

United States Department of the Interior
Bureau of Land Management

Land Health Evaluation
Carter Lease No. 5213
September 2019



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
1.1	Definitions of Arizona Standards for Rangeland Health and Guidelines for Grazing Administration	1
2	Allotment profile AND GENERAL DESCRIPTION	2
2.1	Location.....	2
2.2	Physical Description	4
2.2.1	Surface Land Ownership.....	4
2.2.2	Precipitation and Temperature.....	6
2.2.3	Watersheds and Water Resources	7
2.2.4	Soils.....	9
2.2.5	Range Improvements.....	11
2.3	Biological Resources.....	13
2.3.1	Major Land Resource Areas	13
2.3.2	Ecological Sites	13
2.3.3	Plant Resources	17
2.3.4	Wildlife Resources.....	20
2.4	Special Management Areas	20
2.5	Recreation Resources.....	20
2.6	Cultural Resources.....	21
2.6.1	Native American Concerns	23
3	Grazing Management	24
3.1	Grazing History.....	24
3.2	Mandatory Terms and Conditions for Permitted Use	25
4	OBJECTIVES.....	26
	Land Use Plan Management Objectives	26
4.2	Allotment Specific Objectives.....	26
4.2.1	Land Health Standards	26
4.2.2	Key Area Objectives.....	27
5	Rangeland inventory and monitoring methodology	28
	Monitoring Protocols	29
6	Management Evaluation and Summary of Studies data	31
6.1	Actual Use	31
6.2	Rangeland Health Assessments.....	31
7	DETERMINATION OF LAND HEALTH STANDARDS.....	34
	Standard 1: Upland Sites.....	34

Standard 2: Riparian-Wetland Sites	34
Standard 3: Desired Resource Condition	34
8 Recommended Management Actions	35
8.1 Terms and Conditions:	35
9 List of Preparers.....	38
11 Authorized Officer Concurrence.....	39
12 references	40
13 Appendix A: Species Lists	42
14 Appendix B: Monitoring protocols	43
14.1 Indicators of Rangeland Health.....	43
14.2 Monitoring Protocols	44
14.2.1 Line Point Intercept (species composition and ground cover)	45
14.2.2 Pace Frequency	45
14.2.3 Fetch	45
14.2.4 Dry Weight Rank	46
14.2.5 Utilization.....	46
15 Appendix C: Monitoring Data	47
15.1 Key Area Data	47
15.2 Utilization.....	47
15.3 Rangeland Health Evaluations and Frequency/Cover, Composition, and Structure Data	47
15.3.1 Standard 1: Upland Sites	50
17 APPENDIX E: INTERESTED PUBLIC.....	57

This page left intentionally blank

1 INTRODUCTION

The purpose of this draft Land Health Evaluation (LHE) report for the Carter allotment is to evaluate whether the Arizona Standards for Rangeland Health (Standards) are being achieved on the 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 land health evaluation 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:

1. If Standards are being achieved or not achieved, and, if not, if significant progress is being made towards achievement of land health on the allotment.
2. If it is ascertained that Standards are not being achieved, to determine whether livestock grazing is a significant factor causing that non-achievement.

1.1 Definitions of Arizona Standards for Rangeland Health and Guidelines for Grazing Administration

The Arizona standards for rangeland health are expressions of levels of physical and biological condition or degree of function required for healthy, sustainable rangelands and defines minimum resource conditions that must be achieved and maintained. Determination of rangeland health is based upon conformance with these standards.

Guidelines for grazing administration consider the type and level of grazing use. Guidelines for grazing management are types of methods and practices determined to be appropriate to ensure the standards can be met, or that significant progress can be made toward meeting the standard. Guidelines are tools that help managers and lessees achieve standards.

Although the process of developing standards and guidelines applies to grazing administration, present rangeland health is the result of the interaction of many factors in addition to grazing livestock. Other contributing factors may include, but are not limited to: past land uses, land use restrictions, recreation, wildlife, rights-of-way, wild horses and burros, mining, fire, weather, and insects and disease (Arizona Standards and Guidelines, 1997).

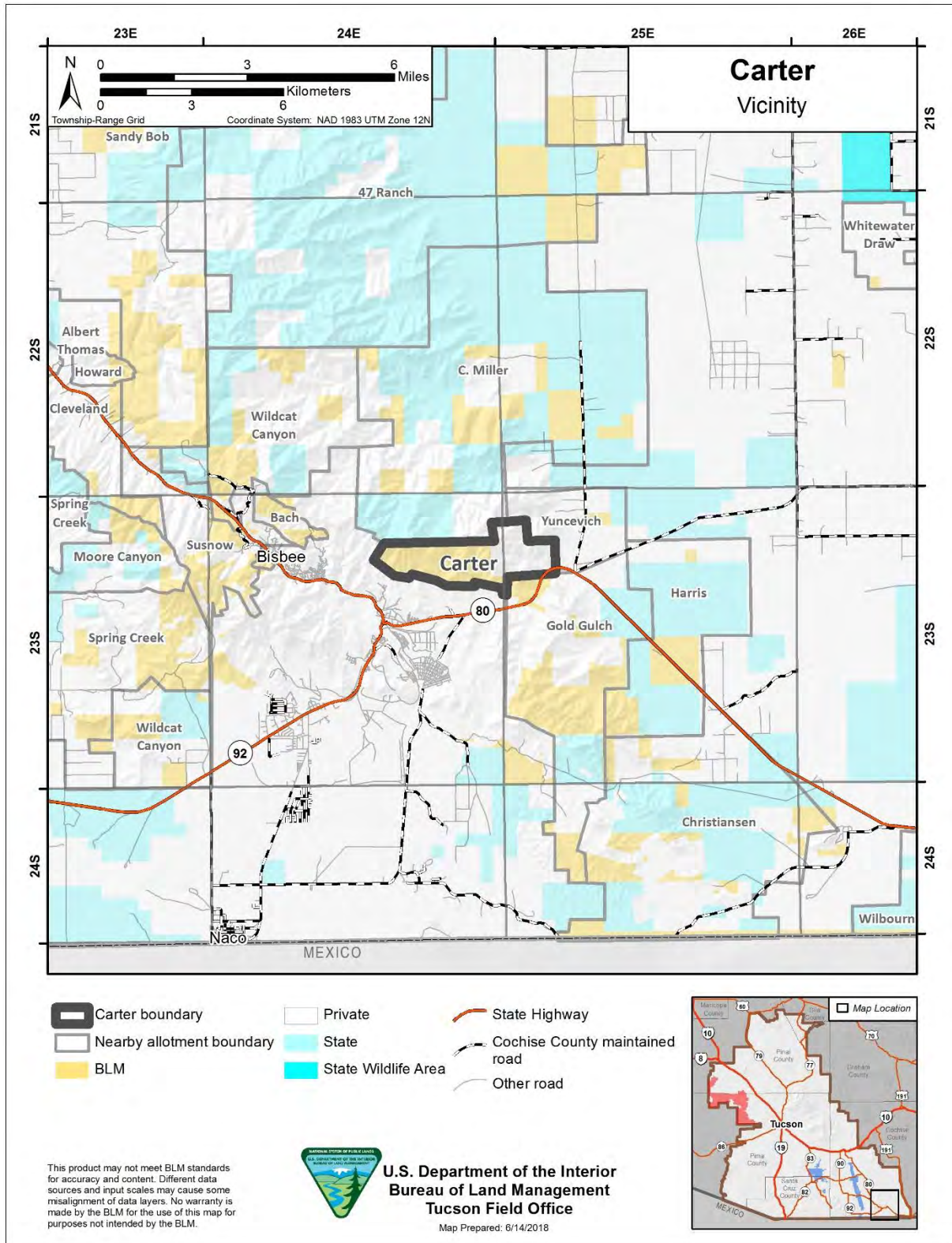
The Arizona Standards and Guidelines identify three standards regarding (1) upland sites, (2) riparian-wetland sites, and (3) desired resource conditions based on specific indicators, as discussed in *Section 6 Rangeland Inventory and Monitoring Methodology* of this document.

2 ALLOTMENT PROFILE AND GENERAL DESCRIPTION

2.1 Location

The BLM portion of the Carter allotment is located about 2 miles north of the town of Bisbee in Cochise County, Arizona. The BLM lands within the allotment are comprise approximately 60 percent of the total livestock operation. The ranch borders Gold Gulch to the south, the Yuncevich allotment to the East, the C. Miller allotment the north. Figure 1 below shows the Carter allotment location.

Figure 1. Vicinity Map of the Carter Allotment



2.2 Physical Description

This section describes physical characteristics within the Carter Allotment.

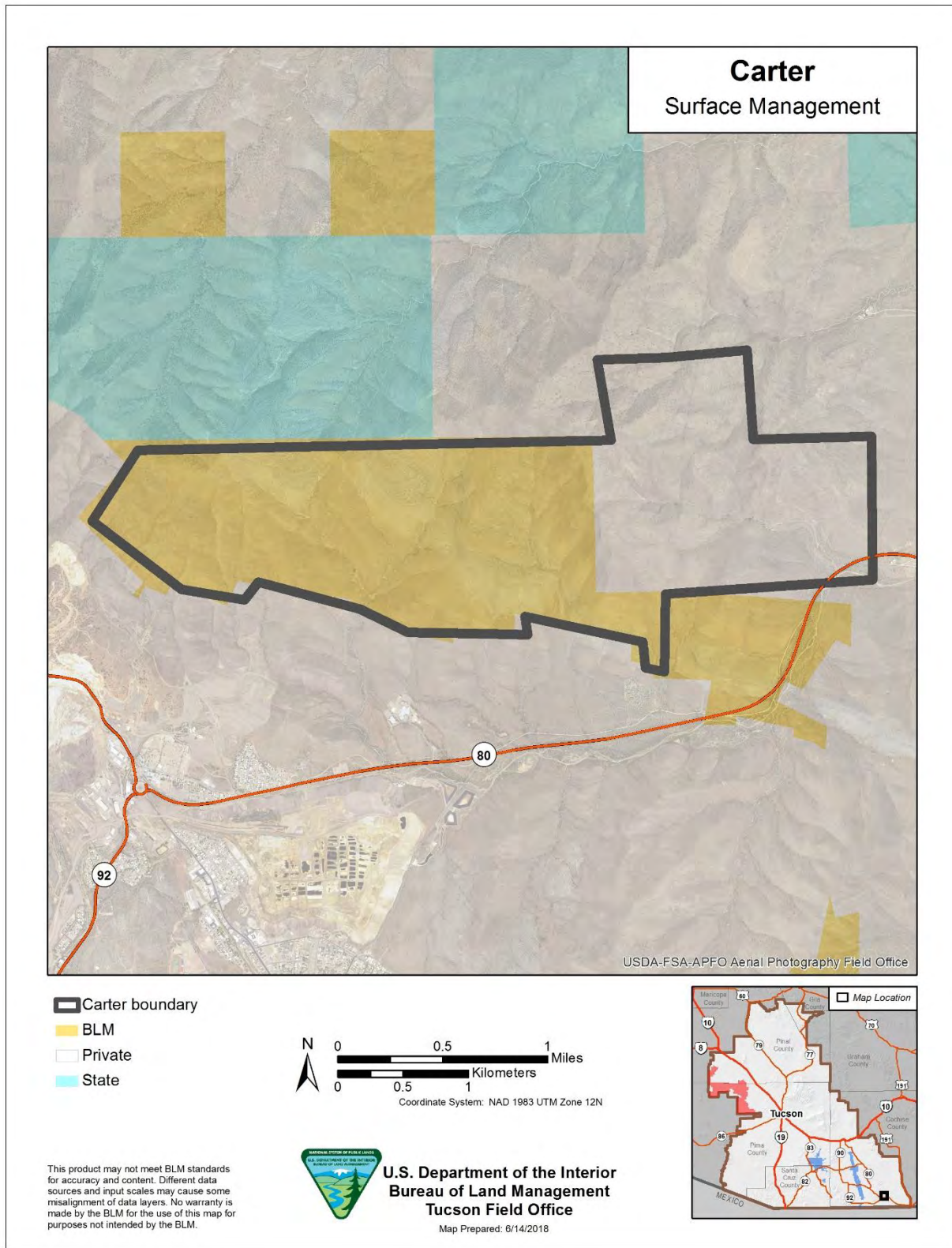
2.2.1 *Surface Land Ownership*

The acreage of the Carter allotment is detailed below (Table 1). The BLM lands within the allotment are all located on the western portion. The allotment is ran as a single pasture. Fence lines do not separate between land ownership. Lands within the allotment are predominately public lands, with lesser amounts of private lands. Public lands constitute about 60 percent of the allotment. Spatial distributions of land ownership are displayed in Figure 2.

Table 1. Acreage of Landownership

Land Classification	Carter Allotment
Public Acres	1,167
Private Land Acres	793
Total Acres	1,960

Figure 2. Land Ownership of the Carter Allotment



2.2.2 Precipitation and Temperature

Climate data comes from the Limestone Hills 12-16" precipitation zone (p.z.) Ecological Site Description (ESD). Precipitation in this common resource area ranges from 12-16 inches yearly in the eastern part with elevations from 3600-5000 feet, and 13-17 inches in the western part where elevations are 3300-4500 feet. Winter-Summer rainfall ratios are 40-60% in the west and 30-70% in the east. Summer rains fall July-September, originate in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal, originates in the Pacific and Gulf of California, and falls in widespread storms with long duration and low intensity. Snow rarely lasts more than one day. May and June are the driest months of the year. Humidity is generally very low. Temperatures are mild. Freezing temperatures are common at night from December-April; however temperatures during the day are frequently above 50 F. Occasionally in December-February, brief 0 F temperatures may be experienced some nights. During June, July and August, some days may exceed 100 F. Cool season plants start growth in early spring and mature in early summer. Warm season plants take advantage of summer rains and are growing and nutritious July-September. Warm season grasses may remain green throughout the year. Climate stations for the average precipitation and temperature tables below are: 020309, Apache Powder Co. Period of record 1923-1990, 022659 Douglas Period of Record 1948-2004, 023120 Fort Huachuca Period of Record 1900-1981, 027530 San Manuel Period of Record 1954-2004, 028619 Tombstone Period of Record 1893-2004.

Table 2. Precipitation and Temperature Averages for Limestone Hills Upland Site

Averaged Temperature and Precipitation (1894-2005)													
Frost-free period (days): 195													
Freeze-free period (days): 0													
Mean annual precipitation (inches): 16													
Monthly Precipitation (Inches):													
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	
<i>High</i>	1.10	0.97	0.50	0.30	0.24	0.52	3.86	3.46	1.72	0.88	0.74	1.08	
<i>Low</i>	0.76	0.67	0.50	0.29	0.17	0.50	2.44	2.61	1.63	0.90	0.53	0.87	
Monthly Temperature (°F):													
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Dec</u>
<i>High</i>	46.8	49.7	54.6	61.7	68.1	77.1	80.7	78.6	73.9	65.1	54.1	48.3	48.3
<i>Low</i>	46.3	48.8	54.0	60.0	67.5	76.8	77.3	75.2	72.1	64.1	53.5	47.1	47.1

Table 3. Western Regional Climate Center data from BISBEE, ARIZONA (020775).

Period of Record Monthly Climate Summary. Period of Record: 03/01/1985 to 06/09/2016
 (https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az0775)

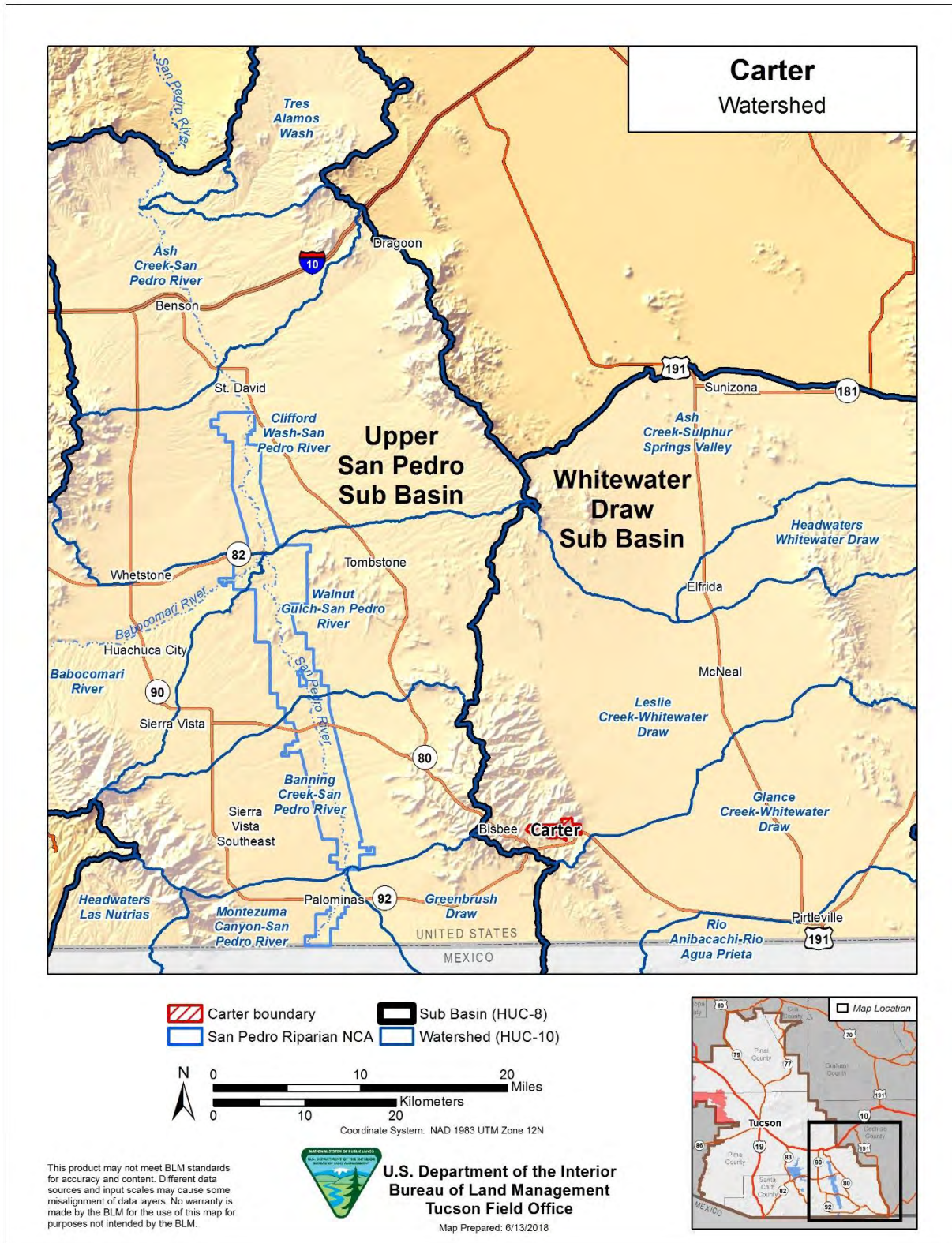
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	56.7	60.2	66.7	74.0	81.6	89.5	87.4	84.6	82.3	74.7	64.0	56.1	73.2
Average Min. Temperature (F)	30.6	33.0	36.8	43.0	49.8	58.4	61.8	59.9	55.1	46.0	36.7	30.6	45.2
Average Total Precipitation (in.)	1.13	1.19	0.88	0.57	0.21	0.64	4.13	4.20	1.90	1.26	0.90	1.36	18.38
Average Total SnowFall (in.)	2.4	1.6	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.4	6.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

2.2.3 Watersheds and Water Resources

The Carter allotment is located on the other side of the basin divide from San Pedro River and lies within the Whitewater Draw HUC-8 Sub Basin (Figure 3) in the Douglas Basin of the Sulfur Springs Valley. Within this sub basin, the allotment is included in the smaller Leslie Creek- Whitewater Draw (HUC-10). In this semi-arid basin, most of the streams are ephemeral. Whitewater draw is the largest of these drainages with the U.S. portion draining from its headwaters in the southern end of the Chiricahua's to Mexico near Douglas, AZ

No natural perennial or intermittent water features exist in the allotment. The ephemeral stream channels in the allotment are head water tributaries near watershed divides.

Figure 3. Map of watersheds associated with Carter



2.2.4 Soils

The soil composition on the Carter allotment is varied as presented in Table 4 and Figure 4. The dominant soil orders in this Major Land Resource Area (MLRA) (see section 3.3.1) are Aridisols and Entisols. The soils in the area have a dominantly thermic or hyperthermic soil temperature regime (warm), an aridic soil moisture regime (dry), mixed mineralogy, and are formed in alluvium.

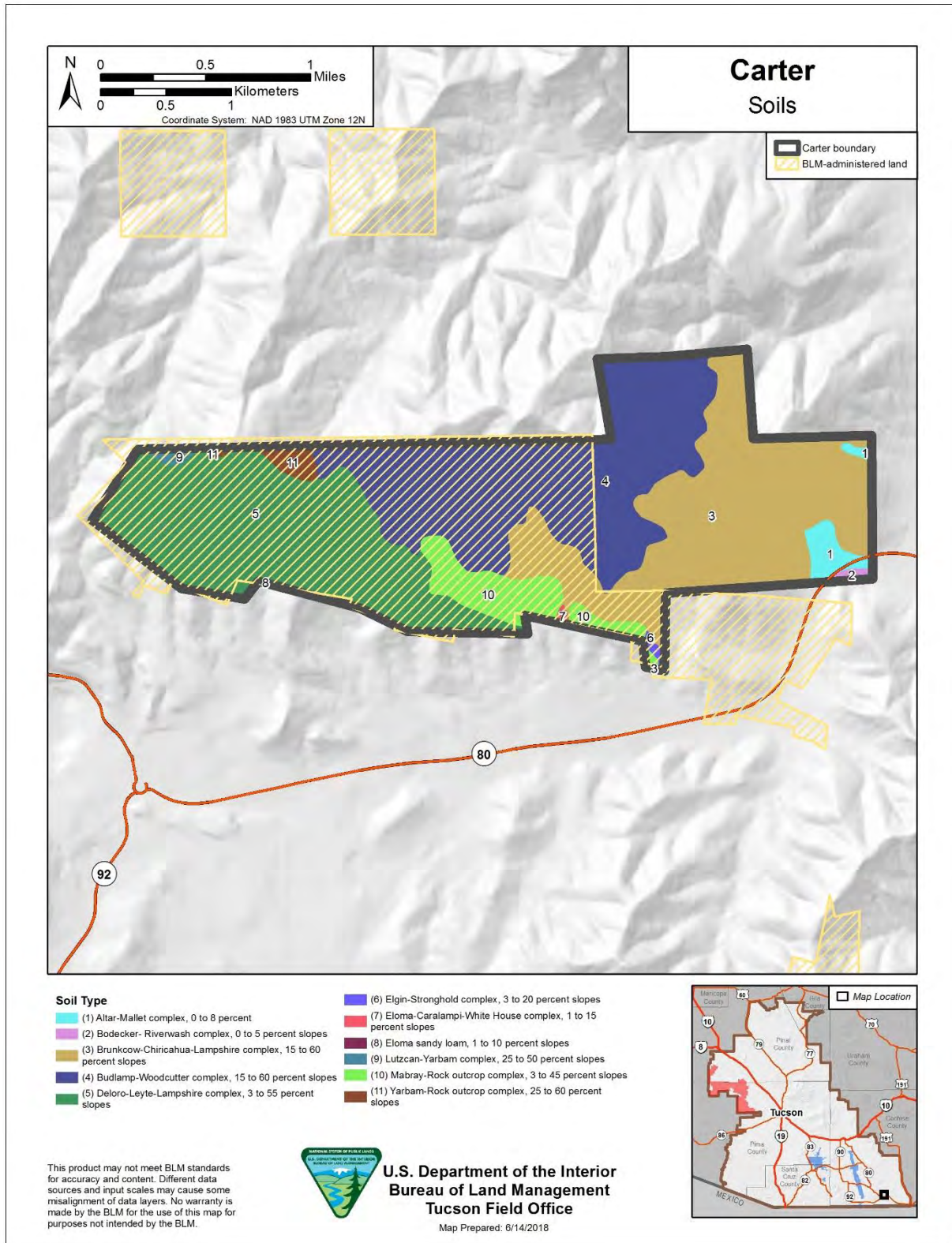
They vary from very shallow to very deep and are well drained to somewhat excessively drained. Haplocambids (Denure and Hayhook series), Haplocalcids (Gunsight and Stagecoach series), Calcargids (Mohall and Pinaleno series), and Natrargids (Casa Grande series) soils are formed on fan terraces and relict basin floors. Torrifluvents (Antho and Comoro series) soils are formed on alluvial fans and flood plains. Shallow and very shallow Torriorthents (Cellar and Quilotosa series) are formed on hills and mountains.

The specific soils on the Carter allotment are shown in the table below. The dominant soils are Rock outcrop-Lajitas complex, 5 to 60 percent slopes and Fig family-Topock complex, 5 to 50 percent slopes. The acreages may not be accurate due to difficulty defining the area of interest in the web soil survey system.

Table 4. Soils on the Carter Allotment

Map Unit Name		Acres in Allotment	Percent of Allotment Acres
Altar-Mallet complex, 0 to 8 percent slopes		36.20	1.85
Bodecker- Riverwash complex, 0 to 5 percent slopes		6.07	0.31
Brunkcow-Chiricahua-Lampshire complex, 15 to 60 percent slopes		578.14	29.48
Budlamp-Woodcutter complex, 15 to 60 percent slopes		625.63	31.91
Deloro-Leyte-Lampshire complex, 3 to 55 percent slopes		564.35	28.78
Elgin-Stronghold complex, 3 to 20 percent slopes		4.75	0.24
Eloma-Caralampi-White House complex, 1 to 15 percent slopes MLRA 41		2.78	0.14
Eloma sandy loam, 1 to 10 percent slopes		0.41	0.02
Lutzcan-Yarbam complex, 25 to 50 percent slopes		9.41	0.48
Mabray-Rock outcrop complex, 3 to 45 percent slopes		110.50	5.64
Yarbam-Rock outcrop complex, 25 to 60 percent slopes		22.58	1.15
Totals for Allotment		1,960.81	100.0%

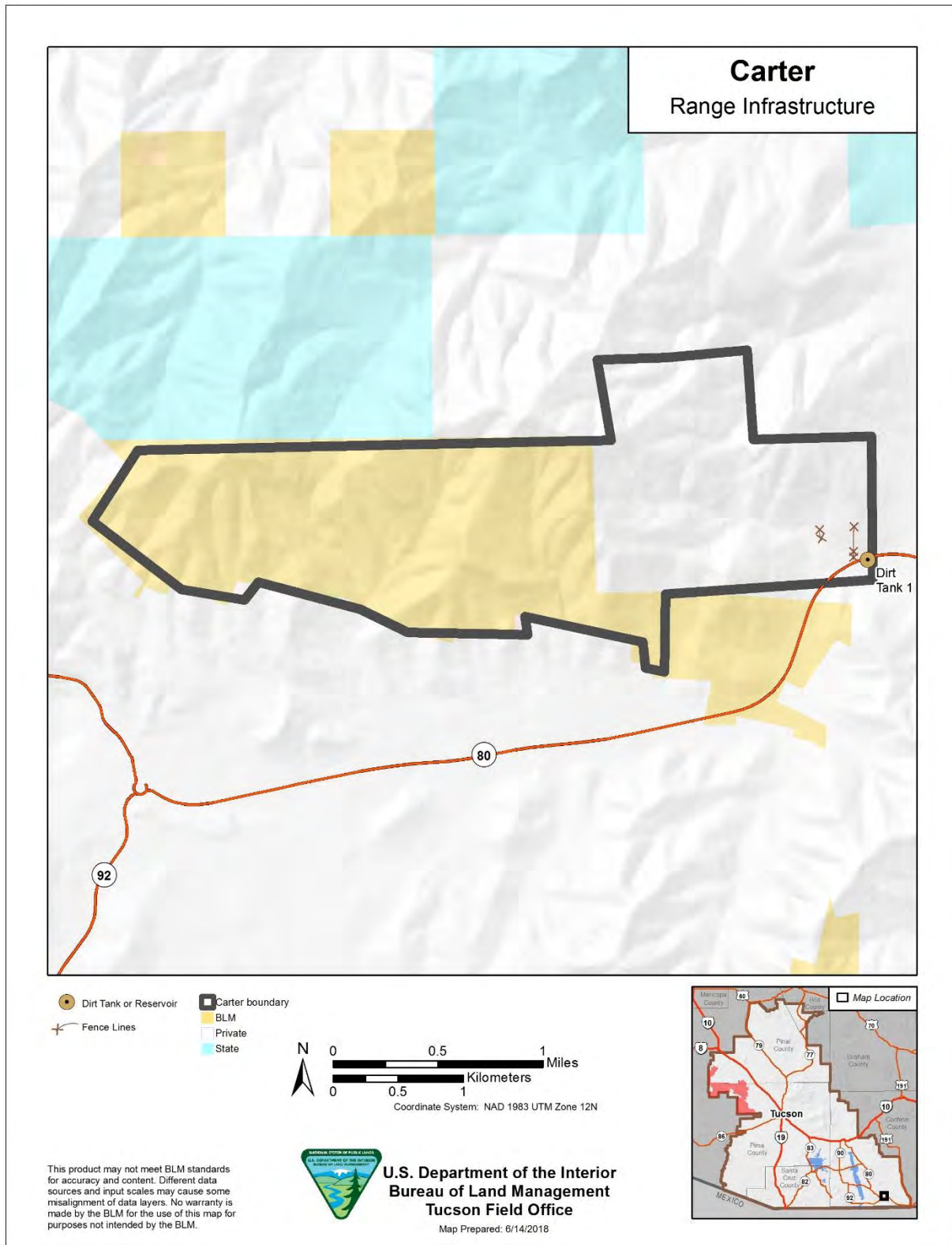
Figure 4. Map of Soil Types within the Carter Allotment



2.2.5 *Range Improvements*

Carter Allotment has fencing, including its boundary, and a dirt tank which are not on BLM. Figure 5 shows the existing range improvements throughout the entire allotment. This mapping exercise was completed using areal imagery as well as verification from the lease holder.

Figure 5. Existing Range Improvements on the Carter Allotment



2.3 Biological Resources

2.3.1 Major Land Resource Areas

Major Land Resource Areas are geographically associated land resource units, usually encompassing several thousand acres. Natural Resource Conservation Service (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. Major Land Resource Areas are characterized by particular patterns of soils, geology, climate, water resources, and land use. The Carter allotment is located in MLRA 41—Southeastern Arizona Basin and Range. It makes up about 15,730 square miles.

Most of this area is in the Mexican Highland Section of the Basin and Range Province of the Intermontane Plateaus. The eastern one-fifth of the area 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. In the vicinity of Willcox, there is a distinct closed basin called the Willcox 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.

Most of this area is in the Sonoran Desert Section of the Basin and Range Province of the Intermontane Plateaus. Many short, fault-block mountain ranges trending southeast to northwest rise abruptly from the smooth or gently sloping desert valley floors. These include the Painted Rock, Gila Bend, Big Horn, Copper, Granite, and Santa Rosa Mountains. Elevation ranges from 980 to 3,600 feet (300 to 1,100 meters) in most of this area. The Gila River then flows west across the southern part of the MLRA to the Colorado River.

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/>.

A total of 15 ecological sites exist within the entire Carter allotment. One key area, C-1, have been established on BLM public lands. Key area C-1 is within Limestone Hills 12-16" precipitation zone (p.z) ecological site, which is the primary ecological sites within the BLM lands in the allotment (Figure 6). Key Area C-1 was established by the BLM and University of Arizona Extension, and pace frequency data is collected to be able to track any changes in long-term trend of vegetation and ground cover. C-1 is also

the location where the U.S. Forest Service Strike Team, referred to as TEAMs documented the 2013 LHE and collected line-point intercept data.

The ecological site for key areas C-1 is Limestone Hills 12-16" precipitation zone (R041XC307AZ). Key vegetative species for this site include: featherplume (*dalea formosa*), ocotillo (*fouquieria splendens*), sideoats grama (*bouteloua curtipendula*) and New Mexico feathergrass (*hesperostipa neomexicana*)

The plant communities found on an ecological site are naturally variable. 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.

2.3.3 Plant Resources

The historic native state includes the native plant communities that occur on the site, including the historic climax plant community. This state includes other plant communities that naturally occupy the site following fire, drought, flooding, herbivores, and other natural disturbances. The historic climax plant community represents the natural climax community that eventually will re-occupy the site with proper management.

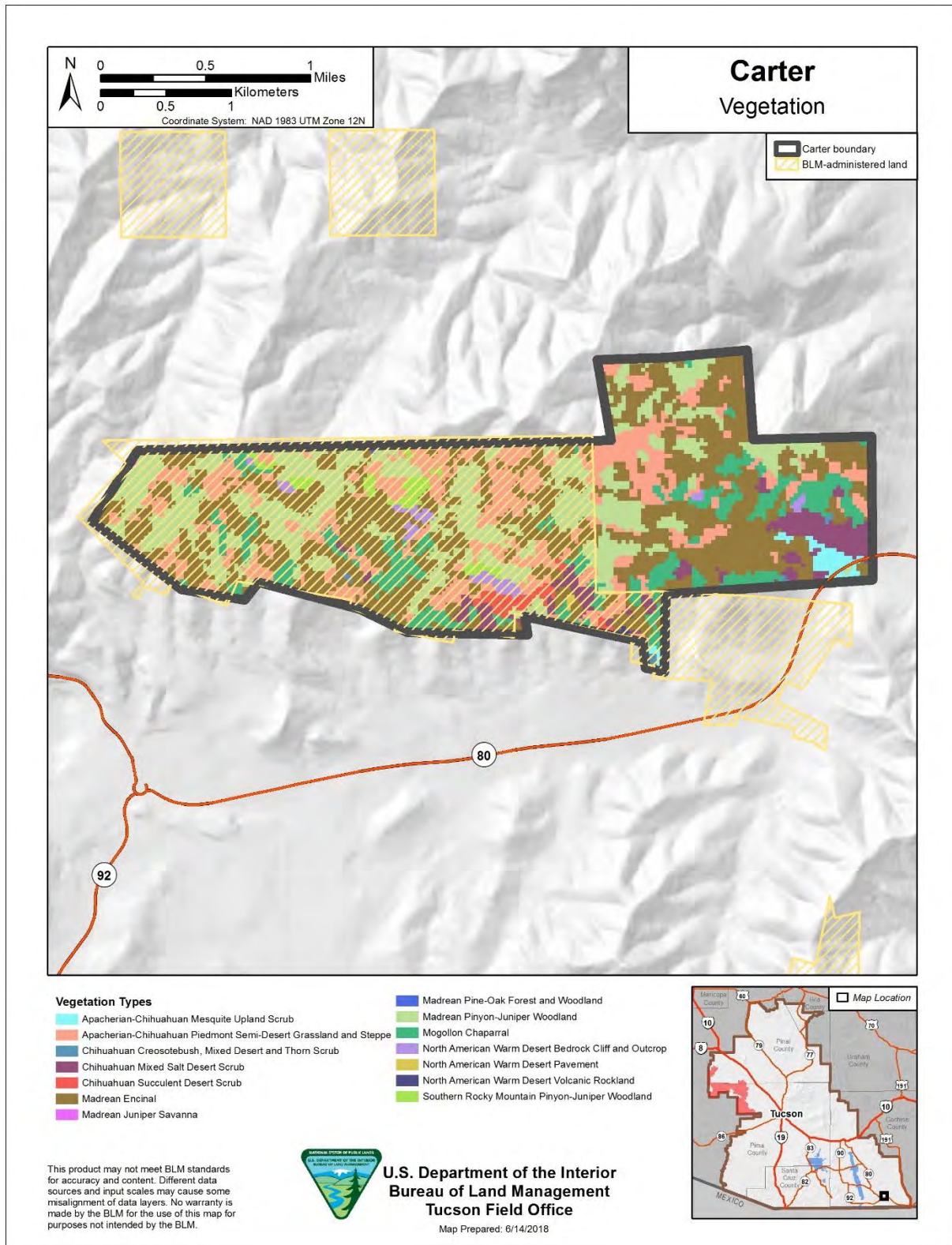
The Limestone Hills ecological site support desert shrub vegetation. Table 5 below lists the vegetation communities within the Carter allotment. There are three vegetation types that make up almost 79 percent of the total acreage. Those majority communities are;

1. Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe. "This ecological system is a broadly defined desert grassland, mixed shrub-succulent or xeromorphic tree savanna that is typical of the Borderlands of Arizona, New Mexico and northern Mexico [Apacherian region], but extends to the Sonoran Desert and throughout much of the Chihuahuan Desert. It is found on gently sloping bajadas that supported frequent fire throughout the Sky Islands and on mesas and steeper piedmont and foothill slopes in the Chihuahuan Desert. Common grass species include *Bouteloua eriopoda*, *Bouteloua hirsuta*, *Eragrostis intermedia*, *Muhlenbergia porteri*, *Muhlenbergia setifolia*, *Pleuraphis jamesii*, *Pleuraphis mutica*, and *Sporobolus airoides*, succulent species of *Agave*, *Dasyliiron*, and *Yucca*, and tall shrub/short tree species of *Prosopis* and various oaks (e.g., *Quercus grisea*, *Quercus emoryi*, *Quercus arizonica*). Many of the historical desert grassland and savanna areas have been converted, some to Chihuahuan Mesquite Upland Scrub (*Prosopis* spp.-dominated), through intensive grazing and other land uses. (<http://swregap.nmsu.edu>)
2. Madrean Encinal occurs in foothills, canyons, alluvial fan piedmonts (bajadas) and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, extending north into Trans-Pecos Texas, southern New Mexico and sub-Mogollon Arizona. Stands occur down to 900 m elevation in southern Sonora, but generally range from around 1200-1350 m intermixed with semi-desert grasslands, and extend up to 1650-2200 m as pure oak patches within Madrean montane forests and woodlands (Brown 1982a). Soils are variable but generally thin and rocky. Where encinal occurs within grasslands, it generally occupies the rockier substrates or is restricted to drainages (Brown 1982a). *Soil/substrate/hydrology*: Soils are variable but generally thin and rocky. Where encinal occurs within grasslands, it generally occupies the rockier substrates or is restricted to drainages (Brown 1982a). (<https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=833206>)
3. The Madrean Pinyon-Juniper Woodland is the second largest ecosystem in the study area (after Madrean Encinal), and with the greatest elevation range, from 4500 feet near Kielberg Canyon, to 7763 feet atop Bassett Peak. It is also the steepest ecosystem, with 98% on slopes of excess of 10 degrees (19%). The Madrean Pinyon-Juniper is also strongly correlated with the massive rhyolitic rocks that characterize much of the skyline of the Galiuros, except in the northern study area. There, in the watershed of Four Mile Canyon, this ecosystem is replaced by encinal and by Great Basin Pinyon-Juniper, with the latter characterized by the single-needle pinyon. (<https://www.azfirescape.org>)

Table 5. Vegetation Communities Found Within the Carter Allotment

Vegetation Type	Acres on Allotment	Percent of Acres
Apacherian-Chihuahuan Mesquite Upland Scrub	25.83	1.32
Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe	368.68	18.80
Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub	4.53	0.23
Chihuahuan Mixed Salt Desert Scrub	91.64	4.67
Chihuahuan Succulent Desert Scrub	21.84	1.11
Madrean Encinal	728.96	37.18
Madrean Juniper Savanna	0.69	0.03
Madrean Pine-Oak Forest and Woodland	0.54	0.03
Madrean Pinyon-Juniper Woodland	454.08	23.16
Mogollon Chaparral	206.45	10.53
North American Warm Desert Bedrock Cliff and Outcrop	24.46	1.25
North American Warm Desert Pavement	1.33	0.07
North American Warm Desert Volcanic Rockland	3.75	0.19
Southern Rocky Mountain Pinyon-Juniper Woodland	28.02	1.43
Total	1,960	-

Figure 7. Vegetation Communities within Carter Allotment



2.3.4 Wildlife Resources

General Wildlife

Wildlife species composition expected to occur on these allotments is characteristic of the Madrean Basin and Range province in Southeastern Arizona. Common species would include: mule deer, white-tailed deer, mountain lion, coyote, bobcat, raccoon, skunk, white-throated woodrat, white-footed mouse, gopher snake, king snake, western diamondback rattlesnake, prairie rattlesnake, coachwhip, patch-nosed snake, western whiptail lizard, side-blotched lizard, tree lizard, canyon tree frog, red-tailed hawk, Cooper's hawk, golden eagle, prairie falcon, raven, turkey vulture, meadowlark, ladder-back woodpecker, ash-throated flycatcher, canyon wren, and rough-winged swallow.

Livestock impact wildlife in a variety of ways, by their presence, through behavioral disturbance, and through competition for forage. Behavioral impacts resulting from inter-specific encounters (including human and livestock) are difficult to quantify, as they vary by species and by type of interaction. Wildlife currently present on the allotments have, to varying degrees, acclimated to the presence of livestock and associated human disturbances. Impacts to wildlife and habitat components include, but are not limited to: cover and forage removal, soil disturbance and erosion, reduction of fine fuels available to carry fire (altered fire regime), addition of artificial water and mineral sources; habitat fragmentation, changes in overland and channel flow regimes, and long-term vegetative community conversion.

The Carter allotment, which includes public, private, and state lands offers diverse habitats for migratory birds, providing valuable food, water, and cover. Migratory species that utilize the area include but are not limited to: Red-tailed hawk, Cooper's hawk, bald eagle, golden eagle, American peregrine falcon, raven, turkey vulture, meadowlark, ladder-back woodpecker, ash-throated flycatcher, canyon wren, and rough-winged swallow. No surveys have been conducted specifically within this allotment for this project to determine presence but these species have the potential of occurring within the vegetation communities located on this allotment (Figure 7). Current livestock presence and management dictates habitat condition relative to the stable state vegetative community that has developed on each site as a result of the long term grazing impacts. Overall, this Allotment provides adequate habitat for wildlife species.

Special Status Species

An Arizona Game and Fish Department Heritage Data Management System (HDMS) and Project Evaluation Program (PEP) analysis was conducted for the allotment area (Project ID: HGIS- 09547). Through that analysis, it was determined that 32 species with special status (Appendix A, includes effects determinations and rational) could occur within a 5 mile radius of the allotment. Of those species, seven could potentially be impacted by the proposed action, however, forage and cover availability, for these species within the allotment is sufficient based on LHE standards being met, so impacts to plants and animal species are considered discountable.

2.4 Special Management Areas

There are no special management areas within the Carter Allotment.

2.5 Recreation Resources

There are no developed recreation sites within the allotment. Dispersed recreation primarily involves small and big game hunting, target shooting, hiking, and off-highway vehicle operation.

2.6 Cultural Resources

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 cultural significance to Native Americans. Should the BLM identify impacts to sites or traditional-use plants, 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 BLMTFO's assessment efforts regarding applicable heritage resources management and compliance criteria.

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.) and its implementing regulations found at 36 C.F.R. 800, wherein the BLM has the legal responsibility to consider the effects of its actions on *historic properties*. BLM Manual 8100 Series and the Arizona BLM Protocol (the Statewide Protocol) provide applicable Section 106 compliance procedures 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 the 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 among the BLM and the Arizona State Historic Preservation Officer (SHPO; agreement executed December 14, 2014). Should the BLM determine that a routine undertaking would result in *no historic properties affected* or *no adverse effect*, as advised by a qualified cultural resources specialist, the undertaking may proceed under the terms and conditions of the Statewide Protocol. If the undertaking is determined to have an *adverse effect*, or otherwise meets stipulated consultation thresholds, project-specific consultation is then initiated with the SHPO.

A small number of controlled studies that examine potential grazing impacts on historic properties have been performed (e.g., Osborn and Hartley 1991, Osborn et al. 1987, Roney 1977, and Van Vuren 1982). For example, Alan Osborn and his colleagues (c.f., Osborn et al. 1987; Osborn and Hartley 1991) 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 6 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 fewer than 15 centimeters (Osborn et al. 1987).

The results varied by study plot location with the greatest impacts recorded near water sources, where higher concentrations of livestock use occurred. Osborn and Hartley (1991) concluded that “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 and other above-ground cultural features such as rock art (Broadhead 2001; Osborn et al. 1987). Indirect impacts from livestock concentrations may include accelerated soil erosion and gulying, 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 Carter grazing allotment between August 9, 2019. 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* (2019), Arizona's statewide cultural resource inventory system, and the *National Register of Historic Places Focus Database & NP Gallery Digital Asset Search* (2019). 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 one prior cultural resources investigation (1995-412.ASM; Doak 1996) that inventoried approximately 495 acres of BLM-managed surface and resulted in the documentation of three cultural resource sites (AZ FF:9:32-34[ASM]). Known site types consist of historic-age mining features. Additionally, historic GLO plat maps depict mining claims, mines, roads, and associated infrastructure in the vicinity of the subject allotment; however, none of the depicted features correspond with the BLM-administered portion of the allotment.

Statement of Effect Determination

There are no range improvements or potential livestock concentration areas on the BLM-administered portion of the allotment. As a routine undertaking with no currently identified impacts to historic properties within the BLM-administered portion of the allotment, lease issuance for continued livestock use of the Carter allotment is appropriate under a finding of *no historic properties affected* with the following, standard Conditions of Approval (COAs). Any newly proposed range improvements would be subject to individual project review and assessment for Section 106 compliance in accordance with 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.

2.6.1 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 nine Native American tribes who claim cultural affiliation to and/or traditional use of the area—as determined through the online *Arizona Government-to-Government Consultation Toolkit* (accessed August 8, 2019)—by sending letters

summarizing the results of the Class 1 cultural resources assessment and rangeland monitoring data for the Carter allotment. Tribes consulted include the Fort McDowell Yavapai Nation, Hopi Tribe, Pascua Yaqui Tribe, the Pueblo of Zuni, San Carlos Apache Tribe, Tohono O'odham Nation, and White Mountain Apache Tribe. Identified plant species in the subject allotment with potential cultural significance include velvet mesquite (*Prosopis velutina*; USDA-NRCS 2019).

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

This section discusses the grazing history, permitted use, and terms and conditions on the current lease for the Carter allotment.

3.1 Grazing History

Historic and recent grazing use has been by cattle on the Carter allotment. The BLM lands within the allotment comprise approximately 60 percent of the total livestock operation. There are 8 head of cattle authorized on the BLM portion of the Carter allotment. Between the public land and the other leased and private lands, a yearlong grazing system is utilized. The 96 Animal Unit Months (AUMs) under the BLM section 15 grazing lease are included in the total head of cattle in addition to the private land and State lease, and are managed together on the entire allotment.

The management category given to the Carter 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 AUMs available on the public lands. The individual ranch operator determines 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. The BLM will work with the operator to adjust livestock numbers on the total grazing unit if utilization is found to be excessive or the range trend to be downward. Grazing units managed custodial 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.

The allotment is 1,960.03 total acres, of which 1,167.03 acres is administered by the BLM. There is currently one lease issued for 96 Animal Unit Months (AUMs) on the BLM public lands for the Carter allotment. An AUM is the amount of forage required by one animal unit for a period of 30 days or one month. Within the allotment, yearlong grazing from March 1 to February 28 is allowed under the terms and conditions of the lease. The BLM lands associated with this allotment are used in conjunction with the private in a rotational grazing system, the BLM land, however, is not fenced off completely. An Animal Unit (AU) is considered to be one mature cow of about 1,000 pounds either with or without a calf up to six months of age or one bull, consuming about 20 pounds of forage per day. AUMs totals for the Carter allotment leases are in Table 6.

Table 6. Carter Lease and AUMs

Ownership	Animal Unit Months (AUMs)	Animal Units (AU)
BLM – Carter #5213	96 AUMs	8 AU Yearlong

3.2 Mandatory Terms and Conditions for Permitted Use

Grazing use on the Carter Allotment is in accordance with the terms and conditions of the current lease issued for 96 AUMs on public lands. The Mandatory Terms and Conditions of the lease are listed below.

Table 7. Mandatory Terms and Conditions of the Lease

Total Livestock on the BLM acres of the Allotment	Livestock Kind	Grazing Period of Use	Percent Public Land*	Type Use	AUMs on Public Land
8	Cattle	3/1 to 2/28	100	Active	96

* 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.

Existing Other Terms and Conditions

1. In order to improve livestock distribution on the public lands, all salt blocks and /or mineral supplements will not be placed within a ¼ mile of any riparian area, wetland meadow, or watering facility (either permanent or temporary) unless stipulated through a written agreement or decision in accordance with 43 CFR 4130.3-2(c).
2. If in connection with operations under this authorization, any human remains, funerary objects, sacred 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, the permittee/lessee shall stop operations in the immediate area of the discovery, protect the remains and objects, and immediately notify the Authorized Officer of the discovery. The permittee/lessee shall continue to protect the immediate area of the discovery until notified by the Program Manager that operations may resume.
3. In accordance with 43 CFR 4130.8-1(F): Failure to pay grazing bills within 15 days of the due date specified in the bill shall result in a late fee assessment of \$25.00 or 10 percent of the grazing bill, whichever is greater, but not to exceed \$250.00. Payment made later than 15 days after the due date, shall include the appropriate late fee assessment. Failure to make payment within 30 days may be a violation of 43 CFR Secs. 4150.1 and 4160.1-2.

4 OBJECTIVES

This section provides an overview of the Tucson Field Office management objectives that are associated with the Carter Allotment per the Safford Resource Management Plan (RMP) (BLM, 1991), as amended by the decision record for Arizona Standards and Guidelines and incorporates the Gila District Livestock Grazing Program Biological Opinion, 2012. The Safford RMP incorporates by reference the decisions from the Eastern Arizona Grazing Final Environmental Impact Statement (FEIS) Record of Decision (1987).

Eastern Arizona Grazing Environmental Impact Statement (1987)

Safford District Resource Management Plan (1991)

Gila District Livestock Grazing Program Biological Opinion (2012)

Land Use Plan Management Objectives

- BLM's authority for management of upland vegetation (vegetation outside riparian zones) comes from the Endangered Species Act (1973), Taylor Grazing Act (1934), Public Rangelands Improvement Act (1978) and The Federal Land Policy and Management Act /1976). These laws require BLM to manage vegetation for its use while maintaining sufficient ground cover to maintain and enhance watershed condition and reduce non-point source pollution from rangeland management and use activities. Best management practices would be selected from available grazing management systems, livestock management practices and BLM standards for range improvements to ensure ground cover and reduce non-point pollution (to Arizona's waters sediment production and fecal contamination) resulting from grazing activities. Safford RMP page 24
- Livestock grazing is managed through allotment management plans, most of which were developed from decisions resulting from the Upper Gila-San Simon Grazing Environmental Impact Statement (BLM 1978) and the Eastern Arizona Grazing Environmental Impact Statement (BLM 1986). These plans were written for a specific unit of rangeland (allotment) based on multiple-use resource management objectives established through existing land use plans and activity level plans by resource specialists and permittees. An Allotment Management Plan establishes objectives, seasons of use, grazing system, numbers of livestock permitted on the range, range improvements, monitoring plans and evaluation procedures for the allotment. Safford RMP page 137

4.2 Allotment Specific Objectives

The Carter Allotment is subject to the following objectives as established in the Arizona Standards for Rangeland Health:

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.

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 Carter 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.

Desired Plant Community Objective

As part of the land health evaluation 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. The NRCS’s Ecological Site Descriptions were used to provide guidance to develop DPC’s for the sites.

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.

4.2.2 Key Area Objectives

In grazing administration, a key area is defined as a relatively small portion of a range selected because of its location, use, or grazing value as a monitoring point for grazing use. Key areas are indicator areas that are able to reflect what is happening on a larger area as a result of on-the-ground management actions. A key area should be a representative sample of a large stratum, such as a pasture, grazing allotment, wildlife habitat area, herd management area, watershed area, etc. Objectives should be developed so that they are specific to the key area. Monitoring studies can then be designed to determine if these objectives are being met (USDI, 1996).

Key area C-1 is within Limestone Hills 12-16” precipitation zone (p.z) ecological site, which is the primary ecological site within the BLM lands in the allotment (Figure 6 above). Key Area C-1 was established by the BLM and University of Arizona Extension, and pace frequency data is collected to be able to track any changes in long-term trend of vegetation and ground cover. C-1 is also the location where the U.S. Forest Service Strike Team, referred to as TEAMS documented the 2013 LHE and collected line-point intercept data.

Refer to Table 8 and Figure 6 for the location of the key area on the Carter Allotment. Addressed in this LHE report are the results from the key area monitored by the U.S. Forest Service (USFS) TEAMS in 2013 (Appendix B).

Table 8. Location of the Carter Allotment Key Area

Key Area	Ecological Site	Ecological Site ID	GPS Coordinates (NAD83 CONUS)
C-1	Limestone Hills 12-16”	R041XC307AZ	12 R 609122 m E 3478700 m N

The key area objective for the Carter Allotment is to meet the land health standards as established in the Arizona Standards for Rangeland Health. Specific objectives are defined below to guide the determination of whether the land health standards are being met.

Key Area C-1 Desired Plant Community Objectives for Limestone Hills 12-16” precipitation zone ecological site

- Maintain Grasses/Grasslike plants composition of ≥15%
- Maintain a palatable shrub composition of ≥10%
- Maintain vegetative foliar cover at ≥40%

Rationale: Maintaining a perennial grass composition of 15 percent on this site is in between the drought /fire interaction in the HCPC for Limestone Hills state and transition model. Palatable shrub composition of 10% or greater is appropriate for the site based on its aspect and elevation and complies with the expected ranges, 10-15 percent, of shrub production in the Ecological Site Guide. Foliar cover is expected to be between 30% and 40% as per the reference sheet. A vegetative foliar cover of 40% or greater should serve to prevent accelerated erosion beyond what is expected in the reference state.

5 RANGELAND INVENTORY AND MONITORING METHODOLOGY

The Arizona standards for rangeland health were assessed for the Carter Allotment by a U.S. Forest Service Interdisciplinary (ID) team on January 11, 2014. The ID team consisted of a rangeland management specialist and a wildlife biologist. Documents and publications used in the assessment process include the Web Soil Survey of Arizona (NRCS, 2015), Ecological Site Descriptions for Major Land Resource 35 (NRCS, 2007), Interpreting Indicators of Rangeland Health Technical Reference 1734-6 (USDI-BLM et al., 2005), Sampling Vegetation Attributes Technical Reference 1734-4 (USDI-BLM et al.,

1996), and the National Range and Allotment Handbook (USDA-NRCS, 2003). A complete list of references is included at the end of this document and monitoring methodology can be found on Appendix C. All are available for public review in the BLM Tucson Field Office. The ID team used rangeland monitoring data and professional observations to assess conformance with the Arizona standards for rangeland health.

Monitoring Protocols

Monitoring occurred on the Carter Allotment at key areas C-1. Quantitative measurements for cover and species composition were collected along each transect and were analyzed in conjunction with qualitative indicators of soil quality, hydrologic function, and biological health. This was completed to assess the existing conditions within the ecological site Limestone Hills 12-16" p.z. The existing conditions were compared to site specific reference conditions established by the NRCS, which are considered to be representative of relatively undisturbed states within a given soil-plant community type. This comparison between existing and reference conditions determines the level of departure from the potential natural community.

The key area was recorded using a global positioning system (GPS) using a projection of North American Datum (NAD) 83. Inventory and monitoring data are provided in Appendix B.

Line Point Intercept

The method used to obtain transect data pertaining to species composition and soil cover is line point intercept (LPI). This method consists of a horizontal, linear measurement of plant intercepts along the course of a line (tape) 100 feet in length. LPI is a rapid and accurate method for measuring occurrence of grass or grass-like plants, forbs, shrubs, and trees in which vegetation composition is extrapolated. It also quantifies soil cover, including vegetation, litter, rocks, and biotic crusts. These measurements are indicators of wind and water erosion, water infiltration, and the ability of the site to resist and recover from degradation.

Indicators of Rangeland Health

The five steps for a land health evaluation (LHE) are protocols for evaluating the three rangeland health attributes (soil and site stability, hydrologic function, and biotic integrity), as outlined in Technical Reference 1734-6. They are:

Step 1. Identify the Key Area; Determine the Soil and Ecological Site

Step 2. Obtain or Develop the Reference Sheet and the Corresponding Evaluation Matrix

Step 3. Collect Supplementary Information

Step 4. Rate the 17 Indicators on the Evaluation Sheet

Step 5. Determine the Functional Status of the Three Rangeland Health Attributes:

1. Soil and site stability (S) – The capacity of an area to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.
2. Hydrologic function (H) – The capacity of an area to capture, store, and safely release water from rainfall, run-on and snowmelt (when relevant), to resist a reduction in this capacity, and to recover this capacity when a reduction does occur.

3. Biotic integrity (B) – The capacity of the biotic community to support ecological processes within the normal range of variability expected for the site, to resist a loss in the capacity to support these processes, and to recover this capacity when losses do occur. The biotic community include plants, animals, and microorganisms occurring both above and below ground.

The RHA provides information on the functioning 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 assessment provides information that is not available with other methods of evaluation. It gives an indication of the status of the three rangeland attributes chosen to represent the health of the “key area” (i.e., the area where the evaluation of the rangeland health attributes occurs). The following are the 17 indicators that are evaluated during a RHA assessment 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 Run off: 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

Attribute ratings reflect the degree of departure from expected levels for each indicator per the reference sheet. The degree of departure may be categorized (rated) as:

- None to Slight

- Slight to Moderate
- Moderate
- Moderate to Extreme
- Extreme to Total

6 MANAGEMENT EVALUATION AND SUMMARY OF STUDIES DATA

6.1 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). Actual use reports will identify the amount of livestock use and period of use for each water source/pasture. According to billed use the lease has paid full use since 1992. Livestock grazing for the Carter Allotment is permitted as a Section 15 grazing lease. Allowable AUMs are calculated on BLM-administered land only. Lease holders are billed for their maximum use available on public lands unless non-use is requested and approved. Non-use by the lessee was not requested during the evaluation period.

6.2 Rangeland Health Assessments

Upland range health was evaluated at one key area (C-1) and is located in the Limestone Hills 12-16" p.z. The key area was selected for its consistency with average livestock use within the allotment. A quantitative and qualitative assessment of rangeland health indicators was conducted in order to determine if any gaps existed between existing condition and ecological reference condition. Using these assessments, it was determined whether or not applicable resource standards were being met within the allotment.

A RHA of the three rangeland attributes was completed at key area C-1. Ratings of Moderate or more are considered to indicate resource concerns for soil erosion, water quantity, and plant productivity. It is important to remember that these ratings are made relative to the potential for the site. For example, a site with highly erodible soils and low potential for stabilizing vegetation may be rated as having a Slight departure from reference conditions even though the actual amount of soil movement is significant, while a site with a high potential for stability rated "Moderate" may have relatively little soil movement. Monitoring data recorded for the RHA is provided in Appendix C. A summary of the assessment conducted at key area C-1 on the Carter Allotment is presented in Table 9 below.

Table 9. Summary of Range Health Assessment Ratings

Key Area	Ecological Site	Range Health Attributes – Degree of Departure		
		Soil	Hydrology	Biotic Integrity
C-1	Limestone Hills 12-16" p.z.	None to Slight	None to Slight	None to Slight

The potential plant community on this site is dominated by warm season perennial grasses. Several species of shrubs are well represented on the site. Shrubs can be in concentrations at the edges of rock outcrops and in canyon bottoms. Most of the grass and shrub species are well dispersed throughout the plant community. A few species (black grama, New Mexico feathergrass, amole, sandpaper bush and mariola) grow in patches which vary in size and are not well dispersed over larger areas of the site.

In the absence of wildfire and/or with overgrazing, shrubs increase to dominate the plant community. Well-developed gravel and cobble covers protect the soil from erosion and help protect forage species from heavy utilization. The large amount of rock outcrop on the site tends to magnify water received by adjacent soil areas. Natural fire was a factor in the development of the potential plant community. The frequency of natural fire on this site was about once every ten years. Fires burned May through August.

Rangeland Health Attribute 1: Soil and Site Stability

C-1- There were no rills or gullies observed, these indicators were rated None to Slight. Water flow patterns were not observed and were rated None to Slight. Pedestals and/or Terracettes were rated as None to Slight because there were none observed on the site. Bare ground was measured at zero percent, indicating the site has moderate to high plant cover, and that the soils were well armored by rock fragments and was rated None to Slight. There was no evidence of wind-scouring observed due to a heavy gravel and rock component and was rated None to Slight. All litter size classes remained at the base of plants with little to no movement and was rated None to Slight. Soil surface resistance to erosion was rated as None to Slight due to the area being naturally armored by the heavy gravel and rock component. Rock and gravel fragments covered 90 percent of the soil surface. Plants were able to grow through these fragments and provided a canopy cover measured at 82 percent and 10 percent basal cover at C-1 (Appendix C). Soil surface loss and degradation were None to Slight as soils are stable and in place. Compaction layers were not present and not restricting water infiltration or root penetration and was rated None to Slight.

The overall rating for Soil and Site Stability was None to Slight. All 10 indicators for soil site stability were rated as None to Slight.

Rangeland Health Attribute 2: Hydrologic Function

C-1- There were no rills or gullies observed. These indicators were rated None to Slight. Water flow patterns were not observed and were rated None to Slight. Pedestals and/or Terracettes were rated as None to Slight because there were none observed on the site. Bare ground was measured at zero percent, indicating the site has moderate to high plant cover, and that the soils were well armored by rock fragments and was rated None to Slight. Soil surface resistance to erosion was rated as None to Slight due to the area being naturally armored by rock and canopy cover. Rock and gravel fragments covered 90 percent of the soil surface. Canopy cover was measured at 82 percent and 10 percent basal cover at C-1 (Appendix C). Soil surface loss and degradation were None to Slight as soils are stable and in place.

Compaction layers were not present and not restricting water infiltration or root penetration and was rated None to Slight. Litter amounts were measured at 50.5 percent. It was rated None to Slight.

Plant community composition and distribution relative to infiltration was rated None to Slight. The vegetation composition is effective at soil stability due to the basal area cover and root systems that are not restricted by a compaction layer. This type of plant community is moderately to highly effective at capturing and storing precipitation.

The overall rating for Hydrologic Function was None to Slight. All 10 indicators for hydrologic function were rated as None to Slight.

Rangeland Health Attribute 3: Biotic Integrity

C-1- Soil surface resistance to erosion was rated as None to Slight. Soil surface is naturally armored by rock and canopy cover. Rock and gravel fragments covered 90 percent of the soil surface. Canopy cover was measured at 82 percent and 10 percent basal cover at C-1 (Appendix C). Soil surface loss and degradation were None to Slight as soils are stable and in place. Compaction layers were not present and not restricting water infiltration or root penetration and was rated None to Slight. Functional/structural groups was rated None to Slight. Plant mortality/decadence was rated None to Slight; all age classes were evenly represented. Litter amounts were measured at 50.5 percent, and were therefore rated None to Slight. Annual production was rated as None to Slight and is appropriate for the site. Invasive plants was rated None to Slight as there were none noted on the site. Reproductive capability of perennial plants was rated None to Slight, as the native plants are adapted to the climate and are capable of producing seeds, stolons, and rhizomes except during the most severe droughts.

The overall rating for Biotic Function was None to Slight. All Nine indicators for biotic function were rated as None to Slight.

Key Area Conclusions:

Upland range health was evaluated at one key area (Referred to C-1). The key area was selected for its consistency with average livestock use within the Allotment. A quantitative and qualitative assessment of rangeland health indicators was conducted in order to determine if any gaps existed between existing condition and ecological reference condition. Using this assessment, it was determined whether or not applicable resource standards were being met within the Allotment.

Key Area C-1

- | | |
|--|----------|
| • Maintain Grasses/Grasslike plants composition of $\geq 15\%$ | ACHIEVED |
| • Maintain a palatable shrub composition of $\geq 10\%$ | ACHIEVED |
| • Maintain vegetative foliar cover at $\geq 40\%$ | ACHIEVED |

Rationale: The grass composition objective is being met at C-1. The most current long-term monitoring data shows a grass composition of 33 percent. Palatable shrub composition on the site, expected 10-15 percent, consist of 13 percent of the plant community. The vegetative foliar cover objective is being met at this site, with foliar cover of 82 percent. No sign or utilization (0 percent) by livestock was observed at the site.

7 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 the trend plot shows that cover and litter are adequate to ensure soil stabilization and appropriate permeability rates within the ecological site. The ESDs describe 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 C-1 describes the Historical Climax Plant Community (HCPC) as: “*The potential plant community on this site is dominated by warm season perennial grasses. Several species of shrubs are well represented on the site. Shrubs can be in concentrations at the edges of rock outcrops and in canyon bottoms. Most of the grass and shrub species are well dispersed throughout the plant community...*” The key management area (KMA) 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, almost the entire allotment is armored by rocks. 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 Carter allotment.

Standard 3: Desired Resource Condition

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

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 current vegetative composition of 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 that support a productive and a diverse native biotic community. C-1 key area is sufficiently vegetated by perennial grasses that supports soil productivity and protection and provides forage and habitat for both wildlife and livestock. The presence of 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.

The vegetative community at C-1 represents the composition, structure, and distribution of the HCPC state of a “Native shrub, succulent, grass, forb” 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. Several species of shrubs are well represented on the site...*” The allotment represents this description as presented within the ESD. The allotment does indicate the “*natural variability of the site*” with respect to soil, aspect and precipitation (Figure 1). The functional/structure group was found to have none or only a slight deviation from the reference community as described within the ESD (Table 5). The site is naturally armored by rock (> 90% cover) on the soil surface, which protects plant species from livestock and wildlife use. This helps maintain plant diversity overtime as described in the ESD. Although slight deviations from the reference community could exist within the allotment, the composition and structure of the vegetation still provides well distributed habitat for wildlife (general wildlife and sensitive species).

8 RECOMMENDED MANAGEMENT ACTIONS

Based on the determinations in Section 7 above, 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 and recommended terms and conditions:

8.1 Terms and Conditions:

Terms:

Allotment	Livestock # and Kind	Grazing Period of Use	Percent Public Land	AUMs	Type Use
Carter	8 Cattle	3/1 to 2/28	100	96	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.

13. 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 TFO. The immediate area of the discovery shall be protected until notified by the BLMTFO Manager that operations may resume.

14. In order to improve livestock distribution on the public lands, all salt blocks and/or mineral supplements shall not be placed within a ¼ mile of any riparian area, wet meadow or watering facility (either permanent or temporary) unless stipulated through a written agreement or decision in accordance with 43 CFR 4130.3-2(C).

The following Other Terms and Conditions should be added to the BLM lease:

- The lessee shall submit, upon request, a report of the actual grazing use made on this allotment for the previous grazing period, March 1 to February 28. Failure to submit such a report by March 15 of the current year may result in suspension or cancellation of the grazing lease.
- In accordance with 43 CFR 4130.8-1(F): Failure to pay grazing bills within 15 days of the due date specified in the bill shall result in a late fee assessment of \$25.00 or 10 percent of the grazing bill, whichever is greater, but not to exceed \$250.00. Payment made later than 15 days after the due date, shall include the appropriate late fee assessment. Failure to make payment within 30 days may be a violation of 43 CFR Secs. 4150.1 and 4160.1-2.

9 LIST OF PREPARERS

List of Preparers

Name	Organization	Title
Eric Baker	Tucson Field Office USDI Bureau of Land Management	Rangeland Management Specialist
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
Kristen Duarte	Tucson Field Office USDI Bureau of Land Management	Rangeland Management Specialist
Keith Hughes	Tucson Field Office USDI Bureau of Land Management	Natural Resource Specialist
Dave Murray	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

12 REFERENCES

- Arizona Government-to-Government Consultation Toolkit. 2019. Available online at <https://sites.google.com/view/az-consultation-toolkit/home> (accessed August 8, 2019).
- AZSite. 2019. Arizona's Cultural Resource Inventory, maintained by the Arizona State Museum. Available online at <http://azsite3.asurite.ad.asu.edu/azsite/> (accessed August 9, 2019).
- 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.
- Doak, David. 1996. *The Mural Hill Survey: An Archaeological Survey of Approximately 495 Acres East of Bisbee, Cochise County, Arizona*. SWCA Environmental Consultants, Inc., Tucson.
- National Register of Historic Places Database & NPGallery Digital Asset Search. 2019. Maintained by the National Park Service. Available online at <https://www.nps.gov/subjects/nationalregister/database-research.htm> (accessed August 9, 2019).
- 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. Natural Resource Conservation Service, Arizona and University of Arizona Water Resources Research Center. 2008. Brawley Wash - Los Robles Wash Watershed, (Altar Wash - Brawley Wash Watershed), Arizona, Rapid Watershed Assessment
- USDA. 2009. Ecological Site Description System. NRCS. Online. http://esis.sc.egov.usda.gov/esis_report/fsReport.aspx?approved=yes&id=R041XC306AZ
- 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. 2019. Culturally Sensitive Plants Database. Available online at <https://plants.usda.gov/java/factSheet?cultural=yes> (accessed August 8, 2019).

USDI. 1996. Sampling Vegetation Attributes. Bureau of Land Management.

USDI. 2005. Interpreting Indicators of Rangeland Health. Interagency Protocol (BLM, ARS, NRCS).

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

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.

13 APPENDIX A: SPECIES LISTS

Table 1--Effects Determinations with Rationals for BLM and USFWS Special Status Species and Special Areas Documented within 5 Miles of Project Vicinity, as determined by Arizona Game and Fish Department's Heritage Data Management System (HDMS) and Project Evaluation Program (PEP) Project ID: HGIS-09547.

Scientific Name	Common Name	FWS	BLM	Effects Determination	Rational
<i>Aquila chrysaetos</i>	Golden Eagle	BGA	S	NE	E
<i>Carex ultra</i>	Cochise Sedge		S	MA	B
<i>Gentianella wislizeni</i>	Wislizeni Gentian	SC		MA	B
<i>Graptopetalum bartramii</i>	Bartram Stonecrop	SC	S	MA	B
<i>Hexalectris warnockii</i>	Texas Purple Spike	SC	S	MA	B
<i>Leptonycteris yerbabuenae</i>	Lesser Long-nosed Bat	SC		NE	E
<i>Lithobates chiricahuensis</i>	Chiricahua Leopard Frog	LT		NE	A
<i>Sceloporus slevini</i>	Slevin's Bunchgrass Lizard		S	MA	B
<i>Terrapene ornata luteola</i>	Desert Box Turtle		S	MA	B
<i>Accipiter gentilis</i>	Northern Goshawk	SC	S	NE	E
<i>Ammodramus savannarum ammolegus</i>	Arizona grasshopper sparrow		S	NE	E
<i>Anthus spragueii</i>	Sprague's Pipit	SC		MA	B
<i>Athene cucularia hypugaea</i>	Western Burrowing Owl	SC	S	NE	E
<i>Buteo regalis</i>	Ferruginous Hawk	SC	S	NE	E
<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat	SC	S	NE	F
<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog	CCA	S	NE	C
<i>Dipodomys spectabilis</i>	Banner-tailed Kangaroo Rat		S	NE	F
<i>Euderma maculatum</i>	Spotted Bat	SC	S	NE	F
<i>Eumops perotis californicus</i>	Greater Western Bonneted Bat	SC	S	NE	F
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	SC	S	NE	A
<i>Haliaeetus leucocephalus</i>	Bald Eagle	SC, BGA	S	NE	E
<i>Kinosternon sonoriense sonoriense</i>	Desert Mud Turtle		S	NE	A
<i>Leopardus pardalis</i>	Ocelot	LE		NE	F
<i>Leptonycteris yerbabuenae</i>	Lesser Long-nosed Bat	SC		NE	F
<i>Lithobates blairi</i>	Plains Leopard Frog		S	NE	A
<i>Myotis occultus</i>	Arizona Myotis	SC	S	NE	F
<i>Myotis velifer</i>	Cave Myotis	SC	S	NE	F
<i>Myotis yumanensis</i>	Yuma Myotis	SC		NE	F
<i>Panthera onca</i>	Jaguar	LE		NE	F
<i>Peucaea botterii arizonae</i>	Arizona Botteri's Sparrow		S	NE	F
<i>Pyrgulopsis thompsoni</i>	Huachuca Springsnail	CCA		NE	A
<i>Sorex arizonae</i>	Arizona Shrew	SC		NE	F
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl	LT		NE	A

S= BLM Sensitive Species; SC= FWS Species of Concern; BGA= Bald and Golden Eagle Protection Act; CCA= Candidate Conservation Agreement; LE= Listed Endangered; LT= Listed Threatened

NE= No Effect, MA= May Affect; A= habitat for species does not occur in or near project footprint; B= habitat for species occurs in or near project footprint and activity proposed could remove habitat or harm individuals; C= species does not occur in or near project footprint; D= Habitat for species occurs in or near project footprint, but species is not present during proposed action; E= habitat for species occurs in or near project footprint, but proposed action will not negatively impact species due to mobility and large range; F= Habitat for species occurs in project area, but project activities do not impact primary constituent elements of habitat for the species

This section includes the list of plant species present or potentially present within the Limestone Hills 12-16" precipitation zone (p.z.) ecological site located on the public lands within the Carter allotment. These plant species provide key forage and cover for wildlife species and livestock.

Table 11 presents a list of plant species from the Limestone Hills 12-16" p.z. ecological site description located on the Carter allotment.

Table 11. Key Plant Species from the Limestone Hills 12-16" p.z. ecological site description from C-1

Common name	Scientific name
Whitethorn acacia	Acacia constricta
Threeawn	Aristida L.
	Annual forbs
Cane bluestem	Bothriochloa barbinodis
Sideoats grama	Bouteloua curtipendula
Black grama	Bouteloua eriopoda
Hairy grama	Bouteloua hirsuta
Fairyduster	Calliandra eriophylla
Featherplume	Dalea formosa
Bush monkeyflower	Diplacus
Buckwheat	Eriogonum
Lehmann lovegrass	Eragrostis lehmanniana
Ocotillo	Fouquieria splendens
Slender janusia	Janusia gracilis
Bush muhly	Muhlenbergia porteri
Ring muhly	Muhlenbergia torreyi
Mariola	Parthenium incanum
Muttongrass	Poa fendleriana
Velvet mesquite	Prosopis velutina
Arizona signalgrass	Urochloa arizonica

14 APPENDIX B: MONITORING PROTOCOLS

The following sections describe the inventory and monitoring protocols that were used on the Carter allotment in 2014.

14.1 Indicators of Rangeland Health

A rangeland health evaluation 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 health 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

14.2 Monitoring Protocols

The standards were assessed for the Carter allotment by a contracted U.S. Forest Service interdisciplinary team consisting of rangeland management specialists and wildlife biologists (both with additional resource backgrounds in soils and botany). TEAMS (Talent, Expertise, Agility, Mobility and Simplicity) Enterprise mission is to provide convenient and cost effective environmental planning, field services, and policy development through an exemplary workforce of dedicated, creative, and experienced natural resource specialists. Additional information is on their website: <https://www.fs.fed.us/teams/>.

The interdisciplinary team used rangeland monitoring data, professional observations, and photographs to assess achievement of the Standards and conformance with the Guidelines. 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 [LPI]) 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 the key area within the Carter 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 key area C-1 was the 17 indicators of rangeland health (NRCS 2005) and utilization.

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

The method used to obtain transect data pertaining to species composition, and soil cover is the LPI. This method consists of a horizontal, linear measurement of plant intercepts along the course of a line (tape) 100 foot in Carter. 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.

14.2.2 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).

14.2.3 Fetch

Fetch is the distance from the nearest perennial plant base within 360 degrees of the quadrat's 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 rangeland health evaluation. One-hundred distances were measured in conjunction with pace frequency as baseline data for future monitoring.

14.2.4 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 (1st, 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.

14.2.5 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 13. 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 seedstalks 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 seedstalks 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 seedstalks 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 seedstalks 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 seedstalks.
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 14. 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.

Rating	Description
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 so as to appear artificially clipped or consistent browsing of terminal buds of browse species that results 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.

15 Appendix C: Monitoring Data

15.1 Key Area Data

Upland range health was evaluated at one key area (C-1). The key areas were selected for their consistency with average livestock use within the allotment. A quantitative and qualitative assessment of rangeland health indicators was conducted in order to determine if any gaps existed between existing condition and ecological reference condition. Using these assessments, it was determined whether or not applicable resource standards were being met within the allotment.

Upland range health was evaluated on C-1 in 2014 by TEAMS.

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 applicable resource standards were being met within the allotment and whether adequate perennial grass resources were available relative to Sonoran desert tortoise forage needs.

Key area C-1 is located in the Limestone Hills 12-16" p.z. These are shallow soils formed on limestone and related sedimentary and metamorphic bedrock. Parent material is carbonatic. Soils are dark colored gravelly and stony loams, very calcareous, and have well-developed covers of limestone gravels and cobbles. Large areas of rock outcrop occur intermingled with soil areas. Plant-soil moisture relationships are poor to fair. Soils mapped on this site include Mabray, and Sutherland where there rock fragments are larger than stone size.

15.2 Utilization

Utilization measured at C-1 at the time of the study in 2014 was 0 percent.

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

Tables 13 below shows the results from the land health evaluation completed in December 2014 on the Carter allotment. Summary results are shown from the Rangeland Health Evaluation at key area C-1. All attributes ranked none to slight from departure of the Limestone Hills 12-16" p.z. reference sheet.

Table 13. January 11, 2014 Summary Results from Rangeland Health Evaluation at Key Area C-1.

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 14. Summary of 17 Indicators for Limestone Hills 12-16" p.z. Ecological Site on Key Area C-1.

17 Indicators Reference Sheet	Rational from December 2013
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 1-3 feet in length.	None to slight. None observed.
3. Number and height of erosional pedestals or terracettes: Pedestals are uncommon on perennial grass and shrubs. Terracettes are uncommon.	None to slight. None observed.
4. Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground): 0-5%	None to slight. Parameters of ESD.
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): All litter size classes staying in place.	None to slight. None observed. Fine litter at plant bases.
8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): Expect values of 1-3 in canopy interspaces, and 4-6 under plant canopies.	None to slight. Adequate veg/rock cover.
9. Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and	None to slight. None observed.

17 Indicators Reference Sheet	Rational from December 2013
<p>thickness): weak granular; color is 7.5YR4/2 dry; 5YR3/2 Moist; 2-8 inches.</p>	
<p>10. Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Canopy 30-40%, basal 5%, litter 20-55%; 40-50% of canopy cover is perennial grasses, 5% perennial forbs, 40-45% shrubs and trees, 5% succulents. Cover is well dispersed throughout site.</p>	None to slight. Veg composition is per ESD.
<p>11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): None</p>	None to slight. No compaction of soils at site.
<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: perennial grass > subshrubs > annual grasses & forbs > shrubs succulents = perennial forbs</p>	None to slight. HCPC community.
<p>13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): 50% of basal cover of perennial grasses has likely been lost in recent prolonged drought.</p>	None to slight. Even age class distribution.
<p>14. Average percent litter cover (20-55%) and depth (0.25-0.50inches):</p>	None to slight. Per ESD.
<p>15. Expected annual production (this is TOTAL above-ground production, not just forage production): 500 lbs/ac unfavorable precipitation; 700 lbs/ac normal precipitation; 1000 lbs/ac favorable precipitation</p>	None to slight. Per ESD.
<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</p>	None to slight. None observed.

17 Indicators Reference Sheet	Rational from December 2013
<p>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: Whitethorn, mesquite, prickley pear, cane cholla, & ocotillo may increase. Red brome and wild oats.</p>	
<p>17. Perennial plant reproductive capability: Not affected even following several years of prolonged drought period for the region.</p>	<p>None to slight. Within parameters of ESD.</p>

15.3.1 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:

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

The ecological site for the C-1 key area is R041XC307AZ Limestone Hills 12-16" p.z. *dalea formosa* - *fouquieria splendens* / *bouteloua curtipendula* - *hesperostipa neomexicana* (featherplume - ocotillo / sideoats grama - New Mexico feathergrass) ecological site. Vegetative cover collected at C-1 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 10).

Figure 10. Key Area C-1 in January 2014



The approximate potential ground cover (surface, basal, and foliar) is described in Tables 1 below. Table 1 specifically provides a comparison between the desired conditions as described by the ESD (NRCS 2005) and the current conditions of C-1 in January 2014. Tables 2 and 3 address the kind and amount (by cover) of vegetation at the sites. Litter should be in the range of 10 to 25%, with 25 to 50% surface fragments. A tolerable range of bare ground would be between 5 and 60%. Foliar cover collected at C-1 was 82% with 10% basal cover of perennial grasses and shrubs. Total litter at C-1 was measured at 51%, with bare ground measuring 0%. Rock and rock fragments covered 81% of the soil surface. Utilization measured at C-1 at the time of the study was 0%.

Table 17. A comparison between conditions described in the ESD (R041XC307AZ – NRCS 2006) and current conditions of key area C-1. Soil cover components include: plants (including basal cover), biological crusts, litter, and surface fragment.

	Basal Cover				Biological Crust	Litter	Surface Fragments > 1/4" & <= 3"	Surface Fragments > 3"	Bedrock	Bare Ground
	Grass/Grass like	Forb	Shrub / Vine	Tree						
ESD	2-5	0-1	2-5	0	0-1	10-25	25-50	0-8	0-15	5-60
C-1	5	2	3	0	0	50.5	8.9	81.2	0	0

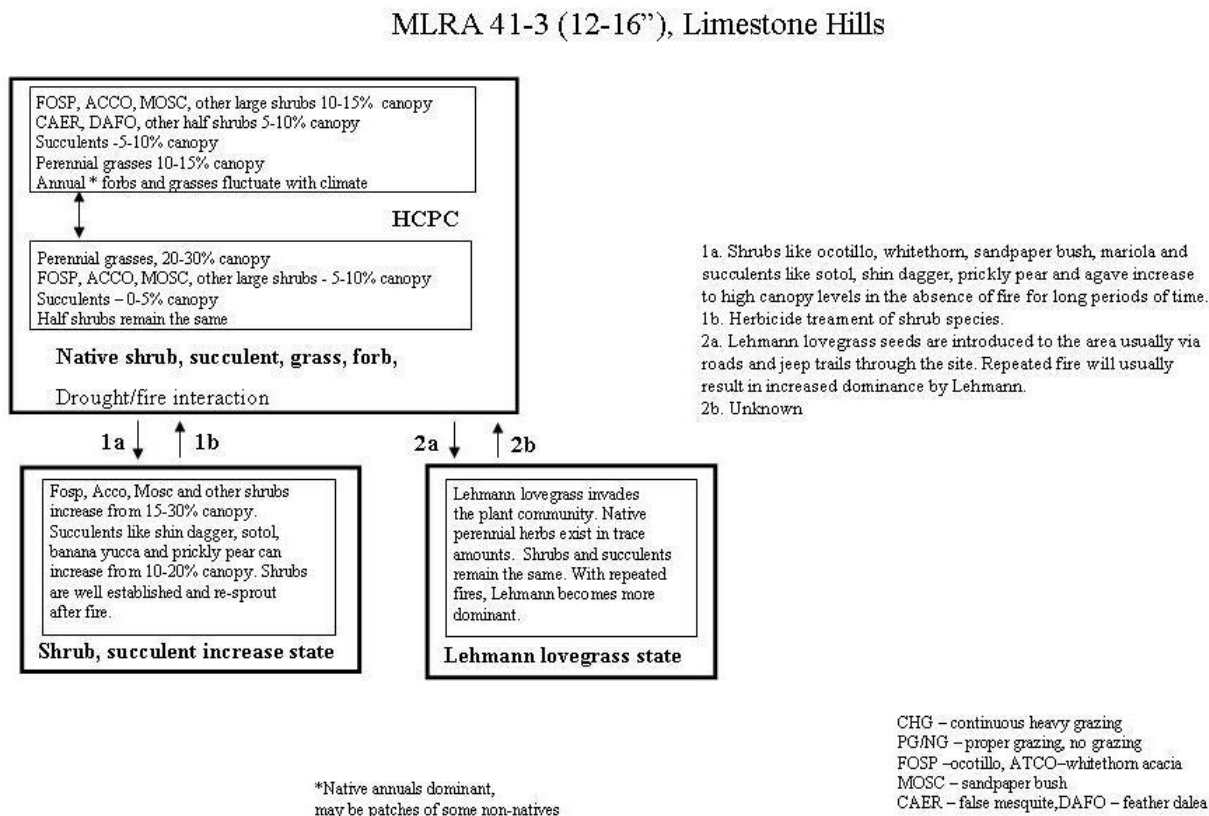
Table 18. Foliar cover of species recorded in the LPI plot for key areas C-1.

Key area information	Species	Line point intercept canopy cover at C-1
Trend Plot 1 Carter Allotment	Acacia constricta	16%
Range site: R041XC307AZ	Aristida L.	16%
	Annual forbs	16%
	Bothriochloa barbinodis	1%
	Bouteloua curtipendula	1%
	Bouteloua eriopoda	10%
	Bouteloua hirsuta	2%
	Calliandra eriophylla	7%
	Dalea formosa	5%
	Diplacus	1%
	Eriogonum	9%
	Eragrostis lehmanniana	2%
	Fouquieria splendens	10%
	Janusia gracilis	2%
	Muhlenbergia porteri	7%
	Muhlenbergia torreyi	1%
	Parthenium incanum	1%
	Poa fendleriana	9%
	Prosopis velutina	1%
	Urochloa arizonica	3%
Foliar Cover	82%	
Basal Cover	10%	
Bare Ground	0%	

Conclusion:

The data at the trend plot shows that cover and litter are adequate to ensure soil stabilization and appropriate permeability rates within the ecological site. The ESDs describe 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 C-1 describes the Historical Climax Plant Community (HCPC) as: “*The potential plant community on this site is dominated by warm season perennial grasses. Several species of shrubs are well represented on the site. Shrubs can be in concentrations at the edges of rock outcrops and in canyon bottoms. Most of the grass and shrub species are well dispersed throughout the plant community...*” The key management area (KMA) 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, almost the entire allotment is armored by rocks. The allotment is within the variability of the state and transition models as delineated in the ecological site descriptions. (Figure 14).

Figure 14. State and transition model for Limestone Hills



Key Area C-1

The vegetative community at C-1 represents the composition, structure, and distribution of the HCPC state of a “Native shrub, succulent, grass, forb” 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. Several species of shrubs are well represented on the site...*” The allotment represents this description as presented within the ESD. The allotment does indicate the “*natural variability of the site*” with respect to soil, aspect and precipitation (Figure 1). The functional/structure group was found to have none or only a slight deviation from the reference community as described within the ESD (Table 5). The site is naturally armored by rock (> 90% cover) on the soil surface, which protects plant species from livestock and wildlife use. This helps maintain plant diversity overtime as described in the ESD. Although slight deviations from the reference community could exist

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 C-1.

Cover data described by the ESD	LPI Data C-1 Canopy Cover
FOSP, ACCO, MOSC, other large shrubs 10 to 15% Canopy Cover	FOSP2 – 10% ACCO2 – 17% PRVE – 1%
CAER, DAFO, other half shrubs 5 to 10% Canopy Cover	CAER – 7% DAFO – 5% PAIN2 – 1%
Succulents 5 to 10% Canopy Cover	Present but not within transect
Perennial grasses 10 to 15% Canopy Cover	BOBA3 – 1% BOCU – 1% BOER4 – 10% BOHI2 – 2% ERLE – 2% MUPO2 – 7% MUTO2 – 1% POFE – 9%

Figure 19. Species Composition at Key Area C-1

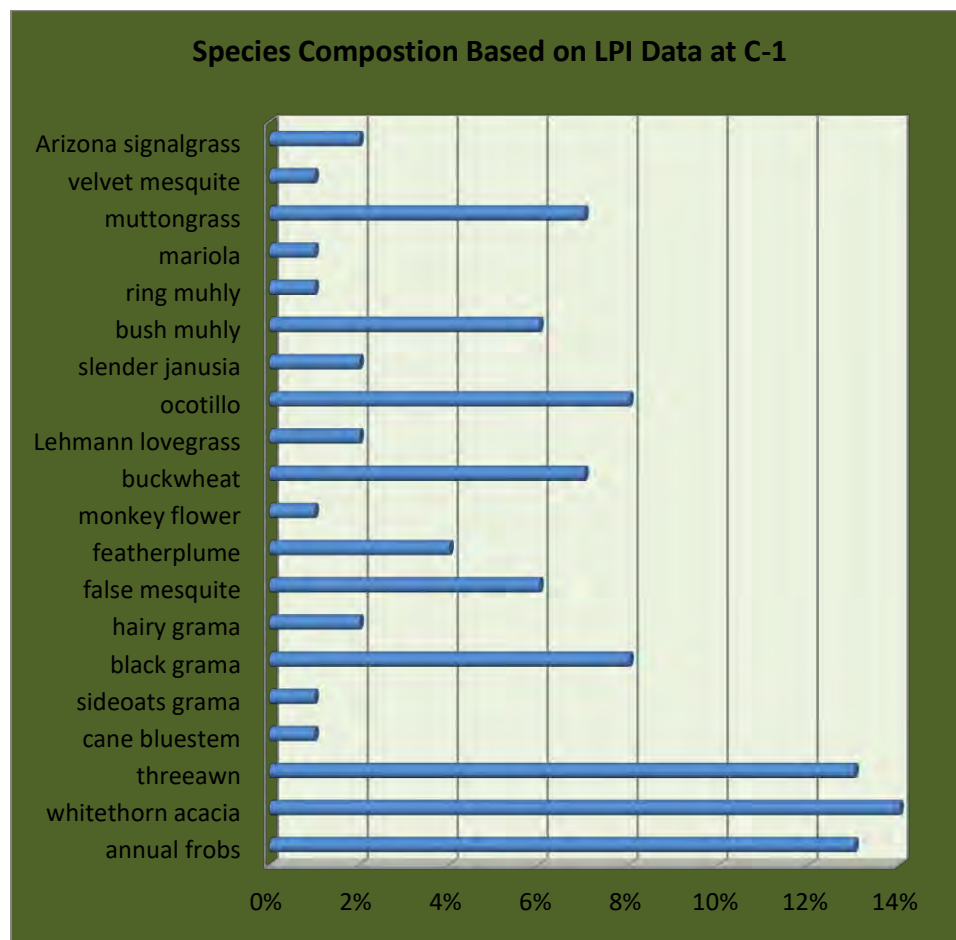


Table 20. Functional/structural plant groups at C-1

Ranking	Species List for Functional/Structural Groups at C-1
S	PRVE
S	ACCO2
S	PAIN2
S	FOSP2
M	POFE
M	PAAR
M	YUCCA
M	MUPO2
M	DIPLA3
M	BOBA3
M	BOER4
M	ERLE
M	ERIOG
M	ARIST
T	BOHI2
T	CAER

Ranking	Species List for Functional/Structural Groups at C-1
	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.

17 APPENDIX E: INTERESTED PUBLIC
