENCE	03/01/1930
224087	HICKS PIKES INTERIOR	03/01/1930
224088	HICKS WINTERS BOUNDARY FENCE	03/01/1930
224089	SQUAW BUTTE DIVISION FENCE	03/01/1930
224090	WINDMILL DIVISION FENCE	03/01/1930
224091	HEADQUARTERS FENCE	03/01/1930
224092	LITTLE PASTURE FENCE	03/01/1930
224093	PIKES PEAK POISON SPRINGS BOUNDARY FENCE	03/01/1930
224094	PIKES PEAK SLEEPING BEAUTY BOUNDARY FENCE	03/01/1960
224095	PIKES PEAK FENCE	03/01/1930
224097	WEST STEER PASTURE FENCE	03/01/1960
224099	ORTEGA HOPE DIVISION FENCE	03/01/1995
224101	HICKS RADIUM BOUNDARY FENCE	03/01/1930
224102	HICKS SEDOW BOUNDARY FENCE	03/01/1982
224103	HICKS ROOT PLOW FENCE	03/01/1970
224104	MAIN DIVISION FENCE	03/01/1989
224105	RIP FENCE	03/01/1989
224106	SHUTE SPRING FENCE	
224109	REDMOND WING FENCE	
224119	KENNY MURPHY FENCE	
224120	WEST FENCE	
224122	EAST ORTEGA DIVISION FENCE	9/2018
224123	EAST ORTEGA DRIFT BOUNDARY FENCE	9/2018

Table 29: Existing Improvements - Stock Tanks

Improvement Number	Improvement Name	Year Constructed
224025	MURRAY WASH STK	03/01/1930
224026	SHUTE SP STK	03/01/1930
224027	SHUTE STK #2	03/01/1960
224028	REDMOND MTN STK	03/01/1960
224051	APACHE STK	03/01/1930
224052	KYLES STK	03/01/1930
224053	BIG BOULDER STK	03/01/1930
224054	JACKSON STK	03/01/1930
224055	ROCKINSTRAW STK	03/01/1960
224056	ROCKINSTRAW STK #2	03/01/1960
224057	ROCK STK	03/01/1960
224058	HORSE SPR STK	03/01/1930
224059	ROYS STK	03/01/1930
224060	SUMMIT STK	03/01/1930
224073	APACHE STK #2	03/01/1960
224110	BIG POND STK	
224121	RIP SPRING STK	

Table 30: Existing Improvements - Water Systems

Improvement Number	Improvement Name	Year Constructed
224001	PRICE HORIZONTAL WELL	03/01/1968
224002	DAGGER HORIZONTAL WELL	03/01/1969
224004	MONES CAMP HORIZONTAL WELL	03/01/1971
224005	HORSE SPRING	03/01/1960
224006	SHUTE SPRING WINDMILL	03/01/1930
224007	SHUTE SPRING WINDMILL PIPELINE	03/01/1930
224008	JUMPOFF SPRING	03/01/1930
224009	LAUREL SPRING	03/01/1930
224010	MURPHY SPRING	03/01/1930
224011	MEXICAN CAMP SPRING	03/01/1960

Improvement Number	Improvement Name	Year Constructed
224012	39 SPRING	03/01/1930
224013	GRANITE SPRING	03/01/1930
224014	DEVORE WASH WINDMILL	03/01/1930
224015	DEVORE WASH PIPELINE	03/01/1960
224016	BLUFF SPRING	03/01/1930
224017	HICKS WINDMILL	03/01/1930
224018	COLD WATER SPRING	03/01/1930
224019	ROCKHOUSE WINDMILL	03/01/1930
224020	INDIAN SPRING	03/01/1960
224021	DAGO SPRING	03/01/1960
224022	SHUTE ROAD WINDMILL	03/01/1960
224023	SHUTE ROAD WINDMILL STORAGE	03/01/1960
224024	SCALON WINDMILL	03/01/1960
224029	REDNMOND WINDMILL	03/01/1960
224030	REDMOND WINDMILL STORAGE	03/01/1960
224036	MOONSHINE SPRING	03/01/1960
224061	LITTLE BREWSTER SPRING	03/01/1930
224062	PROCOPIP SPRING	03/01/1930
224063	CEMENT SPRING	03/01/1930
224064	SYCAMORE WINDMILL	03/01/1930
224065	LITTLE MUD WINDMILL	03/01/1930
224066	GRANITE SPRING	03/01/1930
224067	JUMPOFF SPRING	03/01/1930
224068	LOWER MUD SPRING	03/01/1930

Improvement Number	Improvement Name	Year Constructed
224069	LOWER GUN CYN SPRING	03/01/1930
224070	UPPER GUN CYN SPRING	03/01/1930
224071	TURNOUT SPRING	03/01/1930
224072	WILLOW SPRING	03/01/1930
224075	NEW WATER WINDMILL	03/01/1960
224076	UPPER WINDMILL	03/01/1960
224077	BIG PASTURE WINDMILL	03/01/1930
224078	LOWER WINDMILL	03/01/1960
224079	GRAPEVINE SPRING	03/01/1930
224080	SUMMIT WINDMILL	03/01/1960
224081	SUMMIT PIPELINE	03/01/1960
224082	WOOD SPRING	03/01/1930
224083	WOOD PIPELINE	03/01/1930
224084	PINAL WINDMILL	03/01/1930
224085	STORM CANYON WINDMILL	03/01/1930
224096	JUMPOFF PIPELINE	03/01/1960
224098	39 SPRING PIPELINE	03/01/1988
224100	DEVORE WASH WINDMILL STORAGE	03/01/1988
224107	SHUTE ROAD WINDMILL PIPELINE	
224113	ROYS WINDMILL	2010

Table 31: Existing Improvements - Corrals

Improvement Number	Improvement Name	Year Constructed
224034	MURPHY PICKET CORRAL	03/01/1930
224035	MIDDLE WATER CORRAL	03/01/1930

Improvement Number	Improvement Name	Year Constructed
224037	DEVORE WASH CORRAL	03/01/1930
224038	PICKET CORRAL	03/01/1960
224039	DAGO SPR CORRAL	03/01/1960
224040	ROCKHOUSE CORRAL	03/01/1965
224041	SHUTE WINDMILL CORRAL	03/01/1967
224042	SQUAW BUTTE CORRAL	03/01/1930
224043	GRAPEVINE CORRAL	03/01/1930
224044	STORM CANY0N CORRAL	03/01/1930
224045	PROCOPIO SPR CORRAL	03/01/1930
224046	BRUSH CORRAL	03/01/1930
224047	SUMMIT CORRAL	03/01/1960
224048	LOWER MILL CORRAL	03/01/1930
224049	SYCAMORE CORRAL	03/01/1930
224050	HORSESHOE BEND CORRAL	03/01/1930
224108	REDMOND CORRAL	
224111	BIG POND CORRAL	
224112	WOOD SPRING CORRAL	
224051	BIG POND CORRAL	
224114	WEST CORRAL	
224115	WOOD SPRING CORRAL	