

United States Department of the Interior
Bureau of Land Management

Land Health Evaluation
Cerro Colorado Lease No. 6186
June 2017

U.S. Department of the Interior
Bureau of Land Management
Gila District
Tucson Field Office
3201 East Universal Way
Tucson, AZ 85756
Phone: (520) 258-7200
FAX: (520) 258-7238



This page left intentionally blank

Contents

1.	Introduction	1
2.	Allotment Profile.....	1
2.1	Location.....	1
2.2	Physical Description	3
2.2.1	Acreage	3
2.2.2	Watersheds	5
2.2.3	Soils.....	5
2.3	Biological Resources.....	6
2.3.1	Major Land Resource Areas	6
2.3.2	Ecological Sites	6
2.3.3	Vegetation Communities	9
2.3.4	General Wildlife Resources.....	11
2.3.5	Threatened & Endangered Species	12
2.3.6	BLM Sensitive Species	15
2.3.7	Migratory Birds	18
2.4	Special Management Areas.....	18
2.5	Recreation Resources.....	18
2.6	Heritage Resources & the Human Environment	18
2.6.1	Cultural Resources.....	18
2.6.2	Native American Concerns	21
3.	Grazing Management	22
3.1	Grazing History.....	22
3.2	Grazing System.....	23
3.2.1	Existing Range Improvements	24
3.3	Mandatory Terms and Conditions for Permitted Use.....	26
4.	Objectives	26
4.1	Relevant Planning and Environmental Documents.....	26
4.2	Allotment Specific Objectives.....	26
4.2.1	Land Health Standards	26
5.	Plant List	28
6.	Inventory and Monitoring Methodology	32
6.1	Evaluation Protocol	32
6.1.1	Indicators of Rangeland Health.....	32
6.2	Monitoring Protocols	33

Cerro Colorado Allotment Land Health Evaluation

6.2.1	Line Point Intercept (species composition and ground cover)	33
6.2.2	Pace Frequency	34
6.2.3	Fetch	34
6.2.4	Dry Weight Rank	34
6.2.5	Utilization	34
7.	Management Evaluation and Summary of Studies data	36
7.1	Actual Use	36
7.2	Precipitation	36
7.3	Key Area Data	37
7.3.1	Utilization	37
7.3.2	Rangeland Health Evaluations and Frequency/Cover, Composition and Structure Data	37
8.	Determination of Land Health Standards	54
9.	Recommended Management Actions	56
9.1	Proposed Terms and Conditions	56
10.	List of Reviewers and Preparers	58
11.	Authorized Officer Concurrence	59
12.	References	60

This page left intentionally blank

1. INTRODUCTION

The purpose of this draft Land Health Evaluation (LHE) report is to evaluate whether the Arizona Standards for Rangeland Health are being achieved on the Cerro Colorado allotment. In the case of non-achievement of Standards, the LHE would also seek to determine if livestock are the causal factor for either not achieving or not making significant progress towards achieving the Standards. An evaluation is not a decision document, but a stand-alone report that clearly records the analysis and interpretation of the available inventory and monitoring data. As part of the LHE process, Desired Plant Community (DPC) objectives (also referred to as key area objectives in this document) were established for the biological resources within the allotment.

The Secretary of the Interior approved Bureau of Land Management (BLM) Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (Standards and Guidelines) in April 1997. The Decision Record, signed by the Arizona BLM State Director (April 1997) provides for full implementation of the Standards and Guidelines in Arizona land use plans. Standards and guidelines are implemented by the BLM through terms and conditions of grazing permits, leases, and other authorizations, grazing related portions of activity plans, and through range improvement-related activities. Land health standards are measurable and attainable goals for the desired condition of the biological resources and physical components/characteristics of desert ecosystems found within the allotment.

This evaluation seeks to ascertain:

If Standards are being achieved or not achieved, and, if not, if significant progress is being made towards achievement of the land health.

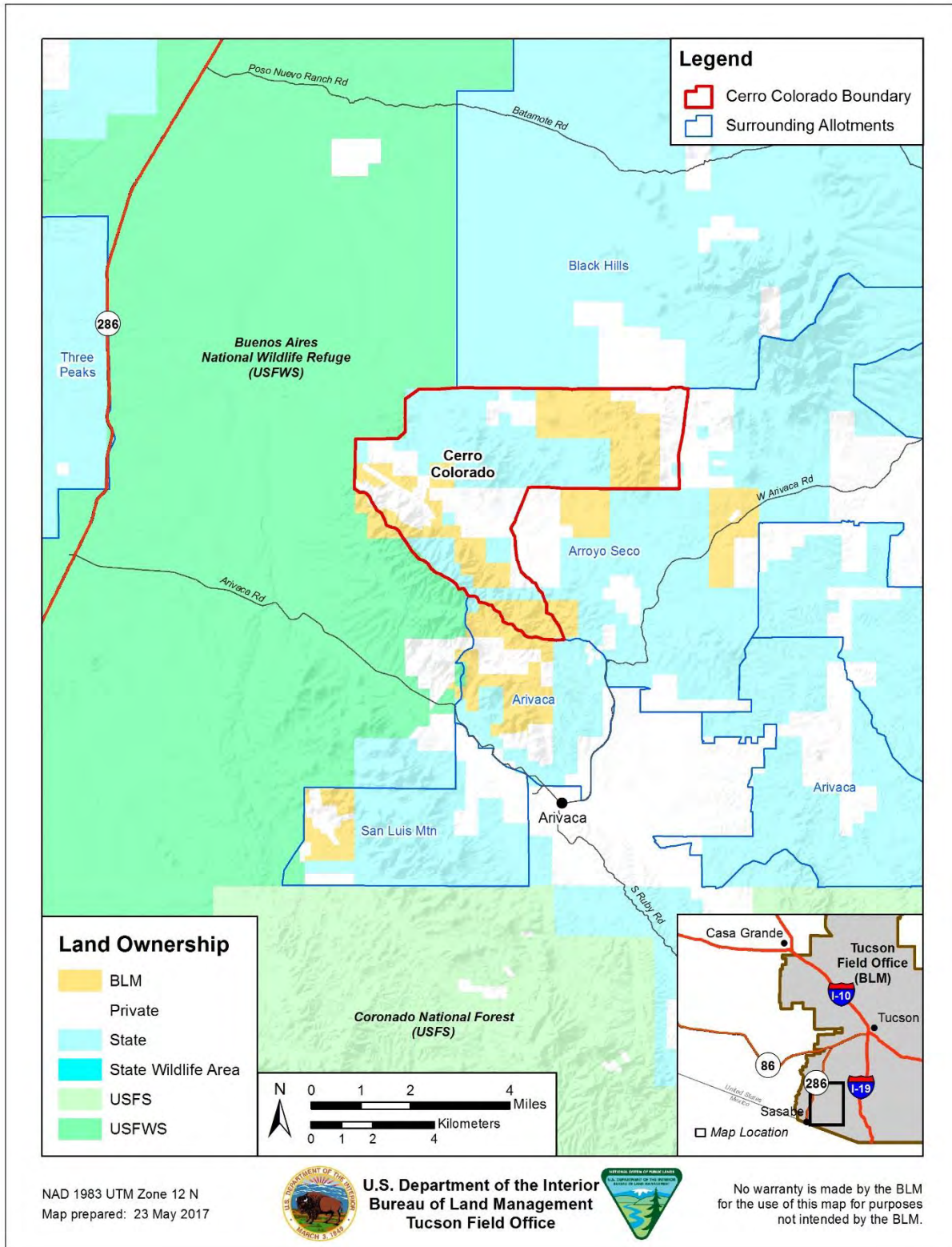
In the case of non-achievement of Standards, determine whether livestock grazing is a significant factor causing that non-achievement.

2. ALLOTMENT PROFILE

2.1 Location

The Cerro Colorado allotment is located approximately 3 miles north of the town of Arivaca, and 12 miles southwest of Amado, Pima County, Arizona. It is located 15 miles northeast and 15 miles west of the weather stations in Sasabe and Tumacacori, respectively. The ranch is bordered by the Buenos Aires Wildlife Refuge to the west, the Arroyo Seco allotment to the East, the Marley Ranch to the north, and the Arivaca Ranch to the south (Figure 1).

Figure 1 Vicinity Map of Cerro Colorado Allotment



2.2 Physical Description

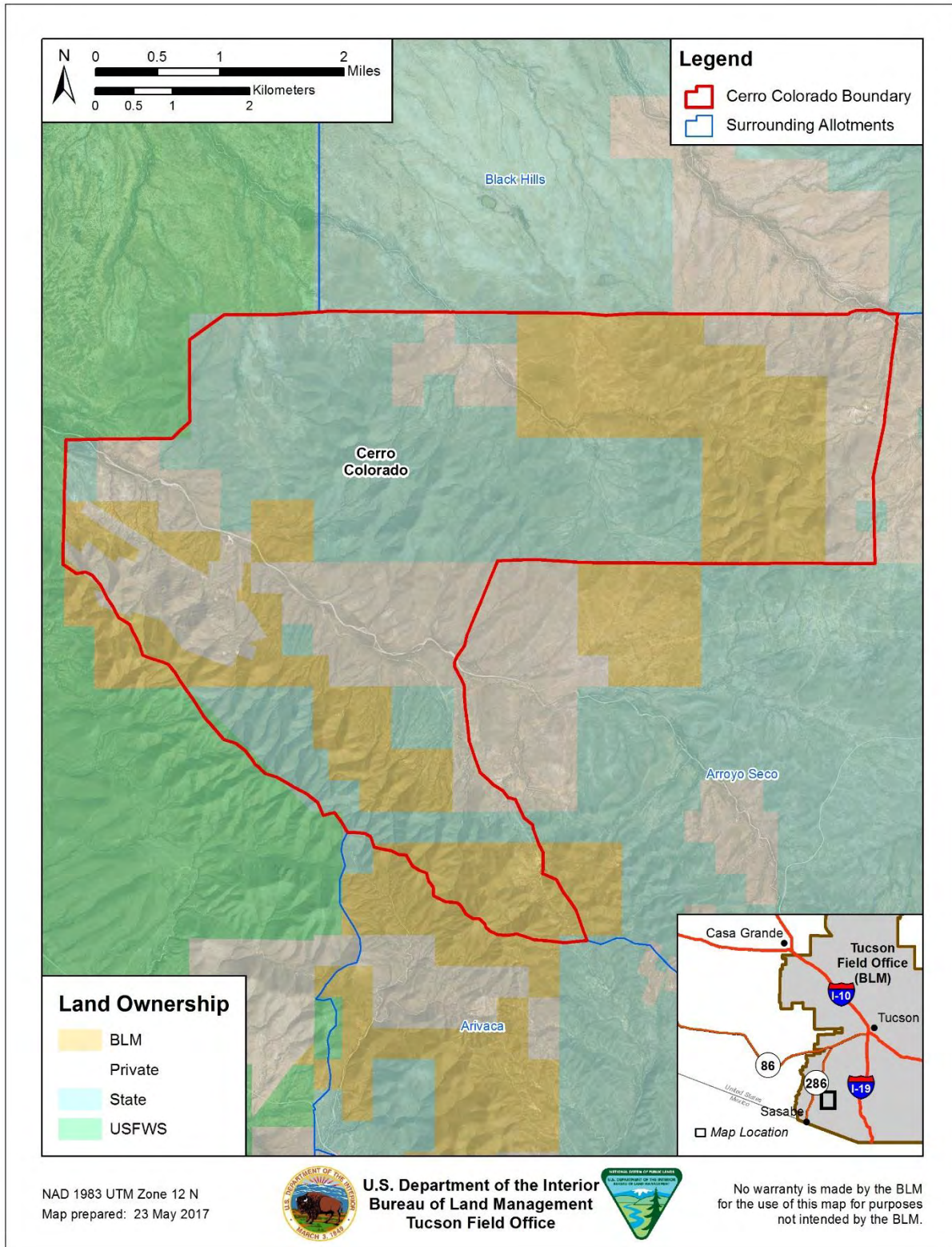
2.2.1 Acreage

The acreage of the Cerro Colorado allotment is given below in Table 1. Lands within the allotment are predominately State-owned, with lesser amount of private lands. Public lands constitute about 37 percent of the allotment. Spatial distributions of land ownership are displayed in Figure 2. Public lands are located within the entire allotment.

Table 1. Acreage of landownership

Land Classification	
Public Acres	3,715
State Acres	4,657
Private Acres Owned by Pima County	1,780
Total Acres	10,152

Figure 2. Land Ownership of the Cerro Colorado Allotment



2.2.2 Watersheds

The Southwestern portion of the Cerro Colorado allotment is bounded by the Las Guijas Mountains, while it encompasses part of the Cerro Colorado Mountains to the North East. The allotment is situated along the watershed divide between the Altar Wash (HUC 10 -1505030403) watersheds to the North and the Arivaca Creek (HUC 10 - 1505030401) to the South. The Arivaca Creek watershed is approximately 89,000 acres and has an elevation range from 5,300 to 3,200 feet, with an average elevation of 3,900 feet. The Altar Wash watershed covers an area of 224,000 acres, with an elevation ranging from 7,700 to 2,700 feet. The watersheds are a part of the Brawley Wash - Los Robles Wash sub basin that drains from the US-Mexico border near Sasabe to the confluence with the Santa Cruz River.

The Santa Cruz Basin (HUC 6 -150503) covers almost 5 ½ million acres with an elevation range from over 9,400 feet in the Santa Rita Mountains to near 1,100 feet near its terminus at the Santa Cruz Flats. Within the Santa Cruz Basin, the Santa Cruz River originates in high grassland headwaters of the San Rafael Valley of southcentral Arizona where it flows south into Northern Sonora, Mexico. From there it makes a 149 mile U-turn, flows north again, reentering the U.S. near and just east of Nogales, Arizona, then drains north through Tucson and continues northward to join the Gila River. The Gila then flows west into the Colorado River at the Arizona-California state line, which then flows south into Mexico and empties into the Gulf of California via the Laguna Santa Clara (also known as the Santa Clara Slew).

2.2.3 Soils

The soil composition on the Cerro Colorado allotment is varied. Data presented in Table 2 is derived from the Natural Resource Conservation Service (NRCS) Web Soil Survey system. The Area of Interest (AOI) does not exactly match the allotment boundary but is very close being less than 1 percent difference. The dominant soils are Deloro-Andrada complex, 5 to 35 percent slopes and Deloro-Rock outcrop complex, 15 to 60 percent slopes. The soils in the area dominantly have a thermic soil temperature regime, an aridic or ustic soil moisture regime, and mixed mineralogy and are formed in alluvium. They are very shallow to very deep and are well drained and somewhat excessively drained. Ustic Torrifluvents (Ubik and Keysto series) formed on flood plains. Calcids (Blakeney series) formed on terraces. Argids (Eloma and Forrest series) and Aridic Haplustalfs (Gardencan and Crowbar series) formed on fan terraces. Shallow and very shallow Haplustolls (Far and Yarbam series) formed on hills and mountains.

Table 2. Soil Survey for vicinity of the Cerro Colorado Allotment

Map Unit Name	Acres in AOI	Percent of AOI
Altar-Sasabe complex, 1 to 8 percent slopes	46.6	0.5%
Bernardino-Tombstone association, 5 to 16 percent slopes	4.7	0.0%
Caralampi very gravelly sandy loam, 5 to 15 percent slopes	43.5	0.4%
Comoro sandy loam, 0 to 2 percent slopes	98.6	1.0%
Deloro-Andrada complex, 5 to 35 percent slopes	5,901.1	58.9%
Deloro-Rock outcrop complex, 15 to 60 percent slopes	2,165.2	21.6%
Lampshire-Romero-Rock outcrop complex, 10 to 65 percent slopes	1,329.3	13.3%
Oracle-Romero-Rock outcrop complex, 5 to 35 percent slopes	76.9	0.8%
Pantak-Deloro complex, 8 to 35 percent slopes	6.5	0.1%
Riveroad and Comoro soils, 0 to 2 percent slopes	242.1	2.4%
Romero-Oracle complex, 25 to 60 percent slopes	56.5	0.6%
Sasabe-Caralampi complex, 1 to 15 percent slopes	52.9	0.5%
Totals	10,023.7	100.0%

2.3 Biological Resources

2.3.1 Major Land Resource Areas

Major Land Resource Areas (MLRAs) are geographically associated land resource units, usually encompassing several thousand acres. NRCS soil scientists in appropriate states wrote the descriptions of new MLRAs and MLRAs with changed boundaries. The National Soil Survey Center staff wrote the descriptions of MLRAs with no boundary changes since 1981. The information in the United States Department of Agriculture Handbook 296 Issued 2006 is current as of October 2005. A unit may be one continuous area or several separate nearby areas. MLRAs are characterized by particular patterns of soils, geology, climate, water resources and land use. The Cerro Colorado allotment is located in MLRA 41—Southeastern Arizona Basin and Range, this area is in Arizona (89 percent) and New Mexico (11 percent). It makes up about 15,730 square miles.

Most of this MLRA is in the Mexican Highland Section of the Basin and Range Province of the Intermontane Plateaus. The eastern one-fifth of the MLRA is in the Sonoran Desert Section of that same province and division. This MLRA has mountain ranges that trend southeast to northwest and has relatively smooth valleys between the mountains. Examples of the many mountain ranges are the Chiricahua, Dagoon, Swisshelm, and Pedregosa Mountains. Near Wilcox Arizona, there is a distinct closed basin called the Wilcox Playa. The southeast boundary of the part of this MLRA in New Mexico is the Continental Divide. Elevation ranges from 2,620 to 4,590 feet in most areas. It generally ranges from 4,920 to 5,900 feet in the mountains. On some peaks, however, it can reach almost 8,900 feet. On Mt. Graham, in Arizona, it reaches 10,717 feet. The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Middle Gila (1505), 51 percent; Upper Gila (1504), 33 percent; Sonora (1508), 14 percent; and Rio Grande-Mimbres (1303), 2 percent. The Gila River runs through the northern end of this area. The San Francisco, San Simon, and San Pedro Rivers are tributaries to the Gila River in this MLRA.

Major Land Resource Areas are broken down further into ecological sites, which are associated units of soil and vegetation with quantifiable characteristics.

2.3.2 Ecological Sites

An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. It is the product of all the environmental factors responsible for its development, and it has a set of key characteristics (soils, hydrology, and vegetation) that are included in the Ecological Site Description. Development of the soils, hydrology, and vegetation are all interrelated (TR 1734-07, Ecological Site Inventory). Ecological sites are named and classified based on soil parent material or soil texture and precipitation. Ecological sites provide a consistent framework for classifying and describing rangeland soils and vegetation thereby delineating land units that share similar capabilities to respond to management activities or disturbance. NRCS provides Ecological Site Descriptions online at <https://esis.sc.egov.usda.gov/>.

Eight ecological sites exist within the Cerro Colorado allotment. Two Key Areas (KA) CC-2 and CC-3 have been established based on their representative features to measure the long-term trend of vegetation and ground cover within the Volcanic Hills 12-16" precipitation zone ecological site (R041XC323AZ). This ecological site constitutes the majority of the BLM lands in the allotment (Figure 3). Line point intercept, ground cover utilization, and photos were collected at both key areas and are the locations where the LHE was documented in 2014. Key vegetative species for this ecological site include Wrights buckwheat (*Eriogonum wrightii*), side-oats grama (*Bouteloua curtipendula*), and hairy grama (*Bouteloua hirsute*).

The Volcanic Hills 12-16" precipitation zone ecological site occurs in the middle elevations of the Madrean Basin and Range province of southeastern Arizona. It occurs on hill-slopes and ridge-tops. Slope aspect is site differentiating at elevations near MLRA boundaries.

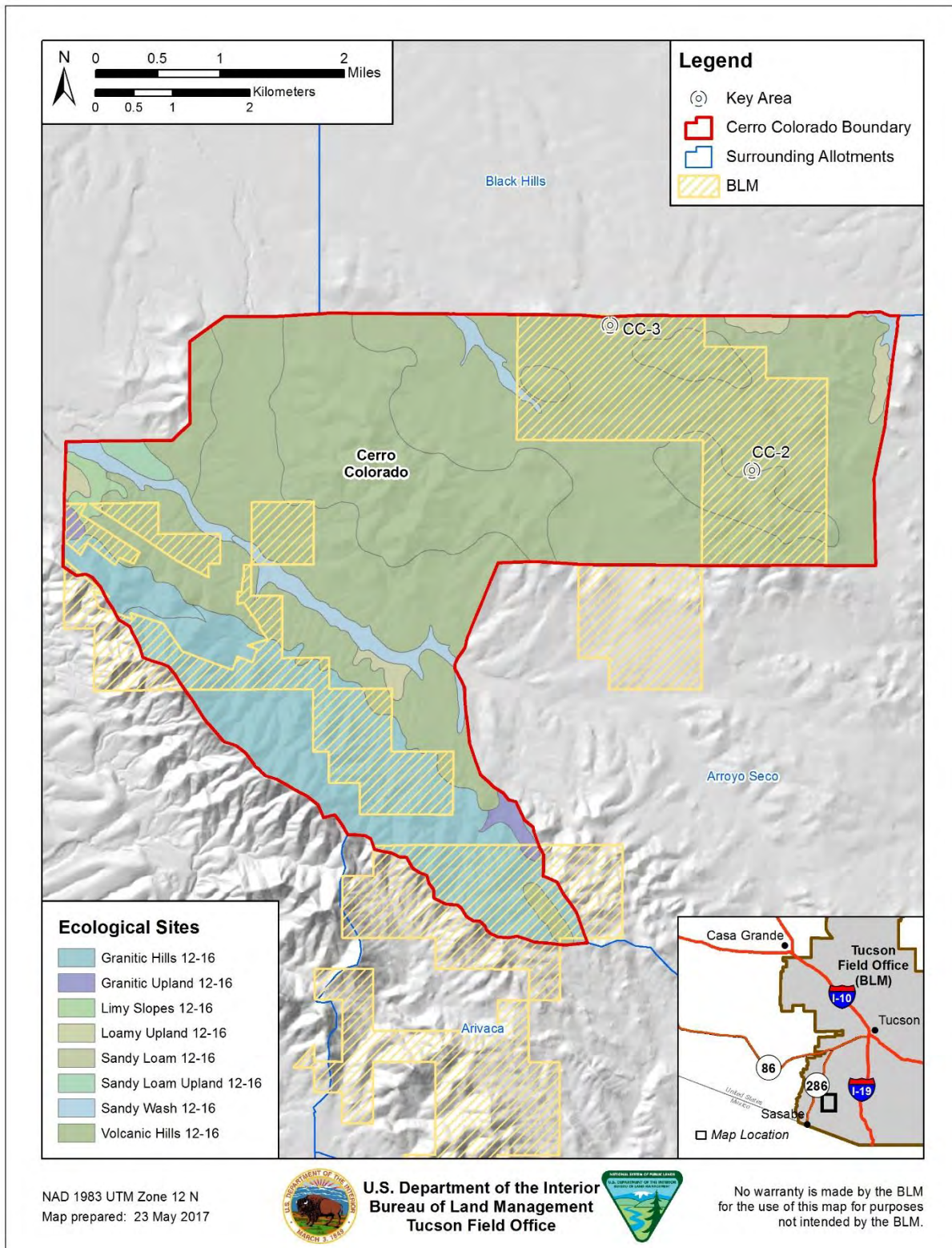
The natural plant communities found on the ecological site are diverse. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The Historical Climax Plant Community represents the natural potential plant communities found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as fire, grazing, or drought.

Warm season perennial grasses dominate the potential natural plant community on this site. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community.

The aspect is shrub dotted grassland. Cool season plants start growth in early spring and mature in early summer, while warm season plants take advantage of summer rains and are growing and nutritious in July-September. Warm season grasses may remain green through the winter. In the absence of wildfire for long periods of time and with overgrazing, shrubs and succulents can increase to dominate the plant community. Climatic warming may be driving the increase of shrubs like the mimosa species.

Well-developed gravel, stone and cobble ground cover protect the soil from erosion and protect forage species from heavy utilization. Large areas of rock outcrop and inaccessible areas hold reserves of perennial grasses and forbs to help reseed lower slopes. The natural fire regime was an important factor in the development of the potential plant community and helped maintain a balance between grasses, forbs and shrubs. The natural fire regime interval was about 10 years.

Figure 3. Ecological sites within the Cerro Colorado Allotment



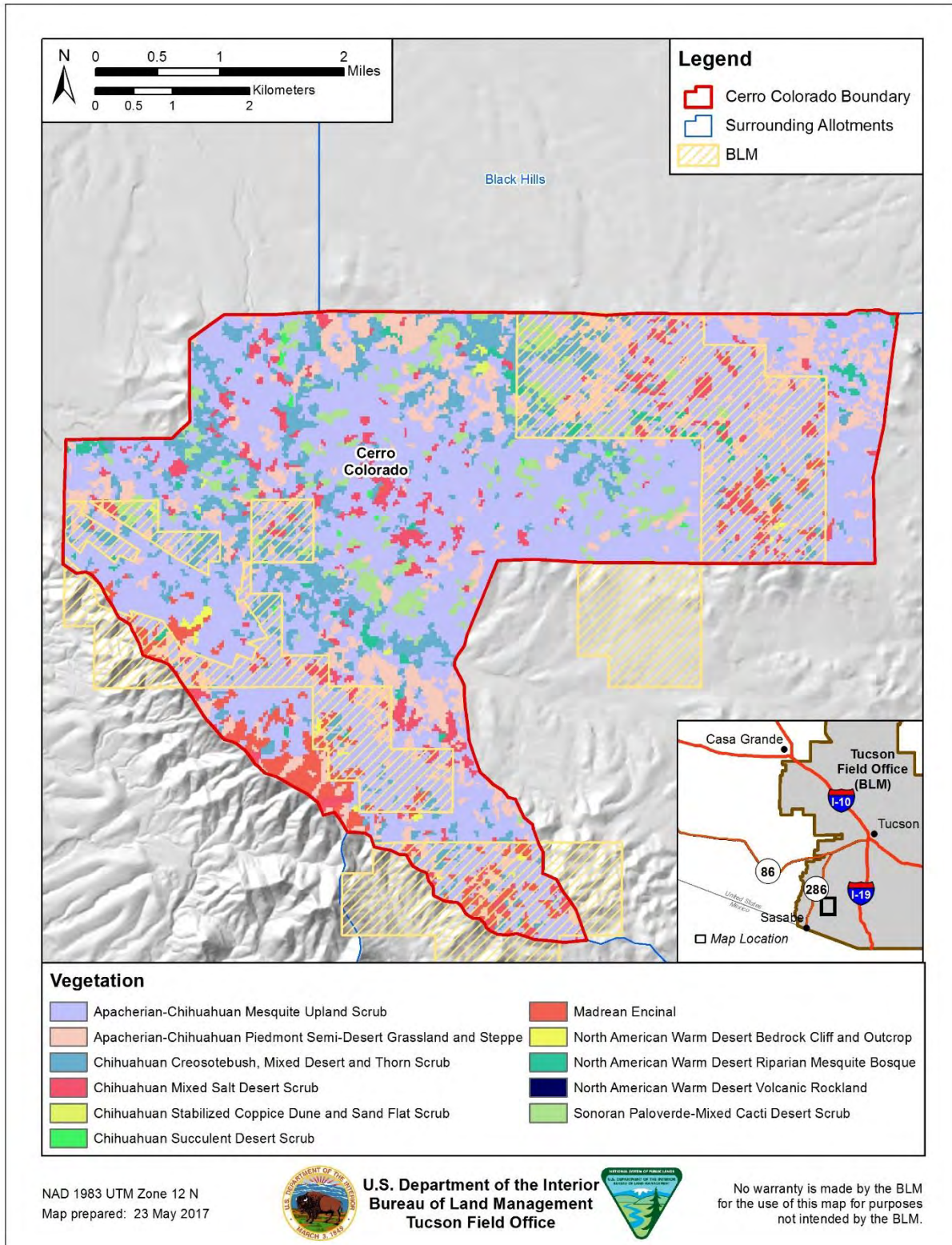
2.3.3 Vegetation Communities

The Southeastern Arizona Basin and Range major land resource area supports forest, savanna, and desert shrub vegetation. Pine-oak woodlands are at the higher elevations, where ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), canyon live oak (*Quercus chrysolepis*), New Mexico locust (*Robinia neomexicana*), Mexican pinyon (*Pinus cembroides*), buckbrush (*Ceanothus cuneatus*), and manzanita (*Arctostaphylos pungens*) grow along with an understory of muhlys (*Muhlenbergia* spp.), bluegrasses (*Poa* spp.), sedges (*Carex* spp.), pine dropseed (*Blepharoneuron tricholepis*), and squirreltail (*Elymus elymoides*). Evergreen woodland savannas are at intermediate elevations, where Mexican blue oak (*Quercus oblongifolia*), Emory oak (*Quercus emoryi*), and turbinella oak (*Quercus turbinella*) are the dominant species and cane beardgrass (*Bothriochloa barbinodis*), sideoats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), Texas bluestem (*Schizachyrium cirratum*), plains lovegrass (*Eragrostis intermedia*), sprucetop grama (*Bouteloua chondrosioides*), threeawns (*Aristida* spp.), and needlegrass (*Achnatherum* spp.) characterize the understory. Whitethorn acacia (*Vachellia constricta*), soaptree yucca (*Yucca elata*), fourwing saltbush (*Atriplex canescens*), mesquite (*Prosopis* spp.), and ocotillo (*Fouquieria splendens*) grow on the drier soils at the lower elevations. The understory on these sites consists of Rothrock's grama (*Bouteloua rothrockii*), black grama (*Bouteloua eriopoda*), alkali sacaton (*Sporobolus airoides*), curly mesquite (*Hilaria belangeri*), plains bristlegrass (*Setaria vulpiseta*), and bush muhly (*Muhlenbergia porteri*).

Many of the plant species occur in various vegetation communities across the MLRA, with the vegetation communities being defined by the dominant species that occur in them. An example is the Apacherian-Chihuahuan mesquite upland scrub being dominated by mesquite with a grass and shrub understory, while grasses and shrubs dominate the Apacherian-Chihuahuan piedmont semi-desert grassland and steppe with a mesquite component giving it a steppe aspect. The BLM lands within the allotment are mainly composed of those two vegetation communities.

Figure 4 below shows the vegetation community types based on the Southwest Regional GAP Analysis Project within the Cerro Colorado allotment.

Figure 4. Vegetation Communities within Cerro Colorado Allotment



2.3.4 General Wildlife Resources

Wildlife species expected to occur on this allotment include the following;

- mule deer (*Odocoileus hemionus*),
- white-tailed deer (*Odocoileus virginianus*),
- mountain lion (*Puma concolor*),
- javelina (*Tayassu tajacu*),
- coyote (*Canis latrans*),
- bobcat (*Lynx rufus*),
- raccoon (*Procyon lotor*),
- Stripped skunk (*Mephitis mephitis*),
- white-throated woodrat (*Neotoma albigula*),
- white-footed mouse (*Peromyscus leucopus*);

Birds

- red-tailed hawk (*Buteo jamaicensis*),
- Cooper's hawk (*Accipiter cooperii*),
- golden eagle (*Aquila chrysaetos*),
- prairie falcon (*Falco mexicanus*),
- raven (*Corvus corax*),
- turkey vulture (*Cathartes aura*),
- meadowlark (*Sturnella neglecta*),
- ladder-back woodpecker (*Dryobates scalaris*),
- ash-throated flycatcher (*Myiarchus cinerascens*),
- canyon wren (*Catherpes mexicanus*),
- rough-winged swallow (*Stelgidopteryx serripennis*);

Reptiles

- gopher snake (*Pituophis catenifer*),
- king snake (*Lampropeltis getula*),
- western diamondback rattlesnake (*Crotalus atrox*),
- prairie rattlesnake (*Crotalus viridis*),
- coachwhip (*Coluber flagellum*),
- patch-nosed snake (*Salvadora hexalepis*),
- desert grassland whiptail lizard (*Aspidoscelis uniparens*),
- side-blotched lizard (*Uta stansburiana*),
- ornate tree lizard (*Urosaurus ornatus*),

Amphibians

- Canyon tree frog (*Hyla arenicolor*).

2.3.5 Threatened & Endangered Species

A query conducted on the U.S. Fish & Wildlife Service (USFWS) Information for Planning and Conservation (IPaC; USDI 2016) website showed that the following threatened, endangered and proposed (TEP) species may occur within the allotment:

- Lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*)
- Jaguar (*Panthera onca*)
- Ocelot (*Leopardus pardalis*)
- Sonoran pronghorn (*Antilocapra americana sonoriensis*)
- Chiricahua leopard frog (*Lithobates chiricahuensis*)
- California least tern (*Sterna antillarum browni*)
- Mexican spotted owl (*Strix occidentalis lucida*)
- Yellow-billed cuckoo (*Coccyzus americanus*)
- Northern Mexican garter snake (*Thamnophis eques megalops*)
- Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*)

Review of habitat requirements for each species was conducted to determine its potential to occur on the allotment and to inform the Effects Determination for each species (Table 3). No designated or proposed critical habitats overlap with this allotment.

Table 3. Species indicated by 2016 USDI iPAC analysis for Cerro Colorado Allotment

Species	Habitat	Potential for Occurrence on Cerro Colorado Allotment and Effects Determination
Lesser long-nosed bat	Mainly desert scrub habitat in the U.S. portion of its range. In Mexico, the species occurs up into high elevation pine-oak and ponderosa pine forests. Altitudinal range is from 1,600-11,500 feet. Roosting is in caves, abandoned mines, and unoccupied buildings at the base of mountains where agave, saguaro, and organ pipe cacti are present. Forages at night on nectar, pollen, and fruit of paniculate agaves and columnar cacti. ⁵	Forage species for lesser long-nosed bat may occur on Cerro Colorado allotment; however, forage availability to lesser long-nosed bat in the area will not be significantly reduced because of livestock grazing on the allotment, as lesser long-nosed bat are a mobile species, foraging up to 50 miles from roost sites. No effect to lesser long-nosed bat.
Jaguar	In the northern portion of the range, found in thornscrub, desert scrub, and grasslands. Vegetation communities used in Arizona range from Sonoran desert scrub at lower elevations to sub-alpine mixed conifer in the mountain ranges. ³	The allotment is located within the potential range of jaguar and may be used by the species for foraging or travel between mountain ranges. Consultation with USFWS concerning effects of livestock grazing to jaguar within the Gila District was completed in 2012 (USDI 2012). USFWS concurred with the determination that livestock grazing within the allotment may affect, but is not likely to adversely affect jaguars.

Species	Habitat	Potential for Occurrence on Cerro Colorado Allotment and Effects Determination
Ocelot	Desert scrub communities in Arizona ⁴	Several confirmed sightings of ocelots have been made in Arizona in recent years, with confirmed sightings of live ocelots made in 2009 and 2011 in Cochise County. ⁴ No sightings are known from the Cerro Colorado allotment area. USFWS concurred with the determination in USDI 2012 that livestock grazing within the allotment may affect, but is not likely to adversely affect ocelot
Sonoran pronghorn	Lower Sonoran Desert habitat ⁶	Historic range of the species included nearby Altar Valley, however Sonoran pronghorn have not occupied this area since probably the 1920-1940s. Populations of the species in the US occur only on the Cabeza Prieta National Wildlife Refuge and the Organ Pipe Cactus National Monument near Ajo AZ approximately 80-100 miles west of the Cerro Colorado allotment. Sonoran Pronghorn do not occupy the Cerro Colorado allotment area. No Effect
Chiricahua leopard frog	The Chiricahua leopard frog historically occurred in cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet. It is now often restricted to springs, livestock tanks, and streams in the upper portions of watersheds where non-native predators either have yet to invade or habitats are marginal for them. ²	No known habitat for the species occurs on the allotment. No Effect
California least tern	Forms nesting colonies on barren to sparsely vegetated areas. Nests in shallow depressions on open sandy beaches, sandbars, gravel pits, or exposed flats along shorelines of inland rivers, lakes, reservoirs, and drainage systems. Primarily in California, may occur in different parts of Arizona where habitat components are	Habitat does not exist for California Least Tern on the Cerro Colorado allotment. No effect

Cerro Colorado Allotment Land Health Evaluation

Species	Habitat	Potential for Occurrence on Cerro Colorado Allotment and Effects Determination
	adequate for nesting or feeding such as large lakes, recharge basins, or wetland areas. Breeding documented in Maricopa County. Transient migrants occur more frequently and have recently been documented in Mohave and Pima counties. ¹	
Mexican spotted owl	Spotted owls are residents of old-growth or mature forests that possess complex structural components (uneven aged stands, high canopy closure, multi-storied levels, high tree density). Canyons with riparian or conifer communities are also important components. In southern Arizona and New Mexico, the mixed conifer, Madrean pine-oak, Arizona cypress, encinal oak woodlands, and associated riparian forests provide habitat in the small mountain ranges (Sky Islands) distributed across the landscape. ⁷	Habitat for this species does not occur on or near the allotment. No Effect
Yellow-billed cuckoo	Nests in willows along streams and rivers, with nearby cottonwoods serving as foraging sites. Critical habitat designated but no designation on the Cerro Colorado allotment. ⁹	Yellow-billed cuckoo habitat not on the Cerro Colorado allotment. No effect
Northern Mexican gartersnake	This species occurs up to about 8,500 feet in elevation, but is most frequently found between 3,000 and 5,000 feet in the United States. The northern Mexican gartersnake is found in both lotic and lentic habitats that include cienegas and stock tanks (in southern Arizona), as well as river habitat that includes pools and backwaters. It forages along the banks of waterbodies feeding primarily upon native fish and adult and larval leopard frogs. ¹⁰	Habitat for northern Mexican gartersnake does not occur on the Cerro Colorado allotment. No Effect
Pima pineapple cactus	This cactus grows in alluvial basins or on hillsides in semi-desert grassland and Sonoran desert scrub in southern	Some potential for occurrence on allotment, though surveys have not been conducted. USFWS concurred with the determination in

Species	Habitat	Potential for Occurrence on Cerro Colorado Allotment and Effects Determination
	Arizona and northern Mexico. Soils range from shallow to deep, and silty to rocky, with a preference for silty to gravely deep alluvial soils. The plant occurs most commonly in open areas on flat ridge tops or areas with less than 10-15% slope. ⁸	USDI 2012 that livestock grazing within the allotment may affect, but is not likely to adversely affect Pima Pineapple cactus.
<p>¹https://www.fws.gov/southwest/es/arizona/Documents/Redbook/California%20Least%20Tern%20RB.pdf</p> <p>²https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Chiricahua%20Leopard%20Frog%20RB.pdf</p> <p>³https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Jaguar%20RB.pdf</p> <p>⁴https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Ocelot%20RB.pdf</p> <p>⁵https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Lesser%20Long-nosed%20bat%20RB.pdf</p> <p>⁶https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Sonoran%20Pronghorn%20RB.pdf</p> <p>⁷http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B074</p> <p>⁸https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Pima%20Pineapple%20cactus%20RB.pdf</p> <p>⁹http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B06R</p> <p>¹⁰https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Northern%20Mexican%20gartersnake%20RB.pdf</p>		

2.3.6 BLM Sensitive Species

The BLM sensitive species that have suitable habitat present and are known or have the potential to exist within this allotment are:

- spotted bat (*Euderma maculatum*),
- Townsend’s big-eared bat (*Corynorhinus townsendii*),
- Mexican long-tongued bat (*Choeronycteris mexicana*),
- California leaf-nosed bat (*Macrotus californicus*),
- cave myotis (*Myotis velifer*),
- western mastiff bat (*Eumops perotis*),
- Sonoran desert tortoise (*Gopherus morafkai*),
- western narrow-mouthed toad (*Gastrophryne olivacea*),
- Sonoran green toad (*Anaxyrus retiformis*),
- American peregrine falcon (*Falco peregrinus*),
- bald eagle (wintering) (*Haliaeetus leucocephalus*),
- Botteri’s sparrow (*Peucaea botterii*),
- cactus ferruginous pygmy-owl (*Glaucidium brasilianum*),
- desert purple martin (*Progne subis hesperia*),
- gilded flicker (*Colaptes chrysoides*),
- golden eagle (*Aquila chrysaetos*),
- desert ornate box turtle (*Terrapene ornata ornata*).

Cerro Colorado Allotment Land Health Evaluation

The bat species may occur on the allotment if roosting habitat is available in cliffs, caves, or mines. The bat species utilize the desert habitats for foraging for nectar, pollen, insects or fruits.

The aquatic species such as the western narrow-mouthed toad and the Sonoran green toad are associated with any perennial native or man-made spring/water source that possesses water year-round, although none provide riparian habitat. They utilize grasslands, rocky and wooded hills, and areas along the edge of marshes and inhabit rain pools, wash bottoms, and areas near water in semi-arid mesquite-grassland, creosote bush desert, and upland saguaro-paloverde desert scrub.

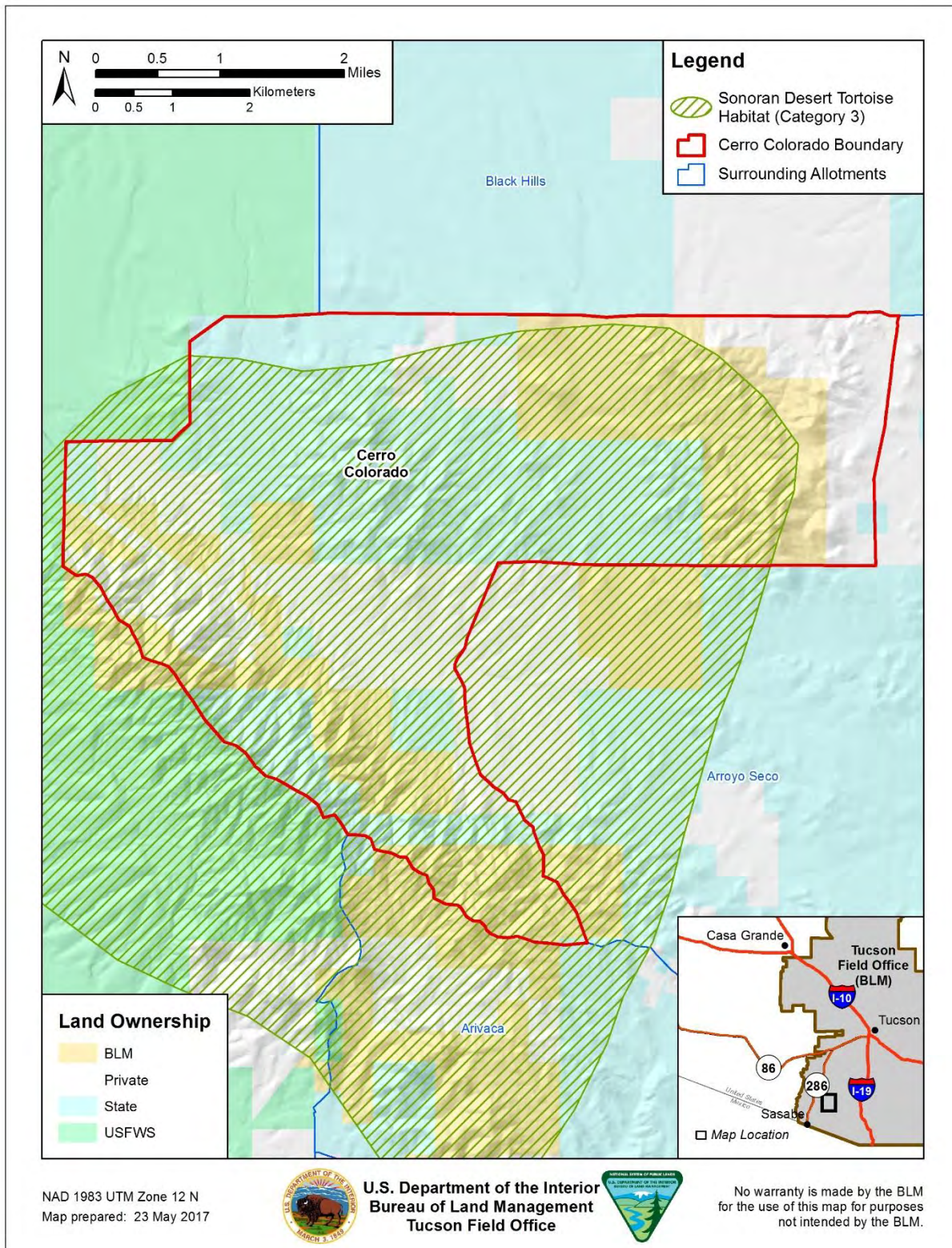
In central and southern Arizona, the pygmy-owl is currently found primarily in Sonoran desert scrub vegetation, with some locations in riparian drainages and woodlands within semi-desert grassland vegetation communities.

This allotment contains category 3 Sonoran desert tortoise habitat for a total of 9,655 total acres of categorized tortoise habitat of which 3,213 acres of category 3 habitat overlap BLM managed lands as shown in figure 5 below. The purpose of tortoise habitat categorization is to provide for the protection of tortoise habitat through the management of multiple uses to ensure that adequate forage, cover and space are available to tortoise throughout the year (USDI 1988). The tortoise utilizes rugged uplands such as rocky bajadas, hillsides, mountain slopes, and canyons. The bird species utilize the grassland, open shrub, and cliff habitat for nesting and foraging.

The desert ornate box turtle utilizes low valleys, plains and gentle bajadas of the semi-desert grasslands and Chihuahuan desertscrub communities and is most abundant between 3,000 and 6,500 feet. The box turtle feeds on insects and plant materials.

Bartram stonecrop is found in rock crevices, ledges, and gravelly slopes ranging from 3,652 to 6,700 feet in elevation in southern Arizona and Mexico. The plant is typically found in the shade of Madrean evergreen woodland overstory and under dense litter. Populations tend to be very small, typically consisting of a few individuals, and are widely scattered.

Figure 5. Sonoran Desert Tortoise Category 3 Habitat within the Cerro Colorado allotment



2.3.7 Migratory Birds

The Cerro Colorado allotment, which includes the BLM managed public lands and other land jurisdictions, offer diverse habitats for migratory birds, providing valuable food, water, and cover. Migratory species that utilize the area include but are not limited to:

- Arizona woodpecker (*Leuconotopicus arizonae*),
- Bendire's thrasher (*Toxostoma bendirei*),
- canyon towhee (*Melospiza fusca*),
- five-striped sparrow (*Amphispiza quinquestrata*),
- golden eagle,
- red-tailed hawk,
- raven,
- turkey vulture,
- meadowlark,
- ladder-back woodpecker,
- ash-throated flycatcher,
- canyon wren,
- varied bunting (*Passerina versicolor*),
- Costa's hummingbird (*Calypte costae*),
- gilded flicker (*Colaptes chrysoides*),
- phainopepla (*Phainopepla nitens*), and
- rufous-winged sparrow (*Peucaea carpalis*).

No surveys have been conducted specifically within this allotment for this project to determine presence but these species have the potential of occurring within these habitats.

2.4 Special Management Areas

There are no special management areas within the Cerro Colorado allotment boundary.

2.5 Recreation Resources

The BLM managed public lands in the area provide opportunities for dispersed recreation primarily related to hunting and recreational off highway vehicle driving for pleasure and sightseeing. There are no developed recreation sites on the allotment. Overall, recreational use is low in volume.

2.6 Heritage Resources & the Human Environment

The BLM's evaluation of rangeland health standards includes considerations for the protection of cultural resources—such as prehistoric and historic-age sites, buildings, and structures—and plants that may be of traditional and/or cultural significance to Native Americans. Should impacts to sites or traditional-use plants be identified, revised lease terms and conditions may be warranted and/or rangeland management directives could be modified to achieve desired resource conditions. The following sections describe the BLM TFO's assessment efforts regarding applicable heritage resources management and compliance criteria.

2.6.1 Cultural Resources

The BLM's authorization of grazing leases is considered an undertaking subject to compliance with Section 106 of the National Historic Preservation Act (NHPA; 54 U.S.C. 306108 et seq.). The BLM has the legal responsibility to consider the effects of its actions on *historic properties* located on public lands.

BLM Manual 8100 Series and the Arizona BLM Protocol (the Statewide Protocol) provide Section 106 compliance requirements to meet appropriate cultural resources management standards. Additionally, cultural resources evaluations for proposed grazing permits and leases generally follow the procedures and guidance provided in BLM Instructional Memoranda.

Section 106 of NHPA requires federal agencies to 1) identify historic properties within Areas of Potential Effects (APEs) for a federal undertaking, 2) evaluate the significance of cultural resources by determining National Register of Historic Places (NRHP) eligibility, and 3) consult with applicable federal, state, and tribal entities regarding assessment results, NRHP eligibility determinations, and proposed methods to avoid or mitigate potential impacts to historic properties. In Arizona, the BLM's NHPA responsibilities are carried out in accordance with the Statewide Protocol—a Programmatic Agreement (PA) among the BLM and the Arizona State Historic Preservation Officer (SHPO; executed December 14, 2014). Should a routine undertaking be determined to have “no historic properties affected” or “no adverse effect” by a qualified BLM archaeologist, the undertaking may proceed under the terms and conditions of the Statewide Protocol. If the undertaking is determined to have “adverse effects,” or otherwise meets the stipulated consultation thresholds, project-specific consultation is then initiated with the SHPO.

A small number of controlled studies have been performed to examine potential grazing impacts on historic properties (c.f., Osborn and Hartley 1991, Osborn et al. 1987, Roney 1977, and Van Vuren 1982). For example, Alan Osborn and his colleagues examined the effects of domestic livestock grazing on the archaeological resources of Capitol Reef National Park in southern Utah. The study included reconnaissance and observations at recorded sites, and the creation of experimental and control plots containing several types of newly manufactured lithic and ceramic artifacts that were measured, weighed, placed, and mapped. Several study plots were located close to water sources. The study plots and artifacts were reexamined after six months of grazing use. Osborn found that 93 percent of the artifacts remained intact, and 84 percent remained visible. Pottery fragments were more prone to breakage. Mapping revealed that 23 percent of artifacts were displaced, but that 75 percent of the displaced artifacts had moved less than 15 centimeters.

The results varied by study plot location with the greatest impacts recorded near water sources, which received higher concentrations of livestock use. Osborn and Hartley (1991) concluded, “the degree of effect is a direct reflection of grazing intensity and dependence on limited water sources in this cold desert environment.” This conclusion is also reflected in a study that examined lithic artifact breakage in areas of variable livestock use along the Central Arizona Project aqueduct in the western Arizona desert (Brown and Stone 1982) where collections of lithic artifacts from six archaeological sites were found to exhibit breakage rates between 13 and 17 percent. In comparison, 52 percent of the artifacts from a seventh site located near a cattle-accessed reservoir were found broken. In sum, these studies have demonstrated that grazing impacts to cultural resources are primarily of concern in areas of concentrated livestock use such as around water sources and corrals.

Direct impacts to historic properties where livestock concentrate may include trampling, chiseling, and churning of site soils, cultural features and artifacts, artifact breakage, and impacts from standing, leaning, or rubbing against historic structures, above-ground cultural features and/or rock art (Broadhead 2001; Osborn et al. 1987). Indirect impacts from livestock concentrations may include accelerated soil erosion and gullying, in addition to increased potential for unlawful artifact collection and/or vandalism of cultural resources. Other indirect impacts may include degradation of the historic setting, thereby detracting from the view-shed and historic feeling of nearby cultural resource sites. However, cultural resources are constantly subject to site formation processes or events after creation (Binford 1981; Schiffer 1987). These processes can be both cultural and natural, and may occur instantly or over

thousands of years. Cultural formation processes include activities directly or indirectly caused by humans. Natural processes include chemical, physical, and biological processes of the natural environment that impinge upon and/or modify cultural materials. Determining the cause of impacts to historic properties may be difficult, in some cases, because activities such as camping and off-highway vehicle use may also result in the same kinds of effects as described above.

A BLM cultural resources specialist completed a comprehensive Class 1 (existing information) assessment of the Cerro Colorado grazing allotment between November 28, 2016 and January 15, 2017, and conducted field inspections of select locations—including one of the four identified livestock concentration areas—on February 8, 2017 with other members of the BLM Interdisciplinary Team. Data reviewed were obtained from BLM TFO cultural program project files, site reports, and atlases, in addition to BLM-maintained General Land Office (GLO) plats and patent records. Electronic files also were reviewed using online cultural resource databases including *AZSite*, Arizona's statewide cultural resource inventory system (administered by the Arizona State Museum), and the *National Register of Historic Places Focus Database & NPGallery Digital Asset Search* (maintained by the National Park Service). Archival information was compared with livestock grazing and range improvement data to determine the potential for resource conflicts, particularly in livestock concentration areas such as around water sources, at chutes/corrals, and near supplemental feeding locations. The results of archival research are summarized as follows; data provided are applicable to BLM administered lands within the subject allotment (i.e., the jurisdictional APE) and based on currently available information from the aforementioned sources.

Background research identified no prior cultural resources surveys and one possible site on the BLM administered portion of the Cerro Colorado allotment. The site, AZ DD:7:10 (ASM), is documented as prehistoric artifact scatter with possible subsurface features. Although locational data among *AZSite* and BLM records are inconsistent, neither of the potential locations are within an identified livestock concentration area on BLM administered lands. Documented Native American sites in the general vicinity (i.e., not on BLM administered lands) include rockshelters in the nearby mountains, and two villages that were occupied between A.D. 900 and 1200.

Historic-age GLO plats also depict the locations of “Hoistens House” and “Liberty Mine,” with associated “corral” and “shaft” features (plat no. 2370, dated 1886); “Martinez’s House” and an unnamed road (plat no. 2367, dated 1886); the “Pesqueria Mining Camp,” an unnamed mine, and an unnamed road (plat no. 2426, dated 1907); and various lode claims associated with the Las Guijas Mine (plat no. 2366, dated 1904) within the current study area. Area mines, such as Las Guijas, were worked prior to the early 1900s for gold and silver. The nearby Las Guijas Mill Site, AZ DD:7:29 (ASM), consists of a 1940s- to 1950s-era foundation with associated footers, artifacts, and features (Varney 1998:103; Hesse 2005); this site, along with most of identified cultural features, provides evidence that, for over 100 years, the landscape has supported a variety of economic activities such as ranching and mineral exploitation (Freshwater 2005).

Field inspection resulted in the identification of a previously undocumented historic habitation and/or campsite (possibly related to a historic-age GLO feature), and the remains of another 1930s-to-1950s-era mill structure; however, neither of these sites were located within a livestock concentration area and grazing-related impacts were not observed. These sites will be subject to more formalized documentation and NRHP assessment at a later date.

Statement of Effect Determination

Because of this cultural resources assessment, *no impacts were observed to historic properties that also coincide with areas of potential impacts from concentrated livestock use on the BLM administered portion of the Cerro Colorado allotment.* A light-to-moderate level of dispersed livestock use would be allowed under the proposed lease terms; no new range improvement projects are currently proposed as a component of this land-health evaluation or lease issuance.

As a routine undertaking with no identified livestock-related impacts to historic properties within the BLM administered portion of the allotment, lease issuance for continued grazing of the Cerro Colorado allotment is appropriate under a finding of “no adverse effect,” with the following Conditions of Approval (COAs) applied as lease stipulations. Any subsequent cultural resources inventory should focus on identified areas of livestock concentration within the BLM administered portion of the allotment, as appropriate. Proposed range improvements would be subject to individual project review and assessment for compliance with Section 106 and the Statewide Protocol. If, as a result of any new assessment or monitoring, historic properties are identified and found to exhibit potential for or actively occurring grazing impacts, mitigation measures would be developed in coordination with the SHPO and any other applicable consulting parties.

Cultural Resources Stipulations / Standard Conditions of Approval (COAs)

The operator is responsible for informing all persons who are associated with the allotment operations that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts. Any cultural (historic/prehistoric site or object) or paleontological resource (fossil remains of plants or animals) discovered during operations shall be immediately reported to the Authorized Officer (AO) or his/her designee. All operations in the immediate area of the discovery shall be suspended until written authorization to proceed is issued. An evaluation of the discovery shall be made by a qualified archaeologist or paleontologist to determine appropriate actions to prevent the loss of significant cultural or scientifically important values.

If in connection with this work any human remains, funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (P.L. 101-601; 104 Stat. 3048; 25 U.S.C. 3001) are discovered, operations in the immediate area of the discovery shall cease, the remains and objects shall be protected, and the operator shall immediately notify the BLM Tucson Field Manager. The immediate area of the discovery shall be protected until notified by the BLM Tucson Field Manager that operations may resume.

2.6.2 Native American Concerns

Native American religious concerns are legislatively considered under several acts and Executive Orders including the American Indian Religious Freedom Act (AIRFA; 42 U.S.C. 1996), the Native American Graves Protection and Repatriation Act (NAGPRA; 25 U.S.C. 3001), and Executive Order 13007 (Indian Sacred Sites). In sum, and in concert with other provisions such as those found in the NHPA and Archaeological Resources Protection Act (ARPA; 16 U.S.C. 470aa-470mm), these acts and orders require the federal government to carefully and proactively consider the traditional and religious values of Native American culture and lifeways to ensure, to the greatest degree possible, that access to sacred sites, treatment of human remains, the possession of sacred items, conduct of traditional religious practices, and the preservation of important cultural properties are not unduly infringed upon. In some cases, these concerns are directly related to *historic properties* and/or archaeological resources, such as

those considered under Section 106 of the NHPA. Likewise, elements of the landscape without archaeological or human material remains also may be involved.

The BLM initiated government-to-government consultation with three Native American tribes who claim cultural affiliation to and/or traditional use of the area by sending letters summarizing the results of the cultural resources assessment and rangeland monitoring data for the Arroyo Seco and Cerro Colorado allotments. Tribes consulted include the Hopi Tribe, Pascua Yaqui Tribe, Tohono O'odham Nation, and the White Mountain Apache Tribe. Plant species with potential cultural significance are noted to occur within the Cerro Colorado allotment such as broom snakeweed (*Gutierrezia sarothrae*) and velvet mesquite (*Prosopis velutina*; USDA-NRCS 2017).

Currently, there are no known adverse impacts to any culturally significant plants, items, sites, or landscapes (see prior Cultural Resources section). Additionally, because lease issuance does not include authorization for new construction, ground disturbance, or the direct sale/exchange of federally managed lands, the undertaking will not prevent access to any known sacred sites, prevent the possession of sacred objects, or otherwise interfere with the performance of traditional ceremonies and/or rituals.

If new information is provided by consulting tribes, additional or edited terms and conditions of land-use and/or mitigation may be required to protect or restore resource values. Future assessment and/or consultations would occur during the BLM's review of any additional proposed actions within the subject allotment such as range improvement projects. Should the BLM identify adverse impacts, additional consultations regarding potentially significant sites and possible protection or mitigation strategies would be warranted.

3. GRAZING MANAGEMENT

3.1 Grazing History

The Rancho Seco Coordinated Resource Management Plan summarizes the allotment's history. The Old Seco (Cerro Colorado) and the Santa Lucia (Arroyo Seco) units are the two parts of what was formerly Rancho Seco, a larger historic ranch. Rancho Seco has been owned and operated by the Rowley family for the last 60 years.

Neighbors to the ranch included the Kemper Marley Ranch on the north, the Arivaca Ranch on the south, and the Sopori Ranch to the east. The west neighbor was Gil Cattle Co, then later Pruett-Wray Ranches, which is now the Buenos Aires Wildlife Refuge.

Don Rowley, his foreman Ernest "Chapo" Valenzuela, and a cowboy crew of four operated the ranch with about 800 head of high quality straight Hereford cattle for the next 40 years.

Following the death of Don Rowley, Rancho Seco, covering over 36,000 acres, was purchased by Pima County in the fall of 2005 and the operation was split into two units. The northwest portion of the ranch, the Old Seco unit, is called the Cerro Colorado allotment, and operates it under Rancho Seco, LLC. This unit currently consists of about 10 sections with 50 percent being Arizona State Trust Land lease, 25 percent Bureau of Land Management lease, and 25 percent privately owned by Pima County.

Pima County acquired the lands, including the State and the BLM grazing leases, in 2005 using bond election funds intended to preserve open space lands under the Sonoran Desert Conservation Plan (SDCP). These lands are intended to function as mitigation for development impacts in other portions of the County, and are to be managed for their ecological health and integrity, as well as to maintain a viable ranching operation that is compatible with the SDCP.

The ranch unit is currently operated under a management agreement with the Rowley brothers. The agreement permits cattle grazing and the pasturing of ranch horses in specific areas provided that the biological resources of the ranch are protected and not adversely affected. In order to achieve this, the Pima County Range Management Standards and Guidelines were developed in conjunction with range experts to set parameters for acceptable levels of use and provide science-based methods for gauging current range conditions. While the ranch operators control the day-to-day management, the County and the Manager have agreed to meet at least annually to evaluate resource conditions and determine whether the Coordinated Resource Management Plan (CRMP) is appropriate for existing conditions or needs to be modified. Pima County is responsible for all final management actions, including the right to limit or exclude grazing from certain areas of the property.

The management category given to the allotment is custodial (C). “Custodial grazing management is applied to areas having acceptable range condition and a stable or improving trend. Under custodial management, the BLM management actions are limited to licensing livestock use based on the animal unit months (AUMs) available on the public lands, and the individual ranch operator determines the livestock numbers and the grazing system (if any) to be used. The BLM checks these grazing units to ensure that the utilization on public lands is not excessive, that range condition and trend are being maintained, and that applicable regulations are being followed. If utilization is found to be excessive or the range trend to be down, the BLM will work with the operator to adjust livestock numbers on the total grazing unit. Grazing units managed custodially include areas where the effects of livestock use on the public land resources are anticipated to be minimal. Selection of public land areas for custodial management is based on the following criteria:

- (1) Present range condition is not a factor.
- (2) Allotments have low resource production potential and are producing near their potential.
- (3) Limited resource-use conflict/controversy may exist.
- (4) Opportunities for positive economic return on public investment do not exist or are constrained by technological or economic factors.
- (5) Present management appears satisfactory or is the only logical practice under existing resource conditions.

3.2 Grazing System

There is currently one lease issued for 780 AUMs on public lands for the Cerro Colorado allotment. The Cerro Colorado (Old Seco) Allotment is 10,512 total acres of which 3,715 acres is administered by the BLM. AUM totals for the Cerro Colorado allotment leases are in Table 4.

Table 4. Cerro Colorado Leases and AUMs

Grazing Lease	Animal Unit Months	Authorized Animal Units
State Trust #005-389-00-010	1,020 AUMs	85 AU Yearlong
BLM #06186 Cerro Colorado	780 AUMs	65 AU Yearlong
Total	1,800 AUMs	150 AU Yearlong

The Rancho Seco CRMP includes the most accurate description of the current grazing system. At present, a major factor in livestock distribution on the Cerro Colorado allotment is water availability in the pastures. Thus, during the dry months the herd is rotated through the pastures with the best wells: the Tapioca, Shirley and Mary G. The well at Old Seco is weak, so even though the Old Seco East pasture represents a large portion of the ranch it currently remains underutilized. The dry Old Seco pasture has been primarily utilized during the post-monsoon season when the tanks are full, and then the herd is rotated into the eastern pastures in the spring following the recent dry winters where they can utilize water from the functional wells. Overall herd numbers have been reduced in recent years to avoid negatively affecting land resources. Planned use/rotation future grazing plans in the ranch will be based on the current established rotations and modified as necessary in response to environmental conditions. Due to climate, drought and other unforeseen circumstances, adaptive management will be employed with respect to numbers and timing when moving cattle between pastures. Salt and supplemental protein may be provided to the cow herd at the operator's discretion. Salt blocks and supplements should be moved periodically to avoid creating permanent "salt grounds" and placed away from water whenever feasible.

Perhaps the greatest annual variation in southern Arizona is the amount and effectiveness of precipitation received. The plant communities found here are adapted to this kind of variability as long as they are healthy and vigorous. As a pasture rotation system is utilized, one critical strategy within both units of the ranch will be to build up a reserve of forage in the rested pastures to provide supplemental feed in particularly dry years, and thereby avoid drastic herd reductions. When necessary, herd numbers will be reduced to avoid affecting the land.

3.2.1 Existing Range Improvements

The Cerro Colorado unit currently contains five pastures: the Tapioca (approximately 1200 ac.) to the east of the Rancho Seco Headquarters, the Mary G (approximately 600 ac.) and Horse Trap (approximately 335 ac.) in the south, the Shirley Trap (approximately 50 ac.) to the north, and the large Old Seco East pasture (approximately 4100 ac.) in the west. Three reliable wells are located in the Tapioca, Shirley and Mary G pastures, while the remainder of the ranch mostly relies on seasonal wells and surface waters (dirt tanks). Other current range improvements consist of watering facilities, corrals, stock tanks, fence lines and pipelines. Figure 6 is a map of the existing range improvements throughout the entire allotment. This mapping exercise was completed using aerial imagery as well as verification from the lease holder.

3.3 Mandatory Terms and Conditions for Permitted Use

There is currently one lease issued for 780 AUMs on public lands. The Mandatory Terms and Conditions of the lease are listed below:

Table 5. Mandatory Terms and Conditions of the Lease

Livestock Kind	Grazing Period of Use	Percent Public Land*	Type Use	AUMs
Cattle	3/1 to 2/28	100	Active	780

* Percent Public Land is used for calculating AUMs on the BLM acreage. This is not stating the percent of public land within the total allotment.

4. OBJECTIVES

4.1 Relevant Planning and Environmental Documents

- Eastern Arizona Grazing Environmental Impact Statement (1987)
- Phoenix District Resource Management Plan (1989)
- Gila District Livestock Grazing Program Biological Opinion, 2012

4.2 Allotment Specific Objectives

4.2.1 Land Health Standards

Standard 1: Upland Sites

“Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform (ecological site).”

Criteria for meeting Standard 1:

Soil conditions support proper functioning of hydrologic, energy, and nutrient cycles. Many factors interact to maintain stable soils and healthy soil conditions including appropriate amounts of vegetative cover, litter, soil porosity, and organic matter. Under proper functioning conditions, rates of soil loss and infiltration are consistent with the potential of the site.

Ground cover in the form of plants, litter or rock is present in pattern, kind, and amount sufficient to prevent accelerated erosion for the ecological site; or ground cover is increasing as determined by monitoring over an established period of time.

Signs of accelerated erosion are minimal or diminishing for the ecological site as determined by monitoring over an established period of time.

As indicated by such factors as:

- Ground Cover
 - Litter

- Live vegetation, amount and type (e.g. grass, shrubs, trees, etc.)
- Rock
- Signs of erosion
 - Flow pattern
 - Gullies
 - Rills
 - Plant pedestaling

Standard 2: Riparian-Wetland Sites

“Riparian-wetland areas are in proper functioning condition.”

Standard 2 is **not applicable** because no riparian-wetland sites exist within the Cerro Colorado allotment.

Standard 3: Desired Resource Conditions

“Productive and diverse upland and riparian-wetland plant communities of native species exist and are maintained.”

Criteria for meeting Standard 3:

Upland and riparian-wetland plant communities meet desired plant community objectives. Plant community objectives are determined with consideration for all multiple uses. Objectives also address native species, and the requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and appropriate laws, regulations, and policies.

Desired plant community objectives will be developed to assure that soil conditions and ecosystem function described in Standards 1 and 2 are met. They detail a site-specific plant community, which when obtained, will assure rangeland health, State water quality standards, and habitat for endangered, threatened, and sensitive species. Thus, desired plant community objectives will be used as an indicator of ecosystem function and rangeland health.

As indicated by such factors as:

- Composition
- Structure
- Distribution

Desired Plant Community Objective

As part of the LHE process, Desired Plant Community (DPC) objectives were established for important biological resources. DPC objectives address the desired resource conditions based on vegetation attributes, such as composition, structure, and cover that are desired within the allotment. These include establishing vegetative characteristics necessary for soil protection, providing forage and habitat for both livestock and wildlife.

Perennial grass components of the DPCs provide important forage resources for Sonoran desert tortoise by providing protein for nutrition and to help tortoises excrete excess potassium. Shrub components provide forage for grazing wildlife such as mule deer, as well as foliar cover for smaller animals such as rabbits, quail and tortoise.

Maintain plant species diversity such that the potential plant community on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland.

Key Areas CC-2 and CC-3 Desired Plant Community Objectives for Volcanic Hills 12-16” precipitation zone ecological site:

- Maintain Grasses/Grasslike plants composition of ≥50%
- Maintain a palatable shrub composition of ≥10%
- Maintain vegetative foliar cover at ≥20%
- Maintain current vegetative diversity in the key area

Rationale:

Key areas CC-2 and CC-3 are located on a north facing hillslope at an approximate elevation of 3700’. The range of DPCs listed above was derived from the NRCS Reference Sheet, which is part of the ecological site guide. The Ecological Site Guide used for this key area is the Volcanic Hills 12-16” p.z.

Maintaining a grass and grasslike plant composition of 50 percent on this site complies with Sonoran desert tortoise habitat requirements and is appropriate for the site based on its aspect and elevation. Palatable shrub composition of 15 percent or greater is appropriate for the site based on its aspect and elevation and complies with the expected ranges of shrub production in the Ecological Site Guide. Foliar cover is expected to be between 10 percent and 35 percent as per the reference sheet. A vegetative foliar cover of 15 percent or greater should serve to prevent accelerated erosion beyond what is expected in the reference state.

5. PLANT LIST

This section includes the list of plant species present or potentially present within the Volcanic Hills 12-16” p.z. ecological site located on the public lands within the Cerro Colorado allotment. These plant species provide key forage and cover for wildlife species and livestock.

Table 6 presents a list of plant species from the Volcanic Hills 12-16” p.z. ecological site description located on the Cerro Colorado allotment. Tables 7 and 8 present a list of species collected at CC-2 and CC-3 key areas.

Table 6. Key Plant Species from the Volcanic Hills 12-16” p.z. ecological site description.

Plant Group	Species
Dominant Mid Grasses	cane beardgrass (<i>Bothriochloa barbinodis</i>), sideoats grama (<i>Bouteloua curtipendula</i>), plains lovegrass (<i>Eragrostis intermedia</i>) tanglehead (<i>Heteropogon</i> sp.), green sprangletop (<i>Leptochloa dubia</i>), bullgrass (<i>Muhlenbergia emersleyi</i>)
Dominant short grasses	sprucetop grama (<i>Bouteloua chondrosioides</i>), black grama (<i>Bouteloua eriopoda</i>), blue grama (<i>Bouteloua gracilis</i>), hairy grama (<i>Bouteloua hirsuta</i>), purple grama (<i>Bouteloua radicata</i>), slender grama (<i>Bouteloua repens</i>), curly mesquite (<i>Hilaria belangeri</i>), common wolfstail (<i>Lycurus phleoides</i>), Hall’s panicgrass (<i>Panicum hallii</i>)
Cool season grasses	southwestern needlegrass (<i>Achnatherum eminens</i>), woolly bunchgrass (<i>Elionurus barbiculmis</i>), squirreltail (<i>Elymus elymoides</i>), prairie Junegrass (<i>Koeleria macrantha</i>), muttongrass (<i>Poa fendleriana</i>)

Cerro Colorado Allotment Land Health Evaluation

Plant Group	Species
Miscellaneous perennial grasses	Rothrock's grama (<i>Bouteloua rothrockii</i>), silver bluestem (<i>Bothriochloa saccharoides</i>), fluffgrass (<i>Dasyochloa pulchella</i>), Arizona cottontop (<i>Digitaria californica</i>), fall witchgrass (<i>Digitaria cognate</i>), spike pappusgrass (<i>Enneapogon desvauxii</i>), Arizona muhly (<i>Muhlenbergia arizonica</i>), bamboo muhly (<i>Muhlenbergia dumosa</i>), bush muhly (<i>Muhlenbergia porteri</i>), deergrass (<i>Muhlenbergia rigens</i>), maidencane (<i>Panicum hemitomon</i>), vine mesquite (<i>Panicum obtusum</i>), Texas bluestem (<i>Schizachryium cirratum</i>), little bluestem (<i>Schizachryium scoparium</i>), southwestern bristlegrass (<i>Setaria scheelei</i>), plains bristlegrass (<i>Setaria vulpiseta</i>), sand dropseed (<i>Sporobolus cryptandrus</i>), Mexican gamagrass (<i>Tripsacum lanceolatum</i>), slim tridens (<i>Tridens muticus</i>), rough tridens (<i>Tridens muticus</i> var. <i>elongatus</i>)
Perennial threeawns	poverty threeawn (<i>Aristida divaricata</i>), Havard's threeawn (<i>Aristida havardii</i>), Wooton's threeawn (<i>Aristida pansa</i>), red threeawn (<i>Aristida purpurea</i> var. <i>longiseta</i>), blue threeawn (<i>Aristida purpurea</i> var. <i>nealleyi</i>), Parish threeawn (<i>Aristida purpurea</i> var. <i>parishii</i>), purple threeawn (<i>Aristida purpurea</i> var. <i>purpurea</i>), Wright's threeawn (<i>Aristida purpurea</i> var. <i>wrightii</i>), Orcutt's threeawn (<i>Aristida schiedeana</i> var. <i>orcuttiana</i>), spidergrass (<i>Aristida ternipes</i>), mesa threeawn (<i>Aristida ternipes</i> var. <i>hamulosa</i>)
Annual grasses	Fragilegrass (<i>Aegopogon tenellus</i>), sixweeks threeawn (<i>Aristida adscensionis</i>), prairie threeawn (<i>Aristida oligantha</i>), sixweeks needle grama (<i>Bouteloua aristidoides</i>), sixweeks grama (<i>Bouteloua barbata</i>), Arizona brome (<i>Bromus arizonicus</i>), feather fingergrass (<i>Chloris virgata</i>), tapertip cupgrass (<i>Eriochloa acuminata</i>), Mexican lovegrass (<i>Eragrostis Mexicana</i>), desert lovegrass (<i>Eragrostis pectinacea</i> var. <i>miserrima</i>), tufted lovegrass (<i>Eragrostis pectinacea</i>), goldentop grass (<i>Lamarckia aurea</i>), Mexican sprangletop (<i>Leptochloa fusca</i> ssp. <i>uninervia</i>), mucronate sprangletop (<i>Leptochloa panicea</i>), delicate muhly (<i>Muhlenbergia fragilis</i>), littleseed muhly (<i>Muhlenbergia microsperma</i>), witchgrass (<i>Panicum capillare</i>), Mexican panicgrass (<i>Panicum hirticaule</i>), Bigelow's bluegrass (<i>Poa bigelovii</i>), Arizona signalgrass (<i>Uruchloa arizonica</i>), Eastwood fescue (<i>Vulpia microstachys</i> var. <i>ciliata</i>), desert fescue (<i>Vulpia microstachys</i> var. <i>microstachys</i>), sixweeks fescue (<i>Vulpia octoflora</i>)
Perennial forbs	Palmer's Indian mallow (<i>Abutilon palmeri</i>), desert-holly (<i>Atriplex hymenelytra</i>), pink perezia (<i>Acourtia wrightii</i>), San Felipe dogweed (<i>Adenophyllum porophylloides</i>), trailing four o'clock (<i>Allionia incarnata</i>), largeflower onion (<i>Allium macropetalum</i>), slimleaf bursage (<i>Ambrosia confertiflora</i>), desert anemone (<i>Anemone tuberosa</i>), Louisiana sagewort (<i>Artemisia ludoviciana</i>), perennial rockcress (<i>Arabis perennans</i>), Astragalus (<i>Astragalus</i> spp.), shrubby ayenia (<i>Ayenia microphylla</i>), hairyseed bahia (<i>Bahia absinthifolia</i>), desert marigold (<i>Baileya multiradiata</i>), scarlet spiderling (<i>Boerhavia coccinea</i>), climbing wartclub (<i>Boerhavia scandens</i>), Arizona carlowrightia (<i>Carlowrightia arizonica</i>), desert mariposa lily (<i>Calochortus kennedyi</i>), sego lily (<i>Calochortus nuttallii</i>), Castilleja (<i>Castilleja</i> sp.), lipfern (<i>Cheilanthes</i> sp.), whitemouth dayflower (<i>Commelina erecta</i>), leatherweed (<i>Croton pottsii</i>), fingerleaf gourd (<i>Cucurbita digitata</i>), Cooley's bundleflower (<i>Desmanthus cooleyi</i>), desert larkspur (<i>Delphinium parishii</i>), bluedicks (<i>Dichelostemma capitatum</i>), Arizona foldingwing (<i>Dicliptera resupinata</i>), spreading fleabane (<i>Erigeron divergens</i>), trailing fleabane (<i>Erigeron flagellaris</i>), desert trumpet buckwheat (<i>Eriogonum inflatum</i>), hairy evolvulus (<i>Evolvulus nuttallianus</i>), Arizona snakecotton (<i>Froelichia arizonica</i>), Gaura (<i>Gaura</i> spp.), Gooding mock verbena (<i>Glandularia gooddingii</i>), pearly globe amaranth (<i>Gomphrena nitida</i>), desert wild cotton (<i>Gossypium thurberi</i>), Arizona gumweed (<i>Grindelia arizonica</i>), hairy false goldenaster (<i>Heterotheca villosa</i>), Arizona rosemallow (<i>Hibiscus biseptus</i>), Coulter hibiscus (<i>Hibiscus coulteri</i>), rock hibiscus (<i>Hibiscus denudatus</i>), Trans-Pecos thimblehead (<i>Hymenothrix wislizeni</i>), slender janusia (<i>Janusia gracilis</i>), longflower tube tongue (<i>Justicia longii</i>), narrowleaf puccoon (<i>Lithospermum incisum</i>), Lewis blue flax (<i>Linum lewisii</i>), Greene deervetch (<i>Lotus greenei</i>), red and yellow deervetch (<i>Lotus rigidus</i>), Wright's deervetch (<i>Lotus</i>

Cerro Colorado Allotment Land Health Evaluation

Plant Group	Species
	<p>wrightii), Parry's false prairie-clover (<i>Marina parryi</i>), spiny tansyaster (<i>Machaeranthera pinnatifida</i>), plains blackfoot daisy (<i>Melampodium leucanthum</i>), wishbone-bush (<i>Mirabilis laevis</i> var. <i>villosa</i>), desert tobacco (<i>Nicotiana obtusifolia</i>), cloak fern (<i>Notholaena</i> sp.), tufted evening-primrose (<i>Oenothera caespitosa</i>), Cliffbrake (<i>Pellaea</i> sp.), Parry penstemon (<i>Penstemon parryi</i>), desert penstemon (<i>Penstemon pseudospectabilis</i>), narrowleaf bean (<i>Phaseolus angustissimus</i>), orange fameflower (<i>Phemeranthus aurantiacus</i>), yerba de venado (<i>Turnera diffusa</i>), velvetseed milkwort (<i>Polygala obscura</i>), shrubby purslane (<i>Portulaca suffrutescens</i>), Wright's cudweed (<i>Pseudognaphalium canescens</i>), twinleaf senna (<i>Senna bauhinoides</i>), desert senna (<i>Senna armata</i>), Lemmon's ragwort (<i>Senecio lemmonii</i>), New Mexico sida (<i>Sida neomexicana</i>), silverleaf nightshade (<i>Solanum elaeagnifolium</i>), desert globemallow (<i>Sphaeralcea ambigua</i>), brownplume wirelettuce (<i>Stephanomeria pauciflora</i>), big talinum (<i>Talinum paniculatum</i>), Coulter's wrinklefruit (<i>Tetradlea coulteri</i>), hairy fourwort (<i>Tetramerium nervosum</i>), branched noseburn (<i>Tragia ramosa</i>), American vetch (<i>Vicia Americana</i>), Louisiana vetch (<i>Vicia ludoviciana</i>), Texas zinnia (<i>Zinnia grandiflora</i>)</p>
Annual Forbs	<p>New Mexico copperleaf (<i>Acalypha neomexicana</i>), carelesweed (<i>Amaranthus palmeri</i>), western fiddleneck (<i>Amsinckia tessellate</i>), Astragalus (<i>Astragalus</i> spp.), wheelscale saltbush (<i>Atriplex elegans</i>), fewflower beggarticks (<i>Bidens leptoccephala</i>), Coulter spiderling (<i>Boerhavia coulteri</i>), hoary bowlesia (<i>Bowlesia incana</i>), fringed redmaids (<i>Calandrinia ciliata</i>), Chenopodium (<i>Chenopodium</i> sp.), sensitive partridge pea (<i>Chamaecrista nictitans</i>), New Mexico thistle (<i>Cirsium neomexicanum</i>), golden corydalis (<i>Corydalis aurea</i>), American wild carrot (<i>Daucus pusillus</i>), western tansymustard (<i>Descurainia pinnata</i>), wedgeleaf draba (<i>Draba cuneifolia</i>), western wallflower (<i>Erysimum asperum</i>), miniature woollystar (<i>Eriastrum diffusum</i>), sorrel buckwheat (<i>Eriogonum polycladon</i>), bull filaree (<i>Erodium texanum</i>), Mexican gold poppy (<i>Eschscholzia californica</i> ssp. <i>Mexicana</i>), Euphorbia (<i>Euphorbia</i> sp.), star gilia (<i>Gilia stellata</i>), pearly globe amaranth (<i>Gomphrena nitida</i>), longleaf false goldeneye (<i>Heliomeris longifolia</i>), camphorweed (<i>Heterotheca subaxillaris</i>), crestrub morning-glory (<i>Ipomoea costellata</i>), redstar (<i>Ipomoea coccinea</i>), Thurber's morning-glory (<i>Ipomoea thurberi</i>), orange caltrop (<i>Kallstroemia grandiflora</i>), warty caltrop (<i>Kallstroemia parviflora</i>), shaggyfruit pepperweed (<i>Lepidium lasiocarpum</i>), intermediate pepperweed (<i>Lepidium virginicum</i> var. <i>medium</i>), foothill deervetch (<i>Lotus humistratus</i>), coastal bird's-foot trefoil (<i>Lotus salsuginosus</i>), Arizona lupine (<i>Lupinus arizonicus</i>), Mojave lupine (<i>Lupinus odoratus</i>), Fendler desert-dandelion (<i>Malacothrix fendleri</i>), slender tansyaster (<i>Psilactis tenuis</i>), Tahoka tansyaster (<i>Machaeranthera tanacetifolia</i>), whitestem stickleaf (<i>Mentzelia albicaulis</i>), longtube four o'clock (<i>Mirabilis longiflora</i>), Arizona monardella (<i>Monardella arizonica</i>), Montia (<i>Montia</i> spp.), green carpetweed (<i>Mollugo verticillata</i>), spring evening-primrose (<i>Oenothera</i> spp.), Florida pellitory (<i>Parietaria floridan</i>), Pectocarya (<i>Pectocarya</i> spp.), Phacelia (<i>Phacelia</i> sp.), lipstick plant (<i>Plagiobothrys arizonicus</i>), desert Indianwheat (<i>Plantago ovata</i>), woolly Indianwheat (<i>Plantago patagonica</i>), straighttube devilsclaw (<i>Proboscidea altheaefolia</i>), annual devilsclaw (<i>Proboscidea parviflora</i>), desert-chicory (<i>Rafinesquia neomexicana</i>), Chia (<i>Salvia columbariae</i>), sawtooth sage (<i>Salvia subincisa</i>), prostrate sida (<i>Sida abutifolia</i>), streamside bur cucumber (<i>Sicyos ampelophyllus</i>), sleepy catchfly (<i>Silene antirrhina</i>), cutleaf bur cucumber (<i>Sicyos laciniatus</i>), sand fringe pod (<i>Thysanocarpus curvipes</i>), woolly tidestromia (<i>Tidestromia lanuginosa</i>)</p>
Dominant Half Shrubs	<p>prairie acacia (<i>Acaciella angustissima</i>), false mesquite (<i>Calliandra eriophylla</i>), Gregg's prairie clover (<i>Dalea greggii</i>), shrubby buckwheat (<i>Eriogonum fasciculatum</i>), broom snakeweed (<i>Gutierrezia sarothrae</i>), range ratany (<i>Krameria erecta</i>), rough menodora (<i>Menodora scabra</i>), Schott's stickpea (<i>Zapoteca formosa</i>)</p>
Miscellaneous Shrubs	<p>orange Indianmallow (<i>Abutilon palmeri</i>), catclaw acacia (<i>Senegalia greggii</i>), Santa Rita acacia (<i>Mariosousa millefolia</i>), mintbush lippia (<i>Aloysia wrightii</i>),</p>

Plant Group	Species
	desert-honeysuckle (<i>Anisacanthus thurberi</i>), Pringle manzanita (<i>Arctostaphylos pringlei</i>), fourwing saltbush (<i>Atriplex canescens</i>), yerba de pasmo (<i>Baccharis pteronioides</i>), baccharis (<i>Baccharis</i> sp.), desert broom baccharis (<i>Baccharis sarothroides</i>), California brickellbush (<i>Brickellia californica</i>), Coulter's brickellbush (<i>Brickellia coulteri</i>), spiny hackberry (<i>Celtis ehrenbergiana</i>), javelina bush (<i>Condalia ericoides</i>), Mexican crucillo (<i>Condalia warnockii</i>), Kearney's snakewood (<i>Condalia warnockii</i> var. <i>kearneyana</i>), ragged rockflower (<i>Crossosoma bigelovii</i>), hopseed bush (<i>Dodonaea viscosa</i>), white brittlebush (<i>Encelia farinosa</i>), rayless brittlebush (<i>Encelia frutescens</i>), longleaf Mormon tea (<i>Ephedra trifurca</i>), flattop buckwheat (<i>Eriogonum fasciculatum</i>), coralbean (<i>Erythrina flabelliformis</i>), turpentine bush (<i>Ericameria laricifolia</i>), Tahitian kidneywood (<i>Eysenhardtia orthocarpa</i>), desert olive (<i>Forestiera shrevei</i>), ocotillo (<i>Fouquieria splendens</i>), fringed twinevine (<i>Funastrum cynanchoides</i>), gumhead (<i>Gymnosperma glutinosum</i>), burweed (<i>Isocoma tenuisecta</i>), limberbush (<i>Jatropha cardiophylla</i>), Jacobina (<i>Justicia candicans</i>), range ratany (<i>Krameria erecta</i>), spreading ratany (<i>Krameria lanceolata</i>), Lycium (<i>Lycium</i> sp.), algerita barberry (<i>Berberis haematocarpa</i>), wait-a-bit (<i>Caesalpinia phyllanthoides</i>), velvetpod mimosa (<i>Mimosa dysocarpa</i>), Schott's yellowhood (<i>Nissolia schottii</i>), blue palo verde (<i>Cercidium floridum</i>), foothill palo verde (<i>Cercidium microphyllum</i>), turbinella oak (<i>Quercus turbinella</i>), skunkbush sumac (<i>Rhus trilobata</i>), evergreen sumac (<i>Rhus virens</i>), western soapberry (<i>Sapindus saponaria</i> var. <i>drummondii</i>), jojoba (<i>Simmondsia chinensis</i>), yellow trumpetbush (<i>Tecoma stans</i>), California trixis (<i>Trixis californica</i>), heartleaf goldeneye (<i>Viguiera cordifolia</i>), Parish's goldeneye (<i>Viguiera parishii</i>), graythorn (<i>Ziziphus obtusifolia</i>)
Succulents	Palmer's agave (<i>Agave palmeri</i>), Parry's agave (<i>Agave parryi</i>), smallflower agave (<i>Agave parviflora</i>), Schott's agave (<i>Agave schottii</i>), saguaro (<i>Carnegiea gigantea</i>), Arizona pencil cholla (<i>Cylindropuntia arbuscula</i>), jumping cholla (<i>Cylindropuntia fulgida</i>), Christmas cactus (<i>Cylindropuntia leptocaulis</i>), walkingstick cactus (<i>Cylindropuntia imbricata</i>), staghorn cholla (<i>Cylindropuntia versicolor</i>), sotol (<i>Dasyllirion wheeleri</i>), Echinocereus (<i>Echinocereus</i> sp.), white fishhook cactus (<i>Echinomastus intertextus</i>), rainbow cactus (<i>Echinocereus pectinatus</i>), fishhook barrel cactus (<i>Ferocactus wislizeni</i>), fishhook pincushion cactus (<i>Mammillaria crinita</i>), little nipple cactus (<i>Mammillaria heyderi</i>), sacahuista (<i>Nolina microcarpa</i>), dollarjoint pricklypear (<i>Opuntia chlorotica</i>), Engelmann pricklypear (<i>Opuntia engelmannii</i>), purple pricklypear (<i>Opuntia macrocentra</i>), tulip pricklypear (<i>Opuntia phaeacantha</i>), banana yucca (<i>Yucca baccata</i>), soaptree yucca (<i>Yucca elata</i>)
Trees	netleaf hackberry (<i>Celtis laevigata</i> var. <i>reticulata</i>), oneseed juniper (<i>Juniperus monosperma</i>), western honey mesquite (<i>Prosopis glandulosa</i> var. <i>torreyana</i>), velvet mesquite (<i>Prosopis velutina</i>), Arizona white oak (<i>Quercus arizonica</i>), Emory oak (<i>Quercus emoryi</i>), Mexican blue oak (<i>Quercus oblongifolia</i>)

Table 7. Summary of plant species on CC-2 key area.

Plant Group	Species
Trees/Shrubs	velvet mesquite
Perennial Grasses	Arizona signal grass, Lehmann lovegrass, curly-mesquite, slender janusia, green sprangletop, threeawn, cane bluestem, sprucetop grama, sideoats grama
Perennial Forbs	false mesquite

Plant Group	Species
Annual Species	annual forbs

Table 8. Summary of plant species on CC-3 key area.

Plant Group	Species
Trees/Shrubs	whitethorn acacia, bush monkeyflower, buckwheat, ocotillo, broom snakeweed, velvet mesquite
Perennial Grasses	Threeawn, Arizona needle grama, false mesquite, low woolly grass, Lehmann lovegrass, common wolfstail, bush muhly, Arizona signal grass
Perennial Forbs	flower of stone
Annual Species	annual forbs

6. INVENTORY AND MONITORING MEHODOLOGY

The following information is the inventory and monitoring protocols that have were used on the Cerro Colorado allotment in 2014.

6.1 Evaluation Protocol

6.1.1 Indicators of Rangeland Health

A range LHE provides information on the function of ecological processes (water cycle, energy flow, and nutrient cycle) relative to the reference state for the ecological site or other functionally similar unit for that land area. This evaluation provides information that is not available with other methods of evaluation. It gives an indication of the status of the three attributes chosen to represent the health of the “evaluation area” (i.e., the area where the evaluation of the rangeland heath attributes occurs). The three attributes are:

1. Soil/Site Stability (S)
2. Hydrologic (H)
3. Biotic Integrity (B)

The following are the 17 indicators of rangeland health that are evaluated during an evaluation and the attribute(s) they measure:

1. Rills: S, H
2. Water Flow Patterns: S, H
3. Pedestals and/or Terracettes: S, H
4. Bare Ground: S, H
5. Gullies: S, H
6. Wind-scoured, Blowout, and/or Depositional Areas: S
7. Litter Movement: S
8. Soil Surface Resistance to Erosion: S, H, B
9. Soil Surface Loss or Degradation: S, H, B

10. Plant Community Composition and Distribution Relative to Infiltration and Runoff: H
11. Compaction Layer: S, H, B
12. Functional/Structural Groups: B
13. Plant Mortality/Decadence: B
14. Litter Amount: H, B
15. Annual Production: B
16. Invasive Plants: B
17. Reproductive Capability of Perennial Plants: B

The three attributes of rangeland health (soil/site stability, hydrologic function, and biotic integrity) are evaluated and assigned rating categories for each of the 17 attributes (Technical Reference 1734-6).

Attribute ratings reflect the degree of departure from expected levels for each indicator per the Reference Sheet. The degree of departure may be categorized as:

- Extreme to Total
- Moderate to Extreme
- Moderate
- Slight to Moderate
- None to Slight

6.2 Monitoring Protocols

The standards were assessed for the Cerro Colorado allotment by a contracted U.S. Forest Service interdisciplinary team consisting of a rangeland management specialist and wildlife biologists (both with additional resource backgrounds in soils and botany).

The interdisciplinary team used rangeland monitoring data, professional observations, and photographs to assess achievement of the Land Health Standards. All study sites were recorded with a GPS using projection of NAD 83.

Quantitative cover and species composition, collected along each transect (Line Point Intercept) was used in conjunction with qualitative indicators of soil quality, hydrologic function, and biological health (Indicators of Rangeland Health) in order to assess existing condition of ecological sites at CC-2 and CC-3 within the Cerro Colorado allotment. Existing condition was compared to site-specific reference conditions (thought to represent relatively undisturbed states within a given soil--plant community type) in order to determine the level of departure from the potential natural community. Other data collected at CC-2 and CC-3 included the 17 indicators of rangeland health (NRCS 2005) and utilization.

6.2.1 *Line Point Intercept (species composition and ground cover)*

The method used to obtain transect data pertaining to species composition, and soil cover is the line point intercept (LPI). This method consists of a horizontal, linear measurement of plant intercepts along the course of a line (tape) 100' in the Cerro Colorado allotment. It is designed for measuring grass or grass-like plants, forbs, shrubs, and trees. This method is a rapid, accurate method for quantifying soil cover, including vegetation, litter, rocks and biotic crusts. These measurements are related to wind and water erosion, water infiltration and the ability of the site to resist and recover from degradation. The LPI method measures vegetation cover along a given distance and from that composition is extrapolated.

6.2.2 Pace Frequency

Pace frequency is the number of times a plant species is present within a given number of uniformly sized sample quadrats (plot frames placed repeatedly across a stand of vegetation). Plant frequency is expressed as percent presence for each species encountered within total number of quadrat placements, therefore, frequency reflects the probability of encountering a particular plant species within a specifically sized area (quadrat size) at any location within the key area. The total number of frequency hits among all species will not equal the total number of quadrat placements and frequency is insensitive to the size or number of individual plants. Frequency is a very useful monitoring method but does not express species composition, only species presence. Frequency is an index that integrates species' density and spatial patterns.

A 40 x 40 cm. (0.16 m²) quadrat is used for pace frequency applied as follows:

1. Species present within the bounds of the sample quadrat are recorded with a single tally.
2. If no species are present, no frequency data are recorded.
3. Perennial or annual grasses and forbs must be rooted within the quadrat to be counted.
4. A grass or forb plant base present under the quadrat frame is considered "in."
5. Annual plants, grasses and forbs, are counted whether green or dried.
6. Tree/shrub canopy and basal hits are recorded separately. Over time, these parameters can indicate changes in tree/shrub size (canopy) or plant numbers (basal).
7. A canopy hit is any part of the tree or shrub that overhangs the quadrat (enters an imaginary vertical projection of the plot frame).
8. Quadrat placements are placed at one-pace intervals (2-steps), patterned in transects (straight lines) and are run parallel to each other, generally contouring slope, within the area of one ecological site (vegetation and soil type).

6.2.3 Fetch

Fetch is the distance from the nearest perennial plant base within 360 degrees of the quadrats ground cover point. Fetch, reported with descriptive statistics, relates to plant distribution and watershed characteristics. Perennial plant cover can reduce soil erosion by creating an obstruction, slowing the rate of overland flow. A shorter distance between perennial plant bases lessens the opportunity for flowing water to acquire the necessary energy to remove soil and litter from a site. Overtime, fetch data can be used to assess changes in the spatial distribution and connectivity of vegetation patches plus document trends in the fragmentation of plant cover for range LHE. One-hundred distances were measured in conjunction with pace frequency as baseline data for future monitoring.

6.2.4 Dry Weight Rank

Dry weight rank estimates plant composition on a dry weight production basis. This data collection was made using a 40cm x 40cm plot frame and 100 placements. The three perennial species within a vertical projection of quadrats placed repeatedly (100 times) comprising the most annual biomass production on a dry weight basis are ranked (first, 2nd, and 3rd most biomass). Multiple ranks are given when less than 3 species are present. For example, if species A and species B are the two species present, ranks of 1 and 3, 1 and 2, or 2 and 3 are given to species A; if only species B is present, it receives a tally for each rank. No tally was recorded at quadrat placements void of perennial species.

6.2.5 Utilization

Utilization is the proportion or degree of the current year's forage production that is consumed or destroyed by animals (including insects). Utilization may refer to either a single plant species, a group of

species, or the vegetation as a whole. Utilization is a comparison of the amount of vegetation left compared with the amount of vegetation produced during the year (USDA, NRCS, and USDO, 1996).

Table 8. Herbaceous (grasses and forbs) utilization classes

Rating	Description
0-5%	The rangeland shows no evidence of grazing use or negligible use.
6-20%	The key species has the appearance of very light grazing. Plants may be topped or slightly used. Current seed stalks and young plants are little disturbed.
21-40%	The key species may be topped, skimmed, or grazed in patches. Between 60 and 80 percent of current seed stalks remain intact. Most young plants are undamaged.
41-60%	Half of the available forage (by weight) on key species appears to have been utilized. Fifteen to 25 percent of current seed stalks remain intact.
61-80%	More than half of the available forage on key species appears to have been utilized. Less than 10 percent of the current seed stalks remain. Shoots of rhizomatous grasses are missing.
81-94%	The key species appears to have been heavily utilized and there are indications of repeated use. There is no evidence of reproduction or current seed stalks.
95-100%	The key species appears to have been completely utilized. The remaining stubble is utilized to the soil surface.

Source: Interagency Technical Reference, *Utilization Studies and Residual Measurements*, 1996.

Seven utilization classes show relative degrees of use of available current year's growth (leaders) of key browse plants (shrubs, half shrubs, woody vines, and trees). Each class represents a numerical range of percent utilization. Utilization classes are as follows:

Table 9. Browse (shrubs, half shrubs, woody vines, and trees) utilization classes

Rating	Description
0-5%	The key browse plants show no evidence of grazing use or only negligible use.
6-20%	The key browse plants have the appearance of very light use. The available leaders are little disturbed.
21-40%	There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 60 to 80% of the available leader growth remains intact.
41-60%	Key browse plants appear rather uniformly utilized and 40 to 60% of the available leader growth remains intact.
61-80%	The key browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain. Between 20 and 40% of the available leader growth remains intact.
81-94%	There are indications the key browse species have been utilized repeatedly. There is no evidence of terminal buds and usually less than 20% of available leader growth remains intact. Some, and often much, of the second and third years' growth has been utilized. Hedging (the appearance of browse plants that have been browsed to appear artificially clipped or consistent browsing of terminal buds of browse species that result in excessive lateral branching and a reduction in upward and outward growth) is readily apparent. Key browse plants frequently have broken branches.
95-100%	Less than 5% of the available leader growth on the key browse plants remain intact. Most of the second and third years' growth have been utilized. All key browse plants have major portions broken.

Source: Interagency Technical Reference, *Utilization Studies and Residual Measurements*, 1996.

7. MANAGEMENT EVALUATION AND SUMMARY OF STUDIES DATA

7.1 Actual Use

Actual use information will be submitted within 15 days of the end of the grazing year in accordance with 43 CFR 4130.3-2(d). According to billed use the lease has been paid for the full 780 AUMs on the lease from 2006-2016.

7.2 Precipitation

The nearest local climate recording station is the Arivaca 1E station. The station is located about 1000 feet southwest of the town of Arivaca off Fragutta Road. Figure 7 below is an average total monthly precipitation summary from the Western Regional Climate Center - Arivaca 1E station. Table 11 is the climate data for the station. Figure 7 is the precipitation data for CC-3.

Figure 7. Arivaca 1E station precipitation data

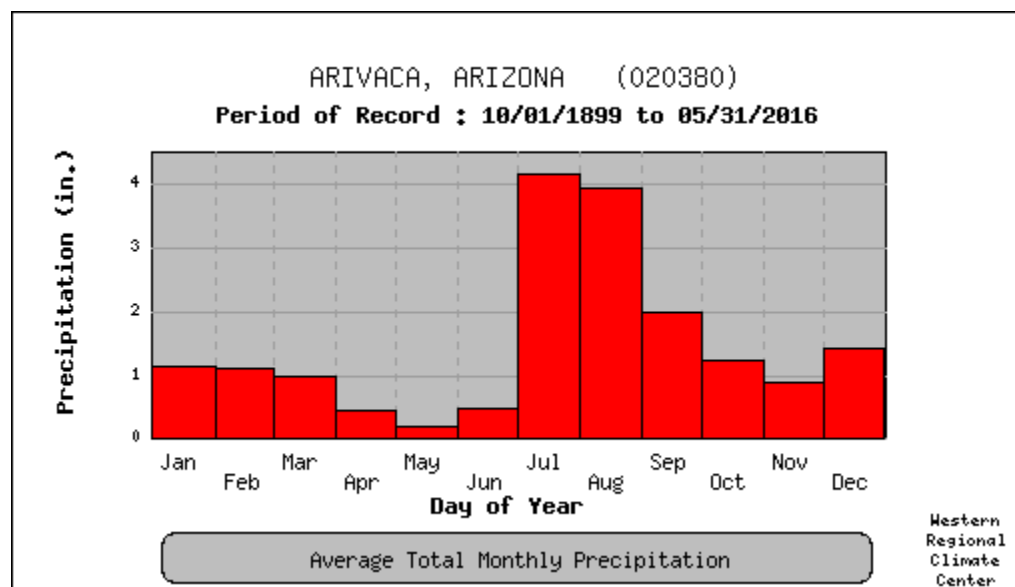


Table 10. Climate Data from ARIVACA, ARIZONA (020380), Period of Record: 10/01/1899 to 05/31/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	60.9	68	72.7	76	81.3	99.8	97.9	93.7	89.3	83.2	76	71.9	80.9
Average Min. Temperature (F)	32.8	35.6	40.6	40.1	45.3	61	64.8	61.6	57.4	47.1	38.9	30	46.3
Average Total Precipitation (in.)	1.12	1.15	0.99	0.44	0.19	0.45	4.09	3.93	1.85	1.21	0.88	1.44	17.74

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Total Snowfall (in.)	0.3	0.5	0.6	0.2	0	0	0	0	0	0	0.3	0.8	2.6
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 11. Summary of CC-3 rain data on Cerro Colorado.

	2008	2009	2010	2011	2013
Rainfall- Oct-May (in.)		4	8.7	0	3.1
Rainfall- June-Sept. (in.)	7.5	6.25	6.5	3.5	17.2

7.3 Key Area Data

Upland range health was evaluated at two key areas (CC-2 and CC-3). These key areas were selected for consistency with average livestock use within the allotment. A quantitative and qualitative evaluation of rangeland health indicators was conducted in order to determine if any gaps existed between existing condition and the ecological reference condition. Using these evaluations, it was determined whether or not applicable resource standards were being met within the Cerro Colorado allotment and whether adequate perennial grass resources were present.

7.3.1 Utilization

Utilization measured at the two key areas, CC-2 and CC-3, on the Cerro Colorado allotment at the time of the study was 0 percent.

7.3.2 Rangeland Health Evaluations and Frequency/Cover, Composition and Structure Data

Tables 12, 13, 14 and 15 below show the results from the evaluation completed in January 2014 on the Cerro Colorado allotment at CC-2 and CC-3. Every attribute ranked none to slight from the departure of the Volcanic Hills 12-16" p.z. reference sheet.

Table 12. January 13, 2014 summary results from Rangeland Health for CC-2.

Rangeland Health Attribute	Departure From Ecological Site Description				
	Extreme	Moderate to Extreme	Moderate	Slight to Moderate	None to Slight
Soil/Site Stability	0	0	0	0	10
Hydrologic Function	0	0	0	0	10
Biotic Integrity	0	0	0	0	9

Table 13. Summary of 17 indicators for Volcanic Hills 12-16" p.z. ecological site for CC-2.

17 Indicators Reference Sheet	Rationale from January 2014
1. Number and extent of rills: None	None to slight. None observed
2. Presence of water flow patterns: Uncommon; probably cover no more than 10% of area, discontinuous, very short, usually less than 1 foot in length; broken primarily by high rock and gravel cover.	None to slight. None observed
3. Number and height of erosional pedestals or terracettes: Most perennial	None to slight. None observed.

17 Indicators Reference Sheet	Rationale from January 2014
<p>grass and shrub plants have accumulated pedestals 1-2 inches in height, respectively. Terracettes are 15-20 feet apart along water flow paths with a 2-inch elevation difference from above to below the terracete. Terracettes are not as stable as those observed in 12-16" pz, in that they are breached more often on this site.</p>	
<p>4. Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground): 40-45%; some areas have higher cover on gentler slopes and lower cover on steeper slopes.</p>	<p>None to slight. Within ESD parameters.</p>
<p>5. Number of gullies and erosion associated with gullies: none</p>	<p>None to slight. None observed.</p>
<p>6. Extent of wind scoured, blowouts and/or depositional areas: none</p>	<p>None to slight. None observed.</p>
<p>7. Amount of litter movement (describe size and distance expected to travel): Herbaceous litter transported in water flow paths 30-50 feet in length and herbaceous litter moving from bare soil areas.</p>	<p>None to slight. Litter at plant bases.</p>
<p>8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): No slake test done. Expect ratings of 2-3 in bare areas, and 4-5 under shrub and perennial grass canopies.</p>	<p>None to slight. High vegetation/ rock content.</p>
<p>9. Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness): Weak angular to subangular blocky; color is 10YR7/3 dry, 10YR5/3 moist; thickness to 13 inches.</p>	<p>None to slight. None observed.</p>
<p>10. Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: 30% canopy cover of large shrubs, succulents, half shrubs and grasses; 50-55% litter cover; approximately 2.5% basal cover; 25% of cover is perennial grasses; 30% of cover is trees and shrubs; cover is well dispersed throughout the site. Note: reference area has a higher cover of mesquite than expected for the site.</p>	<p>None to slight. Historic Climax Plant Community (HCPC) community within ESD parameters.</p>
<p>11. Presence and thickness of compaction layer (usually none; describe soil</p>	<p>None to slight. None observed.</p>

17 Indicators Reference Sheet	Rationale from January 2014
<p>profile features which may be mistaken for compaction on this site): No compaction layer on this site; bare soil areas have thin laminar crust from raindrop impact; penetrometer tests with weight drop distance from top of weight to top of impact ring = 2.24 feet were: average = 3.92 inches, s.d. = 1.19 inches. Tests outside IBP enclosure on SRER were average = 2.17, s.d. = 0.4.</p>	
<p>12. Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines: Dominant: large shrubs (mesquite #1, desert hackberry #2, blue paloverde #3, and Mormon tea) > perennial grasses > succulents > half shrubs = annual forbs & grasses.</p>	<p>None to slight. Vegetation community within ESD parameters.</p>
<p>13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Approximately 50% basal cover of perennial grass species and 50% basal cover of sub shrub species has been lost due to prolonged drought.</p>	<p>None to slight. Even age class distribution.</p>
<p>14. Average percent litter cover (50%) and depth (0.5inches):</p>	<p>None to slight. Litter within ESD parameters.</p>
<p>15. Expected annual production (this is TOTAL above-ground production, not just forage production): 175 lbs. /ac unfavorable precipitation; 750 lbs. /ac normal precipitation; 1340 lbs. /ac favorable precipitation.</p>	<p>None to slight. Per ESD</p>
<p>16. Potential invasive (including noxious) species (native and non-native). List Species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicator, we are describing what is NOT expected in the reference state for the ecological site: mesquite, Opuntia, burroweed, & snakeweed are increasing not invading. Buffelgrass and Lehmann lovegrass.</p>	<p>None to slight. None observed.</p>

17 Indicators Reference Sheet	Rationale from January 2014
17. Perennial plant reproductive capability: Not affected even following several years of drought period for the region. Good age class distribution of plants.	None to slight. Within ESD parameters.

Table 14. January 13, 2014 summary results from Rangeland Health for CC-3.

Rangeland Health Attribute	Departure From Ecological Site Description				
	Extreme	Moderate to Extreme	Moderate	Slight to Moderate	None to Slight
Soil/Site Stability	0	0	0	0	10
Hydrologic Function	0	0	0	0	10
Biotic Integrity	0	0	0	0	9

Table 15. Summary of 17 indicators for Volcanic Hills 12-16" p.z. ecological site for CC-3.

17 Indicators Reference Sheet	Rationale from January 2014
1. Number and extent of rills: None	None to slight. None observed
2. Presence of water flow patterns: Uncommon; probably cover no more than 10% of area, discontinuous, very short, usually less than 1 foot in length; broken primarily by high rock and gravel cover.	None to slight. None observed
3. Number and height of erosional pedestals or terracettes: Most perennial grass and shrub plants have accumulated pedestals 1-2 inches in height, respectively. Terracettes are 15-20 feet apart along water flow paths with a 2-inch elevation difference from above to below the terracete. Terracettes are not as stable as those observed in 12-16" p.z, in that they are breached more often on this site.	None to slight. None.
4. Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground): 40-45%; some areas have higher cover on gentler slopes and lower cover on steeper slopes.	None to slight. Within ESD parameters.
5. Number of gullies and erosion associated with gullies: none	None to slight. None observed.
6. Extent of wind scoured, blowouts and/or depositional areas: none	None to slight. None observed.
7. Amount of litter movement (describe size and distance expected to travel): Herbaceous litter transported in water flow paths 30-50 feet in length and herbaceous litter moving from bare soil areas.	None to slight. Litter at plant base.
8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of	None to slight. Good vegetation/ rock cover.

17 Indicators Reference Sheet	Rationale from January 2014
<p>values): No slake test done. Expect ratings of 2-3 in bare areas, and 4-5 under shrub and perennial grass canopies.</p>	
<p>9. Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness): Weak angular to subangular blocky; color is 10YR7/3 dry, 10YR5/3 moist; thickness to 13 inches.</p>	<p>None to slight. None observed.</p>
<p>10. Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: 30% canopy cover of large shrubs, succulents, half shrubs and grasses; 50-55% litter cover; approximately 2.5% basal cover; 25% of cover is perennial grasses; 30% of cover is trees and shrubs; cover is well dispersed throughout the site. Note: reference area has a higher cover of mesquite than expected for the site.</p>	<p>None to slight. Vegetation cover within ESD parameters.</p>
<p>11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): No compaction layer on this site; bare soil areas have thin laminar crust from raindrop impact; penetrometer tests with weight drop distance from top of weight to top of impact ring = 2.24 feet were: average = 3.92 inches, s.d. = 1.19 inches. Tests outside IBP enclosure on SRER were average = 2.17, s.d. = 0.4.</p>	<p>None to slight. None observed.</p>
<p>12. Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines: Dominant: large shrubs (mesquite #1, desert hackberry #2, blue paloverde #3, and mormon tea) > perennial grasses > succulents > half shrubs = annual forbs & grasses.</p>	<p>None to slight. Per ESD HCPC community.</p>
<p>13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Approximately 50% basal cover of perennial grass species and 50% basal cover of sub shrub species has been lost due to prolonged drought.</p>	<p>None to slight. Even age class distribution.</p>

17 Indicators Reference Sheet	Rationale from January 2014
14. Average percent litter cover (50%) and depth (0.5 inches):	None to slight. Within ESD parameters.
15. Expected annual production (this is TOTAL above-ground production, not just forage production): 175 lbs. /ac unfavorable precipitation; 750 lbs. /ac normal precipitation; 1340 lbs. /ac favorable precipitation.	None to slight. Within ESD parameters.
16. Potential invasive (including noxious) species (native and non-native). List Species that BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicator, we are describing what is NOT expected in the reference state for the ecological site: mesquite, Opuntia, burroweed, & snakeweed are increasing not invading. Buffelgrass and Lehmann lovegrass.	None to slight. None observed.
17. Perennial plant reproductive capability: Not affected even following several years of drought period for the region. Good age class distribution of plants.	None to slight. Per ESD

Standard 1: Upland Sites

Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform (ecological site).

Criteria for meeting Standard 1:

Soil conditions support proper functioning of hydrologic, energy, and nutrient cycles. Many factors interact to maintain stable soils and healthy soil conditions including appropriate amounts of vegetative cover, litter, soil porosity, and organic matter. Under proper functioning conditions, rates of soil loss and infiltration are consistent with the potential of the site.

Ground cover in the form of plants, litter or rock is present in pattern, kind, and amount sufficient to prevent accelerated erosion for the ecological site; or ground cover is increasing as determined by monitoring over an established period of time.

Signs of accelerated erosion are minimal or diminishing for the ecological site as determined by monitoring over an established period of time.

The below indicators were applied to the potential of the ecological site.

As indicated by such factors as:

Cerro Colorado Allotment Land Health Evaluation

- Ground cover
 - Litter
 - Live vegetation, amount and type (e.g. grass, shrubs, trees, etc.)
 - Rock
- Signs of erosion
 - Flow pattern
 - Gullies
 - Rills
 - Plant pedestaling

The ecological site for the CC-2 and CC-3 key areas is R041XC323AZ (Volcanic Hills 12-16" precipitation zone) ecological site. Litter should be in the range of 20 to 50 percent, with 1 to 50 percent surface fragments. A tolerable range of bare ground would be between 5 and 35 percent.

Overall, the soil on the allotment is stable. The allotment exhibits biotic integrity, and it is in a productive and sustainable condition. Currently, soil loss or degradation is not occurring. Perennial, native grasses are very effective at holding soil cover due to their basal area and their fine fibrous root systems. These grasses contribute organic matter directly into the soil and help build stable soil aggregates. In addition the plant and litter cover provide protection against wind erosion, and it increases infiltration and decreases runoff.

Vegetative cover collected at both key areas is adequate to ensure soil stabilization and appropriate permeability rates within the ecological system. There were no rills/gullies present at the site, pedestals and/or terracettes were slight to non-existent. Wind scouring and litter movement were none to slight. The ground is naturally armored by rock/gravel (Figure 8 and 9).

Figure 8. Photo of CC-2 key area in January 2014



Figure 9. Photo of CC-3 key area in January 2014



The approximate potential ground cover (surface, basal, and foliar) is described in Tables 16-18 below. Table 16 specifically provides a comparison between the desired conditions as described by the ESD (NRCS 2005) and the current conditions of CC-2 and CC-3 in January 2014 while tables 17 and 18 address the kind and amount (by cover) of vegetation at the sites. Litter should be in the range of 20 to 50 percent, with 1 to 50 percent surface fragments. A tolerable range of bare ground would be between 5 and 35 percent. Foliar cover collected at CC-2 was 97 percent with 16 percent basal cover of perennial grasses and shrubs. Total litter at CC-2 was measured at 69 percent, with bare ground measuring 0 percent. Rock and rock fragments covered 56 percent of the soil surface. Utilization measured at CC-2 at the time of the study was 0 percent.

Table 16. A comparison between conditions described in the ESD (Volcanic Hills 12-16" precipitation zone) and current conditions of key areas CC-2 and CC-3. Soil cover components include plants (including basal cover), biological crusts, litter, surface fragments, rock and bare ground.

	<u>Basal Cover</u>				<u>Biologic al Crust</u>	<u>Litter</u>	<u>Surface Fragments > 1/4" & <= 3"</u>	<u>Surface Fragments > 3"</u>	<u>Bedrock</u>	<u>Bare Ground</u>
	<u>Grass/ Grass like</u>	<u>Forb</u>	<u>Shrub / Vine</u>	<u>Tree</u>						
ESD	3-8%	0-1%	1-3%	0-0%	0-1%	10-80%	25-50%	1-12%	1-15%	5-35%
CC-2	16%	0%	0%	0%	0%	69%	10%	46%	0%	0%
CC-3	3%	2%	0%	0%	0%	45%	74%	9%	0%	3%

Table 17. Foliar cover of species recorded in the Line Point Intercept plot for key area CC-2 in January 2014

Key area information Range site: R041XC323AZ Volcanic Hills 12-16" P.Z.	Species	Line point intercept cover at CC-2	
		Foliar Cover	Basal Cover
CC-2 Cerro Colorado Allotment	Cane bluestem (<i>bothriochloa barbinodis</i>)	2%	1%
	Sprucetop grama (<i>bouteloua chondrosioides</i>)	5%	1%
	Annual forbs	44%	0%
	Threeawn species (<i>Aristida sp.</i>)	54%	6%
	Fairy duster (<i>calliandra eriophylla</i>)	8%	0%
	Sideoats grama (<i>bouteloua curtipendula</i>)	22%	3%
	Curly mesquite (<i>hilaria belangeri</i>)	17%	5%
	Buckwheat species (<i>erigonum</i>)	4%	0%
	Lehmans lovegrass (<i>eragrostis lehmanniana</i>)	4%	0%
	Slender janusia (<i>janusia gracilis</i>)	6%	0%
	Green sprangletop (<i>leptochloa dubia</i>)	3%	0%
	Bush muhly (<i>muhlenbergia porterii</i>)	1%	0%
	Velvet mesquite (<i>prosopis velutina</i>)	2%	0%
	Snakeweed (<i>gutierrezia sarothrae</i>)	1%	0%
	Arizona signalgrass (<i>urochloa arizonica</i>)	2%	0%
	Velvet mesquite (<i>prosopis velutina</i>)	10%	0%
Cover/Litter/Bare Ground			
Foliar Cover	97%		
Basal Cover	16%		
Bare Ground	0%		

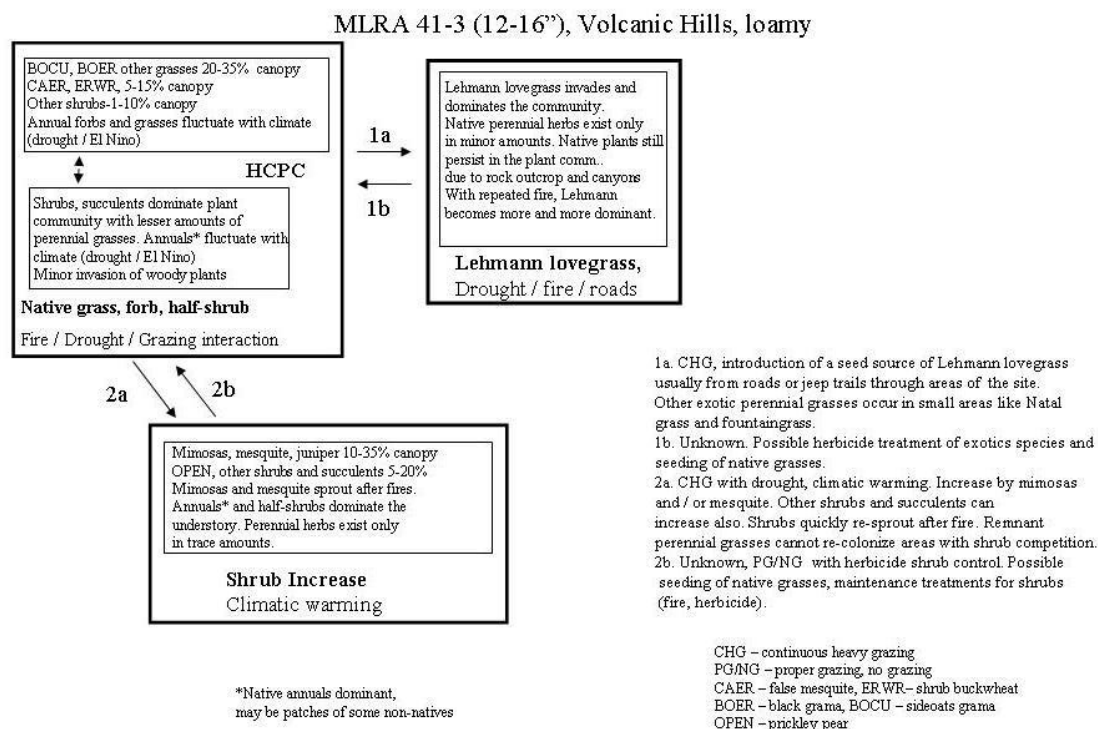
Table 18. Foliar cover of species recorded in the LPI plot for key area CC-3 in January 2014

Key Area Information	Species	Line point intercept cover at CC-3	
		Foliar Cover	Basal Cover
CC-3 Cerro Colorado Allotment Range site: R041XC323AZ	Arizona needle grama (<i>bouteloua aristidoides</i>)	3%	1%
	Whitethorn acacia (<i>acacia constricta</i>)	4%	0%
	Annual forbs	22%	0%
	Threeawn species (<i>aristida sp.</i>)	11%	0%
	Fairy duster (<i>calliandra eriophylla</i>)	1%	0%
	Low woollygrass (<i>dasyochloa pulchella</i>)	4%	0%
	Bush monkeyflower (<i>diplacus</i>)	7%	2%
	Buckwheat species (<i>erigonum</i>)	4%	0%
	<i>Lehmanns lovegrass</i> (<i>eragrostis lehmanniana</i>)	1%	0%
	Ocotillo (<i>fouquieria splendens</i>)	4%	0%
	Wolfstail (<i>lycurus phleoides</i>)	14%	1%
	Bush muhly (<i>muhlenbergia porterii</i>)	1%	0%
	Mesquite (<i>prosopis velutina</i>)	2%	0%
	<i>Snakeweed</i> (<i>gutierrezia sarothrae</i>)	1%	0%
	Arizona signalgrass (<i>urochloa arizonica</i>)	8%	1%
	Clubmoss (<i>selaginella spp.</i>)	1%	0%
Cover/Litter/Bare Ground			
Foliar Cover	63%		
Basal Cover	5%		
Bare Ground	3%		

Conclusion: The data at both key areas show that cover and litter are adequate to ensure soil stabilization and appropriate permeability rates within the ecological site. The ESDs describes the Ecological Dynamics of the Site on the allotment as plant communities that are “naturally variable” (NRCS 2005). These variations occur due to site aspect, soils, and other natural conditions. The ESD for both key areas describes the HCPC as “The potential plant community on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site.

Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland.” The key areas reflects these conditions as described within the ESD. Overall throughout the allotment the soils are productive, stable and in a sustainable condition. There were no rills/gullies present at any of the ecological sites, pedestals and/or terracettes were slight to non-existent. Wind scouring and litter movement were none to slight. Finally, rocks armor almost the entire allotment. The allotment is within the variability of the state and transition models as delineated in the ecological site descriptions (Figure 10).

Figure 10. State and transition model for Volcanic Hills, loamy



Standard 2: Riparian-Wetland Sites

There are no riparian-wetland sites within the Cerro Colorado Allotment Boundary

Standard 3: Desired Resource Conditions

“Productive and diverse upland and riparian-wetland plant communities of native species exist and are maintained.”

Criteria for meeting Standard 3:

Upland and riparian-wetland plant communities meet desired plant community objectives. Plant community objectives are determined with consideration for all multiple uses. Objectives also address native species, and the requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and appropriate laws, regulations, and policies.

Desired plant community objectives will be developed to assure that soil conditions and ecosystem function described in Standards 1 and 2 are met. They detail a site-specific plant

community, which when obtained, will assure rangeland health, State water quality standards, and habitat for endangered, threatened, and sensitive species. Thus, desired plant community objectives will be used as an indicator of ecosystem function and rangeland health.

As indicated by such factors as:

- Composition
- Structure
- Distribution

Exceptions and exemptions (where applicable):

Ecological sites or stream reaches on which a change in existing vegetation is physically, biologically, or economically impractical

Evaluation: In general, the composition, structure and distributions of plant communities are present as described within the ESDs throughout a majority of the allotment. The current vegetative composition of both perennial and annual native species within the allotment is appropriate for the range site and is conducive to meet the requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and other applicable laws, regulations, and policies.

The vegetative community at CC-2 and CC-3 represents the composition, structure, and distribution of the HCPC state of a “Native grass, forb, half-shrub” within the state and transition model described at this range site. The ESD describes this state as “The potential plant community on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland.” Though key area CC-3 is lacking some primary species which are described within the state and transition model for a HCPC site, within the transect this is a direct result of “natural variability of the site” with respect to soil, aspect and precipitation (Figures 11 and 12). The primary species described within the HCPC site are present at key area CC-3 (Table 19) they just did not occur within the transect. The functional/structure group was found to have none or only a slight deviation from the reference community as described within the ESD (Tables 20 and 21) for both key areas. Both sites are naturally armored by rock (> 50 percent cover) on the soil surface, which protects plant species from livestock and wildlife use. This helps maintain plant diversity over time as described in the ESD. Based on observations, the allotment had none to only a slight deviation from the reference community as described by the ESD for the functional/structural groups. Although slight deviations may exist from the reference community within the allotment, the composition and structure of the vegetation still provides well-distributed habitat for wildlife (general wildlife and sensitive species).

Table 19. A comparison between the state and transition model in the ESD and the LPI data collected in January 2014 at CC-2 and CC-3

State in Transition of HCPC Site as described by the ESD for Native grass, forb, half-shrub	LPI Data CC-2 Foliar Cover	LPI Data CC-3 Foliar Cover
Sideoats grama, black grama other grasses 20-35% Canopy Cover	Sideoats grama – 22% Arizona signalgrass– 2% green sprangletop – 3% curly mesquite – 17% Lehmann lovegrass – 4%	Aristida sp. – 11% Arizona signalgrass – 8% bush muhly – 1% common wolfstail – 14% Lehmann lovegrass – 1%

State in Transition of HCPC Site as described by the ESD for Native grass, forb, half-shrub	LPI Data CC-2 Foliar Cover	LPI Data CC-3 Foliar Cover
	sprucetop grama – 5% cane bluestem – 2% Aristida sp. – 54%	low woollygrass – 4% black grama and Sideoats grama were present at the site but did not occur within the transect (Table 18)
Fairy duster, bastardsage 5-15% Canopy Cover	Fairy duster – 8%	Fairy duster – 1%
Other Shrubs 1-10% Canopy Cover	velvet mesquite 10%	velvet mesquite – 2% broom snakeweed – 1% whitethorn acacia – 4%
Annual forbs and grasses fluctuate with climate	Annual forbs – 44%	Annual forbs – 22% Arizona needle grama – 3%

Figure 11. Species composition based on LPI data at CC-2

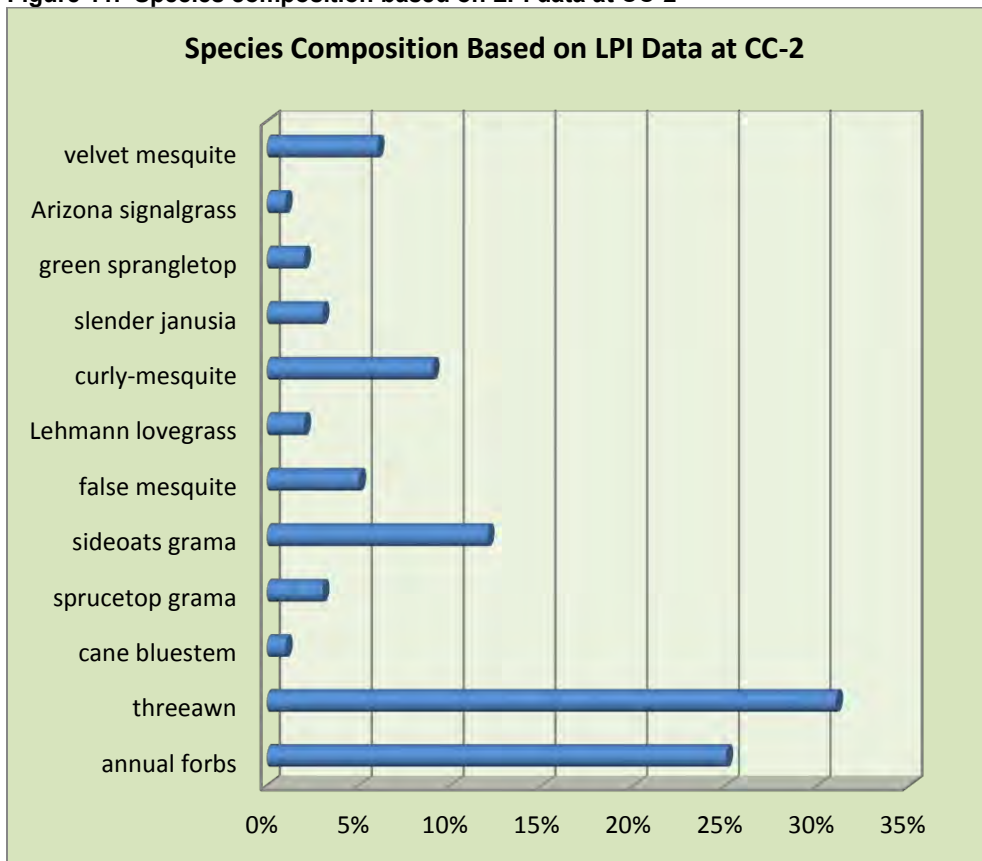


Figure 12. Species composition based on LPI data at CC-3

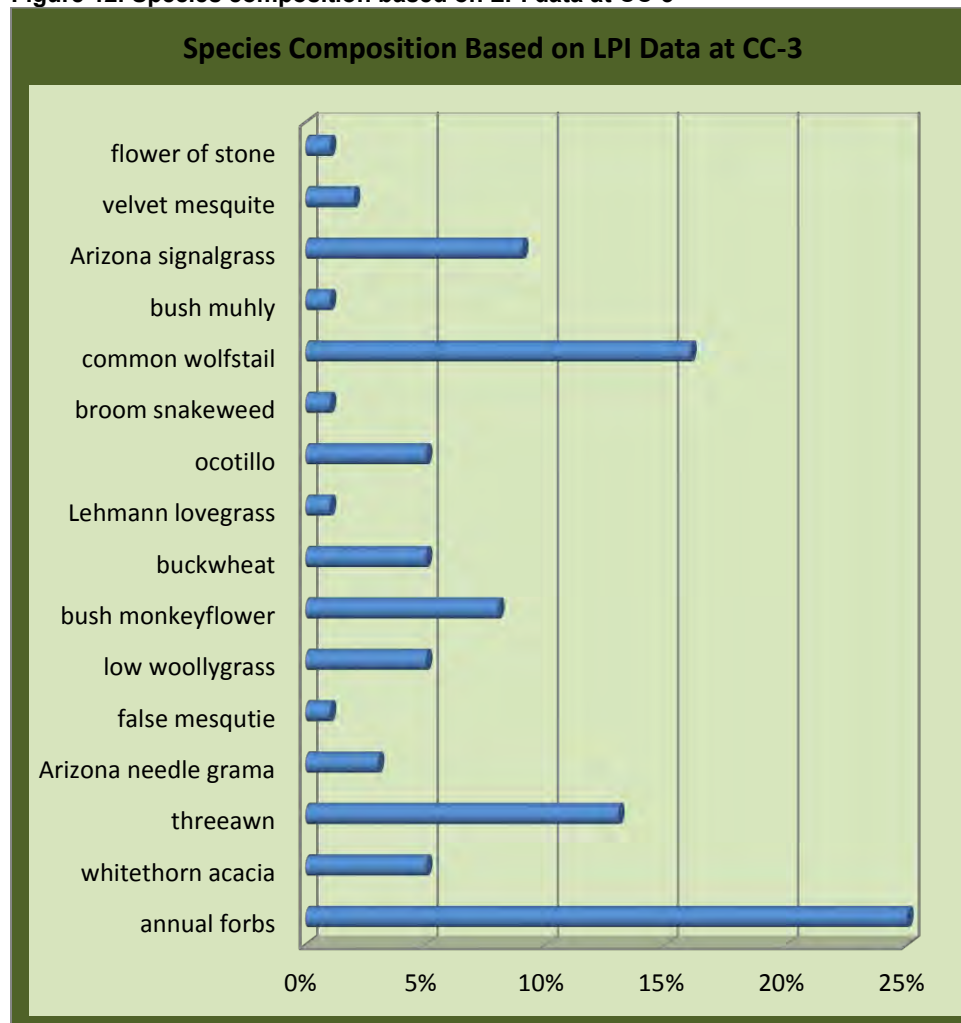


Table 20. Functional/structural plant groups at CC-2

Ranking	Species List for Functional/Structural Groups at CC-2
D	Threeawn species (<i>Aristida Sp.</i>)
S	Velvet mesquite (<i>prosopis velutina</i>)
S	Sideoats grama (<i>bouteloua curtipendula</i>)
M	Green sprangletop (<i>leptochloa dubia</i>)
M	Fairy duster (<i>calliandra eriophylla</i>)
M	Annual forbs
M	Curly mesquite (<i>hilaria belangeri</i>)
T	Barrel cactus (<i>ferocactus wislizeni</i>)
T	Cholla (<i>cylindropuntia</i>)
T	Ocotillo (<i>fouquieria splendens</i>)
T	Prickly pear (<i>opuntia sp.</i>)
T	Sprucetop grama (<i>bouteloua chondrosioides</i>)
T	Snakeweed (<i>gutierrezia sarothrae</i>)
T	Lehmans lovegrass (<i>eragrostis lehmanniana</i>)

Dominant (D) roughly 40-100% composition, Sub-dominant (S) roughly 10-40% composition, Minor Composition (M) roughly 2-5% composition, or Trace (T) roughly <2% composition.

Table 21. Functional/structural plant groups at CC-3

Ranking	Species List for Functional/Structural Groups at CC-3
S	Black grama (<i>Bouteloua eriopoda</i>)
S	Common wolfstail (<i>Lycurus phleoides</i>)
S	Threawn species (<i>Aristida Sp.</i>)
S	Velvet mesquite (<i>Prosopis velutina</i>)
M	Bush monkeyflower (<i>Diplacus Nutt.</i>)
M	SE SPP.
M	Arizona signalgrass (<i>Urochloa arizonica</i>)
M	Sprucetop grama (<i>Bouteloua chondrosioides</i>)
M	Spiny hackberry (<i>Celtis ehrenbergiana</i>)
M	Cholla (<i>Cylindropuntia</i>)
M	Ocotillo (<i>Fouquieria splendens</i>)
M	Annual forbs
M	Buckwheats (<i>Eriogonum Michx</i>)
M	Low woollygrass (<i>Dasyochloa pulchella</i>)
M	Fairy duster (<i>Calliandra eriophylla</i>)
M	Arizona needle grama (<i>Bouteloua aristidooides</i>)
T	Barrel cactus (<i>Ferocactus wislizeni</i>)
T	Prickly pear (<i>Opuntia sp.</i>)
T	Snakeweed (<i>Gutierrezia sarothrae</i>)
T	Sideoats grama (<i>Bouteloua curtipendula</i>)

Conclusion: The current vegetative composition of native species within the allotment is appropriate for the key area and is conducive to meet the requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and other applicable laws, regulations, and policies that support a productive and a diverse native biotic community. Both key areas are sufficiently vegetated by perennial grasses that support soil productivity, protection and provide forage and habitat for both wildlife and livestock. Key area CC-3 lacked primary species within the transect, however the species do occur in the appropriate proportions within the study site as shown in table 6 above. The presence of primary perennial species as described within the ESD within the allotment is an indicator that the overall ecological condition within the community is functioning within the parameters of the ESD.

Generally the composition, structure, and distribution of habitat for the threatened, endangered, and sensitive species is intact and is suitable for use if the species is present. Specifically, for Sonoran desert tortoise, approximately 77 percent of foliar cover measured on the KA transects is comprised of plant species known to be utilized as forage by Sonoran desert tortoise (Van Devender 2002). Given this level of Sonoran desert tortoise plant forage plant species cover on the allotment, particularly viewed in light of the low level of utilization observed (0 percent), Sonoran desert tortoise forage exists and will continue to exist on the allotment in adequate abundance to support tortoise if all other habitat factors for the species (e.g. availability of denning opportunities) also exist.

Standard 3 Desired Plant Community Objective

As part of the LHE process, DPC objectives were established for important biological resources. DPC objectives address the desired resource conditions based on vegetation attributes, such as composition, structure, and cover that are desired within the allotment. These include establishing vegetative characteristics necessary for soil protection, providing forage and habitat for both livestock and wildlife.

Perennial grass components of the DPCs provide important forage resources for Sonoran desert tortoise by providing protein for nutrition and to help tortoises excrete excess potassium. Shrub components provide forage for grazing wildlife such as mule deer, as well as foliar cover for smaller animals such as rabbits, quail and tortoise.

R041XC323AZ Volcanic Hills 12-16" precipitation zone:

Maintain plant species diversity such that the potential plant community on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland.

Conclusions:

Key Area CC-2 DPC Objectives:

- | | |
|--|-------------------------|
| • Maintain Grasses/Grasslike plants composition of $\geq 50\%$ | ACHIEVED |
| • Maintain a palatable shrub composition of $\geq 10\%$ | ACHIEVED |
| • Maintain vegetative foliar cover at $\geq 20\%$ | ACHIEVED |
| • Maintain current vegetative diversity in the key area. | BASELINE
ESTABLISHED |

The grass composition objective is being met at CC-2. The most current long-term monitoring data shows a grass composition of over 100 percent (due to foliar overlap; Figure 11), 98 percent of which is palatable to Sonoran desert tortoise. Palatable shrub composition on the site is met for Sonoran desert tortoise and mule deer with palatable browse (Van Devender, et al. 2002; Oftedal 2002) consisting of 18 percent of the plant community (Table 17 fairy duster, buckwheat, and slender janusia). The vegetative foliar cover objective is being met at this site, with foliar cover of 97 percent. Because there is no record on file with the BLM of past transect layout used in past monitoring by Pima County they cannot be directly compared to current monitoring data. Therefore, the data collected in 2014 establishes the baseline for monitoring trend in vegetative diversity.

Key Area CC-3 DPC Objectives:

- | | |
|--|-------------------------|
| • Maintain Grasses/Grasslike plants composition of $\geq 50\%$ | NOT ACHIEVED |
| • Maintain a palatable shrub composition of $\geq 10\%$ | ACHIEVED |
| • Maintain vegetative foliar cover at $\geq 20\%$ | ACHIEVED |
| • Maintain current vegetative diversity in the key area. | BASELINE
ESTABLISHED |

The grass composition objective is not being met at CC-3. The most current long-term monitoring data shows a grass composition of 43 percent (Figure 12) which is 14% lower than the desired composition. The lower percentage composition could be due to drought but is not far from the DPC and can be looked at later, comparing to this established baseline. Palatable shrub composition on the site is met for Sonoran desert tortoise with palatable browse (Van Devender, et al. 2002; Oftedal 2002) consisting of 5

percent of the plant. This could be due to the specific site location for this key area or due to drought reducing these shrub composition percentages. Palatable shrub availability; however, is met for mule deer, comprising 13 percent of the plant community (Table 18: fairy duster, buckwheat, ocotillo). The vegetative foliar cover objective is being met at this site, with foliar cover of 63 percent. Utilization data on this key area shows 0 percent use and would conclude that livestock grazing is not a factor in not meeting this objective. Barring current livestock utilization, the only other factors would be drought or loss of site potential due to past land use practices. Because the transect layout used in past monitoring was not documented and was not repeated in 2014, previous monitoring results cannot be compared to current monitoring data. Therefore, the data collected in 2014 establishes the baseline for monitoring trend in vegetative diversity.

8. DETERMINATION OF LAND HEALTH STANDARDS

Standard 1: Upland Sites

Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform (ecological site).

Determination:

- Meeting the Standard
- Not Meeting the Standard, but making significant progress towards standard
- Not Meeting the Standard, not making significant progress toward standard

Conclusion: (Standard Achieved)

Rationale: The data at both trend plots show that cover and litter are adequate to ensure soil stabilization and appropriate permeability rates within the ecological site. The ESDs describes the Ecological Dynamics of the Site on the allotment as plant communities that are “naturally variable” (NRCS 2005). These variations occur due to site aspect, soils, and other natural conditions. The ESD for both key areas describes the HCPC as “The potential plant community on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland.” The key area reflects these conditions as described within the ESD. Overall throughout the allotment the soils are productive, stable and in a sustainable condition. There were no rills/gullies present at any of the ecological sites, pedestals and/or terracettes were slight to non-existent. Wind scouring and litter movement were none to slight. Finally, rocks armor almost the entire allotment. The allotment is within the variability of the state and transition models as delineated in the ecological site descriptions.

Standard 2: Riparian-Wetland Sites

Objective: Riparian-wetland areas are in proper functioning condition.

Determination:

- Meeting the Standard
- Not Meeting the Standard; Making Significant Progress Toward Standard
- Not Meeting the Standard; Not Making Significant Progress Toward Standard
- Standard Does Not Apply

Rationale: There are no wetland-riparian sites within the Cerro Colorado Allotment.

Standard 3: Desired Resource Conditions

Productive and diverse upland and riparian-wetland plant communities of native species exist and are maintained

Determination:

- Meeting the Standard

Cerro Colorado Allotment Land Health Evaluation

- Not Meeting the Standard, but making significant progress towards standard
- Not Meeting the Standard, not making significant progress toward standard

Conclusion; (Standard achieved)

Rationale: The current vegetative composition of both perennial and annual native species within the allotment is appropriate for the range site and is conducive to meet the requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and other applicable laws, regulations, and policies.

The vegetative community at CC-2 and CC-3 represents the composition, structure, and distribution of the HCPC state of a “Native grass, forb, half-shrub” within the state and transition model described at this range site. The ESD describes this state as “The potential plant community on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland.”

9. RECOMMENDED MANAGEMENT ACTIONS

Based on existing information there are no resource concerns related to current livestock use that should be considered before lease issuance. Therefore, the 10-year grazing lease may be renewed with the following existing terms and conditions:

9.1 Proposed Terms and Conditions

Terms:

Allotment	Livestock # and Kind	Grazing Period of Use	Percent Public Land	AUMs	Type Use
Cerro Colorado	65 Cattle	3/1 to 2/28	100	780	Active

Conditions:

1. Grazing permit or lease terms and conditions and the fees charged for grazing use are established in accordance with the provisions of the grazing regulations now or hereafter approved by the Secretary of the Interior.
2. They are subject to cancellation, in whole or in part, at any time because of:
 - a. Noncompliance by the permittee/lessee with rules and regulations.
 - b. Loss of control by the permittee/lessee of all or a part of the property upon which it is based.
 - c. A transfer of grazing preference by the permittee/lessee to another party.
 - d. A decrease in the lands administered by the Bureau of Land Management within the allotment(s) described.
 - e. Repeated willful unauthorized grazing use.
 - f. Loss of qualifications to hold a permit or lease.
3. They are subject to the terms and conditions of allotment management plans if such plans have been prepared. Allotment management plans MUST be incorporated in permits or leases when completed.
4. Those holding permits or leases MUST own or control and be responsible for the management of livestock authorized to graze.
5. The authorized officer may require counting and/or additional or special marking or tagging of the livestock authorized to graze.
6. The permittee's/lessees grazing case file is available for public inspection as required by the Freedom of Information Act.
7. Grazing permits or leases are subject to the nondiscrimination clauses set forth in Executive Order 11246 of September 24, 1964, as amended. A copy of this order may be obtained from the authorized officer.

8. Livestock grazing use that is different from that authorized by a permit or lease MUST be applied for prior to the grazing period and MUST be filed with and approved by the authorized officer before grazing use can be made.

9. Billing notices are issued which specify fees due. Billing notices, when paid, become a part of the grazing permit or lease. Grazing use cannot be authorized during any period of delinquency in the payment of amounts due, including settlement for unauthorized use.

10. Grazing fee payments are due on the date specified on the billing notice and MUST be paid in full within 15 days of the due date, except as otherwise provided in the grazing permit or lease. If payment is not made within that time frame, a late fee (the greater of \$25 or 10 percent of the amount owed but not more than \$250) will be assessed.

11. No Member of, or Delegate to, Congress or Resident Commissioner, after his/her election of appointment, or either before or after he/she has qualified, and during his/her continuance in office, and no officer, agent, or employee of the Department of the Interior, other than members of Advisory committees appointed in accordance with the Federal Advisory Committee Act (5 U.S.C. App.1) and Sections 309 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.) shall be admitted to any share or part in a permit or lease, or derive any benefit to arise there from; and the provision of Section 3741 Revised Statute (41 U.S.C. 22), 18 U.S.C. Sections 431-433, and 43 CFR Part 7, enter into and form a part of a grazing permit or lease, so far as the same may be applicable.

12. The operator is responsible for informing all persons who are associated with the allotment operations that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts. Any cultural (historic/prehistoric site or object) or paleontological resource (fossil remains of plants or animals) discovered during operations shall be immediately reported to the Authorized Officer (AO) or his/her designee. All operations in the immediate area of the discovery shall be suspended until written authorization to proceed is issued. An evaluation of the discovery shall be made by a qualified archaeologist or paleontologist to determine appropriate actions to prevent the loss of significant cultural or scientifically important values.

If in connection with this work any human remains, funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (P.L. 101-601; 104 Stat. 3048; 25 U.S.C. 3001) are discovered, operations in the immediate area of the discovery shall cease, the remains and objects shall be protected, and the operator shall immediately notify the BLMTFO. The immediate area of the discovery shall be protected until notified by the BLMTFO Manager that operations may resume.

10. LIST OF REVIEWERS AND PREPARERS

List of Preparers:

Name	Organization	Title
Troy Grooms	Forest Service TEAMS USDA Forest Service	Rangeland Management Specialist
Rick Baxter	Forest Service TEAMS USDA Forest Service	Wildlife Biologist
Doug Middlebrook	Forest Service TEAMS USDA Forest Service	Wildlife Biologist
Evan Darrah	Safford Field Office USDI Bureau of Land Management	Geographic Information Specialist

List of Reviewers:

Name	Organization	Title
Eric Baker	Tucson Field Office USDI Bureau of Land Management	Rangeland Management Specialist
Keith Hughes	Tucson Field Office USDI Bureau of Land Management	Natural Resource Specialist
Ben Lomeli	Tucson Field Office USDI Bureau of Land Management	Hydrologist
Amy Markstein	Gila District Office USDI Bureau of Land Management	Planning & Environmental Specialist
Kim Ryan	Tucson Field Office USDI Bureau of Land Management	Cultural Resources Specialist
Darrell Tersey	Tucson Field Office USDI Bureau of Land Management	Natural Resource Specialist

11. AUTHORIZED OFFICER CONCURRENCE

I have reviewed the determinations presented in Section 8 Determinations of Land Health Standards and the grazing and other management actions identified in Section 9 Recommended Management Actions.

I concur with the determinations and recommendations as written.

I do not concur.

I concur, but with the following modifications:

 /s/ _____

Melissa Warren

Field Office Manager

BLM Tucson Field Office

 6/9/17 _____

Date

12. REFERENCES

- Binford, Lewis R. 1981. Behavioral Archaeology and the "Pompeii Premise". *Journal of Anthropological Research*, 37(3):195-208.
- Broadhead, Wade. 2001. *Brief Synopsis of Experiments Concerning Effects of Grazing on Archaeological Sites*. Bureau of Land Management, Gunnison Field Office, Gunnison, Colorado.
- Brown, Patricia E. and Connie L. Stone. 1982. *Granite Reef: A Study in Desert Archaeology*. Anthropological Research Papers No. 28, Arizona State University, Tempe.
- Freshwater, Diana. 2005. The Santa Lucia Ranch and Rancho Seco. In *Archaeology Southwest*, 19(3):7. Center for Desert Archaeology, Tucson.
- Hesse, Jerome. 2005. *A Cultural Resources Evaluation of Rancho Seco, Pima County, Arizona*. Project No. 9616-115; Accession No. 2005-492.ASM. SWCA Environmental Consultants, Inc., Tucson.
- Osborn, Alan J. and Ralph J. Hartley. 1991. Adverse Effects of Domestic Livestock Grazing on the Archaeological Resources of Capitol Reef National Park, Utah, p.136-153. In *Proceedings of the First Biennial Conference of Research in Colorado Plateau National Parks*. U.S. Geological Survey, Washington, D.C.
- Osborn, Alan J., Susan Vetter, Ralph J. Hartley, Laurie Walsh, and Jesslyn Brown. 1987. Impacts of Domestic Livestock Grazing on Archaeological Resources of Capitol Reef National Park, Utah. *Occasional Studies in Anthropology*, No. 20. U.S. Dept. of the Interior, National Park Service, Midwest Archaeological Center, Lincoln, Nebraska.
- Roney, John. 1977. Livestock and Lithics: The Effects of Trampling. Unpublished Manuscript. U.S. Department of the Interior, Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada.
- Schiffer, Michael B. 1987. *Formation Processes of the Archaeological Record*. University of New Mexico Press, Albuquerque.
- USDA. 1997. National Range and Allotment Handbook
- USDA. 2009. Ecological Site Description System. NRCS. Online.
http://esis.sc.egov.usda.gov/esis_report/fsReport.aspx?approved=yes&id=R041XC323AZ
- USDA. 2009. MLRA Explorer. NRCS. Online.
<http://ceiwin3.cei.psu.edu/MLRA/pdf/rep633991599496468900.pdf>
- USDA. 2009. Soil Survey of Arizona. Natural Resource Conservation Service.
- USDA-NRCS. 2017. Culturally Sensitive Plants Database. Available online at
<https://plants.usda.gov/java/factSheet?cultural=yes> (accessed February 24, 2017).
- USDI. 1988. Desert tortoise habitat management on the public lands: A rangewide plan. Bureau of Land Management. 37pp.
- USDI. 1996. Sampling Vegetation Attributes. Bureau of Land Management.
- USDI. 2005. Interpreting Indicators of Rangeland Health. Interagency Protocol (BLM, ARS, NRCS).

Cerro Colorado Allotment Land Health Evaluation

USDI. 2016. Information for Planning and Conservation (IPaC). U.S. Fish and Wildlife Service. Accessed online at: <https://ecos.fws.gov/ipac/>

Van Devender, T.R. 2002. The Sonoran desert tortoise: Natural History, Biology and Conservation. Appendix 8.1 and 8.2 University of Arizona Press. 388pp.

Van Vuren, Dirk H. 1982. Effects of Feral Sheep on the Spatial Distribution of Artifacts on Santa Cruz Island. *Bulletin of the Southern California Academy of Science*, 81(3):148-151.

Varney, Philip. 1998. *Arizona Ghost Towns and Mining Camps*. An Arizona Highways Book, Fourth Printing. Arizona Department of Transportation, Phoenix.