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Land Health Evaluation
Twin Buttes No. 2 Allotment Lease No. 6208
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1. INTRODUCTION

The purpose of this draft Land Health Evaluation (LHE) report is to evaluate whether the Arizona Standards for Rangeland Health (Standards) are being achieved on the Twin Buttes No. 2 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:

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

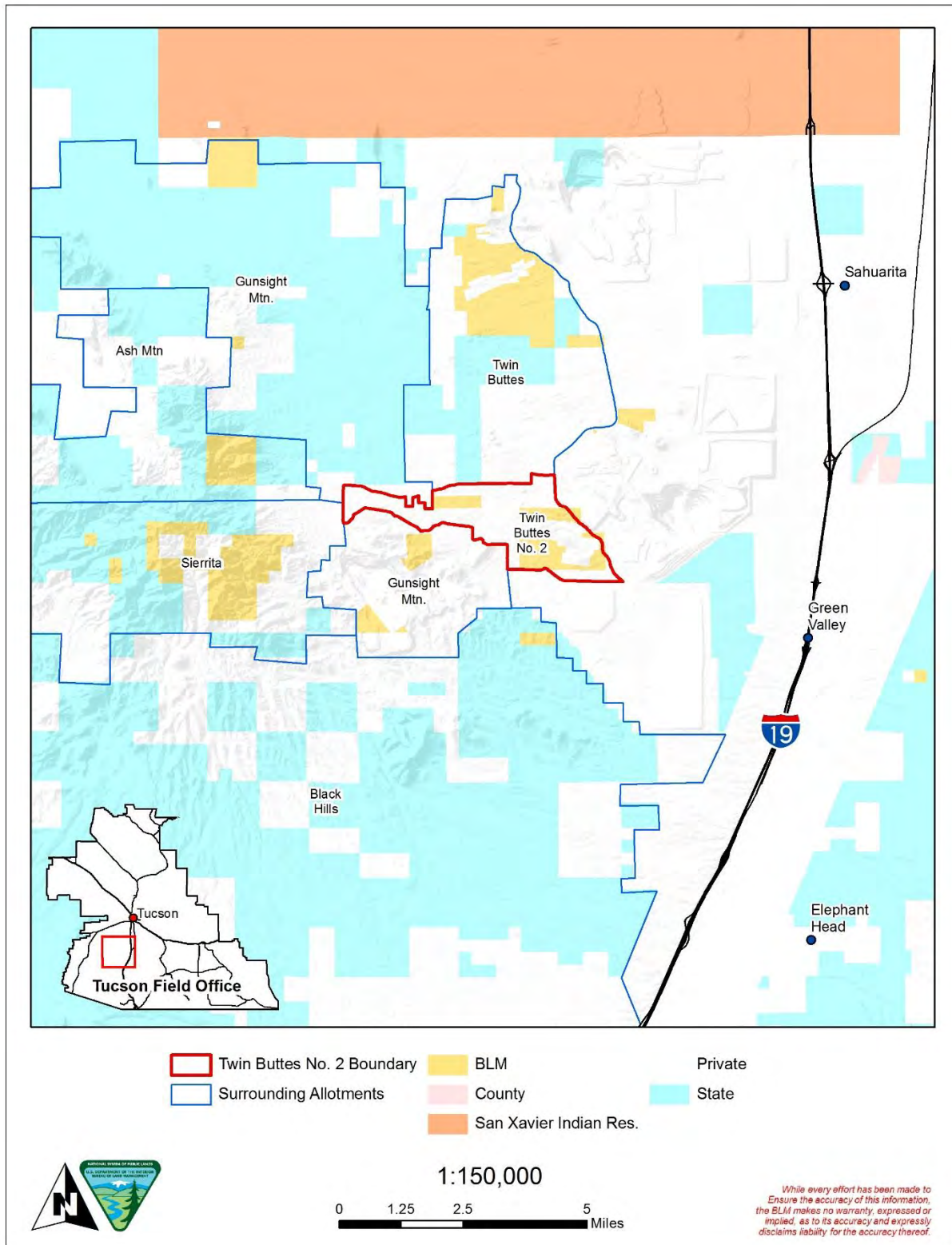
If it is ascertained that Standards are not being achieved, determine whether livestock grazing is a significant factor causing that non-achievement.

2. ALLOTMENT PROFILE

2.1 Location

The Twin Buttes No. 2 allotment is approximately 7 miles southwest of Sahuarita and 5 miles west of Green Valley (Figure 1) in Pima County. The Twin Buttes No. 2 allotment borders the Twin Buttes allotment to its north, the Gunsight Mountain allotment to its west and the Black Hills allotment to the south.

Figure 1. Vicinity Map of Twin Buttes No. 2 Allotment



2.2 Physical Description

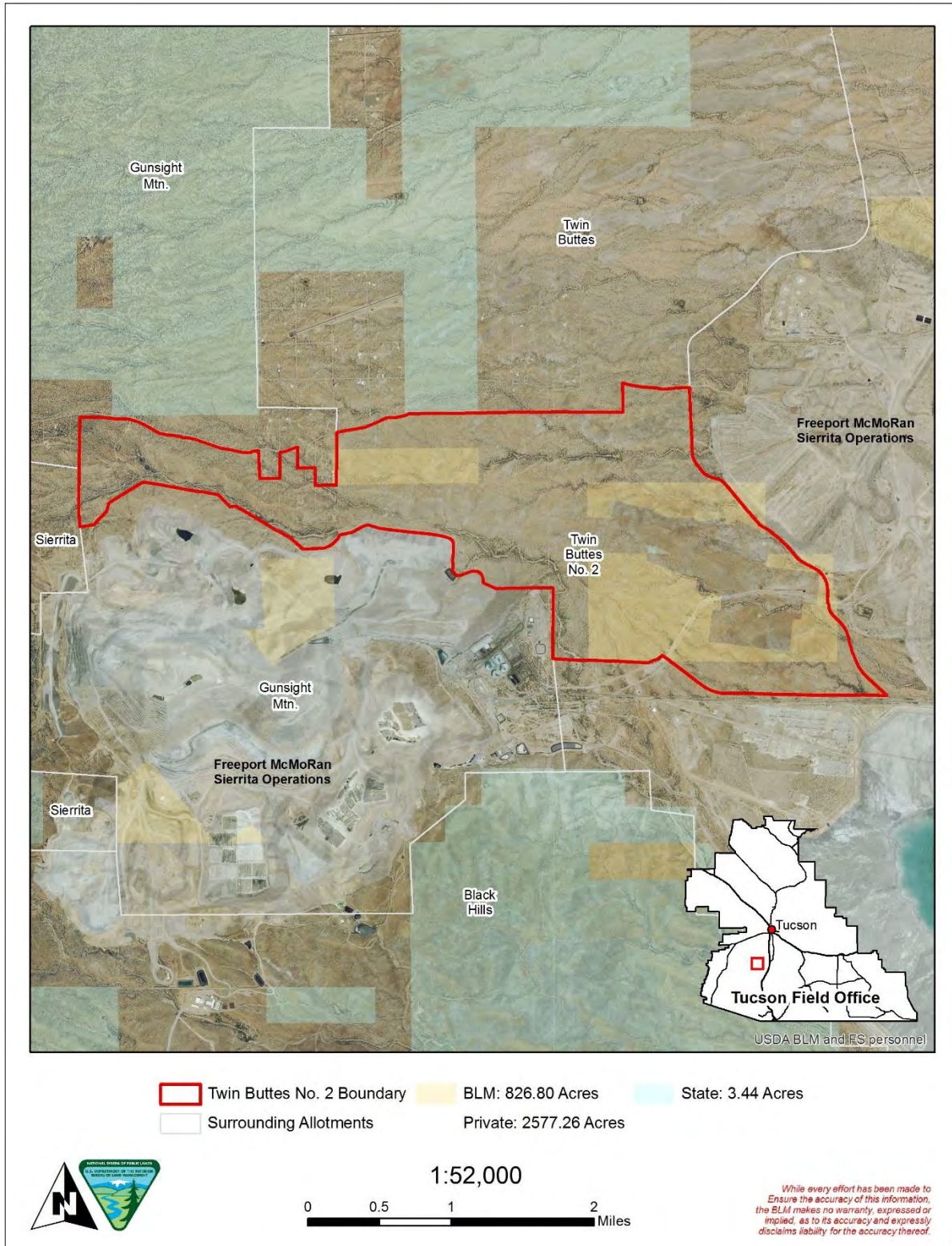
2.2.1 Acreage

The 3,407 acres of the Twin Buttes No. 2 allotment are predominately (76 percent) private lands (Table 1). Public lands constitute about 24 percent of the allotment. Spatial distributions of land ownership are displayed in Figure 2. Public lands are located throughout the allotment. Land ownership with topography is provided in Figure 2 where you can see the allotment's proximity to the two large mines of Freeport McMoRan's Sierrita Operations.

Table 1. Acreage of Landownership

Land Classification	Twin Buttes No. 2 Allotment
Public Acres	827
State Acres	3
Private Land Acres	2,577
Total Acres	3,407

Figure 2. Landownership Map



2.2.2 Watershed

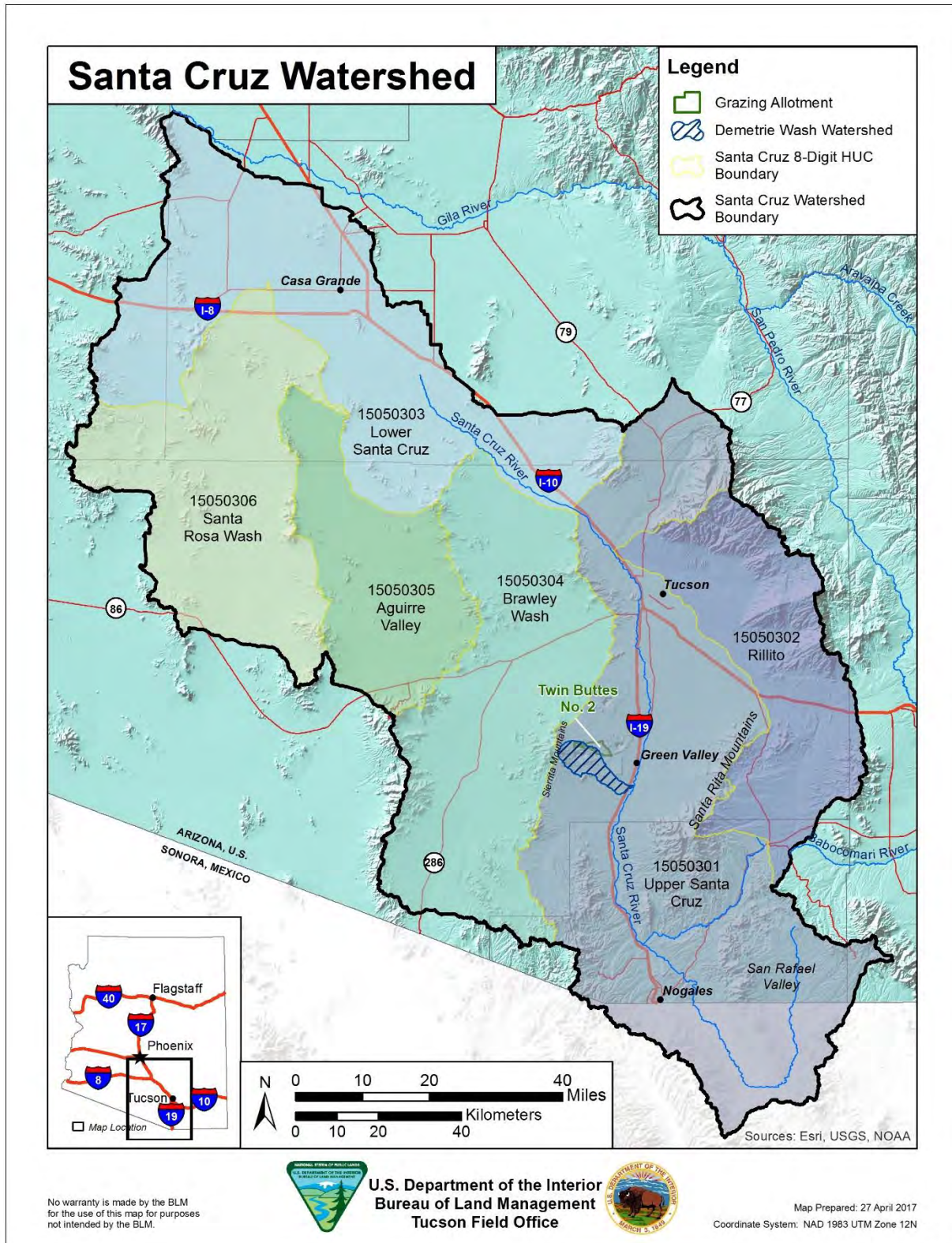
The Twin Buttes No. 2 allotment lies within the Demetrie Wash (also known as Esperanza Wash) watershed, which drains east between Sierrita open pit copper mine and tailings ponds and the Twin Buttes mine, through the town of Green Valley, Arizona, across Interstate 19 and into the Upper Santa Cruz River United States Geological Survey Hydrologic Unit Code (USGS HUC #15050301) (Figure 3).

The Demetrie Wash watershed has been and continues to be highly altered by mining activities, has a drainage area of approximately 31.5 square miles and varies in elevation from approximately 732 feet above mean sea level at its headwaters in the foothills of the Sierrita Mountains near Magee Ranch Road down to approximately 2,916 feet at its confluence with the Santa Cruz River.

The Santa Cruz River watershed, which encompasses Demetrie Wash, covers over 8,000 square miles (USGS Arizona Water Science Center). The watershed ranges from over 9,400 feet in the Santa Rita Mountains to 1,100 feet near the terminus at Santa Cruz Flats (Biological Assessment of the Arizona Game and Fish Department's Statewide and Urban Fisheries Stocking Program, January 2011).

The Santa Cruz River originates in high grassland headwaters of the San Rafael Valley of southcentral Arizona where it flows south into Northern Sonora, Mexico, makes a 149 mile U-turn, flows north again, reentering the U.S. near and just east of Nogales, Arizona, then drains north through Tucson and continues northward to join the Gila River, which flows west into the Colorado River at the Arizona-California state line, which then flows south into Mexico and empties into the Gulf of California via the Laguna Santa Clara (also known as the Santa Clara Slew).

Figure 3. Santa Cruz Watershed Map



2.2.3 Soils

The soil composition on the Twin Buttes No. 2 allotment is varied as presented in Table 2. The dominant soil orders in the Sonoran Basin and Range Major Land Resource Area (MLRA) (see section 2.3.1) are Aridisols and Entisols. An MLRA is a geographic area, usually several thousand acres in extent that is characterized by a particular pattern of soils, climate, water resources, land uses, and type of farming. The soils in the area dominantly have a thermic or hyperthermic soil temperature regime, an aridic soil moisture regime, mixed mineralogy, and are formed in alluvium (deposits of clay, silt, sand, and gravel left by flowing streams). They are very shallow to very deep and are well drained and somewhat excessively drained. Haplocambids (Denure and Hayhook series), Haplocalcids (Gunsight and Stagecoach series), Calciargids (Mohall and Pina Brawley Wash series), and Natrargids (Casa Grande series) formed on fan terraces and relict basin floors. Torrifluvents (Antho and Comoro series) formed on alluvial fans and flood plains. Shallow or very shallow Torriorthents (Cellar and Quilotosa series) formed on hills and mountains.

The specific soils on the Twin Buttes No. 2 allotment are shown in the table below. The dominant soils are Sasabe-Caralampi complex, 1 to 15 percent slopes and Oracle-Romero-Rock outcrop complex, 5 to 35 percent slopes. The acreages may not be accurate due to difficulty defining the area of interest in the web soil survey system.

Table 2. Soils on the Twin Buttes No. 2 Allotment

Map Unit Name	Acres in Allotment	Percent of Allotment Acres
Caralampi very gravelly sandy loam, 5 to 15 percent slopes	73.3	5.1%
Deloro-Andrada complex, 5 to 35 percent slopes	202.7	14.1%
Deloro-Rock outcrop complex, 15 to 60 percent slopes	117.6	8.2%
Keysto extremely gravelly fine sandy loam, 2 to 8 percent slopes	14.7	1.0%
Mabray-Deloro-Rock outcrop complex, 20 to 65 percent slopes	91.2	6.3%
Oracle-Romero-Rock outcrop complex, 5 to 35 percent slopes	352.3	24.5%
Pits, dumps	16.7	1.2%
Sasabe-Caralampi complex, 1 to 15 percent slopes	486.8	33.9%
Tubac gravelly loam, 1 to 8 percent slopes	82.6	5.7%
Totals for Allotment	1,437.8	100.0%

2.3 Biological Resources

2.3.1 Major Land Resource Areas

Major Land Resource Areas (MLRAs) are geographically associated land resource units, usually encompassing several thousand acres MLRAs are characterized by particular patterns of soils, geology, climate, water resources and land use. The Twin Buttes No. 2 allotment is located in MLRA 40—Sonoran Basin and Range that is almost entirely in Arizona, but includes a very small part of California. The MLRA encompasses about 31,765 square miles.

In this MLRA, many short, fault-block mountain ranges trending southeast to northwest rise abruptly from the smooth or gently sloping desert valley floors. These include the Tucson, Gila Bend, Silver Bell, Tortolita, Mineral, and Santa Rosa Mountains. Elevation ranges from 980 to 3,600 feet (300 to 1,100

meters) in most of this area, but it is as high as 4,590 feet (1,400 meters) in the mountains of this MLRA. The Gila River flows west across the southern part of the MLRA to the Colorado River.

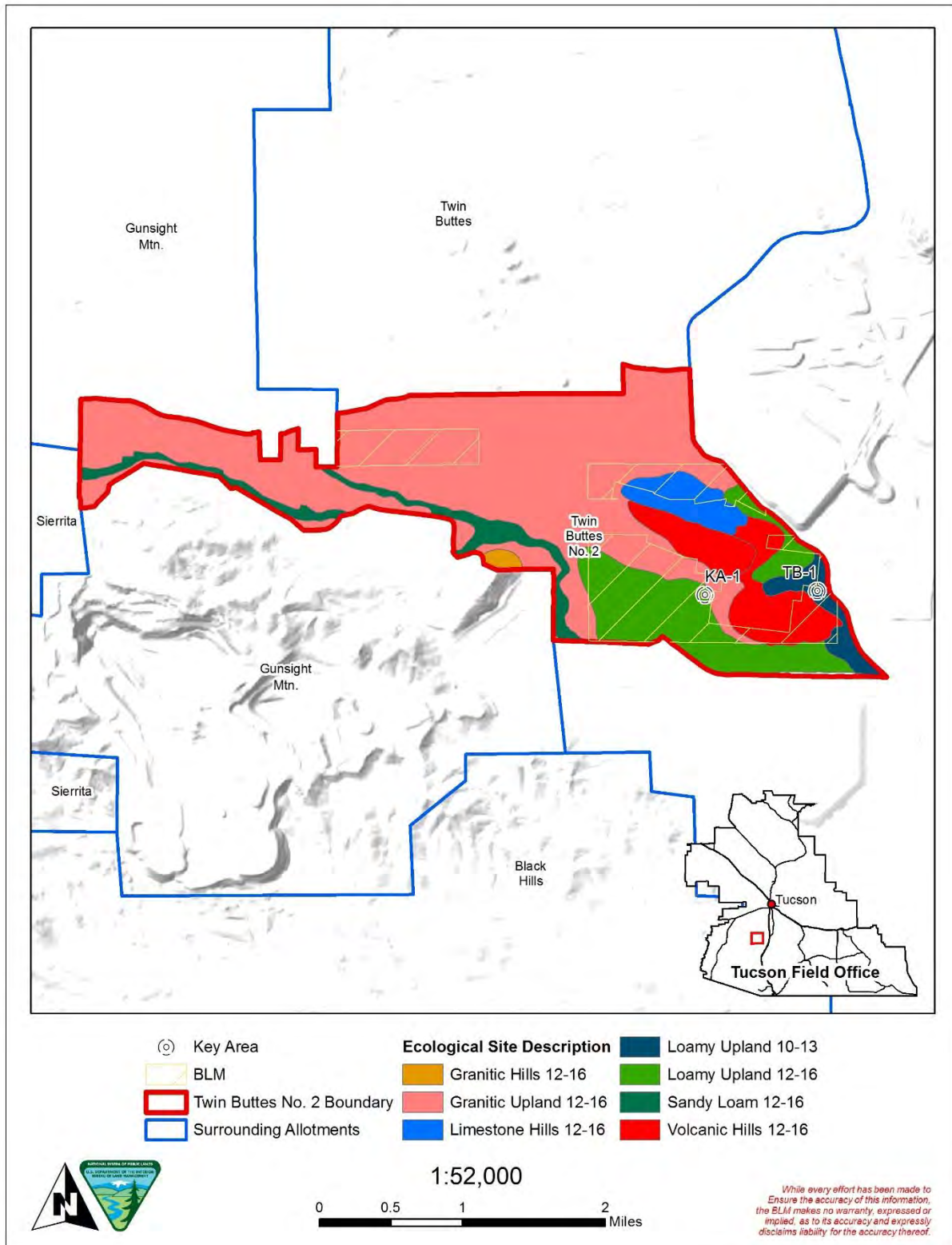
Major Land Resource Areas are broken down further into ecological sites, which are associated units of soil and vegetation with quantifiable characteristics.

2.3.2 Ecological Sites

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

A total of seven ecological sites exist within the Twin Buttes No. 2 allotment. Two key areas (KA-1 and TB-1) have been established, on public land, based on their representative features to measure the long-term trend of vegetation and ground cover. KA-1 is within the Loamy Upland 12-16" precipitation zone ecological site, which constitutes the primary ecological site within the BLM lands in the allotment (Figure 4). Ground cover, pace frequency, dry weight rank and photos are collected at this key area. TB-1 key area is within the Loamy Upland 10-13" ecological site and is the location where the LHE was documented in 2014. Line point intercept, ground cover utilization and photos were taken at TB-1.

Figure 4. Ecological Sites within the Twin Buttes No. 2 Allotment



The ecological site for the KA-1 key area is Loamy Upland 12-16" - R041XC313AZ. Key vegetative species for this site include: false mesquite (*calliandra eriophylla*), range ratany (*krameria erecta*), sideoats grama (*bouteloua curtipendula*) and sprucetop grama (*bouteloua chondrosioides*). This site occurs on fans terraces, old stream terraces, and mesas. The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils.

Production data provided in the site description is standardized to air-dry weight at the end of the summer growing season. The plant communities described in the site description are based on near normal rainfall years.

The ecological site for the TB-1 key area is Loamy Upland 10-13" - R040XA114AZ. Key vegetative species for this site include: velvet mesquite (*prosopis velutina*), desert zinnia (*zinnia acerosa*), triangle bursage (*ambrosia deltoidea*), foothill palo verde (*janusia gracilis*) and black grama (*bouteloua eriopoda*). This site occurs on fans terraces, old stream terraces, and mesas.

The potential plant community is an open stand of desert trees with an understory of low shrubs, cacti and perennial grasses and forbs. The aspect is shrubby.

The Historical Climax Plant Community for both ecological sites represents the natural potential plant communities found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as fire, grazing, or drought.

2.3.3 Climate Data for TB-1 Loamy Upland 10-13" Ecological Site

Precipitation within the ecological site Loamy Upland ranges from 10-13" annually. Winter-summer rainfall ratios range from 40-60 percent in the southern portions of this 40 Sonoran Basin and Range MLRA, to 50 percent in the central portions, to 40-60 percent in the northern part of the land resource unit. Summer rains fall July through September in intense thunderstorms and cool season moisture comes in widespread storms of low intensity and long duration. Snow is rare and seldom lasts more than an hour or two. May and June are the driest months of the year. Humidity is generally very low. Winter temperatures are mild, with very few days recording freezing temperatures in the morning. Summer temperatures are warm to hot, with several days in June and July exceeding 105 degrees F.

Table 3 below shows the precipitation data for the Twin Buttes No. 2 allotment from the Anamax weather station in Pima County.

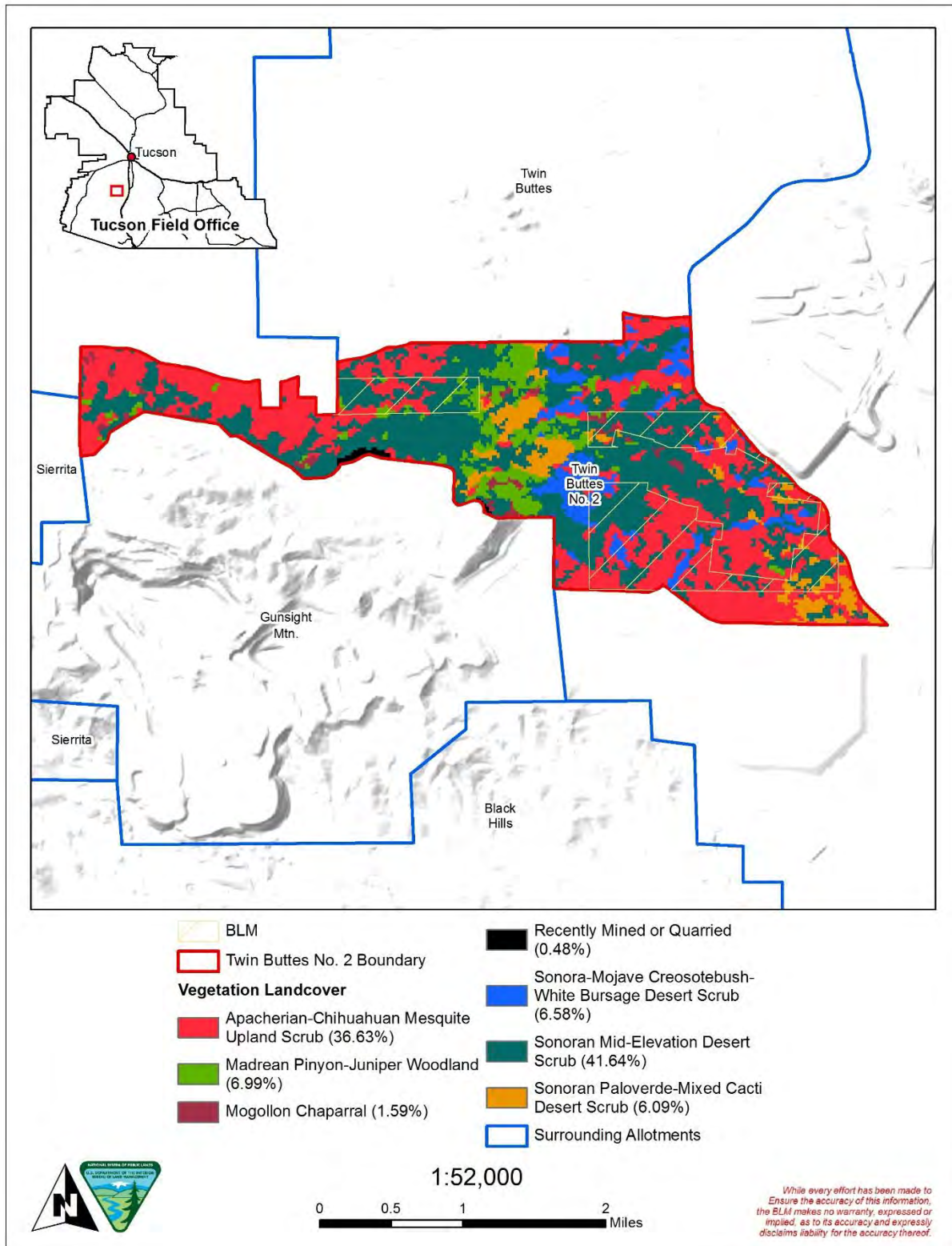
Table 3. Precipitation Data for Twin Buttes No. 2

Monthly Precipitation Data by Water Year for Twin Buttes No. 2 Allotment (Inches)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
WY 2012	0.08	1.02	1.85	0.00	0.12	0.28	0.00	0.00	0.23	2.92	1.69	2.36	10.55
WY 2013	0.05	0.07	1.26	0.55	0.51	0.08	0.00	0.00	0.00	4.96	1.53	0.63	9.64
WY 2014	0.04	2.32	0.75	0.00	0.00	1.10	0.20	0.00	0.00	2.64	1.73	1.10	9.88
WY 2015	0.95	0.35	1.18	1.93	0.12	0.19	0.16	0.04	1.03	3.62	2.67	2.60	14.84
WY 2016	1.81	0.28	0.35	0.95	0.08	0.03	0.48	0.00	0.71	0.74	2.76	1.89	10.08
					2012	2013	2014	2015	2016				
			Summer		7.25	7.16	6.62	11.93	6.58				
			Winter		3.27	2.47	4.17	3.77	1.69				

2.3.4 Vegetation Communities

The Loamy Upland ecological sites support desert shrub vegetation. Triangle bursage, burroweed, desert zinnia are dominant half shrubs. Bush muhly, and spidergrass are the main perennial grasses. Winter annuals can grow in some areas, depending on the amount of winter precipitation. Foothill palo verde and velvet mesquite are two trees expected for this sandy loam upland site. At the lower elevations, creosotebush, ironwood, mesquite, burroweed, and catclaw are associated with an understory of threeawns and annuals, such as red fescue, bluegrasses, fiddle neck, indianwheat, globemallow, and filaree. Figure 5 below shows the vegetation communities within the Twin Buttes No. 2 allotment.

Figure 5. Vegetation Communities within Twin Buttes No. 2 Allotment



2.3.5 General Wildlife Resources

Wildlife species expected to occur on this allotment would include: mule deer, desert bighorn sheep, javelina, coyote, fox, raccoon, bats, rattlesnake, bullsnake, coachwhip, kingsnake, and quail.

2.3.6 Threatened & Endangered Species

A query conducted on the USFWS Information for Planning and Conservation (iPAC; USDI 2016) website showed that the following threatened, endangered and proposed (TEP) species may occur within the allotment: lesser long-nosed bat (LLNB), jaguar, Sonoran pronghorn, California least tern, yellow-billed cuckoo, northern Mexican garter snake, and pima pineapple cactus (PPC).

Review of habitat requirements for each species was conducted to determine its potential to occur on the allotment and to inform the Effects Determination for each species (Table 4). No designated or proposed critical habitats overlap with this allotment.

Table 4. Species indicated by 2016 USDI iPAC analysis for Twin Buttes No. 2 Allotment and Effects Determination

Species	Habitat	Potential for Occurrence on Twin Buttes No. 2 Allotment and Effects Determination
California Least Tern	Forms nesting colonies on barren to sparsely vegetated areas. Nests in shallow depressions on open sandy beaches, sandbars, gravel pits, or exposed flats along shorelines of inland rivers, lakes, reservoirs, and drainage systems. Primarily in California, may occur in different parts of Arizona where habitat components are adequate for nesting or feeding such as large lakes, recharge basins, or wetland areas. Breeding documented in Maricopa County. Transient migrants occur more frequently and have recently been documented in Mohave and Pima counties. ¹	Habitat does not exist for California Least Tern on Twin Buttes No. 2 Allotment. No effect
Jaguar	In the northern portion of the range, found in thornscrub, desertscrub, and grasslands. Vegetation communities used in Arizona range from Sonoran desertscrub at lower elevations to sub-alpine mixed conifer in the mountain ranges. ³	The allotment is located within the potential range of jaguar and could be used by the species for foraging or travel between mountain ranges; however, the adjacent, large, active mining operation and activities associated with that operation make it very unlikely that Jaguar would occupy this allotment. No Effect.
Lesser Long-nosed Bat	Mainly desert scrub habitat in the U.S. portion of its range. In Mexico, the species occurs up into high elevation	Forage species for lesser long-nosed bat may occur on Twin Buttes No. 2 allotment; however,

Species	Habitat	Potential for Occurrence on Twin Buttes No. 2 Allotment and Effects Determination
	pine-oak and ponderosa pine forests. Altitudinal range is from 1,600- 11,500 feet (480-3,450 meters). Roosting is in caves, abandoned mines, and unoccupied buildings at the base of mountains where agave, saguaro, and organ pipe cacti are present. Forages at night on nectar, pollen, and fruit of paniculate agaves and columnar cacti. 5	forage availability to Lesser Long Nose Bat in the area will not be significantly reduced as a result of livestock grazing on the allotment as LLNB are a mobile species, foraging up to 50 miles from roost sites. No effect to Lesser Long Nose Bat.
Sonoran Pronghorn	Lower Sonoran Desert habitat ⁶	Historic range of the species included nearby Altar Valley, however Sonoran Pronghorn have not occupied this area since probably the 1920-1940's. Populations of the species in the US occur only on the Cabeza Prieta National Wildlife Refuge and the Organ Pipe Cactus National Monument near Ajo AZ approximately 80-100 miles west of the Twin Buttes No. 2 Allotment. Sonoran Pronghorn do not occupy the Twin Buttes No. 2 Allotment Area. No Effect
Pima Pineapple Cactus	This cactus grows in alluvial basins or on hillsides in semi-desert grassland and Sonoran desertscrub in southern Arizona and northern Mexico. Soils range from shallow to deep, and silty to rocky, with a preference for silty to gravelly deep alluvial soils. The plant occurs most commonly in open areas on flat ridge tops or areas with less than 10-15% slope. ⁸	Limited potential for occurrence on allotment, surveys have been conducted and no PPC were found. The May 2012 Gila District Grazing Biological Opinion on the Gila District Livestock Grazing Program concluded that ongoing livestock grazing activities were not likely to adversely affect the species.
Yellow Billed Cuckoo	Nests in willows along streams and rivers, with nearby cottonwoods serving as foraging sites. Critical habitat designated but no designation on Twin Buttes No. 2 allotment. ⁹	Yellow-billed Cuckoo habitat not on Twin Buttes No. 2 Allotment. No effect
Northern Mexican Garter Snake	This species occurs up to about 8,500 feet in elevation, but is most frequently found between 3,000 and 5,000 feet in the United States. The northern Mexican gartersnake is found in both	Habitat for northern Mexican garter snake does not occur on the Twin Buttes No. 2 Allotment. No Effect

Species	Habitat	Potential for Occurrence on Twin Buttes No. 2 Allotment and Effects Determination
	lotic and lentic habitats that include cienegas and stock tanks (in southern Arizona), as well as river habitat that includes pools and backwaters. It forages along the banks of waterbodies feeding primarily upon native fish and adult and larval leopard frogs. ¹⁰	
<p>¹https://www.fws.gov/southwest/es/arizona/Documents/Redbook/California%20Least%20Tern%20RB.pdf</p> <p>³ https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Jaguar%20RB.pdf</p> <p>⁵ https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Lesser%20Long-nosed%20bat%20RB.pdf</p> <p>⁶ https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Sonoran%20Pronghorn%20RB.pdf</p> <p>⁸https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Pima%20Pineapple%20cactus%20RB.pdf</p> <p>⁹ http://ecos.fws.gov/ecp0/profile/speciesProfile?sPCODE=B06R</p> <p>¹⁰ https://www.fws.gov/southwest/es/arizona/Documents/Redbook/Northern%20Mexican%20gartersnake%20RB.pdf</p>		

2.3.7 BLM Sensitive Species

The BLM sensitive species that have suitable habitat present and are known or have the potential to exist within this allotment are the western narrow-mouthed toad, Sonoran green toad, American peregrine falcon, bald eagle (wintering), Botteri’s sparrow, cactus ferruginous pygmy-owl, desert purple martin, gilded flicker, golden eagle, spotted bat, Townsend’s big-eared bat, Mexican long-tongued bat, California leaf-nosed bat, cave myotis, and greater western mastiff bat. The allotment lies outside mapped suitable Sonoran desert tortoise habitat. The bird species utilize the grassland, open shrub, and cliff habitat for nesting and foraging. The bird species utilize grasslands, rocky and wooded hills, and inhabit rain pools, wash bottoms, and areas near water in semi-arid mesquite-grassland, creosote bush desert, and upland saguaro-paloverde desert scrub. In central and southern Arizona, the pygmy-owl is currently found primarily in Sonoran desert scrub vegetation, with some locations in riparian drainages and woodlands within semi-desert grassland vegetation communities.

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

2.3.8 Migratory Birds

The Twin Buttes No. 2 allotment, which includes public and other lands, offers diverse habitats for migratory birds, providing valuable food, water, and cover. Migratory species that utilize the area include but are not limited to: Arizona woodpecker, Bendire’s thrasher, canyon towhee, five-striped sparrow, golden eagle, red-tailed hawk, raven, turkey vulture, meadowlark, ladder-back woodpecker, ash-throated flycatcher, canyon wren, varied bunting, Costa’s hummingbird, gilded flicker, phainopepla, and rufous-winged sparrow. No surveys have been conducted specifically within this allotment to determine

presence but these species have the potential of occurring within the vegetation communities located on this allotment (Figure 5).

2.4 Special Management Areas

There are no special management areas within the Twin Buttes No. 2 allotment boundary.

2.5 Recreation Resources

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

2.6 Heritage Resources & the Human Environment

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

2.6.1 Cultural Resources

The BLM's authorization of grazing leases is considered an undertaking subject to compliance with Section 106 of the National Historic Preservation Act (NHPA; 54 U.S.C. 306108 et seq.). The BLM has the legal responsibility to consider the effects of its actions on *historic properties* located on public lands. BLM Manual 8100 Series and the Arizona BLM Protocol (the Statewide Protocol) provide Section 106 compliance requirements to meet appropriate cultural resources management standards. Additionally, cultural resources evaluations for proposed grazing permits and leases generally follow the procedures and guidance provided in BLM Instructional Memoranda.

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

A small number of controlled studies have been performed to examine potential grazing impacts on historic properties (c.f., Osborn and Hartley 1991, Osborn et al. 1987, Roney 1977, and Van Vuren 1982). For example, Alan Osborn and his colleagues examined the effects of domestic livestock grazing on the archaeological resources of Capitol Reef National Park in southern Utah. The study included reconnaissance and observations at recorded sites, and the creation of experimental and control plots containing several types of newly manufactured lithic and ceramic artifacts that were measured, weighed, placed, and mapped. Several study plots were located close to water sources. The study plots and

artifacts were reexamined after six months of grazing use. Osborn found that 93 percent of the artifacts remained intact, and 84 percent remained visible. Pottery fragments were more prone to breakage. Mapping revealed that 23 percent of artifacts were displaced, but that 75 percent of the displaced artifacts had moved less than 15 centimeters.

The results varied by study plot location with the greatest impacts recorded near water sources, which received higher concentrations of livestock use. Osborn and Hartley (1991) concluded 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, above-ground cultural features and/or rock art (Broadhead 2001; Osborn et al. 1987). Indirect impacts from livestock concentrations may include accelerated soil erosion and 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 Twin Buttes No. 2 grazing allotment between November 28, 2016 and January 15, 2017. Data reviewed were obtained from BLM TFO cultural program project files, site reports, and atlases, in addition to BLM-maintained General Land Office (GLO) plats and patent records. Electronic files also were reviewed using online cultural resource databases including *AZSite*, Arizona’s statewide cultural resource inventory system (administered by the Arizona State Museum), and the *National Register of Historic Places Focus Database & NP Gallery Digital Asset Search* (maintained by the National Park Service). Archival information was compared with livestock grazing and range improvement data (see section 3.2.1) to determine the potential for resource conflicts, particularly in livestock concentration areas such as around water sources, at chutes/corrals, and near supplemental feeding locations. The results of archival research are summarized as follows; data provided are applicable to BLM administered lands within the subject allotment (i.e., the jurisdictional APE) and based on currently available information from the aforementioned sources.

Background research identified one prior cultural resources inventory that covered roughly 410 acres of the BLM-administered portion of the allotment (Euler 1988). Five cultural sites were documented as a result of that inventory (AZ DD: 4:90-94 [ASM]), all of which consist of prehistoric lithic scatters and/or procurement areas that have not been formally evaluated for NRHP eligibility. Lacking formal NRHP

evaluation, these sites are considered historic properties for the purpose of this analysis; however, none of the identified sites coincide with existing range improvements or potential livestock concentration areas.

Further review of historic-age GLO plats show evidence of long-term mining claims and activities associated with the development and use of the adjacent Duval (Sierrita) and Twin Buttes Mines, in addition to earlier mineral claims that predate the 1930s. Associated historic-age mining features (such as building and architectural remains, trash dumps, roads, railroad spurs, prospect pits, mine shafts, etc.) are likely to occur within and around the Twin Buttes No. 2 allotment; however, such features—mapped or otherwise—are either in use or are not likely to be impacted by dispersed livestock grazing.

Statement of Effect Determination

As a result of this cultural resources assessment, no historic properties or areas likely to contain historic properties were identified *that also coincide with areas of potential impacts from concentrated livestock use on the BLM administered portion of the Twin Buttes No. 2 allotment.* A light-to-moderate level of dispersed livestock use is proposed under the proposed lease terms, with only one identified concentrated use-area on the BLM administered portion of the allotment. Additionally, no new range improvement projects are currently proposed as a component of land-health evaluation or lease issuance.

As a routine undertaking with no identified impacts to historic properties within the BLM administered portion of the allotment, lease issuance for continued livestock use of the Twin Buttes No. 2 allotment is appropriate under a finding of “no adverse effect,” with the following Conditions of Approval (COAs) applied as lease stipulations. Any subsequent cultural resources inventory should focus on identified areas of livestock concentration within the BLM administered portion of the allotment, as appropriate. Proposed range improvements would be subject to individual project review and assessment for compliance with Section 106 and the Statewide Protocol. If, as a result of any new assessment or monitoring, historic properties are identified and found to exhibit potential for or actively occurring grazing impacts, mitigation measures would be developed in coordination with the SHPO and any other applicable consulting parties.

Cultural Resources Stipulations / Standard Conditions of Approval (COAs)

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

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

Manager. The immediate area of the discovery shall be protected until notified by the BLM Tucson Field Manager that operations may resume.

2.6.2 Native American Concerns

Native American religious concerns are legislatively considered under several acts and Executive Orders including the American Indian Religious Freedom Act (AIRFA; 42 U.S.C. 1996), the Native American Graves Protection and Repatriation Act (NAGPRA; 25 U.S.C. 3001), and Executive Order 13007 (Indian Sacred Sites). In sum, and in concert with other provisions such as those found in the NHPA and Archaeological Resources Protection Act (ARPA; 16 U.S.C. 470aa-470mm), these acts and orders require the federal government to carefully and proactively consider the traditional and religious values of Native American culture and lifeways to ensure, to the greatest degree possible, that access to sacred sites, treatment of human remains, the possession of sacred items, conduct of traditional religious practices, and the preservation of important cultural properties are not unduly infringed upon. In some cases, these concerns are directly related to *historic properties* and/or archaeological resources, such as those considered under Section 106 of the NHPA. Likewise, elements of the landscape without archaeological or human material remains also may be involved.

The BLM initiated government-to-government consultation with five Native American tribes who claim cultural affiliation to and/or traditional use of the area by sending letters summarizing the results of the Class 1 cultural resources assessment and rangeland monitoring data for the Twin Buttes No. 2 allotment. Tribes consulted include the Hopi Tribe, Pascua Yaqui Tribe, Tohono O'odham Nation, White Mountain Apache Tribe, and the Yavapai-Apache Nation. Plant species with potential cultural significance are noted to occur within the Twin Buttes No. 2 allotment such as buckhorn cholla (*Cylindropuntia acanthocarpa*) and velvet mesquite (*Prosopis velutina*; USDA-NRCS 2017).

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

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

3. GRAZING MANAGEMENT

3.1 Grazing History

Historic and recent grazing use has been by cattle on the Twin Buttes No. 2 allotment. The allotment has 827 acres administered by the BLM. There are 2,577 private and 3 state acres for a total of 3,407 acres. The BLM land within the allotment comprises approximately 24 percent of the total livestock operation.

The management category given to the Twin Buttes No. 2 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 custodially include areas where the effects of livestock use on the public land resources are anticipated to be minimal. Selection of public land areas for custodial management is based on the following criteria:

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

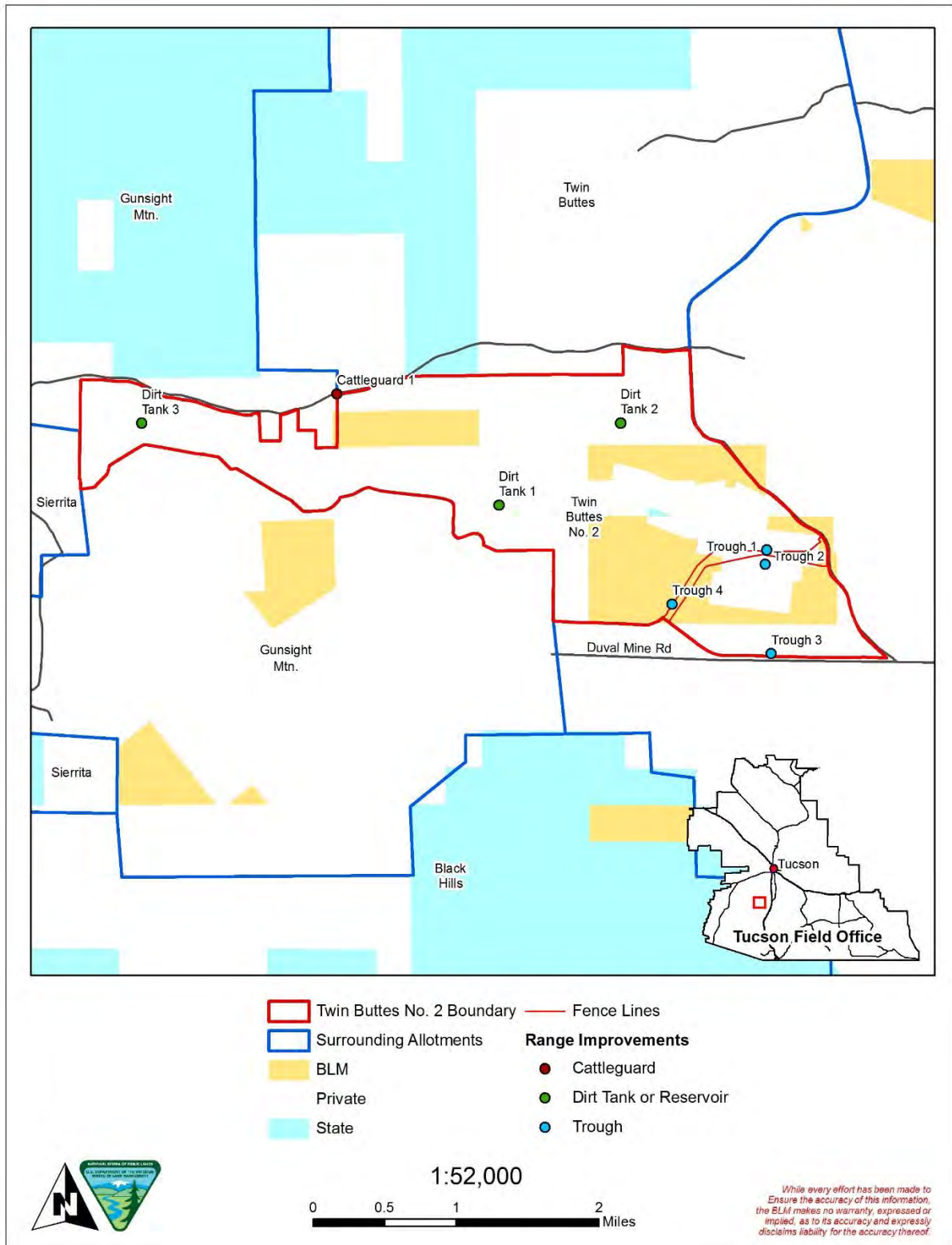
3.2 Grazing System

There is currently one lease issued for 84 AUMs on public lands. The allotment is continuous yearlong use. The southeastern portion of the allotment from Duval Mine Road to the tailings mine road is used seasonally as a separate pasture. The entire allotment has a capacity of 35-40 cows, which includes the 7 cows authorized on the BLM managed public lands and the remainder from a private grazing lease with the Freeport McMoRan's Sierrita Operations mine.

3.2.1 Existing Range Improvements

There are three seasonal dirt tanks within the allotment and four yearlong water troughs. The Sierrita mine supplies water to the eastern portion of the allotment. Figure 6 shows the range improvements throughout the allotment. There are several dirt stock tanks fed by surface runoff on the private lands. The allotment water distribution is good on the east end with troughs from mining operation agreements. The west end of the allotment has one permanent well and one seasonal dirt tank.

Figure 6. Range Improvements on the Twin Buttes No. 2 Allotment



3.3 Mandatory Terms and Conditions for Permitted Use

Table 5. Mandatory Terms and Conditions of the Lease

Livestock Kind	Grazing Period of Use	Percent Public Land*	Type Use	AUMs
7	3/1 to 2/28	100	Active	84

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

4. OBJECTIVES

4.1 Relevant Planning and Environmental Documents

Eastern Arizona Grazing Environmental Impact Statement (1987)

Phoenix District Resource Management Plan (1989)

Gila District Livestock Grazing Program Biological Opinion, 2012

4.2 Allotment Specific Objectives

4.2.1 Land Health Standards

Standard 1: Upland Sites

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

Criteria for meeting Standard 1:

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

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

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

As indicated by such factors as:

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

- Gullies
- Rills
- Plant pedestaling

Standard 2: Riparian-Wetland Sites

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

Standard 2 is **not applicable** because no riparian-wetland sites exist within the Twin Buttes No. 2 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/or riparian-wetland plant communities meet desired plant community objectives. Plant community objectives are determined with consideration for all multiple uses. Objectives also address native species, and the requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and appropriate laws, regulations, and policies.

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

As indicated by such factors as:

- Composition
- Structure
- Distribution

Desired Plant Community Objective

As part of the 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.

Key Area TB-1 Desired Plant Community Objectives for Loamy Upland 10-13” precipitation zone Deep ecological site:

Maintain plant species diversity such that the potential plant community is an open stand of desert trees and cacti with a grassy understory. The major perennial grass species tend to be well dispersed throughout the plant community. The aspect is savannah.

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

Rationale:

TB-1 is located on a southern facing slope at an elevation of approximately 3650 feet. The range of DPCs listed above was derived from the NRCS Reference Sheet. The reference sheet used for TB-1 is the Loamy Upland 10-13" p.z. ecological site.

The reference sheet shows an expected foliar cover of 1-25 percent for perennial grasses and 1-25 percent for palatable shrubs. These covers are determined from the state and transition model for the loamy upland ESD. The large difference in percentages is because of the relation between drought and El Nino years. The DPC objective for grasses/grasslike plants is to maintain composition of ≥ 15 percent. This objective will only be met during El Nino years as it is above the 1-5 percent expected for drought years. The DPC objective for palatable shrub composition is to maintain at ≥ 10 percent or greater should serve to prevent accelerated erosion of the site. The vegetative foliar cover objective of ≥ 15 percent is just slightly lower than the overall expected for the site of 18 percent. Maintaining these objectives will help soil/site stability, hydrologic function, and biotic integrity meet the standards for this site.

5. PLANT LIST

This section includes the list of plant species present or potentially present within the Loamy Upland 10-13" p.z. and Loamy Upland 12-16" p.z. ecological site located on the public lands within the Twin Buttes No. 2 allotment. These plant species provide key forage and cover for wildlife species and livestock.

Table 6 presents a list of key forage plant species from the Loamy Upland 10-13" ecological site description. These plants are potential, not observed, species listed for the ecological site description under plant preference by animal kind for both wildlife and livestock. TB-1 is where the U.S. Forest Service Strike Team, referred to as TEAMS (Talent, Expertise, Agility, Mobility and Simplicity), collected data and completed a LHE. More information on TEAMS is located in 7.2 Monitoring Protocols.

Table 6. Key Plant Species from the Loamy Upland 10-13” p.z. ecological site description on TB-1

Common Name	Scientific Name
Santa Rita threeawn	<i>Aristida californica</i> var. <i>glabrata</i>
Spidergrass	<i>Aristida ternipes</i>
Fourwing saltbush	<i>Atriplex canescens</i>
Black grama	<i>Bouteloua eriopoda</i>
Jumping cholla	<i>Cylindropuntia fulgida</i>
Slender janusia	<i>Janusia gracilis</i>
Lacy tansyaster	<i>Machaeranthera pinnatifida</i> var. <i>pinnatifida</i>
Bush muhly	<i>Muhlenbergia porteri</i>
Foothill palo verde	<i>Parkinsonia microphylla</i>
Yerba de venado	<i>Porophyllum gracile</i>
Velvet mesquite	<i>Prosopis velutina</i>
Desert globemallow	<i>Sphaeralcea ambigua</i>
Desert zinnia	<i>Zinnia acerosa</i>
Whitethorn acacia	<i>Acacia constricta</i>
False mesquite	<i>Calliandra eriophylla</i>
Fishhook barrel cactus	<i>Ferocactus wislizeni</i>
Ironwood	<i>Olneya tesota</i>
Yerba de venado	<i>Porophyllum gracile</i>
Red grama	<i>Bouteloua trifida</i>
Fluffgrass	<i>Dasyochloa pulchella</i>
Bull filaree	<i>Erodium texanum</i>
Engelmann pricklypear	<i>Opuntia engelmannii</i>
Desert Indianwheat	<i>Plantago ovata</i>
Fingerleaf gourd	<i>Cucurbita digitata</i>
Coyote melon	<i>Cucurbita palmata</i>
Bluedicks	subsp. <i>pauciflorum</i>
Saguaro	<i>Carnegiea gigantea</i>
Walkingstick cactus	<i>Cylindropuntia spinosior</i>
Staghorn cholla	<i>Cylindropuntia versicolor</i>

Data from TB-1 included the following observed plants in its key area in January of 2014: Annual forbs, three awn (*aristida* sp.), needle grama (*bouteloua aristidoides*), black grama (*bouteloua eriopoda*), hairy grama (*bouteloua hirsute*), Fairy Duster (*calliandra eriophylla*), buckhorn cholla (*cylindropuntia acanthocarpa*), jumping cholla (*cylindropuntia fulgida*), slender janusia (*janusia gracilis*), velvet mesquite (*prosopis velutina*) and sangre de cristo (*jatropha cardiophylla*).

The following plant list is from the Loamy Upland 12-16” ecological site description where University of Arizona collected data at KA-1 key area. These plants are potential, not observed, species listed for the ecological site description under plant preference by animal kind for both wildlife and livestock.

Table 7. Key Plant Species from the Loamy Upland 12-16” p.z. ecological site description on KA-1

Common Name	Scientific Name
False mesquite	<i>Calliandra eriophylla</i>
Cooley's bundleflower	<i>Desmanthus cooleyi</i>
Bluedicks	<i>Dichelostemma capitatum</i>
Arizona snakecotton	<i>Froelichia arizonica</i>

Common Name	Scientific Name
Engelmann pricklypear	<i>Opuntia engelmannii</i>
Mesquite	<i>Prosopis</i>
Desert globemallow	<i>Sphaeralcea ambigua</i>
Soaptree yucca	<i>Yucca elata</i>
Red threeawn	<i>Aristida purpurea var. longiseta</i>
Cane beardgrass	<i>Bothriochloa barbinodis</i>
Sideoats grama	<i>Bouteloua curtipendula</i>
Blue grama	<i>Bouteloua gracilis</i>
False mesquite	<i>Calliandra eriophylla</i>
Curly mesquite	<i>Hilaria belangeri</i>
Vine mesquite	<i>Panicum obtusum</i>
Tobosa	<i>Pleuraphis mutica</i>
Soaptree yucca	<i>Yucca elata</i>
Catclaw acacia	<i>Acacia greggii</i>
Fishhook barrel cactus	<i>Ferocactus wislizeni</i>
Cane cholla	<i>Opuntia spinosior</i>
Lycium	<i>Lycium</i>

Observed species list from 11/23/2015 Twin Buttes No. 2 KA-1 includes: Annual forbs, Annual grasses, sprucetop grama (*bouteloua chondrosioides*), black grama (*bouteloua eriopoda*), fairy duster (*calliandra eriophylla*), Arizona wrightwort (*carlowrightia arizonica*), cholla (*cylindropuntia*), teddybear cholla (*Cylindropuntia bigelovii*), slender janusia (*janusia gracilis*), ratany (*krameria*), bush muhly (*muhlenbergia porter*), pricklypear (*opuntia engelmannii*), mesquite (*prosopis*) and large-spike bristlegrass (*setaria macrostachya*).

6. INVENTORY AND MONITORING METHODOLOGY

The following sections describe the inventory and monitoring protocols that were used on the Twin Buttes No. 2 allotment in 2014.

6.1 Evaluation Protocol

6.1.1 Indicators of Rangeland Health

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

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

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

1. Rills: S, H
2. Water Flow Patterns: S, H

3. Pedestals and/or Terracettes: S, H
4. Bare Ground: S, H
5. Gullies: S, H
6. Wind-scoured, Blowout, and/or Depositional Areas: S
7. Litter Movement: S
8. Soil Surface Resistance to Erosion: S, H, B
9. Soil Surface Loss or Degradation: S, H, B
10. Plant Community Composition and Distribution Relative to Infiltration and Runoff: H
11. Compaction Layer: S, H, B
12. Functional/Structural Groups: B
13. Plant Mortality/Decadence: B
14. Litter Amount: H, B
15. Annual Production: B
16. Invasive Plants: B
17. Reproductive Capability of Perennial Plants: B

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

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

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

6.2 Monitoring Protocols

The standards were assessed for the Twin Buttes No. 2 Allotment by a contracted U.S. Forest Service interdisciplinary team consisting of rangeland management specialists and wildlife biologists (both with additional resource backgrounds in soils and botany). TEAMS Enterprise mission is to provide convenient and cost effective environmental planning, field services, and policy development through an exemplary workforce of dedicated, creative, and experienced natural resource specialists. Additional information is on their website: <https://www.fs.fed.us/teams/>.

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

Quantitative cover, and species composition, collected along each transect (Line Point Intercept) was used in conjunction with qualitative indicators of soil quality, hydrologic function, and biological health (Indicators of Rangeland Health) in order to assess existing condition of ecological sites at the TB-1 within the Twin Buttes No. 2 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 the TB-1 was the 17 indicators of rangeland health (NRCS 2005) and utilization.

6.2.1 Line Point Intercept (species composition and ground cover)

The method used to obtain transect data pertaining to species composition, and soil cover is the line point intercept (LPI). This method consists of a horizontal, linear measurement of plant intercepts along the course of a line (tape) 100' in Twin Buttes No. 2. It is designed for measuring grass or grass-like plants, forbs, shrubs, and trees. This method is a rapid, accurate method for quantifying soil cover, including vegetation, litter, rocks and biotic crusts. These measurements are related to wind and water erosion, water infiltration and the ability of the site to resist and recover from degradation. The LPI method measures vegetation cover along a given distance and from that composition is extrapolated.

6.2.2 Pace Frequency

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

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

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

6.2.3 Fetch

Fetch is the distance from the nearest perennial plant base within 360 degrees of the 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.

6.2.4 Dry Weight Rank

Dry weight rank estimates plant composition on a dry weight production basis. This data collection was made using a 40cm x 40cm plot frame and 100 placements. The three perennial species within a vertical projection of quadrats placed repeatedly (100 times) comprising the most annual biomass production on a

dry weight basis are ranked (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.

6.2.5 Utilization

Utilization is the proportion or degree of the current year's forage production that is consumed or destroyed by animals (including insects). Utilization may refer 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 USDOI, 1996).

Table 8. Herbaceous (grasses and forbs) utilization classes

Rating	Description
0-5%	The rangeland shows no evidence of grazing use or negligible use.
6-20%	The key species has the appearance of very light grazing. Plants may be topped or slightly used. Current 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 9. Browse (shrubs, half shrubs, woody vines, and trees) utilization classes

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

Rating	Description
	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.

7. MANAGEMENT EVALUATION AND SUMMARY OF STUDIES DATA

7.1 Actual Use

Actual use information will be submitted within 15 days of the end of the grazing year in accordance with 43 CFR 4130.3-2(d). Actual use reports will identify the amount of livestock use and period of use for each water source/pasture. According to billed use the lessee has paid for the full 84 AUMS on the lease from 1993-2016.

7.2 Key Area Data

Two key areas (KA-1 and TB-1) have been established, on public land, based on their representative features to measure the long-term trend of vegetation and ground cover.

Upland range health was evaluated at one key area (TB-1). Key area TB-1 is within the Loamy Upland 10-13" ecological site and is the location where the LHE was collected in 2014. Line point intercept, ground cover utilization and photos were taken at TB-1. The TB-1 key area was selected for consistency with average livestock use within the allotment. A quantitative and qualitative evaluation of rangeland health indicators was conducted in order to determine if any gaps existed between existing condition and the ecological reference condition. Using the evaluation, it was determined whether or not applicable resource standards were being met within the allotment.

KA- 1 was established by the BLM and University of Arizona (UA) and is located on the BLM land. KA-1 is within the Loamy Upland 12-16" ecological site, which constitutes the primary ecological site within the BLM lands in the allotment (Figure 4). Ground cover, pace frequency, dry weight rank and photos are collected at KA-1.

7.2.1 Utilization

Utilization, measured at Key Area TB-1, was 0 percent. TB-1 is approximately half a mile from permanent water and will show signs of livestock use when present.

7.2.2 Rangeland Health Evaluation

Table 10 and 11 below show the results from the evaluation completed in January 2014 on the Twin Buttes No. 2 allotment at TB-1. Every attribute ranked none to slight from the departure of the Loamy Upland 10-13" p.z. reference sheet.

Table 10. January 12, 2014 summary results from Rangeland Health Evaluation

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 11. Summary of 17 indicators for Loamy Upland 10-13" p.z. ecological site.

17 Indicators Reference Sheet	Rationale from January 2014
1. Number and extent of rills: none present on this site.	None to slight. None observed.
2. Presence of water flow patterns: Occupy approximately 10% of the area; discontinuous & long; ranging in length from 15-50 feet where gravel cover is less than 5%; flow appears to be strictly sheet flow where gravel cover is high.	None to slight. None observed.
3. Number and height of erosional pedestals or terracettes: Pedestals are common on half shrubs and suffrutescent forbs, ranging in height from 1-2"; terracettes are infrequent, 40-80 feet apart with a 1-3 inch elevation difference from above to below the terracette. CCC rock spreader structures in the enclosure have created terracettes with a 2-4 inch elevation difference from above to below the terracette.	None to slight. None observed.
4. Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground): 20-70%; on moist areas with higher slopes the gravel cover is higher and bare ground cover lower.	None to slight. 4% bare ground was recorded. Within ESD parameters.
5. Number of gullies and erosion associated with gullies: none	None to slight. None observed.
6. Extent of wind scoured, blowouts and/or depositional areas: none	None to slight. None observed.
7. Amount of litter movement (describe size and distance expected to travel): Litter is trapped and stays in place where gravel and vegetative cover levels are high. Litter moves in flow paths where gravel and vegetative cover levels are low.	None to slight. Litter observed at plant bases.

17 Indicators Reference Sheet	Rationale from January 2014
<p>8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): No slake test done. Expect ratings of 1-3 in bare ground areas and 4-5 under shrub canopies.</p>	<p>None to slight. Observed naturally heavy in gravel.</p>
<p>9. Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness): Thin platy compacted structure from rain drop impact, weak angular to subangular blocky structure from 1/8 to 4"; reference site has thickness to 2".</p>	<p>None to slight. None observed.</p>
<p>10. Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Canopy cover estimated at 18% (3% trees & shrubs, 7% subshrubs & suffrutescent forbs, 6% succulents, 2% perennial grasses), basal cover 1% is irregular patches with approximately 50% cover occupy 5-10% of area.</p>	<p>None to slight. Observed adequate vegetation cover with even distribution.</p>
<p>11. Presence and thickness of compaction layer (usually none; describe soil profile features that may be mistaken for compaction on this site): No compaction layer present. Shallow argillic horizon on this site feels like a compacted layer, but is not.</p>	<p>None to slight. None observed.</p>
<p>12. Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines: Dominant: Half shrubs & suffrutescent forbs > large shrubs > succulents > annual forbs & grasses > perennial grasses > cryptogams.</p>	<p>None to slight. Observed .diverse site per ESD though lacking tobosagrass.</p>
<p>13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Basal cover reduced 50%, primarily for perennial grass plants;</p>	<p>None to slight. Observed even age class distribution.</p>

17 Indicators Reference Sheet	Rationale from January 2014
canopy cover reduced 50% on half shrubs and suffrutescent forbs; canopy cover reduced > 50% on large shrubs and trees.	
14. Average percent litter cover (10-15%) and depth (0.25-0.5”):	None to slight. Litter amount was within the parameters of the site.
15. Expected annual production (this is TOTAL above-ground production, not just forage production): 228 lbs/ac unfavorable precipitation; 550 lbs/ac normal precipitation; 1100 lbs/ac favorable precipitation.	None to slight. Within site parameters.
16. Potential invasive (including noxious species (native and non-native). List Species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicator, we are describing what is NOT expected in the reference state for the ecological site: Euryops, Lehmann lovegrass, buffelgrass, fountaingrass, malta star-thistle, snakeweed & burroweed can increase to dominate with heavy livestock grazing. Introduced cool season annuals (red brome, filaree, Mediterranean grass).	None to slight. None observed.
17. Perennial plant reproductive capability: Not affected. Good size class distribution of subshrubs.	None to slight. Expected for the site.

TB-1 Loamy Upland 10-13” p.z.

Standard 1: Upland Sites

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

Criteria for meeting Standard 1:

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

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

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

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

As indicated by such factors as:

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

The ecological site for the TB-1 key area is Loamy Upland 10-13" p.z. ecological site. The ecological site guide indicates litter should be in the range of 10 to 70 percent with 0 to 65 percent of the surface potentially being covered by rocks or rock fragments, and a range of tolerable bare ground between 25 and 75 percent.

In 2014, it was observed that overall, soils on the allotment are stable, show biotic integrity, and are productive. Though changes have occurred over time, hydrologic, nutrient, and energy cycles continue to function. We observed very little to no soil loss or degradation. Native shrubs are very effective at holding soil cover due to their coarse fibrous root systems. In addition, rocks, other plants, and litter cover provide armor against wind erosion, increase infiltration, and decrease runoff.

Vegetative cover collected at TB-1 was adequate to ensure soil stabilization, and appropriate permeability rates within the ecological system. There were no rills/gullies present at the site, pedestals and/or terracettes were slight to non-existent. Wind scouring and litter movement were none to slight (Figure 7).

Figure 7. Photo of Key Area TB-1 Looking South in January 2014



The approximate potential ground cover (surface, basal, and foliar) is described in Tables 12 and 13 below. Table 12 specifically provides a comparison between the desired conditions as described by the ESD reference sheet for Loamy Upland 10-13" p.z. (NRCS 2008) and the current conditions of TB-1 in January 2014. Table 13 is a complete inventory of species that occurred. Foliar cover collected at TB-1 was 67 percent with 8 percent basal cover of native shrubs and grasses. Total litter cover was 72 percent with bare ground measuring 4 percent. Rock/rock fragments covered a total of 76 percent of the soil surface. Figure 8 shows that state and transition model for the Loamy Upland 10-13" ecological site.

Table 12. A Comparison between Reference Sheet and Current Conditions at Key Area TB-1

	<u>Basal Cover</u>				<u>Biological Crust</u>	<u>Litter</u>	<u>Surface Fragments > 1/4" & <= 3"</u>	<u>Surface Fragments > 3"</u>	<u>Bedrock</u>	<u>Bare Ground</u>
	<u>Grass/ Grass like</u>	<u>Forb</u>	<u>Shrub /Vine</u>	<u>Tree</u>						
ESD	0-4%	0-2%	1-4%	0-1%	15-30%	10-70%	1-65%	0-10%	0%	25-75%
TB-1	5%	0%	3%	0%	0%	72%	73%	3%	0%	4%

Table 13. Foliar Cover of Species Recorded in the Line Point Intercept Plot for Key Area TB-1 in January 2014

Key area information		Species	Line point intercept canopy cover at TB-1
Trend Plot 1 Twin Buttes No. 2 Allotment Range site: R040XA114AZ		Annual forbs	9%
		Three awn (<i>aristida sp.</i>)	4%
		Needle grama (<i>bouteloua aristidoides</i>)	29%
		Black grama (<i>bouteloua eriopoda</i>)	5%
		Hairy grama (<i>bouteloua hirsute</i>)	1%
		Fairyduster (<i>calliandra eriophylla</i>)	7%
		Buckhorn cholla (<i>cylindropuntia acanthocarpa</i>)	1%
		Jumping cholla (<i>cylindropuntia fulgida</i>)	8%
		Slender janusia (<i>janusia gracilis</i>)	1%
		Velvet mesquite (<i>prosopis velutina</i>)	2%
		Sangre de cristo (<i>jatropha cardiophylla</i>)	23%
Cover/Litter/Bare Ground			
Foliar Cover	67%		
Basal Cover	8%		
Bare Ground	4%		

KA-1 is within the Loamy Upland 12-16" ecological site. Tables 14 and 15 below show the results from 2015 monitoring on KA-1.

Table 14. Percent Ground cover on KA-1

Cover Type	Percent Cover
Bare ground	10.67%
Gravel (1/4"-3")	46.67%
Litter	34.67%
Rock >3"	7.33%
Live Basal Vegetation	0.67%

Table 15. Percent Frequency and Dry Weight Rank (DWR) on KA-1

Species	Percent Frequency	Percent DWR Weight Composition
Annual Forbs	88%	
Annual Grasses	1%	
Sprucetop grama (<i>bouteloua chondrosioides</i>)	5%	7.86%
Black grama (<i>bouteloua eriopoda</i>)	6%	14.52%
Fairyduster (<i>calliandra eriophylla</i>)	12%	23.81%
Arizona wrightwort (<i>carlowrightia arizonica</i>)	2%	0.48%
Cholla (<i>cylindropuntia</i>)	1%	9.29%
Cholla (<i>cylindropuntia</i>)-Canopy	3%	
Teddybear cholla (<i>cylindropuntia bigelovii</i>)	1%	1.67%
Slender janusia (<i>janusia gracilis</i>)	2%	0.48%
Ratany (<i>krameria</i>)	2%	7.14%
Ratany (<i>krameria</i>)-Canopy	1%	
Bush muhly (<i>muhlenbergia porter</i>)	3%	3.57%
Pricklypear (<i>opuntia engelmannii</i>)	5%	19.52%
Pricklypear (<i>opuntia engelmannii</i>)- Canopy	4%	
Mesquite (<i>prosopis</i>)	1%	11.43%
Mesquite (<i>prosopis</i>)-Canopy	4%	
Large-spike bristlegrass (<i>setaria macrostachya</i>)	1%	0.24%

Table 16. Comparison between KA-1 and ESD

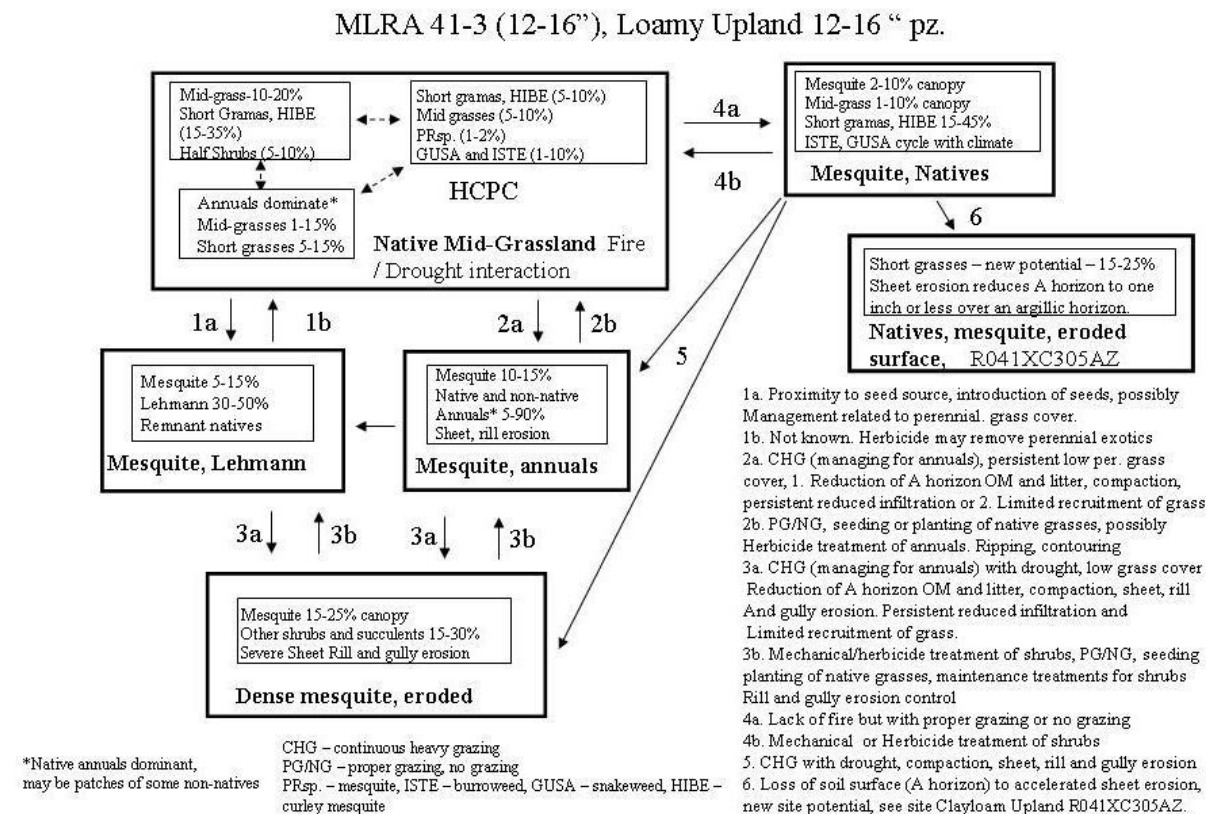
	Basal Cover				Biological Crust	Litter	Surface Fragments > 1/4" & <= 3"	Surface Fragments > 3"	Bedrock	Bare Ground
	Grass/ Grass like	Forb	Shrub/ Vine	Tree						
ESD	6-25%	0-1%	1-5%	0-1%	1-10%	10-60%	5-40%	0-15%	0%	15-25%
KA-1	2%	0%	0%	0%	0%	34%	46%	7%	0%	10%

Table 16 above compares the data from KA-1 on Twin Buttes No. 2 to the Loamy Upland 12-16" ecological site. Basal cover is lower than expected for the site and is largely due to the high percentage of annual forb frequency at 88 percent. Litter was recorded as 34 percent and 10-60 percent is expected for this site. Gravel cover is higher than expected by 6 percent (46 percent vs. 5-40 percent). Rock cover is in the middle of what is expected at 7 percent. Bare ground is below what is expected (15-25 percent) by 5 percent and was recorded as 10 percent. Figure 9 below is a photo of the KA-1 transect in 2015. Figure 10 below shows that state and transition model for the Loamy Upland 12-16" ecological site.

Figure 9. Photo of KA-1 transect



Figure 10. State and transition model for Loamy Upland 12-16”



Conclusion: The conclusion for TB-1 where the LHE was conducted is as follows: The data collected at TB-1 shows that foliar cover, litter, and rock cover are adequate to ensure soil stability and appropriate permeability rates within the ecological sites. The hydrologic, nutrient, and energy cycles are functioning properly. TEAMS observed very little to no soil loss or degradation in the form of rills, gullies, flow patterns, and plant pedestaling. Native shrubs and other plants, as well as rocks and litter cover were effectively providing armor against wind erosion, increasing infiltration, and decreasing runoff. In addition, TEAMS observed very little to no signs of erosion at either of the sites.

Overall, soils on the allotment are stable, show biotic integrity, and are productive. Though changes have occurred over time, hydrologic, nutrient, and energy cycles continue to function. TEAMS observed very little to no soil loss or degradation. Native shrubs are very effective at holding soil cover due to their coarse fibrous root systems. In addition, rock, other plant, and litter cover provide armor against wind erosion, increase infiltration, and decrease runoff.

The ESD describes the site as having “deep soils which have formed in loamy alluvium of mixed origin. Surface textures range from very gravelly sandy loam to loam. Sandy loam surfaces can be no thicker than 4” (8” for gravelly sandy loam). These soils all have argillic horizons near the surface. Plant-soil moisture relationships are fairly good.” The ESD further describes the plant communities as “naturally variable” where “composition and production will vary based on yearly conditions, location, aspect, soils,” and previous disturbances (NRCS 2008). The ESD for TB-1 describes the Historical Climax Plant

Community (HCPC) as “The potential plant community is an open stand of desert trees with an understory of low shrubs, cacti and perennial grasses and forbs. The aspect is shrubby.”

The key area at TB-1 reflects conditions as described within the ESD. There is none to slight departure from reference condition, which was demonstrated by a reduced frequency of grasses and an increase in shrubs and annual forbs. This is likely a result of heavy historical grazing and drought throughout the western United States. Despite these perturbations, soil conditions on the allotment, at the key areas and as a whole, are productive and stable providing for functioning hydrologic, energy, and nutrient cycles.

Standard 2 Riparian-Wetland Sites

Standard does not apply.

Standard 3 Desired Resource Conditions

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

Criteria for meeting Standard 3:

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

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

As indicated by such factors as:

- Composition
- Structure
- Distribution

Exceptions and exemptions (where applicable):

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

Evaluation: In general, the composition, structure and distribution are similar to what is described within the ESDs throughout a majority of the allotment. However, line point intercept (LPI) cover data collected at both of the key areas indicates that primary plant species, such as purple threeawn (*Aristida purpurea*), black grama (*Bouteloua eriopoda*), and bush muhly (*Muhlenbergia porteri*) are reduced. These warm season grammanoid species are desirable/preferred species by livestock and wildlife and are decreaseers within a range site as a result of herbivory. Two of these species were observed within the allotment though at significantly reduced frequencies. These species did not occur within the established monitoring sites. Historical livestock grazing combined with drought has caused a significant decrease of primary species within these ecological sites resulting in the annual native species to become dominant in some cases. The current vegetative composition of both perennial and annual native species within the allotment is appropriate for the range site and is conducive to meet the requirements of the Taylor

Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and other applicable laws, regulations, and policies.

The vegetative community and associated ESD at TB-1 (Table 17) are indicated below. Trees and saguaros did not fall within the transect that was read at TB-1. However, they were present on the site, and made up an estimated 5-7 percent of the canopy cover in the area. Shrubs dominated the mid-level canopy, making up 32 percent of the foliar cover, and annual grasses and forbs (annual grasses present but not in LPI transect) were abundant. The functional/structure group was found to have a slight deviation from the state and transition community as described within the ESD (Table 18). The site is lacking in suffrutescent grasses, which is likely a result of heavy grazing that occurred historically in the area. Although slight deviations from the reference community exist, the composition (Figure 11) and structure of the vegetation still provides well distributed habitat for wildlife (general wildlife and sensitive species) and other multiple uses.

Table 17. A comparison between the cover data found in the ESD and the LPI data collected in January 2014 at TB-1

Cover data described by the ESD for a HCPC Community	LPI Data
Suffrutescent grass/herb – 5 to 25%	Black grama (<i>bouteloua eriopoda</i>) – 5% Canopy cover Hairy grama (<i>bouteloua hirsute</i>) – 1%
Trees and Saguaro – 5-10% Canopy cover	Yellow paloverde and Saguaro present at site, but underrepresented in LPI transect (combined estimated 10-15% canopy cover)
Shrubs – 10 to 25% Canopy cover	Fairyduster (<i>calliandra eriophylla</i>) - 7% Canopy cover Sangre de cristo (<i>jatropha cardiophylla</i>) – 23%
Annuals forbs and grasses fluctuate with climate (drought/El Nino)	Annual forbs – 9% Canopy cover

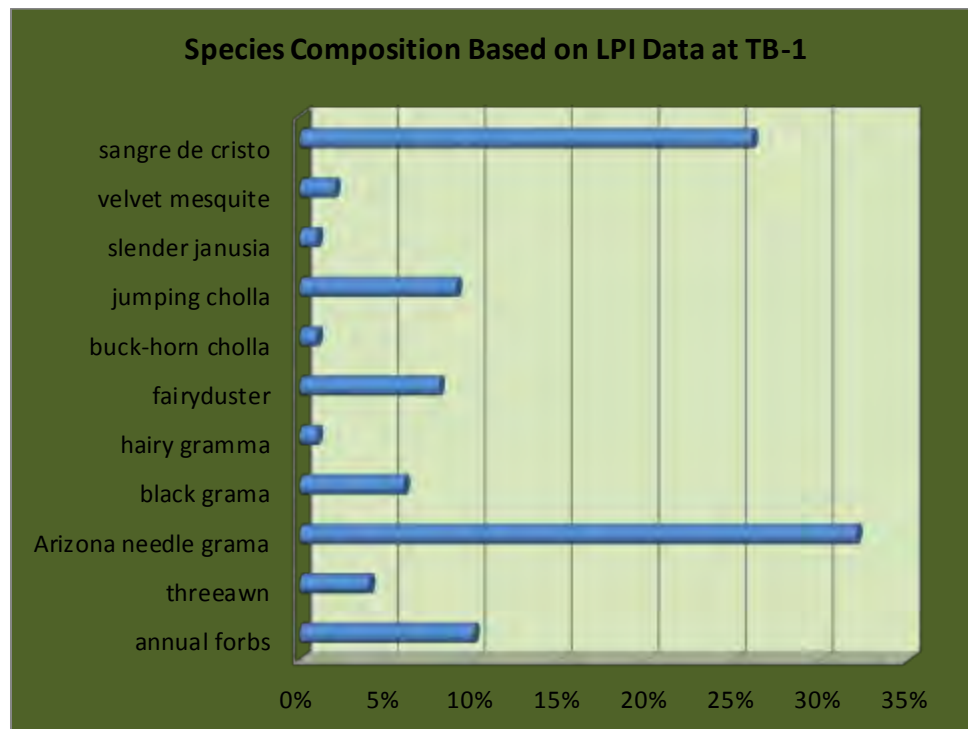
Table 18. Functional/structural plant groups at TB-1

Ranking	Species List for Functional/Structural Groups at TB-1
S	Mesquite (<i>prosopis</i>)
S	Jumping cholla (<i>cylindropuntia fulgida</i>)
S	Buck-horn cholla (<i>cylindropuntia acanthocarpa</i>)
M	Pricklypear (<i>opuntia engelmannii</i>)
S	Three awn (<i>aristida</i>)
T	Spring flower of stone (<i>selaginella lepidophylla</i>)
S	Arizona needle grama (<i>bouteloua aristidoides</i>)
T	Slender janusia (<i>janusia gracilis</i>)
M	Cholla spp (<i>cylindropuntia</i>)
M	Black grama (<i>bouteloua eriopoda</i>)
T	Barrelcactus (<i>ferocactus</i>)
M	Annual Forbs
S	Spiny hackberry (<i>celtis ehrenbergiana</i>)
M	Yellow paloverde (<i>parkinsonian microphylla</i>)

Ranking	Species List for Functional/Structural Groups at TB-1
M	Fairyduster (<i>calliandra</i>)
T	Arizona passionflower (<i>passiflora arizonica</i>)
T	Broom snakeweed (<i>gutierrezia sarothrae</i>)

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

Figure 11. Canopy Cover Species composition at TB-1 based on LPI data collected in January 2014



Conclusion: The current vegetative composition of native species within the allotment is appropriate for the range site and is conducive to meeting 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. Overall, the ecological condition within the community is functioning within the parameters of the ESDs.

No utilization was observed on any plants at TB-1. Therefore, other factors, such as historical grazing, fire, and wide spread drought may have changed the composition of the plant species at the sites. Given the xeric nature of the sites, recovery and/or replacement of primary perennial species will likely be slow, lasting decades, as described in the ESD.

Standard 3 Desired Plant Community Objective

As part of the land health evaluation process, a Desired Plant Community (DPC) objective was established for important biological resources in the Twin Buttes No. 2 allotment. DPC objectives address the desired resource conditions based on vegetation attributes, such as composition, structure,

and cover that are desired within the allotment. These include establishing vegetative characteristics necessary for soil protection, providing forage and habitat for both livestock and wildlife.

Loamy Upland 10-13" p.z. ecological site:

Maintain plant species diversity such that the potential plant community is an open stand of desert trees with an understory of low shrubs, cacti and perennial grasses and forbs. The aspect is shrubby.

Conclusions:

Key Area TB-1 DPC Objectives:

- Maintain perennial Grasses/Grasslike plants composition of $\geq 15\%$
ACHIEVED
- Maintain a palatable shrub composition of $\geq 10\%$
ACHIEVED
- Maintain vegetative foliar cover at $\geq 15\%$
ACHIEVED
- Maintain current vegetative diversity in the key area.
BASELINE ESTABLISHED

The grass composition objective is being met at this TB-1. The most current long-term monitoring data shows a grass composition of 48 percent (Figure 8). Palatable shrub composition on the site is met for mule deer with palatable browse (Van Devender, et al. 2002; Oftedal 2002; Heffelfinger) consisting of 10 percent of the plant community (Figure 8: mesquite, fairyduster, slender janusia). The 10 percent palatable browse is well within the 2-19 percent expected within this ESD. The vegetative foliar cover objective is being met at this site, with foliar cover of 67 percent. No sign or utilization (0 percent) by livestock was observed at TB-1. Because the transect layout used in past monitoring was not documented and was not repeated in 2014 previous data cannot be directly compared to current monitoring data. Therefore, the data collected in 2014 establishes the baseline for monitoring trend in vegetative diversity.

8. CONCLUSIONS

8.1 Determination of Land Health Standards

Standard 1: Upland Sites

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that appropriate to soil type, climate and land form.

Determination:

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

Conclusion: (Standard Achieved)

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

Standard 3: Desired Resource Conditions

Determination:

- Meeting the Standard
- Not Meeting the Standard; making significant progress toward 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. Though the frequency of desirable native primary grammanoid species such as tobosa, black grama, and bush muhly is less than what is recommended in the ESD, the presence of the species within the allotment, though diminished in frequency, is an indicator that the overall ecological condition within the community is functioning within the parameters of the ESDs. In addition, the structure and distribution of vegetation is sufficient to support and sustain native wildlife populations in the area.

9. RECOMMENDED MANAGEMENT ACTIONS

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

9.1 Proposed Terms and Conditions

Terms:

Allotment	Livestock # and Kind	Grazing Period of Use	Percent Public Land	AUMs	Type Use
Twin Buttes No. 2	7 Cattle	3/1 to 2/28	100	84	Active

Conditions:

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

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

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

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

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

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

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

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