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Land Health Evaluation
Sheep Wash Lease No. 5416
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1 INTRODUCTION

The purpose of this draft Land Health Evaluation (LHE) report for the Sheep Wash 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).

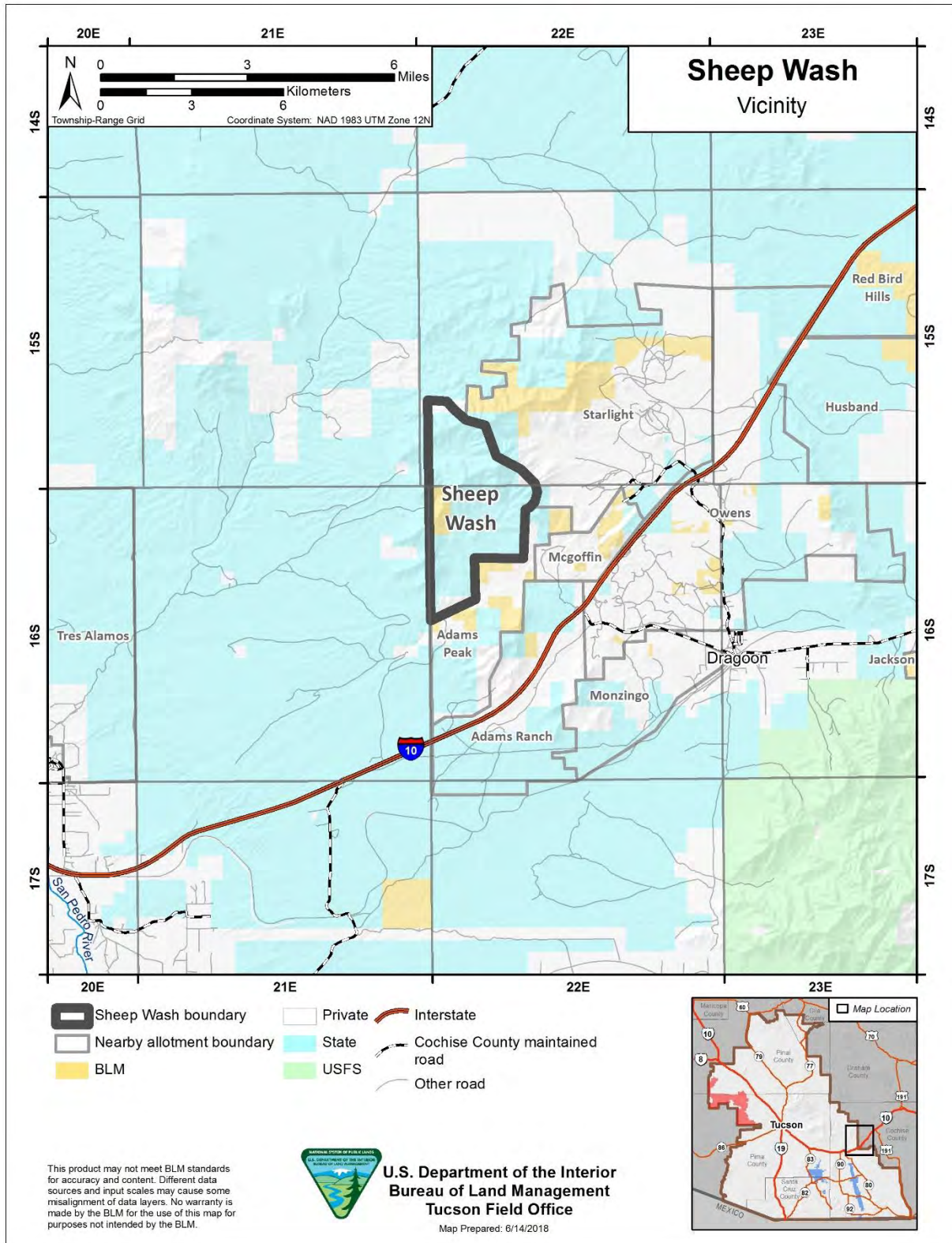
The Arizona Standards and Guidelines identify three standards regarding (1) upland sites, (2) riparian-wetland sites, and (3) desired resource conditions based on specific indicators, as discussed in *Section 6 Rangeland Inventory and Monitoring Methodology* of this document.

2 ALLOTMENT PROFILE AND GENERAL DESCRIPTION

2.1 Location

The BLM portion of the Sheep Wash allotment is located about 12 miles east of the town of Benson in Cochise County, Arizona. The BLM lands within the allotment are comprise approximately 7 percent of the total livestock operation. The ranch borders the Starlight allotment to the east, and Adams Peak to the south. Figure 1 below shows the Sheep Wash allotment location.

Figure 1. Vicinity Map of the Sheep Wash Allotment



2.2 Physical Description

This section describes physical characteristics within the Sheep Wash Allotment.

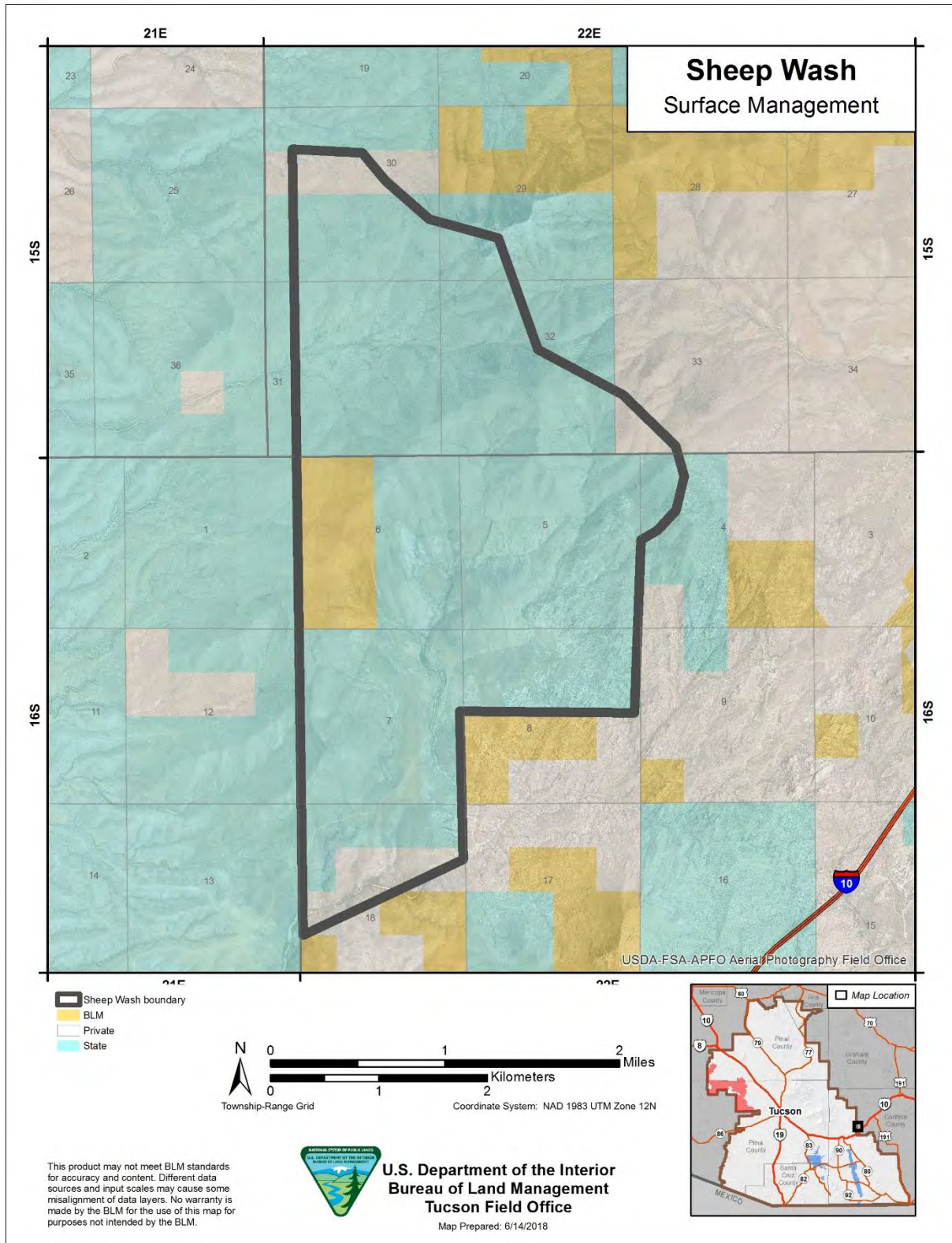
2.2.1 Acreage

The acreage of the Sheep Wash allotment is detailed below (Table 1). The BLM lands within the allotment are all located on the throughout. Fence lines do not separate between land ownership. Lands within the allotment are predominately state lands, with lesser amounts of public and private lands. Public lands constitute about 7 percent of the allotment. Spatial distributions of land ownership are displayed in Figure 2.

Table 1. Acreage of Landownership

Land Classification	Sheep Wash Allotment
Public Acres	280
State Acres	3,432
Private Land Acres	260
Total Acres	3,972

Figure 2. Land Ownership of the Sheep Wash Allotment



2.2.2 Precipitation and Temperature

Climate data comes from the Shallow Hills 16-20" precipitation zone (p.z.) Ecological Site Description (ESD). Precipitation in this zone of the common resource area ranges from 16-20 inches per year with elevations from 4500-5500 feet. Approximately 40% of this moisture comes as gentle rain or snow during the winter-spring (Oct-Apr) season; originates in the north Pacific and Gulf of California and comes as frontal storms with long duration and low intensity. The remaining 60% falls in the summer season (May-Sep); originates in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Snow is common Dec-Mar, averaging 5-15 inches per year, but rarely lasts more than a week. May and June are the driest months. Humidity is low. Temperatures are mild. Freezing temperatures are common at night from Oct-May, but daytime temperatures are almost always over 40 F. Below 0 F temperatures can occur Dec-Feb. Daytime summer highs rarely exceed 95 F. For more detail on local precipitation data please refer to section 7.2 below.

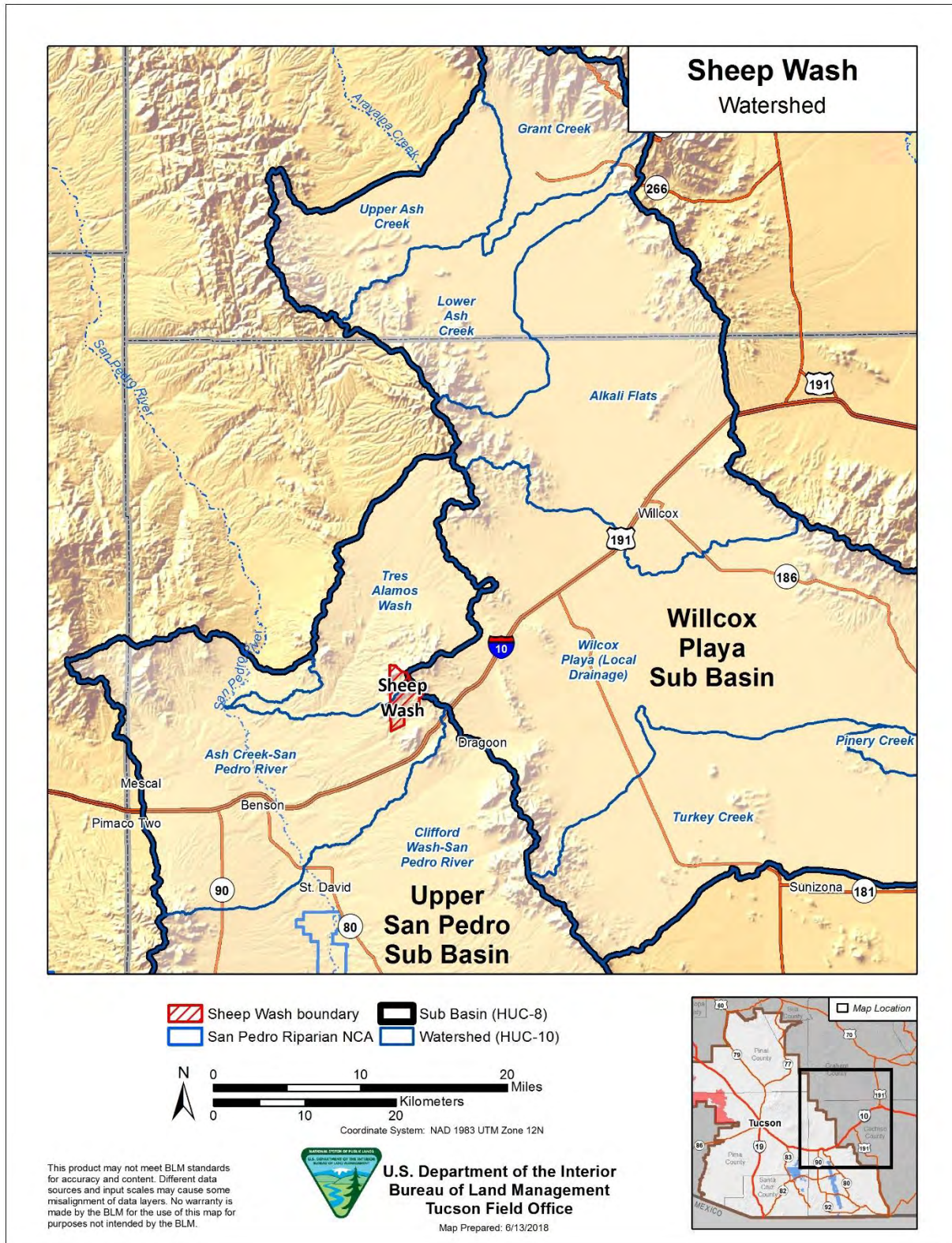
Table 2. Precipitation and Temperature Averages for Shallow Hills Site

Averaged Temperature and Precipitation (1892-2013)												
Frost-free period (days): 208												
Freeze-free period (days): 241												
Mean annual precipitation (inches): 20												
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>	1.69	1.52	1.39	0.45	0.26	0.82	5.41	5.31	2.64	1.30	1.10	1.88
<i>Low</i>	0.28	0.30	0.23	0.02	0.00	0.07	3.01	2.72	0.66	0.21	0.21	0.30
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>
<i>High</i>	59.3	62.3	67.1	74.2	82.4	91.1	89.1	86.5	85.3	77.8	67.5	60.2
<i>Low</i>	27.7	29.5	33.2	38.6	45.2	54.9	61.2	59.8	53.8	44.0	33.8	28.2

2.2.3 Watershed and Water Resources

The Sheep Wash allotment is located just east of the San Pedro River and lies within the Upper San Pedro HUC-8 Sub Basin (Figure 3). Within this sub basin, the allotment is included in the smaller Tres Alamos Wash and Ash Creek San Pedro River (HUC-10).

Figure 3. Map of watersheds associated with Sheep Wash



2.2.4 Soils

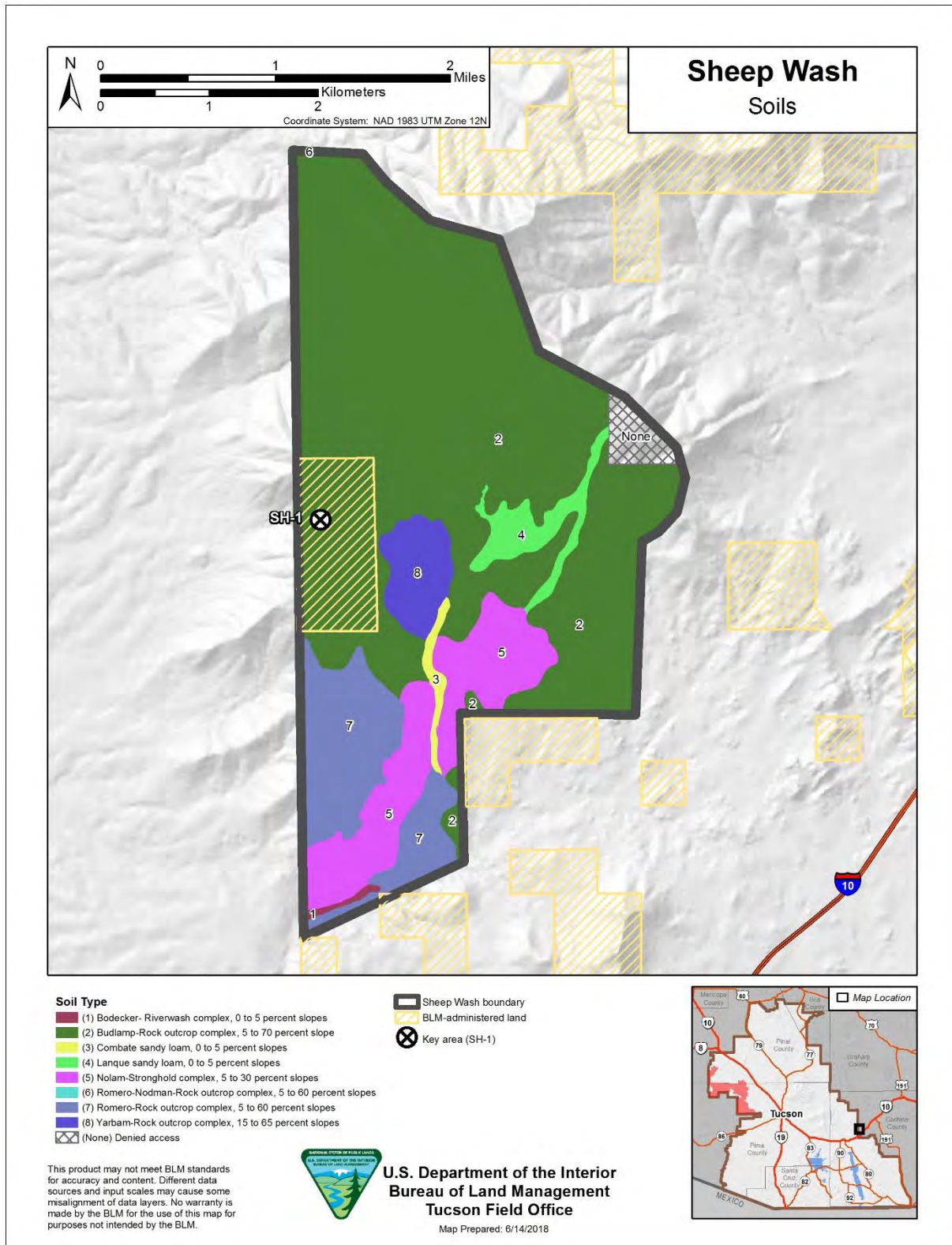
The soil composition on the Sheep Wash allotment is varied as presented in Table 3 and Figure 4. The dominant soil orders in this MLRA are Aridisols, Entisols, Alfisols, and Mollisols. The soils in the area dominantly have a thermic soil temperature regime, an aridic or ustic soil moisture regime, and mixed mineralogy and formed in alluvium. They vary from very shallow to very deep and are well drained to somewhat excessively drained. There are Ustic Torrifluvents (Ubik and Keysto series) that are formed on flood plains, Calcids (Blakeney series) that are formed on terrace deposits and Argids (Eloma and Forrest series) and Aridic Haplustalfs (Gardencan and Crowbar series) that are formed on fan terraces. Shallow and very shallow Haplustolls (Far and Yarbam series) exist on the allotment and are formed on hills and mountains.

The specific soils on the Sheep Wash allotment are shown in the table below. The dominant soil is Bodecker- Riverwash complex, 0 to 5 percent slopes. The acreages may not be accurate due to difficulty defining the area of interest in the web soil survey system.

Table 3. Soils on the Sheep Wash Allotment

Map Unit Name	Acres in Allotment	Percent of Allotment Acres
Bodecker- Riverwash complex, 0 to 5 percent slopes	11.58	0.29
Budlamp-Rock outcrop complex, 5 to 70 percent slope	2,714.12	68.31
Combate sandy loam, 0 to 5 percent slopes	32.32	0.81
Denied access	70.73	1.78
Lanque sandy loam, 0 to 5 percent slopes	116.90	2.94
Nolam-Stronghold complex, 5 to 30 percent slopes	445.58	11.22
Romero-Nodman-Rock outcrop complex, 5 to 60 percent slopes	0.89	0.02
Romero-Rock outcrop complex, 5 to 60 percent slopes	442.25	11.13
Yarbam-Rock outcrop complex, 15 to 65 percent slopes	138.62	3.49
Totals for Allotment	3,972.98	100.0%

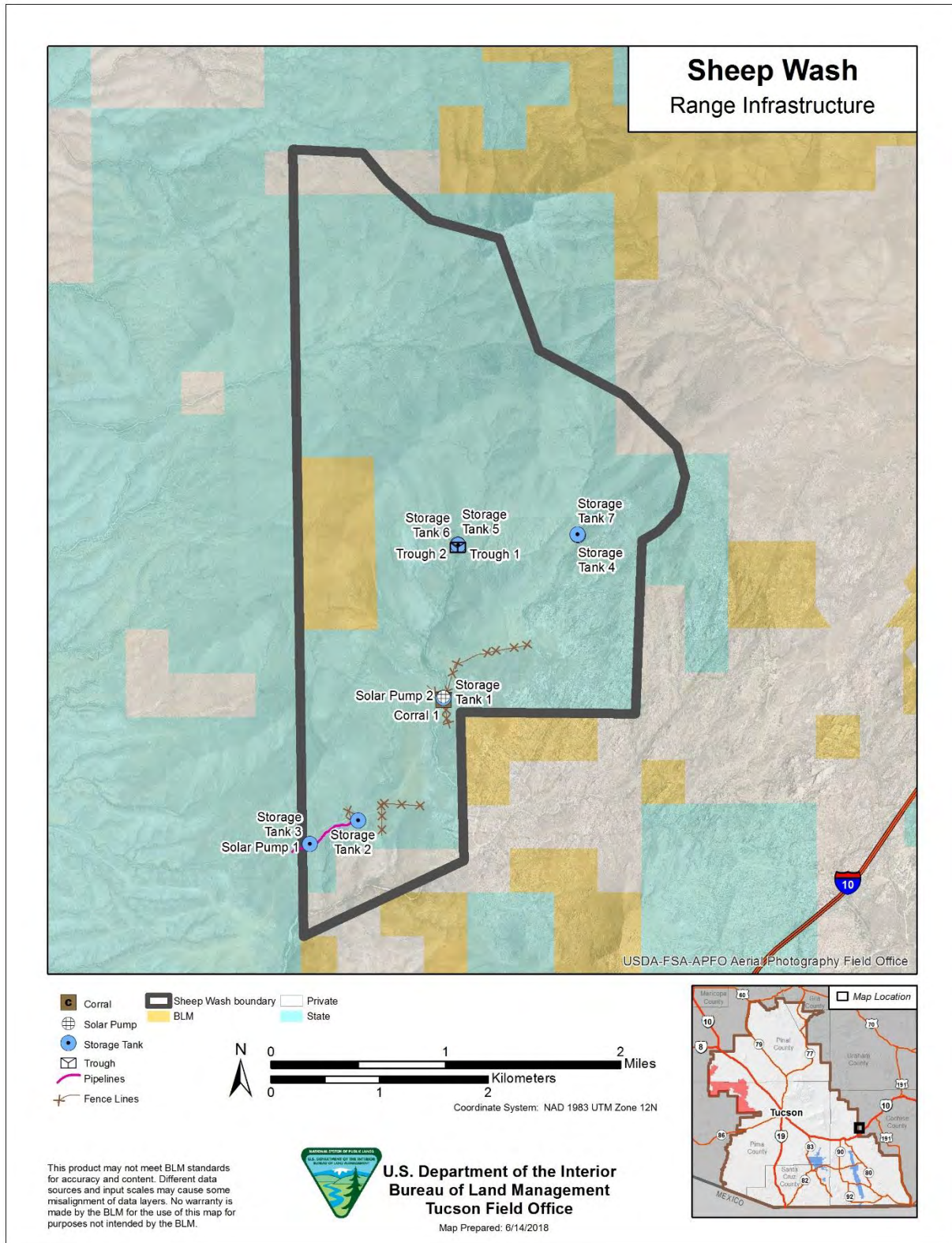
Figure 4. Map of Soil Types within the Sheep Wash Allotment



2.2.5 Range Improvements

After a review of the range improvement record for this allotment there are multiple watering locations with storage tanks as well as fencing within the allotment. Figure 5 is a map of the existing range improvements throughout the entire allotment. This mapping exercise was completed using aerial imagery as well as verification from the lease holder.

Figure 5. Existing Range Improvements on the Sheep Wash 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 Sheep Wash 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 including Soils and Vegetation Communities

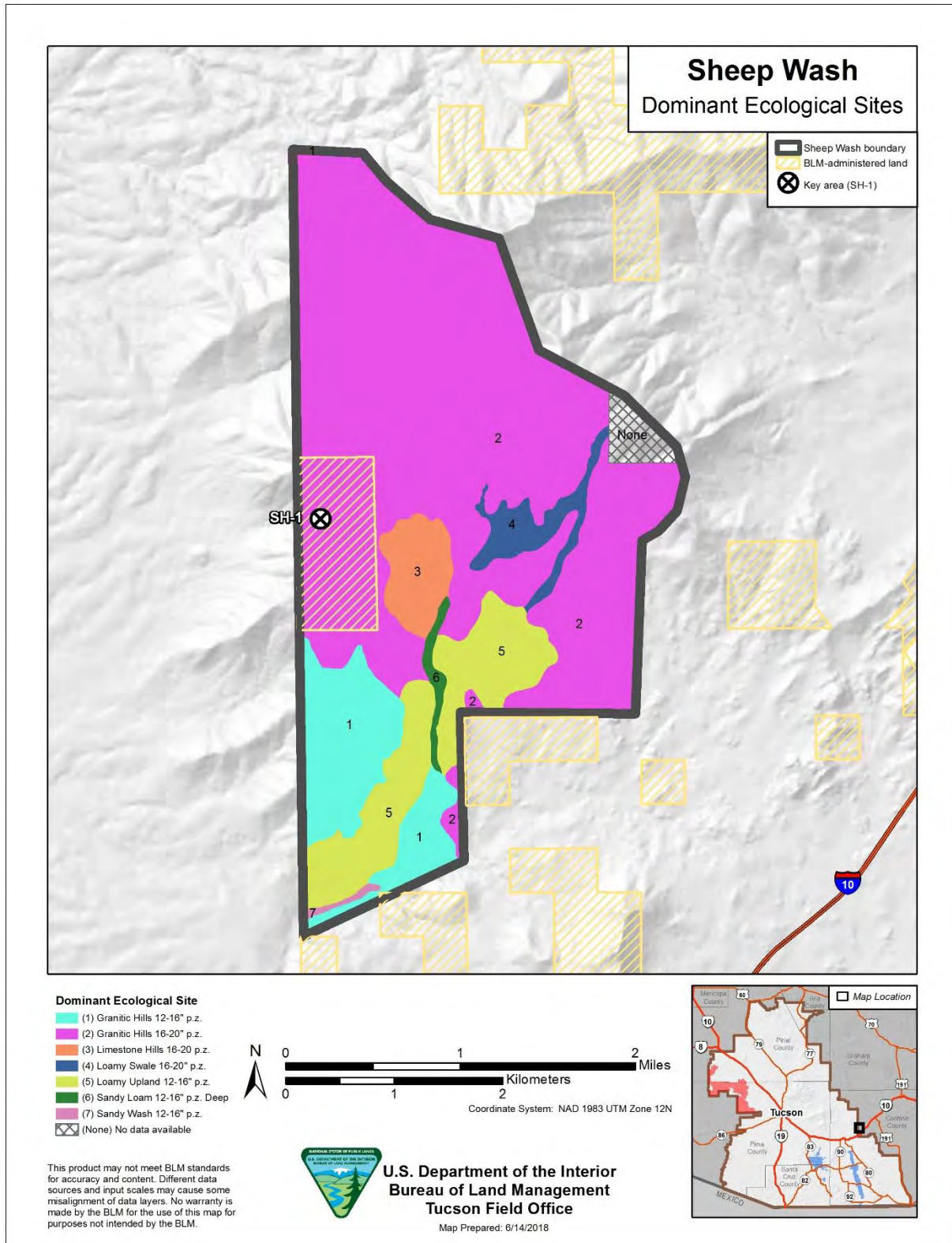
An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. It is the product of all the environmental factors responsible for its development, and it has a set of 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 7 ecological sites exist within the entire Sheep Wash allotment. One key area, SW-1, has been established on BLM public lands. Key areas SW-1 is Shallow Hills 16-20" precipitation zone ecological site (R041XA102AZ), which is one of the primary ecological sites within the BLM lands in the allotment (Figure 6). Key Area SW-1 is the location where the U.S. Forest Service Strike Team, referred to as

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TEAMs documented the 2014 LHE and collected line-point intercept data. The BLM and University of Arizona Extension, collected additional pace frequency data is collected in 2017.

Figure 6. Ecological Sites within Sheep Wash Allotment



The ecological site for key area SW-1 is Shallow Hills 16-20" precipitation zone (R041XA102AZ). Key vegetative species for this site include: Emory oak (*quercus emoryi*), Arizona white oak (*quercus arizonica*), sacahuista (*nolina microcarpa*), coralbean (*erythrina flabelliformis*), sideoats grama (*bouteloua curtipendula*) and Texas bluestem (*schizachyrium cirratum*).

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It is on hill-slopes and rolling pediments. Slope aspect is site differentiating at elevations near common resource area boundaries.

The Reference Plant Community (RPC, see State and Transition Model below) of the 41-1AZ Granitic Hills ecological site is a diverse mixture of warm-season perennial grasses, cool-season perennial grasses, ferns, forbs, succulents and shrubs. Trees are common giving the aspect a savanna appearance. Seasonal rainfall amounts affect amounts and composition of plant productivity. After a wet winter, cool season plants (a mixture of perennial grasses, forbs, sub-shrubs and annuals) begin active growth in March. The months of May and June present a period of little to no active plant growth. Warm season species, mostly perennial grasses, begin active growth after the onset of the summer rainy season usually in July; peak annual production occurs in October. Fire, short-term drought and herbivory (insects and mammals) are recurring disturbances to this ecological site. Historically, these disturbances interacted to shape the plant community phases within the Reference State. Fire reduces shrub cover and maintains the savanna aspect. Between fires, shrub growth continues unimpeded. Prior to historic settlement of the southwest, natural fire-free periods are estimated to have been 10-30 years in length. Today's greatly extended fire-free periods are more influential on plant community dynamics than grazing. Plant community structure (shrub density) and composition is indicative of the length of time since last fire. For example, Mexican pinyon requires shading from shrubs for sapling establishment and are highly susceptible to fire, therefore old, mature pinyon stands indicate that 100+ years have passed since the last fire. Drought can extend the fire-free period by impairing perennial grass productivity and vigor. During extended fire-free periods, small shrubs and succulents can attain dominance of the plant community. When average rainfall resumes, annual forbs flourish while perennial grasses recover. Subsequent fires remove the shrub dominance.

2.3.3 Wildlife Resources

2.3.3.1 General Wildlife

Wildlife species composition expected to occur on the allotment 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. 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. 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.

2.3.3.2 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- 09551). Through that analysis, it was determined that 45 species with special status (Appendix A, includes effects determinations and rationale) could occur within a 5 mile radius of the allotment. Of those species, 14 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.

2.3.4 Plant Resources

The potential plant community is a diverse mixture of warm and cool season perennial grasses, ferns, forbs, succulents and shrubs. The tree and shrub component is influenced by the sun exposure of the hillslope. The warm exposures (southern slopes) have more shrubs like mimosa and manzanita where the cooler exposures (northern slopes) have more alligator juniper and pinyon. Mexican pinyon only comes into these plant communities in the absence of fire. A tree canopy of 5-15% Mexican live-oak occurs on the site. Most perennial herbaceous species are well dispersed throughout the plant community with 25%-40% canopy cover. A few species, however, occur only under the canopies of trees. Oak species on the site are very tolerant of fire. Naturally occurring wildfires in June-August are an important factor to shaping this plant community. Fire-free intervals ranging from 10-30 years maintain a savanna aspect. In the absence of fire for longer periods, the site gets shrubbier and shrubbier. Heavy grazing and drought can extend fire intervals by removing fine fuels needed to carry fire. The aspect is savanna.

Table 4 below lists the vegetation communities within the Sheep Wash allotment. There are two vegetation types that make up 85 percent of the total acreage. Those majority communities are;

1. The Madrean Encinal ecosystem is defined most simply as those places where Madrean evergreen oaks are the dominant or co-dominant tree. Most always the encinal is topographically between the semi-desert grassland and the Madrean pine-oak. However, so are the Madrean Juniper Savanna and the Madrean Pinyon-Juniper. In the field, the proportion of oaks relative to pinyon and juniper can change swiftly with aspect and slope, so the ecosystem map is progressively less reliable as you approach the indicated boundary between the encinal and its neighboring ecosystem. (<https://www.azfirescape.org/galiuro/ecosystem-description/madrean-encinal>)
2. The Apacherian-Chihuahuan Semi-Desert Grassland and Steppe ecosystem ranges from 4750 feet along the eastern boundary of the Coronado, to 6100 feet on the slopes of Saddle Mountain at the southern edge of the Galiuros. The latter is an exception. The majority of the mapped lands are flattish alluvial fans that extend well past the forest boundary into Sulphur Springs and

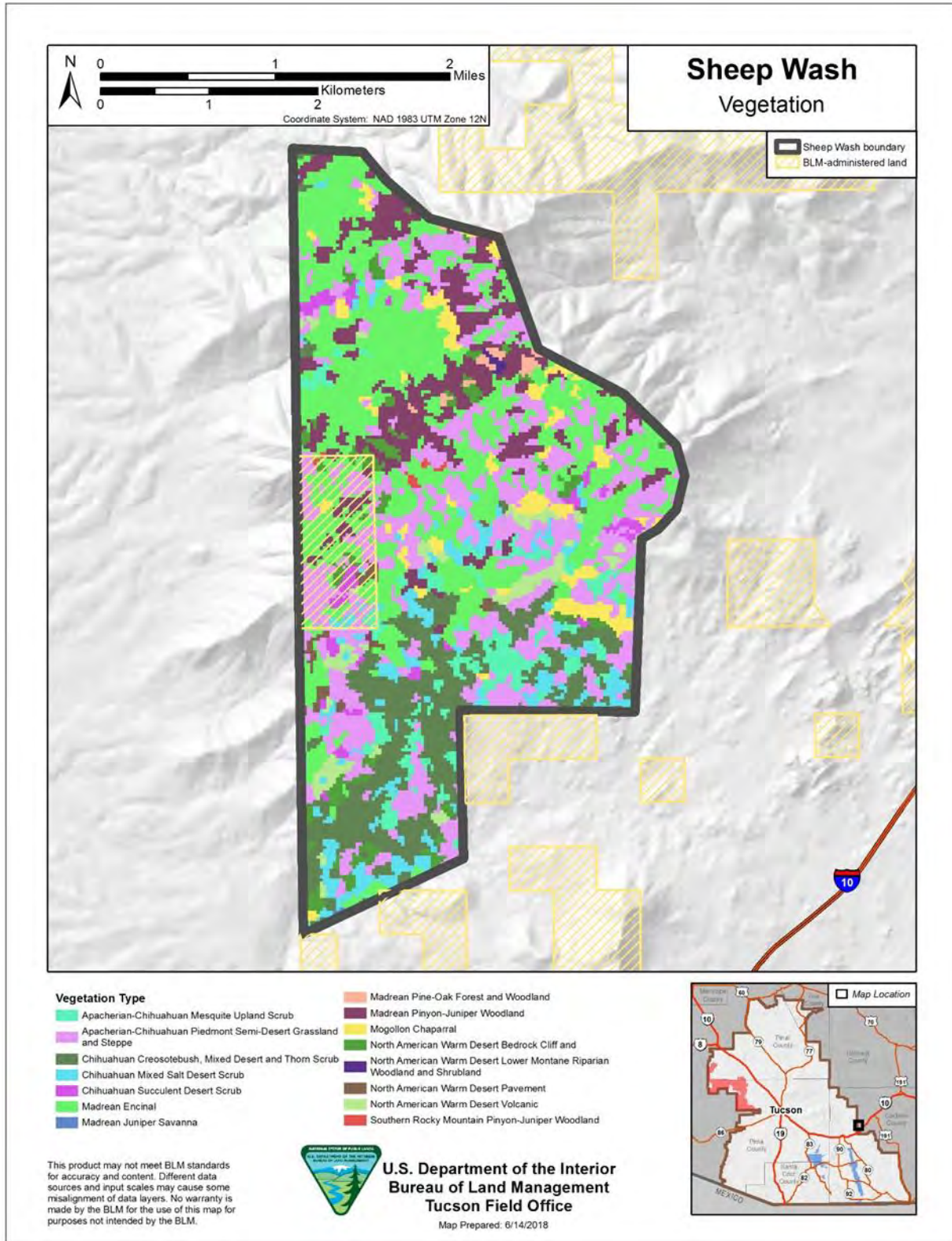
Aravaipa Valleys. Only 11% of the mapped grassland was on slopes exceeding 10 degrees (18%). Upslope, in steeper country, the grasslands typically grade into a juniper savanna. The ecosystem is characterized by dominant and diverse perennial grasses, largely native. Perennial shrubs and trees typically have less than 15% total cover. Grassy areas with over 20% shrub and tree cover were mapped as either juniper savanna, Madrean encinal, or mesquite upland shrub. Areas with intermediate cover, 15-20% cover, could be mapped either way. This ecosystem is not represented within the forest boundary on the west side, but likely existed there, in areas that are now mapped as part of the Apacherian-Chihuahuan mesquite upland scrub.

<https://www.azfirescape.org/galiuro/ecosystem-description/apacherian-chihuahuan-semi-desert-grassland-and-steppe>

Table 4. Vegetation Communities Found Within the Sheep Wash Allotment

Vegetation Type	Acres on Allotment	Percent of Acres
Apacherian-Chihuahuan Mesquite Upland Scrub	189.54	4.77
Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe	916.21	23.06
Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub	518.19	13.04
Chihuahuan Mixed Salt Desert Scrub	214.34	5.39
Chihuahuan Succulent Desert Scrub	67.22	1.69
Madrean Encinal	1,189.44	29.94
Madrean Juniper Savanna	2.06	0.05
Madrean Pine-Oak Forest and Woodland	21.81	0.55
Madrean Pinyon-Juniper Woodland	416.79	10.49
Mogollon Chaparral	161.42	4.06
North American Warm Desert Bedrock Cliff and Outcrop	131.56	3.31
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	4.89	0.12
North American Warm Desert Pavement	30.67	0.77
North American Warm Desert Volcanic Rockland	101.94	2.57
Southern Rocky Mountain Pinyon-Juniper Woodland	6.89	0.17
TOTAL	3,972.98	

Figure 7. Vegetation Communities within Sheep Wash Allotment



2.4 Special Management Areas

There are no special management areas within the Sheep Wash 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 BLMs 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 Sheep Wash grazing allotment on August 9, 2019. Data reviewed were obtained from BLM 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 & NPGallery 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. Background research identified no prior cultural resources investigations and no documented sites within the BLM-administered portion of the allotment. Likewise, a historic-age GLO plat map was reviewed that depicted no cultural features within the study area (plat no. 2190, dated 1890).

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 Sheep Wash allotment is appropriate under a finding of *no historic properties affected* with the following, standard Conditions of Approval (COAs). 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 11 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*—by sending letters summarizing the results of the Class 1 cultural resources assessment and rangeland monitoring data for the Sheep Wash allotment. Tribes consulted include the Fort McDowell Yavapai Nation, Fort Sill Apache Tribe, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Pueblo of Zuni, Tohono O’odham Nation, Tonto Apache Tribe, San Carlos Apache Tribe, White Mountain Apache Tribe, and the Yavapai-Apache Nation. Identified plant species with potential cultural significance include dropseed (*Sporobolus spp.*), broom snakeweed (*Gutierrezia sarothrae*), beargrass (*Nolina spp.*), and 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

3.1 Grazing History

Historic and recent grazing use has been by cattle on the Sheep Wash allotment. The BLM lands within the allotment comprise approximately 7 percent of the total livestock operation. There are 4 head of cattle run on the BLM lease. Between it and the other leased and private lands, there is a yearlong grazing system. The 48 Animal Unit Months (AUMs) under the BLM grazing lease are included in the total head of cattle on the private land and State lease, and are managed together on the entire allotment.

The management category given to the Sheep Wash 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 3,972 total acres, of which 280 acres is administered by the BLM. There is currently one lease issued for 48 Animal Unit Months (AUMs) on the BLM public lands for the Sheep Wash allotment. Public land percentage is 7%. 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 and state 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 30 pounds of forage per day. AUMs totals for the Sheep Wash allotment leases are in Table 6.

Table 6. Sheep Wash Lease and AUMs

Ownership	Animal Unit Months (AUMs)	Animal Units (AU)	Percent Public Land
BLM – Sheep Wash #5416	48 AUMs	4 AU Yearlong	100

3.2 Mandatory Terms and Conditions for Permitted Use

Grazing use on the Sheep Wash Allotment is in accordance with the terms and conditions of the current lease issued for 48 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
4	Cattle	3/1 to 2/28	100	Active	48

* 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 Sheep Wash 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)

4.1 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 Sheep Wash 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 Sheep Wash 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, and providing forage and habitat for both livestock and wildlife. The NRCS’s Ecological Site Descriptions were used to help develop DPC’s for the sites.

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 SW-1 is within Shallow Hills 16-20” precipitation zone (p.z) ecological site, which is the primary ecological site within the BLM lands in the allotment (Figure 6 above). Key Area SW-1 was established by TEAMS and documented the 2014 LHE and collected line-point intercept data. The BLM and University of Arizona Extension collected pace frequency data to collect and to track any changes in long-term trend of vegetation and ground cover in 2017.

Refer to Table 12 and Figure 6 for the location of the key area on the Sheep Wash Allotment. Addressed in this LHE report are the results from the key area monitored by the U.S. Forest Service (USFS) TEAMS in 2014 (Appendix B).

Table 8. Location of the Sheep Wash Allotment Key Area

Key Area	Ecological Site	Ecological Site ID	GPS Coordinates (NAD83 CONUS)
SW-1	Shallow Hills 16-20”	R041XA102AZ	12S UTM 580891 m E 3549006 m N

The key area objective for the Sheep Wash 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 SW-1 Desired Plant Community Objectives for Shallow Hills 16-20" precipitation zone ecological site

- Maintain native perennial grass canopy of $\geq 35\%$
- Bare ground $< 10\%$

Rationale: Maintaining a perennial grass canopy cover of more than 35 percent on this site moves the state to the reference state. Currently Lehman's lovegrass is 38% of canopy cover but the site is also meeting the 35% for other native species. Also keeping bare ground to less than 10% will prevent any erosion. Both are within the Shallow Hills 16-20" state and transition model.

5 RANGELAND INVENTORY AND MONITORING METHODOLOGY

The Arizona standards for rangeland health were assessed for the Sheep Wash Allotment by a U.S. Forest Service Interdisciplinary (ID) team on January 7, 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 40 (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. 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.

5.1 Monitoring Protocols

Monitoring occurred on the Sheep Wash Allotment at key area SW-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 Shallow Hills 16-20" 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.

5.1.1 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 1999. Livestock grazing for the Sheep Wash 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 (SW-1) and is located in the Shallow Hills 16-20" 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.

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 SW-1 on the Sheep Wash 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
SW-1	Shallow Hills 16-20” p.z.	None to Slight	None to Slight	None to Slight

The potential plant community is a diverse mixture of warm and cool season perennial grasses, ferns, forbs, succulents and shrubs. The tree and shrub component is influenced by the sun exposure of the hillslope. The warm exposures (southern slopes) have more shrubs like mimosa and manzanita where the cooler exposures (northern slopes) have more alligator juniper and pinyon. Mexican pinyon only comes into these plant communities in the absence of fire. A tree canopy of 5-15% Mexican live-oak occurs on the site. Most perennial herbaceous species are well dispersed throughout the plant community with 25%-40% canopy cover. A few species, however, occur only under the canopies of trees. Oak species on the site are very tolerant of fire. Naturally occurring wildfires in June-August are an important factor to shaping this plant community. Fire-free intervals ranging from 10-30 years maintain a savanna aspect. In the absence of fire for longer periods, the site gets shrubbier and shrubbier. Heavy grazing and drought can extend fire intervals by removing fine fuels needed to carry fire. The aspect is savanna.

The ecological site for SW-1 is Shallow Hills 16-20”. Litter should be in the range of 25 to 60 percent, with 10 to 50 percent surface fragments. A tolerable range of bare ground would be between 5 and 20 percent. Foliar cover collected at SW-1 was 90 percent with 25 percent basal cover of native shrubs. Total litter at SW-1 was measured at 93 percent, with bare ground measuring 0 percent. Rock and rock fragments covered 65 percent of the soil surface. Utilization, measured at the key area, was 0 percent and we observed no sign of livestock.

Rangeland Health Attribute 1: Soil and Site Stability

SW-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 65 percent of the soil surface. Plants were able to grow

thought these fragments and provided a canopy cover measured at 90 percent and 25 percent basal cover at SW-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. Site was stable and showed no signs of erosion or soil movement.

Rangeland Health Attribute 2: Hydrologic Function

SW-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 65 percent of the soil surface. Canopy cover was measured at 90 percent and 25 percent basal cover at SW-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 93 percent. It was rated None to Slight. Plant community composition and distribution relative to infiltration was rated None to Slight.

The overall rating for Hydrologic Function was None to Slight. All 10 indicators for hydrologic function were rated as None to Slight. The site had very rocky soils that move water through them just fine.

Rangeland Health Attribute 3: Biotic Integrity

SW-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 65 percent of the soil surface. Canopy cover was measured at 90 percent and 25 percent basal cover at SW-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. The ESD describes the current functional groups as being adapted to survival in all years, except during the most severe droughts. Litter amounts were measured at 93 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 SW-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 these assessments, it was determined whether or not applicable resource standards were being met within the Allotment.

Key Area SW-1

- Maintain native perennial grass canopy of $\geq 35\%$ ACHIEVED
- Bare ground $< 10\%$ ACHIEVED

Rationale: The vegetative community at SW-1 represents the composition, structure, and distribution of an HCPC community that is described (Table 4) in the ESD as: *“This state occurs where non-native grass species like Lehmann, Boer and weeping lovegrass dominate the herbaceous understory. Originally seeded in problem areas for soil stabilization, the seed can be transported by vehicles and animals, both wild and domestic, to move in along roads and trails. Established patches of exotic lovegrasses can expand simply from the species’ prolific seed production and germination. Continuous unmanaged grazing removes native perennial grasses by selectively increasing grazing pressure on the natives. Once established, non-native grasses can increase to dominate the site. Tree and shrub species remain in the plant community. Repeated fire tends to increase Lehmann lovegrass on this site at the expense of native species. Herbaceous production in this state can exceed that of the RPC; however, exotic lovegrasses are low in nutritional value (low protein, high indigestible carbohydrates) and generally not preferred by livestock. Considering the steeper slopes found on this ecological site, grazing use in this state will be less than adjacent gentler sloped sites, except during early spring green-up on southerly aspects. Exotic lovegrass seed is very small, making it unavailable as a food for wildlife; a monoculture stand can become too dense for small wildlife movement. This state is very stable. The aspect is savanna.”* 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). This slight departure is due to the large amount of Lehmann lovegrass observed at the site. Although slight deviations from the reference community exist, the composition (Figure 2) and structure of the vegetation (Figure 1) still provides well distributed habitat for wildlife (general wildlife and sensitive species) and other multiple uses.

Conclusions:

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. Perennial grasses and suffrutescent forbs are present and plentiful within the allotment, which is an indicator that the overall ecological condition is meeting standard as described in the ESD. We observed no utilization on any plants at SW-1 and no sign of livestock.

Overall throughout the allotment the soils are productive, stable and in a sustainable condition. There were no rills/gullies present at the ecological site, pedestals and/or terracettes were none to slight. Wind-scouring and litter movement were none to slight. Finally, almost the entire allotment is naturally armored by rocks/gravel. The allotment is within the variability of the state and transition models as delineated in the ecological site descriptions. (Appendix B Figure 14).

7 DETERMINATION OF LAND HEALTH STANDARDS

7.1.1 *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 showed that cover and litter are adequate to ensure soil stabilization and appropriate permeability rates within the ecological sites. The ESDs describe the ecological dynamics of the sites on the allotment as plant communities that are “*naturally variable*” (NRCS 2006). These variations occur due to site aspect, soils, and other natural conditions. We observed almost no signs of soil erosion, rills, gullies, or litter dams. Pedestalling was not occurring around the plant species present.

Energy flow and nutrient cycling is occurring on the allotment as plant vigor, diversity, and cover is high. Other shrubs and succulents exist in minor amounts. Annual forbs and grasses (both native and non-native) are very important in their respective seasons. Overall throughout the allotment the soils are productive, stable and in a sustainable condition within the capability of the ecological sites.

7.1.2 *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 Sheep Wash allotment.

7.1.3 *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. The frequency of desirable native primary grass species and suffrutescent forbs is what is described in the ESD. Overall the allotment provides the composition, structure, and distribution of habitats needed to support sensitive and endangered species (if present).

In general the composition, structure and distribution are present as described within the ESDs throughout a majority of the allotment. However, line point intercept (LPI) cover data collected at the key area indicates that perennial and native *Aristida* grasses, as well as suffrutescent forbs are significantly reduced. The warm season grammanoid species are desirable and preferred by livestock and wildlife and are decreaseers within a range site as a result of herbivory. These species were observed within the allotment, even at the site, just not in the LPI transect. Fire, historical heavy grazing, and drought have likely caused a significant decrease of primary species within these ecological sites resulting in the annual native and non-native species to become dominant. The current vegetative composition of both perennial and annual native species within the allotment, even though shifted from a Climax Community 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. There is one Threatened or Endangered Species or critical habitat known to occur on the Sheep Wash allotment: lesser long-nosed bat. The allotment is within the identified foraging range of a known roost. The Lesser Long-nosed bat requires caves and mines for roost sites and access to health stands of saguaro cactus and paniculate agaves for foraging. This species migrates to Mexico during September/October returning in the spring to bear young.

There are no BLM sensitive species that have suitable habitat present and are known or have the potential to exist within this allotment.

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 terms and conditions:

8.1 Terms and Conditions:

Terms:

Allotment	Livestock # and Kind	Grazing Period of Use	Percent Public Land	AUMs	Type Use
Sheep Wash	4 Cattle	3/1 to 2/28	100	48	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 BLMTFO. 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

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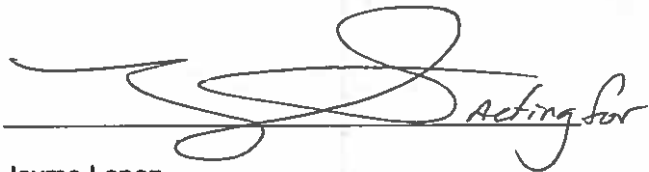
10 AUTHORIZED OFFICER CONCURRENCE

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

I concur with the determinations and recommendations as written.

I do not concur.

I concur, but with the following modifications:

 Acting for

Jayme Lopez

Date

9/10/2019

Field Office Manager

BLM Tucson Field Office

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12 APPENDIX A: SPECIES LISTS

Table 1--Effects Determinations with Rationals for BLM and USFWS Special Status Species and Special Areas Documented within 2 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-09551.

Scientific Name	Common Name	FWS	BLM	Effects Determination	Rational
<i>Aquila chrysaetos</i>	Golden Eagle	BGA	S	NE	E
<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat	SC	S	NE	F
<i>Echinomastus erectocentrus</i> var. <i>erectocentrus</i>	Needle-spined Pineapple Cactus	SC		MA	B
<i>Leptonycteris yerbabuenae</i>	Lesser Long-nosed Bat	SC		NE	F
<i>Lithobates blairi</i>	Plains Leopard Frog		S	NE	A
<i>Phrynosoma cornutum</i>	Texas Horned Lizard	SC		MA	B
<i>Terrapene ornata luteola</i>	Desert Box Turtle		S	MA	B
<i>Accipiter gentilis</i>	Northern Goshawk	SC	S	NE	A
<i>Agosia chrysogaster</i>	Longfin Dace	SC	S	NE	A
<i>Ammodramus savannarum ammolegus</i>	Arizona grasshopper sparrow		S	MA	B
<i>Anthus spragueii</i>	Sprague's Pipit	SC		MA	B
<i>Aspidoscelis stictogramma</i>	Giant Spotted Whiptail	SC		MA	B
<i>Aspidoscelis xanthonota</i>	Red-backed Whiptail	SC		MA	B
<i>Athene cunicularia hypugaea</i>	Western Burrowing Owl	SC	S	NE	F
<i>Buteo regalis</i>	Ferruginous Hawk	SC	S	NE	E
<i>Catostomus clarkii</i>	Desert Sucker	SC	S	NE	B
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo (Western DPS)	LT		NE	A
<i>Colaptes chrysoides</i>	Gilded Flicker		S	NE	E
<i>Coluber bilineatus</i>	Sonoran Whipsnake			MA	B
<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>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher	LE		NE	A
<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>Gopherus morafkai</i>	Sonoran Desert Tortoise	CCA	S	NE	F
<i>Haliaeetus leucocephalus</i>	Bald Eagle	SC, BGA	S	NE	E
<i>Kinosternon sonoriense sonoriense</i>	Desert Mud Turtle		S	NA	A
<i>Leopardus pardalis</i>	Ocelot	LE		NA	F
<i>Lithobates blairi</i>	Plains Leopard Frog		S	NE	A
<i>Lithobates chiricahuensis</i>	Chiricahua Leopard Frog	LT		NE	A
<i>Macrotus californicus</i>	California Leaf-nosed Bat	SC	S	NE	F
<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>Passerculus sandwichensis</i>	Savannah Sparrow			MA	B
<i>Peucaea botterii arizonae</i>	Arizona Botteri's Sparrow		S	MA	B
<i>Progne subis hesperia</i>	Desert Purple Martin		S	NE	E
<i>Sceloporus slevini</i>	Slevin's Bunchgrass Lizard		S	MA	B
<i>Sonorella christenseni</i>	Clark Peak Talussnail	CCA		MA	B
<i>Sonorella grahamensis</i>	Pinaleno Talussnail	CCA		MA	B
<i>Sorex arizonae</i>	Arizona Shrew	SC		MA	B
<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

Key species from Shallow Hills 16-20 ESD

sideoats grama	<u><i>Bouteloua curtipendula</i></u>
hairy grama	<u><i>Bouteloua hirsuta</i></u>
false mesquite	<u><i>Calliandra eriophylla</i></u>
plains lovegrass	<u><i>Eragrostis intermedia</i></u>
shrubby buckwheat	<u><i>Eriogonum wrightii</i></u>
kidneywood	<u><i>Eysenhardtia polystachya</i></u>
prairie Junegrass	<u><i>Koeleria macrantha</i></u>
green sprangletop	<u><i>Leptochloa dubia</i></u>
bullgrass	<u><i>Muhlenbergia emersleyi</i></u>
Emory oak	<u><i>Quercus emoryi</i></u>
Texas bluestem	<u><i>Schizachyrium cirratum</i></u>
crinkleawn	<u><i>Trachypogon spicatus</i></u>

Species recorded in 2014 at SW-1

Annual forbs	annual forbs
Bothriochloa barbinodis (Lag.) Herter	cane bluestem
Bouteloua curtipendula (Michx.) Torr.	sideoats grama
Bouteloua eriopoda (Torr.) Torr.	black grama
Bouteloua rothrockii Vasey	Rothrock's grama
Eragrostis intermedia Hitchc.	plains lovegrass
	Lehmann
Eragrostis lehmanniana Nees	lovegrass
Gutierrezia sarothrae (Pursh) Britton & Rusby	broom snakeweed
Leptochloa dubia (Kunth) Nees	green sprangletop
Selaginella lepidophylla (Hook. & Grev.) Spring	flower of stone
Sporobolus spp.	Sporobolus spp.

13 APPENDIX B: MONITORING PROTOCOLS

13.1 Monitoring Protocols

13.1.1 Indicators of Rangeland Health

A rangeland health assessment 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 assessment 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 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 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 ((Interpreting Indicators of Rangeland Health Technical Reference 1734-6, Version 4 – 2005.)

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

13.2 Monitoring Protocols

Monitoring occurred on the Sheep Wash Allotment at key area SW-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 Shallow Hills 16-20" 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.

13.2.1 *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 Sheep Wash. 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.

13.2.2 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).

13.2.3 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.

13.2.4 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.

13.2.5 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 USDOI, 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

The standards were assessed for the Sheep Wash 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). Documents and publications used in the assessment process include the Soil Survey of Arizona (NRCS 2009), Ecological Site Descriptions for Major Land Resource 40 (NRCS 2009) Interpreting Indicators of Rangeland Health (USDI-BLM et al. 2000), Sampling Vegetation Attributes (USDI-BLM et al. 1996), and the National Range and Allotment Handbook (USDA-NRCS 1997).

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 Sheep Wash 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 SW-1 was the 17 indicators of rangeland health (NRCS 2005) and 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 either to 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).

Tables 13 below show the results from the land health evaluation completed in January 2014 on the Sheep Wash allotment. Summary results are shown from the Rangeland Health Evaluation at key area SW-1. All attributes ranked none to slight from departure of the Shallow Hills 16-20" p.z. reference sheet.

Table 13. January 12, 2014 Summary Results from Rangeland Health Evaluation at Key Area SW-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 Shallow Hills 16-20" p.z. Ecological Site on Key Area SW-1.

17 Indicators Reference Sheet	Rational from January 2014
<p>1. Number and extent of rills: North and South aspects: No rills.</p> <p>Note: When evaluating range health on this ecological site, aspect and slope affect expected reference conditions and should be factored into evaluation. Revision to original reference sheet incorporates reference conditions described from north- and south-facing aspects with 25% slope, 12 years post-burn (Ryan Fire).</p>	None to slight. None observed.
<p>2. Presence of water flow patterns: North aspect: very short (5ft), discontinuous, almost indistinguishable among high cobble/gravel/vegetation cover. South aspect: common (5-15% of area), short (<5ft) and discontinuous and rock/gravel armored.</p>	None to slight. None observed.
<p>3. Number and height of erosional pedestals or terracettes: North aspect: pedestals uncommon on perennial grasses; terracettes common, 2-3 ft. apart with 2-4" elevation difference. South aspect: pedestals uncommon on perennial grasses; terracettes common, 2-3 ft. apart with 2-4" elevation difference.</p>	None to slight. None observed.
<p>4. Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground): North aspect: 5-10% bare ground evenly distributed among gravel/rock cover; non-vegetated areas are scarce. After fire, 25-30% bare ground is observed. South aspect: 10-15% bare ground evenly</p>	None to slight. Better than described in ESD.

17 Indicators Reference Sheet	Rational from January 2014
distributed among gravel/rock cover; after fire, 25-30% bare ground is observed.	
5. Number of gullies and erosion associated with gullies: None	None to slight. None present.
6. Extent of wind scoured, blowouts and/or depositional areas: None	None to slight. None present.
7. Amount of litter movement (describe size and distance expected to travel): North and South aspects: Fine litter moving less than 1 foot, coarse litter stays in place.	None to slight. No litter movement at site.
8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): North and South aspects: No difference between canopy-protected and unprotected soil slake values. All values rated as 5s and 6s.	None to slight. Very resistant to erosion due to cover and rock.
9. Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness): North and South aspects: Soil surface horizon 0-3" depth, very gravelly sandy loam, granular structure. Dark colored, 7.5 YR 3/2 moist, 7.5YR 5/2 dry.	None to slight. None observed.
10. Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: North aspect: Perennial grasses are well-dispersed across site with basal cover 5-12%. Foliar cover is 35-40% perennial grasses and 5-10% Emory oak. South aspect: Perennial mid-grasses dominant with an evenly dispersed short-grass community. Basal cover of perennial grasses is 4-10%. Foliar cover of perennial grasses is 30-45%.	None to slight. Water cycles through soils very well.
11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): North and South aspects: No compaction. Clayey (argillic) horizon at 3" depth may be mistaken for compaction.	None to slight. None at site.
12. Functional/Structural Groups (list in order of descending dominance by	None to slight. As described in the ESD.

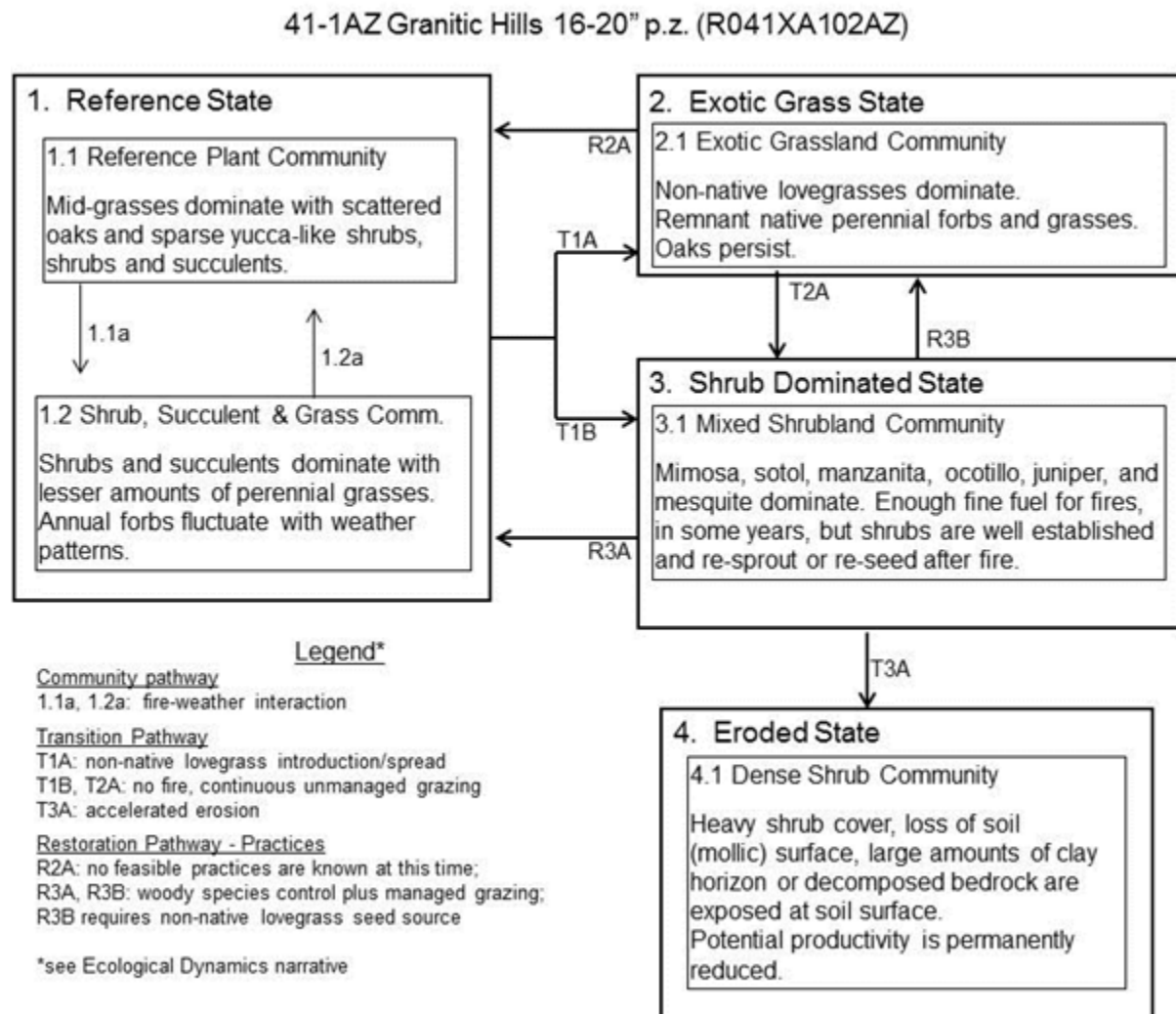
17 Indicators Reference Sheet	Rational from January 2014
<p>above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines: Dominant: North aspect: Warm season mid-grasses. South aspect: Warm season mid-grasses > short-grasses Sub-dominant: North aspect: trees > low shrubs > perennial forbs South aspect: low shrubs (mimosa spp) > perennial forbs Other: succulents Additional: Annual forbs and annual grasses fluctuate with precipitation and can flourish for a season post-burning</p>	
<p>13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): North and South aspects: Perennial grass decadence increases with time since last fire. 12 years post-burning, both aspects exhibit some perennial grasses decadence, little mortality seen.</p>	<p>None to slight. Very little to no mortality.</p>
<p>14. Average percent litter cover (45-65%) and depth (1/4inches): North aspect, 45% litter cover; South aspect, 15% litter cover (at present)</p>	<p>None to slight. Very high amounts of litter, greater than ESD values.</p>
<p>15. Expected annual production (this is TOTAL above-ground production, not just forage production): 524 lbs/ac. in a below average year; 1240 lbs/ac. in an average year; 1985 lbs/ac. in an above average year. North aspect annual production is slightly higher than south aspect, 1200 #/ac (north aspect) and 1000 #/ac (south aspect) observed in year with average rainfall.</p>	<p>None to slight. Good despite drought.</p>
<p>16. Potential invasive (including noxious) species (native and non-native). List Species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not</p>	<p>None to slight. None found at site.</p>

17 Indicators Reference Sheet	Rational from January 2014
<p>actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicator, we are describing what is NOT expected in the reference state for the ecological site: Lehmann lovegrass, Boer lovegrass, yellow bluestem, mesquite, wait-a-bit mimosa</p>	
<p>17. Perennial plant reproductive capability: Not impaired. Warm season perennial grass seed production highly dependent upon the amount and timing of summer monsoons.</p>	<p>None to slight. Very reproductively successful.</p>

Table 17. A comparison between conditions described in the ESD (R041XA102AZ – NRCS 2007) and current conditions of key area SW-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 R041XC319AZ	6-13%	0-1%	1-5%	0-1%	0-1%	25-60%	10-50%	3-17%	0-5%	5-20%
SW-1	25%	0%	0%	0%	0%	93%	13%	52%	0%	0%

Figure 14. State and transition model for Shallow Hills Upland



14 APPENDIX C: MONITORING DATA

14.1.1 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 either to 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). Utilization measured at SW-1 at the time of the study in 2014 was 0%.

Utilization Method

Table 2. 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 3. Browse (shrubs, half shrubs, woody vines, and trees) utilization classes

Rating	Description
0-5%	The key browse plants show no evidence of grazing use or only negligible use.
6-20%	The key browse plants have the appearance of very light use. The available leaders are little disturbed.
21-40%	There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 60 to 80% of the available leader growth remains intact.
41-60%	Key browse plants appear rather uniformly utilized and 40 to 60% of the available leader growth remains intact.
61-80%	The key browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain. Between 20 and 40% of the available leader growth remains intact.
81-94%	There are indications the key browse species have been utilized repeatedly. There is no evidence of terminal buds and usually less than 20% of available leader growth remains intact. Some, and often much, of the second and third years' growth has been utilized. Hedging (the appearance of browse plants that have been browsed 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.

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

Sheep Wash Allotment Land Health Evaluation

Key area information		Species	Line point intercept canopy cover at SW-1
Trend Plot 1 Sheep Wash Allotment			
Range site: R041XA102AZ			
		<i>Annual forbs</i>	7%
		<i>Cane bluestem (Bothriochloa barbinodis)</i>	2%
		<i>Sideoats grama (Bouteloua curtipendula)</i>	5%
		<i>Blue Grama (Bouteloua eriopoda)</i>	7%
		<i>Rothrock's grama (Bouteloua rothrockii)</i>	1%
		<i>Plains Lovegrass (Eragrostis intermedia)</i>	19%
		<i>Lehmann Lovegrass (Eragrostis lehmanniana)</i>	38%
		<i>Broom snakeweed (Gutierrezia sarothrac)</i>	1%
		<i>Green Sprangletop (Leptochloa dubia)</i>	1%
		<i>Resurrection plant (Selaginella lepidophylla)</i>	12%
		<i>Dropseed (Sporobolus spp.)</i>	7%
Cover/Litter/Bare Ground			
Foliar Cover	90%		
Basal Cover	25%		
Bare Ground	0%		

Table 19 and 20 shows the data summary from 1-7-2014 on key area SW-1. Figure 11 is the percent cover data collected by U of A, using line intercept, on the Sheep Wash allotment. Figure 12 and 13 are photos of transect SW-1 from 5/28/2011.

Table 19. 2011 U of A data summary on SW-1.

Data Summary

Site Class: BLM || Tucson || Sheep Wash

Date: 4/19/2017

Site ID: Key 1

Examiner(s): Mike McIntire

% Ground Cover				
Species	Transect (#Hits)			% Cover*
	1	2	Total	
Bare Ground	7	1	8	2.67
Gravel (1/4" - 3")	8	22	30	10.00
Litter	113	82	195	65.00
Rock > 3"	18	31	49	16.33
Live Basal Veg.	4	14	18	6.00

Fetch			
n	100	Minimum	0
Maximum	16	Median**	5.5
Mean	5.94	SE	0.68
Asymmetry	1.83		

% Frequency					40x40 cm		DWR Wt. Composition			Sample Size = 100
Species	Transect (#Hits)	1	2	Total	% Freq*	Rank (#Hits)			Wtd. Sum	% Comp.*
						1	2	3		
Woody Species										
yerba de pasmo-canopy	BAPT		1	1	1.00					
yerba de pasmo	BAPT						1	1	3	0.30
Fendler's ceanothus-canopy	DFFE	3		3	3.00					
Fendler's ceanothus	DFFE					1	1	3	12	1.20
common sotol	DAWH2		3	3	3.00	3	3	10	37	3.70
common sotol-canopy	DAWH2	4	6	10	10.00					
turpentine bush-canopy	ERLA12	2		2	2.00					
turpentine bush	ERLA12							2	2	0.20
broom snakeweed-canopy	GUSA2		1	1	1.00					
broom snakeweed	GUSA2							2	2	0.20
beargrass	NOM1		1	1	1.00	1		4	11	1.10
beargrass-canopy	NOM1	4		4	4.00					
mariola	PAH2		1	1	1.00	1	1	1	10	1.00
mariola-canopy	PAH2		2	2	2.00					
velvet mesquite-canopy	PRVE	15	10	25	25.00					
velvet mesquite	PRVE					19	9	11	162	16.20
banana yucca-canopy	YUBA		1	1	1.00					
banana yucca	YUBA							1	1	0.10
Grasses - Perennial										
cane beardgrass	BOBA3	1	2	3	3.00		4	1	9	0.90
sideoats grama	BOCU	5	7	12	12.00	6	7	5	61	6.10
black grama	BOER4						1		2	0.20

Sheep Wash Allotment Land Health Evaluation

Site Class: BLM || Tucson || Sheep Wash

Date: 4/19/2017

Site ID: Key 1

hairy grama	BOH2		1	1	1.00		1		2	0.20
Arizona cottontop	DICAR	3	1	4	4.00	1	3	5	18	1.80
Lehmann lovegrass	ERLE	40	44	84	84.00	54	57	46	538	53.80
tanglehead	HECO10		6	6	6.00	5	3	1	42	4.20
bullgrass	MUEM	4	1	5	5.00	5	2	2	41	4.10
bush muhly	MUPO2	3		3	3.00	3	3	2	29	2.90
Forbs - Perennial/Biennial										
Perennial forb(s)	PPFF	1		1	1.00	1	1	1	10	1.00
Annuals										
Annual forb(s)	AAFF	2	1	3	3.00					
Unclassified										
bahia	BAHA	1		1	1.00			1	1	0.10
plains bristlegrass	SEMA5	2	1	3	3.00		3	1	7	0.70

* Number of decimal places does not imply level of precision

** Plot median = average transect median, not the median of all plot data

Figure 12. SW-1 Key Area on 4/19/17



Table 19. A comparison between the state and transition model in the ESD and the LPI data collected in January 2014 at SW-1.

State and Transition Exotic grass state	LPI Data SW-1
Perennial grasses and forbs– 35-40%	Perennial grasses –79% Canopy cover Perennial forbs – 12% Canopy cover
Shrubs and succulents – 5-15%	Other shrubs and succulents - 25% Canopy cover
Annual forbs and grasses – Not delineated in ESD	Annual forbs – 7% Canopy cover

Figure 19. Species Composition at Key Area SW-1

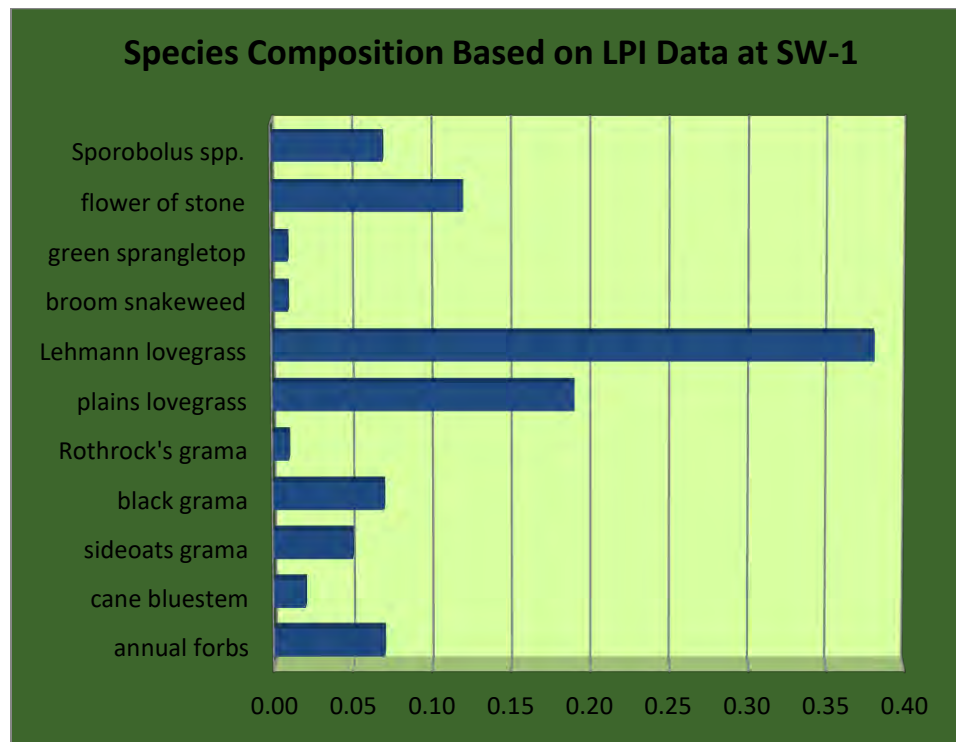


Table 20. Functional/structural plant groups at SW-1

Ranking	Species List for Functional/Structural Groups at SW-1
D	ERLE
S	ACCO2
M	PRVE
M	Yucca spp.
M	BOBA3
M	ERIN
M	BOCU
M	LEDU
M	BOER4
M	Sporobolus spp.
T	Opuntia spp.
T	Setaria spp.
T	FOSP2
	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.